Most-Often-Needed

1960

Volume TV 17

Television

Servicing Information

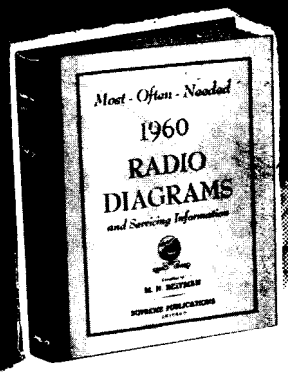
Compiled by

M. N. BEITMAN

SUPREME PUBLICATIONS

PRICE $3

New SUPREME 1960 Radio Manual



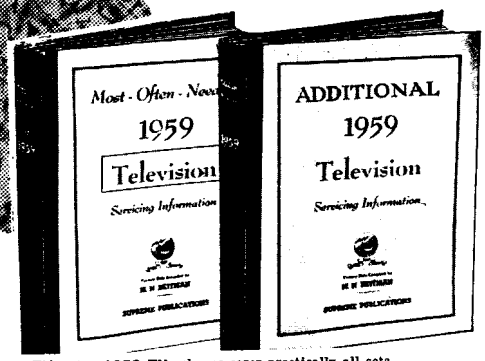
Be prepared to repair quickly all new 1960 radio sets. In this big volume you have easy-to-use, large schematics, needed alignment data, printed circuits views, parts lists, voltage values, information on transistors, hints, location of trimmers, and dial stringing, for almost every 1960 radio. Includes auto radios, stereo, portables, and all types and makes of *home* sets. Giant in size, 8½ x 11"; manual style, sturdy binding. Price, only **$2.50**

RADIO DIAGRAMS

Now you can benefit and save money with **Supreme** amazing scoop of 1960. This one giant volume has all the service data you need on all recent radio sets. A full year of models of all popular makes, home and auto sets, portable radios, stereo, combinations, all included. The full price for this mammoth 1960 manual is only $2.50, nothing else to buy for a whole year. Other popular **Supreme** radio service volumes for previous years (mostly at $2) are described at right. Separate **TV** manuals are listed below.

SUPREME RADIO MANUALS FOR PREVIOUS YEARS

Use **Supreme** manuals to repair all radios faster, easier; save time and make more money. Here is your lowest-priced service data. Covers all years, from 1926-38 to 1959 models, in 18 volumes. Used by 174,000 shrewd servicemen. Most volumes only $2 each, see coupon. Average volume 190 large pages, 8½ x 11 inches. Quality printing, easy to use, manual-style binding. Amazing values. Be wise, use these manuals to get all needed diagrams, voltages, alignment facts, and service hints, at the smallest cost.



These *two* **1959 TV** volumes cover practically all sets of all makes. The new ADDITIONAL **1959 TV** manual includes material almost to the minute. Each giant manual has 192 pages of service data and repair hints, factory changes, double-size circuits. Special price, each only.. **$3**

New ADDITIONAL 1959 TV Volume

LARGE MANUAL COVERS NEWEST 1959 TV SETS
EARLIER TV VOLUMES STILL SOLD AT ONLY $3

AMAZING BARGAINS

Supreme twin **1959 TV** manuals are the scoop of the year. Cover all sets of all important makes. New ADDITIONAL **1959 TV** volume gives you the very latest material. Your price for this mammoth manual is only **$3.** *Supreme* super values defy competition. Each prior-year manual (at only $3) has a whole year of service material. Each volume covers different material, from 1948 to latest 1959 sets. Include circuits, waveforms, alignment, voltage charts, service hints, changes, and double-spread diagrams. Practically tell you how to make every repair. More pages, more data per dollar of cost. To get the best for less, get all *Supreme* manuals.

Supreme **TV** manuals supply all needed service material on every TV set of every important manufacturer. Here is helpful, practical, factory-prepared data. It will really make TV servicing and adjustment easy for you. Join 167,000 servicemen who use, benefit, and save with SUPREME service manuals. In these volumes you get correct factory-checked circuits, alignment procedure, printed boards views, service hints, recommended changes, wave-forms, voltages, easy-to-use giant-size diagrams.

BEST AT LOWEST COST

Here is your TV service material to help you do expert work double-quick; and priced at only $3 per annual volume. Be ready to repair any model by carrying in your car all 14 TV volumes listed in coupon below. Or try one of the new **1959 TV** manuals to see what an amazing bargain you get for only **$3.** See *no-risk* coupon.

NO-RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 1760 Balsam Rd., Highland Park, ILL.

MOST-OFTEN-NEEDED

☐ 196_ Radio Manual, $2.50

☐ 1959 ☐ 1958 ☐ 1957 ☐ 1956 — Popular RADIO Diagram Manuals at only $2.50 each....

☐ 1955 Radio Manual, only $2

☐ 1954 ☐ 1953 ☐ 1952 ☐ 1951 ☐ 1950 ☐ 1949 — These annual RADIO volumes specially priced at only $2.50 each....

☐ 1948 ☐ 1947 ☐ 1946 ☐ 1942 ☐ 1941 ☐ 1940 — THIS GROUP ONLY $2 EACH

☐ 1926-1938 Manual, $2.50

☐ Radio and TV Master Index, 25¢

Rush today **TV** manuals checked ☒ below and **Radio** manuals at left. Satisfaction guaranteed.

☐ *New* **Additional 1959 Television** Manual, only **$3.**

☐ **Early 1959 Television** Manual, **$3.** ☐ **1958 TV, $3.**

☐ **Early 1957 TV, $3.** ☐ **Additional 1957 TV, $3.**

☐ **1956 TV** Manual, **$3.** ☐ **Additional 1955 TV, $3.**

☐ **Early 1955, $3.** ☐ **1954 TV, $3.** ☐ **1953 TV, $3.**

☐ **1952 TV, $3.** ☐ **1951 TV, $3.** ☐ **1949 TV, $3.**

☐ **1948 TV, $3.** ☐ **1957-58 RCA TV** Manual, **$1.50**

☐ I am enclosing $..... Send postpaid.

☐ Send C.O.D. I am enclosing $.....deposit.

Name: .....

Address: .....

Supreme Publications

Sold by All Leading Parts Jobbers

CONTENTS

(Continued on page 4)

Table of Contents, Continued

THEORY
PRACTICE EXPERIENCE

THIS IS A MARK OF SUPREME PUBLICATIONS

This manual is made up of factory prepared service material. Editorial changes and selections were made to conform with the objectives of this manual. Our sincere thanks and appreciation is extended to every manufacturer whose products are covered by the material in this manual and who aided us in the preparation of this book.

M. N. Beitman, Chief Editor of the Engineering Staff, Supreme Publications.

Admiral

20G6, 20UG6, 20H6, 20J6 and 20M6 CHASSIS

The group of television chassis listed above are similar and use 23-inch picture tube. Model identification chart is below at left. The 20G6 chassis is a manually tuned VHF receiver using turret tuner 94E164-7, and its complete schematic diagram is printed on pages 14-15. The 20UG6 chassis is a VHF-UHF receiver and except for tuners is identical to 20G6. The 20H6 chassis in the main is similar to 20G6 except that 3S1 stereo sound amplifier is used with a switching arrangement for changing to phono operation, and two rectifiers (5U4GB and 5Y3GT) are used in the power supply. The 20J6 chassis is also similar, but incorporates a 3S1 stereo sound amplifier, a separate 8W1 radio tuner (see page 18 for diagram), a record changer, and associated switching arrangement. There are two 5U4GB rectifiers used in the power supply. The 20M6 chassis is a VHF receiver operated by both push-bar manual tuning and Son-R remote tuning. A 7-tube remote control amplifier of this receiver (7T1, see page 13 for diagram) is a separate sub-chassis mounted unit. VHF turret tuner 94E164-9 is used with tuning motor and gear assembly. The complete diagram of this TV chassis is printed on pages 16-17.

MODEL IDENTIFICATION CHART

MODEL NUMBER	TV CHASSIS	VHF TUNER
T24M21, T24M22, T24M23	20G6	94E164-7
T24UM21, T24UM22, T24UM23	20UG6	94E164-8
*TS24M52, TS24M53	20M6	94E164-9
C24M21, C24M22, C24M23	20G6	94E164-7
C24UM21, C24UM22, C24UM23	20UG6	94E164-8
C24M32, C24M33, C24M34	20G6	94E164-7
C24UM32, C24UM33, C24UM34	20UG6	94E164-8
*CS24M52, CS24M57	20M6	94E164-9
L24M22, L24M27	20G6	94E164-7
L24UM22, L24UM27	20UG6	94E164-8
L24M31, L24M34, L24M37	20G6	94E164-7
L24UM31, L24UM34, L24UM37	20UG6	94E164-8
*LS24M52, LS24M53, LS24M54	20M6	94E164-9
†ST24M61, ST24M62, ST24M63	20H6	94E164-7
†ST24M72, ST24M77	20H6	94E164-7
‡STR24M81, STR24M82, STR24M83	20J6	94E164-7
‡STR24M92, STR24M97	20J6	94E164-7

*Remote tuning model using S41A or S41B Son-r Tuner and 7T1 Remote Control Amplifier.

‡Combination model using 8W1 FM-AM Radio and 3S1 Stereo sound amplifier.

†Model using 3S1 Stereo sound amplifier.

VHF CHANNEL SLUG ADJUSTMENT FOR ALL SETS EXCEPT SON-R MODELS

a. Turn the set on and allow 15 minutes to warm up.

b. Set **VHF Channel Selector** for a station; set other controls for normal picture and sound.

c. Remove **VHF Channel Selector** knob.

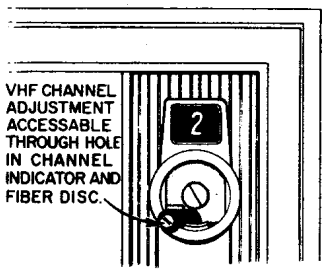


Figure 24. Front View of Escutcheon in All Chassis Sets Son-R Models. Channel Knob Removed.

d. Turn Fine Tuning knob to the left or right until channel slug becomes visible through lower left hole in channel indicator disc and hole in fiber disc in front of tuner; see figure 24. Note: It may be necessary to move channel indicator disc slightly to left or right for making channel slug visible.

e. Carefully insert 3/32" screwdriver blade, flexible non-metallic alignment tool through hole in channel indicator and fiber disc. When alignment tool engages channel slug, carefully adjust slug for best picture.

If adjustment is properly made, it is possible to tune from one VHF station to another by merely turning VHF Channel Selector knob. Adjust as follows:

(Continued on pages 6 through 18)

ADMIRAL Chassis 20G6, 20UG6, 20H6, 20J6, 20M6, Service Information, Continued

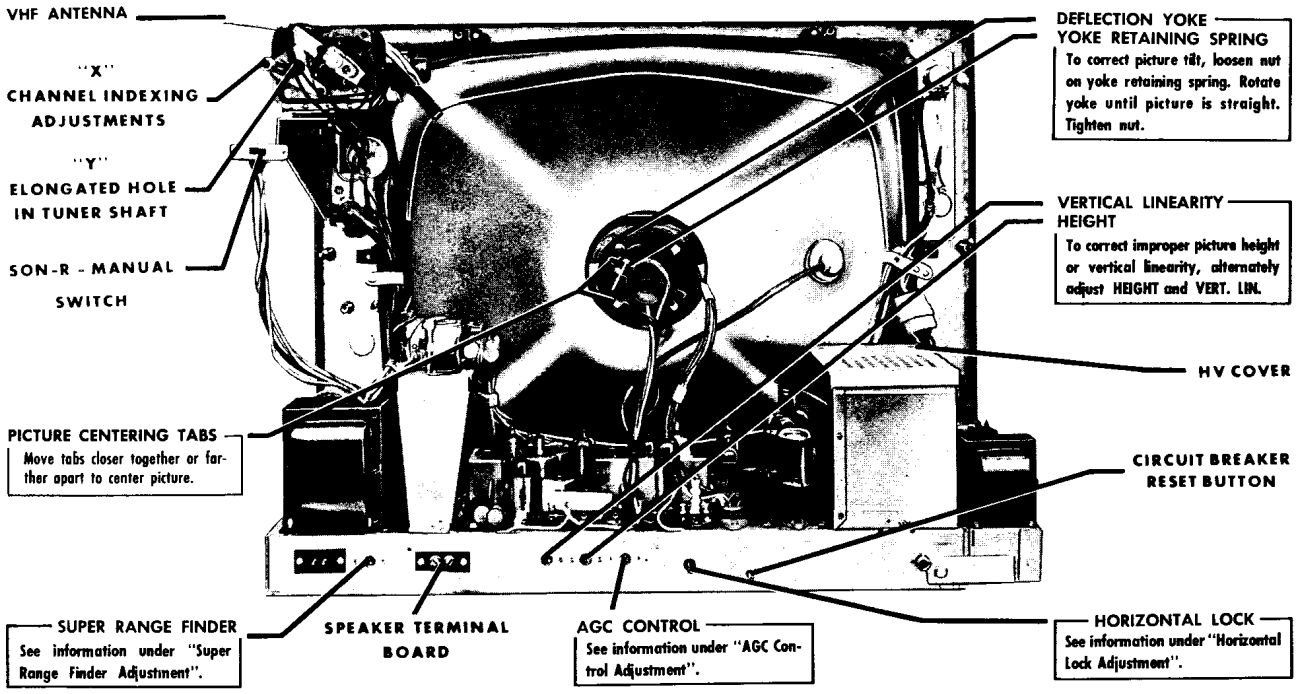


Figure 23. Rear View of 20M6 Chassis Showing Adjustment Locations.

VHF CHANNEL SLUG ADJUSTMENT FOR SON-R MODELS

Check channel slug adjustment for each VHF station received. With proper adjustment, good pictures will be obtained on each channel without need for retuning **Fine Tuning** control. Adjust Channel Slugs, as follows:

1. Remove knobs from in front of push-bar escutcheon.
2. Remove push-bar escutcheon by inserting blade of screwdriver into bottom hole and very gently pry it away.
3. To break contact of push-bar switch, insert a small folded slip of paper around center switch contact.
4. Turn the set on and allow 15 minutes to warm up.
5. At rear of set, carefully insert a 3/16" wide blade screwdriver into elongated hole "Y" extending from end of tuner shaft, see figure 23. When screwdriver engages elongated hole, turn screwdriver until desired channel number appears on channel indicator screen.
6. Turn Fine Tuning shaft to left or right until channel slug becomes visible through lower left hole in channel indicator disc and hole in fiber disc at front of tuner; see figure 25. Note: It may be necessary to move channel indicator disc slightly to left or right for making channel slug visible. Carefully insert 3/32" screwdriver blade, flexible non-metallic alignment tool through hole in channel indicator and fiber disc. When alignment tool engages channel slug, carefully adjust slug.
7. Repeat steps 5 and 6 for each operating channel.
8. After making adjustments, turn set off, remove paper slip from push-bar switch. Reassemble escutcheon and tuning knobs to set. Check adjustment on all channels.

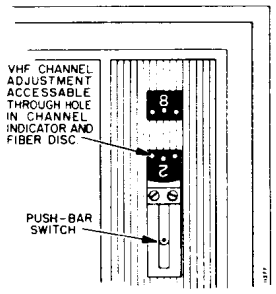


Figure 25. Front View of Escutcheon in Son-R Models. Knobs and Push-Bar Escutcheon Removed.

AGC CONTROL ADJUSTMENT

Note: This control is set at the factory and will not normally require field readjustment.

Improper AGC control adjustment can result in picture bending, tearing (overloading) or buzz in the sound. However, these same conditions can also be caused by other troubles in the set.

If adjustment is required, it should be made exactly as instructed below.

1. Turn set on and allow 15 minutes to warm up.
2. Turn Channel Selector to strongest station in the area.
3. Turn Contrast and Brightness controls to maximum (fully to the right).
4. Set Super Range Finder and AGC controls at rear of set, to minimum (fully to the left).
5. Adjust Horizontal Lock (at rear of set) and Vertical Hold control (at front of set) for steady picture, without bending of vertical lines at top of picture.
6. Very slowly turn AGC control to the right, until picture just begins to bend, tear, shift, or buzz is heard in sound. Then very slowly turn the AGC control to the left, to the point at which picture bending, tearing, shifting and buzz is removed.

ADMIRAL Chassis 20G6, 20UG6, 20H6, 20J6, 20M6, Service Information, Continued

7. Make final adjustment by turning AGC control approximately 10 degrees further to the left.
8. Recheck at maximum contrast on all channels. Picture should not overload and should reappear immediately after changing channels.

IMPORTANT: AGC adjustment should always be made on the strongest TV station received. If adjustment is made only on a weak station, AGC overload may occur when a strong TV station is tuned in.

Note: For Super Range Finder Adjustment see following paragraph.

SUPER RANGE FINDER ADJUSTMENT

The Super Range Finder control cannot be set properly if the Horizontal Lock, Vertical Hold or AGC controls are out of adjustment. **Before attempting to adjust the AGC control, see information under "AGC Control Adjustment".**

The Super Range Finder control is used to improve sync stability in areas (especially fringe areas) where interference caused by ignition systems, switches, motors, etc. results in an unstable picture. **NOTE: At the factory, this control is set completely to the left. It should only be turned from its original position if picture is unstable.**

To adjust, turn Super Range Finder control (at rear of set) to the right until picture becomes stable. A compromise setting of the control may be required in areas having both strong and weak signals. If the control is set too far to the right, picture may overload on the strong signals.

IMPORTANT: Keep the Super Range Finder control as far to the left as possible while still maintaining good sync stability on all channels.

HORIZONTAL LOCK ADJUSTMENT

Make adjustment if picture "slips sideways" or "tears" when switching channels. Adjustment is made by rotating flexible shaft extending from rear of set. Adjust as follows:

1. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for normal picture. Important: Before proceeding, be sure that AGC and Super Range Finder controls have been adjusted according to instructions in this manual.
2. Reduce Contrast to minimum. Very slowly turn Horizontal Lock adjustment to the right or left until picture is in sync. Interrupt the television signal by switching Channel Selector off and on channel. Picture should remain in sync. If picture bends or loses sync, adjust the Horizontal Lock so that picture remains in sync and bending of vertical lines does not appear at top of picture. Check adjustment on all channels; if necessary, repeat procedure.

REMOVING CHASSIS FROM CABINET

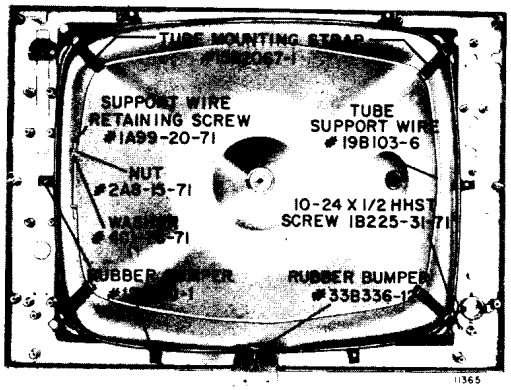
For servicing convenience, chassis including picture tube and front escutcheon are removable as a unit from in front of cabinet. Remove chassis as follows:

1. Remove cabinet back. Disconnect antenna and speaker.
2. Remove chassis mounting screws from bottom of cabinet.
3. From inside of cabinet, remove screws which mount front escutcheon to front of cabinet. Note: A 5/16" socket wrench with 20" long shank will be required for sets with metal cabinet.
4. Remove chassis from cabinet by securely grasping sides of front escutcheon.
5. To reinstall chassis in cabinet, very carefully guide chassis through front of cabinet. In metal cabinet models, the front edges of the cabinet must fit firmly into grooved surfaces of rear of metal escutcheon. In wood cabinet models, guide metal locating pins (at rear of escutcheon) into matching holes in cabinet.
6. After chassis and escutcheon are firmly seated in cabinet, reassemble screws mounting escutcheon to front of cabinet. Reassemble chassis mounting screws at bottom of cabinet. Reconnect antenna and speaker.

PICTURE TUBE REPLACEMENT

The picture tube of these receivers is mounted directly to the front escutcheon as shown in the figure below. To replace picture tube, proceed as follows:

1. Remove chassis, picture tube, yoke coil and front escutcheon as a unit from the front of the cabinet as instructed under "Removing Chassis From Cabinet".



Rear View of Escutcheon with Picture Tube Mounted, Chassis Removed.

2. Remove tuning knobs. Place chassis on a solid table with escutcheon face downward on a clean, soft cloth. Caution: To prevent damage to front tuning controls, place escutcheon on table so that control shafts overhang edge of table.
3. Remove static charge from picture tube by discharging second anode well to chassis ground.
4. Disconnect yoke connector plug, picture tube socket and picture tube second anode lead. If dial light is used, disconnect dial light from mounting bracket.
5. Disconnect brackets mounting VHF tuner and front panel controls by removing bracket mounting screws.
6. Remove screws from brackets at each side of chassis.
7. Remove screws which support inside center of chassis to bracket at bottom of picture tube.
8. After removing chassis mounting screws, securely grasp chassis and carefully remove it from mounting brackets.
9. Remove deflection yoke from picture tube after loosening clamping nut on band at rear of yoke cap.

ADMIRAL Chassis 20G6, 20UG6, 20H6, 20J6, 20M6, Service Information, Continued

10. To remove picture tube from front escutcheon, loosen retaining screw on tube support wire. Remove screws mounting tube support straps.
11. To mount replacement tube, place tube on front escutcheon with second anode well located on same side as original tube. Reassemble support wire and mounting straps removed in step 10.
12. Reassemble deflection yoke to neck of picture tube.
13. Mount chassis to escutcheon brackets by assembling mounting screws removed in steps 6 and 7.
14. Mount VHF tuner and tuning control support brackets to escutcheon.
15. Connect deflection yoke plug, picture tube socket and second anode lead. Reassemble pilot light socket.
16. Turn receiver on and make picture adjustments as instructed in figure on front page. Important: After making picture adjustments, be sure to tighten nut on clamping band at rear of yoke cap. Readjust indexing of channel indicator disc by rotating disc.
17. To reinstall chassis in cabinet, see steps 5 and 6 under "Removing Chassis From Cabinet."

INDEXING CHANNEL INDICATOR DISC

To index channel indicator disc for proper channel indication, remove channel selector knob and using a thin screwdriver, carefully rotate indicator disc in either direction until number coincides with VHF channel tuned in.

If channel number appears blurred, adjust by moving dial light bracket forward or backward for sharp, clear figure on indicator screen.

INDEXING POWER TUNING MECHANISM TO STOP ONLY ON OPERATING CHANNELS

1. Turn set on. Set Son-r Manual switch at rear of set to "Manual" position.
2. Press channel bar tuning control (at front of set) until a non-operating channel number appears on channel indicator screen at front of set.
3. Insert a 3/16" wide blade screwdriver into hole "X". When screwdriver blade engages slot in nylon indexing adjustment, very slowly turn adjustment one half turn to the right (clockwise) until a stop is felt. Repeat steps 2 and 3 for each non-operating channel.
4. If channel tuner skips an operating (desired) channel, insert a 3/16" wide blade screwdriver into hole marked "Y" on cabinet back. When screwdriver engages elongated hole at end of tuner shaft, turn screwdriver until desired channel number appears on channel indicator.
5. Insert a 3/16" wide blade screwdriver into hole marked "X" in cabinet back. When screwdriver blade engages slot in nylon adjustment, very slowly turn adjustment to the left (counterclockwise) about one-half turn until a stop is felt. Repeat steps 4 and 5 for all operating (desired) channels.

PRE-SETTING MAXIMUM VOLUME LEVEL

When operating the receiver with Son-r remote tuning, the sound volume (loudness) is tunable to either of four pre-set levels (mute, low, medium and loud volume). However, in order to obtain the proper loudness at each of these sound levels, it is first necessary to pre-set the highest volume level at which the receiver may be operated.

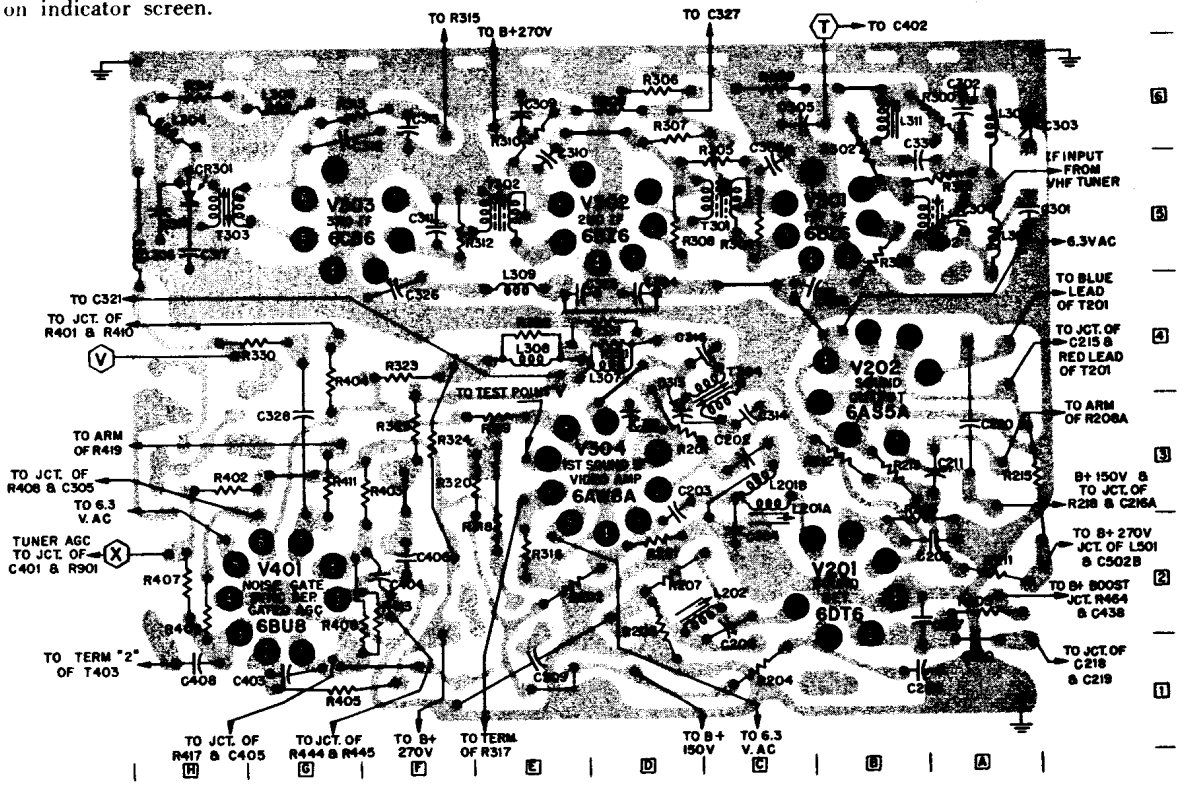


Figure 26. View of ETCHED SIDE of Etched Circuit Board A7623-1. Gray area represents etched circuitry; black symbols and lines represent components and connections on opposite side.

ADMIRAL Son-R Tuners S41A, S41B, used in Chassis 20M6, Continued

SERVICING SON-R TUNERS

The hand held Son-r tuner is entirely mechanical, and does not contain tubes, transistors, batteries, wires, or connecting cables. Under normal handling, the Son-r tuner should seldom if ever require service attention. The tuner should be handled with moderate care and should not be subject to sharp impact by dropping or striking it. If the Son-r tuner is dropped on a solid surface or subjected to other rough handling, the resonator bars may slip from their original position, and thus become inoperative or cause intermittent tuning.

The Son-r tuner can be disassembled after removing the cover retaining screws, see figure 38. Figure 36 shows the correct location of each resonator bar. Figure 37 shows the method of inserting resonator bars within retaining springs.

Important: For removing or inserting resonator bars, it is first necessary to remove mechanism from bottom cover as shown in figure 37.

Note also, that retaining springs on holder must fit within grooved surfaces at center of resonator bars. Insertion of a resonator bar in a wrong position will cause incorrect receiver operation. Insert resonator bars in original position within bracket as shown in figure 36.

To restore retaining springs to proper shape, remove resonator bars from bracket. Caution: Before proceeding, note relative position of each bar in tuner so that bars can be inserted in their original location.

Using long nose pliers, straighten retaining wire (remove bends). Important: It is not necessary to remove retaining wire from bracket unless wire is bent badly out of shape or has to be replaced.

Weak or intermittent operation may also be caused by the hammer spring being bent out of alignment. A gap of .030" should exist between the hammers and the resonator bars. If the hammer is located too far from a resonator bar, weak signals will result. If a hammer touches a resonator bar, damping action will result and operation may be weak, or intermittent.

IMPORTANT CHECKS WHEN SERVICING SON-R TUNERS

When servicing, note following checks, which are important for proper operation, see figures 36 and 37.

1. Bars must be centered within circular mounting holes in bracket.
2. Retaining springs must be perfectly seated in grooves at top and bottom of bars.
3. Ends of retaining springs must extend equally from both sides of bracket.

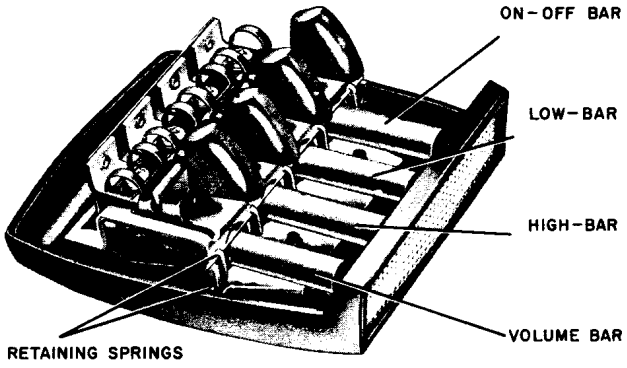


Figure 36. Top View of Son-R Tuners S41A and S41B Showing Location of Resonator Bars.

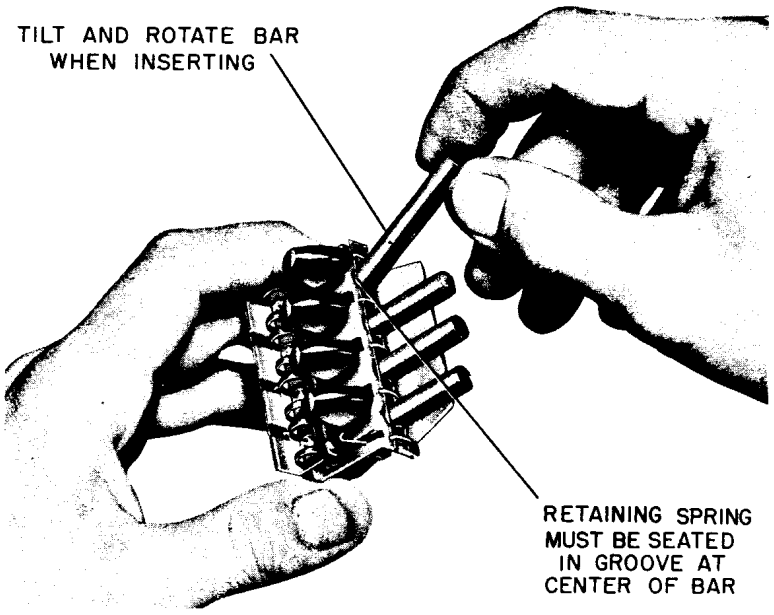


Figure 37. Method of Inserting Resonator Bars in Son-R Tuners S41A and S41B.

ADMIRAL Chassis 20G6, 20UG6, 20H6, 20J6, 20M6, Alignment Information, Continued

IF AMPLIFIER ALIGNMENT

- Connect negative of 3.0 volt bias supply through 10K resistor to test point "T" (IF AGC), see figures 10 and 11, positive to chassis.
- Connect generator high side to 6CG8 mixer-osc. insulated tube shield, see figure 5. Connect low side to chassis near tube shield.
- Connect VTVM high side to test point "V" through a decoupling filter, see figures 7, 10 and 11.
- Set Channel Selector to channel 12 or other unassigned high channel, to prevent interference during alignment.
- Connect a jumper wire across the antenna terminals.
- Set Contrast control fully to the right (clockwise).
- Set AGC and Super Range Finder controls fully to the left (counterclockwise).
- Allow about 15 minutes for receiver and test equipment to warm up.
- Use a non-metallic alignment tool, part No. 98A30-12.

Step	Signal Gen. Freq.	Instructions	Adjust
Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.			
1	45.3 MC	Use —3 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 2 volts.	A1 and A2 for max.
2	43.5 MC		A3 and A4 for max.
3	41.5 MC		A5 for maximum.
4	42.0 MC		A6 for maximum.
5	41.25 MC	If necessary, increase generator output and/or reduce bias to —1 ½ volts to obtain a definite indication on VTVM.	A7 for minimum.
6	39.75 MC		A8 for minimum.
7	47.25 MC		A9 for minimum.
8	43.5 MC	Same as "STEP 1".	A3 for maximum.

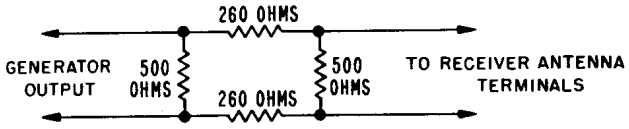


Figure 6. Circuit of 12 DB Attenuation Pad for Viewing Over-all VHF IF Response Curve.

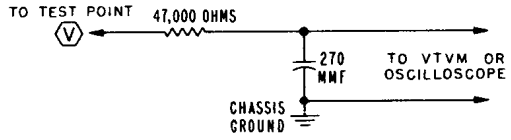


Figure 7. Decoupling Filter.

IF RESPONSE CURVE CHECK (Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 3 or an unassigned low channel. Contrast control fully to the left. Connect negative of 3 volt bias supply to test point "T" (IF AGC); positive to chassis.	Connect high side to 6CG8 mixer-osc. insulated tube shield, see fig. 5. Connect low side to chassis near tube shield. Set sweep frequency to 43 MC, and sweep width approximately 7 MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect high side to test point "V" thru a decoupling filter, see figs. 7, 10 and 11.	Check curve obtained against ideal response curve in fig. 8. Note tolerances on curve. Keep marker and sweep outputs at very minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitude without altering the shape of the response curve. If the curve is not within tolerance or the markers are not in the proper location on the curve, touch-up with IF slugs as instructed below.

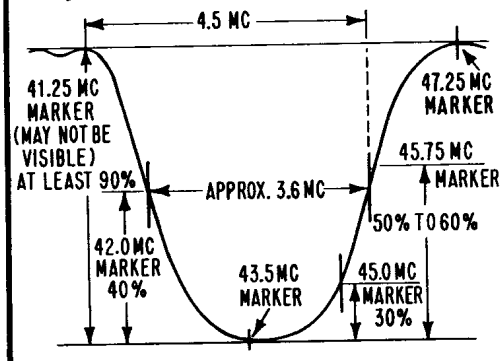


Figure 8. Ideal IF Response Curve.

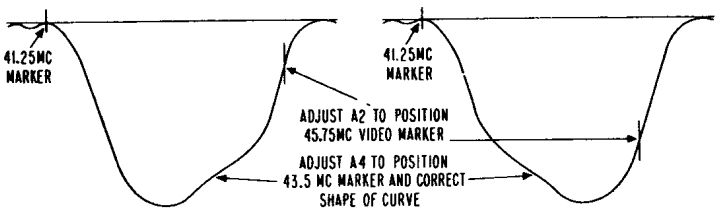
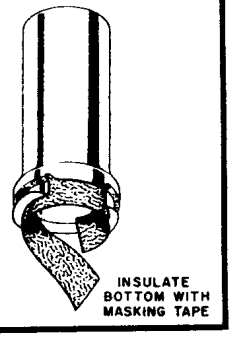


Figure 9. IF Response Curves, Incorrect Shape.

Figure 5. Special Tube Shield for IF Alignment and IF Response Curve Check.



4.5 MC SOUND IF ALIGNMENT USING TELEVISION SIGNAL

For simplicity and required accuracy of the 4.5 MC signal frequency, the sound alignment procedure given in the manual uses a transmitted TV signal rather than test equipment.

Important: Note that step 3 of the sound IF alignment procedure requires the use of a strong transmitted TV signal. Steps 5 and 6 requires the use of a weak (attenuated) TV signal. Failure to use a television signal of the required level as instructed for each of the steps will cause incorrect alignment with resulting weak or distorted sound.

Make alignment adjustments as follows:

1. Remove cabinet back. Turn set on and allow 15 minutes for warm up.
2. Select the strongest TV station received. AGC control must be in proper adjustment, see procedure on page 6. Adjust other controls for normal operation. Turn Super Range Finder Control fully to the left (counterclockwise). See figures 10 and 11 for adjustment locations.
3. Using a non-metallic alignment tool (for hexagonal core IF slugs, Admiral Part No. 98A30-12), very slowly turn slug "A10" several turns counterclockwise until a buzz is heard in the sound. Then turn it clockwise until the loudest and clearest sound is obtained. NOTE: There may be two points (approximately ½ turn apart) at which sound is loudest. The slug should be set at the center range of the second point of loudest sound noted as the slug is turned in (toward etched circuit board).
4. Set Contrast control fully to the left (counterclockwise). Reduce the signal to the antenna terminals until there is a considerable amount of hiss in the sound. For best results, it is recommended that a step attenuator be connected between the antenna and the antenna terminals. The signal can also be reduced by disconnecting the antenna and placing it in close proximity of the antenna terminals or tuner antenna lead-in.
5. Carefully adjust slug "A11" for loudest and clearest sound with minimum hiss level. If hiss disappears during alignment, reduce signal input to maintain hiss level; readjust "A11".
6. Carefully adjust slug "A12" for loudest and clearest sound with minimum hiss level. If hiss disappears during alignment, reduce signal input to maintain hiss level; readjust "A12" Caution: Adjustment "A12" is slug nearest bottom of shield can; use care so as not to disturb slug nearest top of shield can.
7. If the above steps are correctly made, no further adjustment should be required. However, if sound remains distorted at normal volume level when receiver is tuned for best sound, repeat entire procedure.

Caution: Do not readjust slug "A10" unless sound is distorted. If "A10" is readjusted, all steps in alignment procedure should be repeated exactly as instructed above.

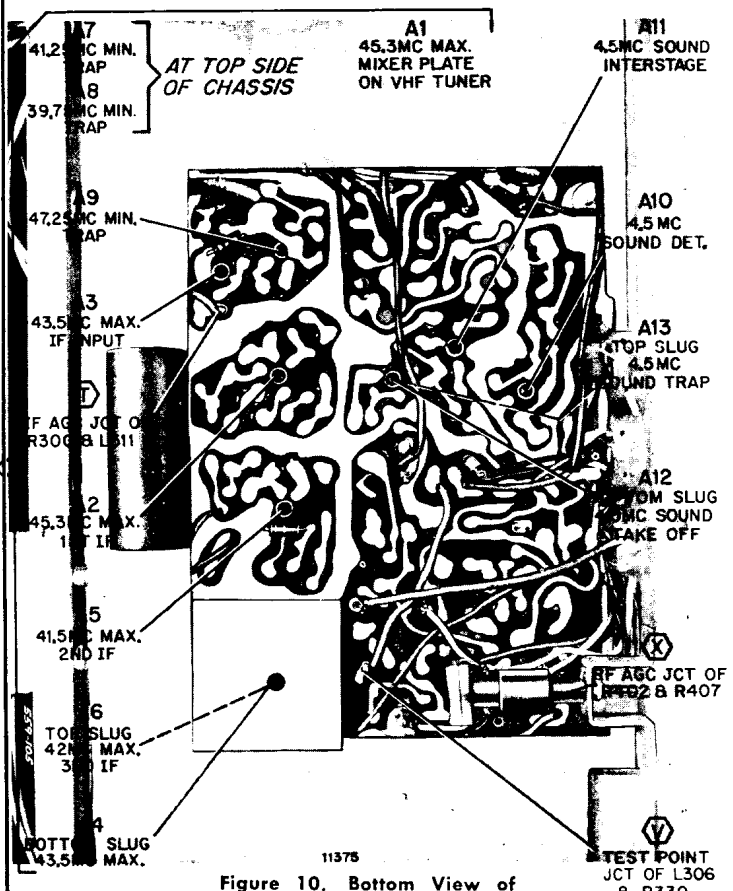


Figure 10. Bottom View of Chassis Showing Test Point Locations and IF Alignment Data. VHF Tuner at Top of Illustration.

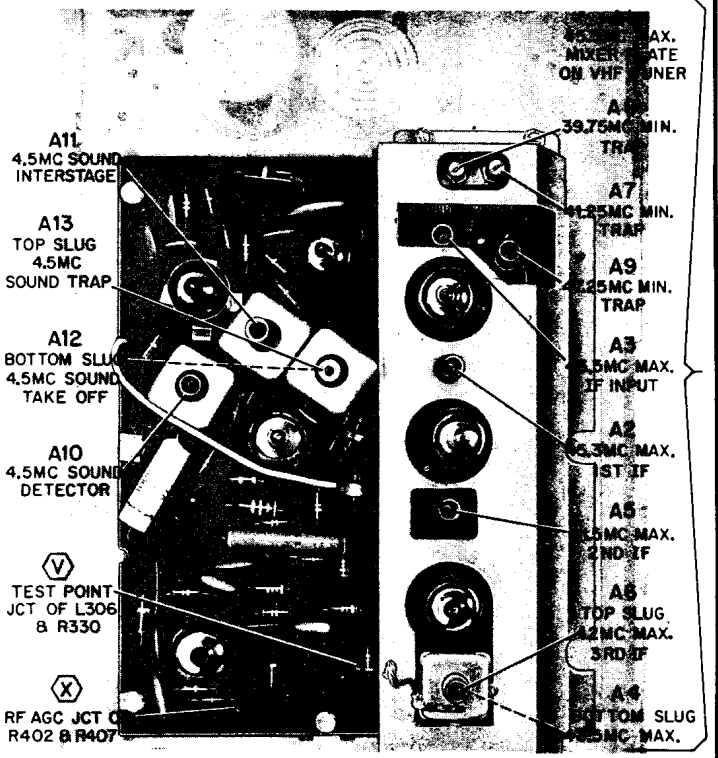


Figure 11. Inside Chassis View of Etched Circuit Board Showing Test Point Locations and IF Alignment Data.

ADMIRAL Remote Control Amplifier 7T1 used in Chassis 20M6, Continued

SERVICING REMOTE CONTROL AMPLIFIER

SERVICING 7T1 REMOTE CONTROL AMPLIFIER

The remote amplifier is a separate sub-chassis mounted at side of main chassis. The amplifier utilizes its own built-in transformer type power supply with plug-in connections so that it can be operated separately from the television chassis. To remove the amplifier chassis for servicing, disconnect connector plug and microphone clamp. Remove screws which mount it to the television chassis.

Note: Since the amplifier chassis obtains its 117 volt AC power from the television chassis, a matching 12 pin socket with line cord connected to pins 1 and 2 is required for operating the amplifier without connection to the television chassis.

CHECKING 117 VOLT AC CIRCUITRY

The 117 volt AC power for operating the television receiver, and remote control amplifier are interconnected through the various switches, relay contacts and connectors contained in the television and remote control amplifier

The 117 volt AC power to the television and remote amplifier chassis is applied through television OFF-ON switch S501, Son-r-Manual switch S506, and contacts of ON-OFF relay S504. Note that contacts of ON-OFF relay S504, are of the "memory type". These contacts alternately open and close, and remain in that position until the ON-OFF push button of the Son-r tuner is again operated.

Power to operate the 24 volt AC motor of the channel tuning mechanism is obtained through contacts of high channel relay K503, low channel relay K502, motor disconnect switch S502 and motor rotation switch S503. When the High or Low push button (on the Son-r tuner) is operated, the switch contacts of higher channel relay K503 or lower channel relay K502 remain closed until the 24 volt AC circuit is opened by motor disconnect switch S502. Note that contacts of motor disconnect S502 are opened or closed by the round or flat surface on the nylon channel indexing screws of the channel tuning rotor disc.

CHECKING OPERATION OF RELAY CONTROL TUBE AND PLATE CIRCUIT RELAY

The operation of a relay control tube and its associated plate circuit relay, may be checked by momentarily shorting the control grid of the tube to chassis ground. Shorting the control grid to chassis ground, reduces the grid bias, thus allowing the tube to conduct. When the tube conducts, the plate current pulse energizes the plate circuit relay for operating the associated switching circuit.

If momentary shorting of the control grid does not cause the associated plate circuit relay to operate, check the relay control tube, voltages at tube socket and mechanical action of the relay for possible cause of trouble.

Operation of the plate circuit relay upon momentary shorting of the control grid is an indication that the cause of trouble lies in circuitry ahead of the control tube. Check tubes in preceding stages of the amplifier, the plug and socket connectors and the mechanical action of the hand held Son-r tuner, etc.

Relay contacts can be checked by removing relay dust cover (if used) and mechanically actuating the relay armature with an insulated tool. Use moderate pressure to prevent bending of contacts or disturbing spring tension which could lead to erratic or faulty relay operation. If actuating relays does not operate circuit function, trouble could be in the cable assemblies, socket and plug connections or channel tuner motor and switch assembly.

Note: There are differences in operation of switches used with the various relays. Relay K504 operates a "memory type" switch having two operating positions. The pole contacts of the memory type switch alternately changes position with each succeeding relay click (pulse).. Note: Relays K502 and K503 operate conventional single-pole double-throw switches. These switch contacts remain closed momentarily, upon each relay click (pulse).

SERVICING VOLUME SWITCH

Volume step switch S505 is a twelve position rotary switch comprised of a phenolic board with etched circuit contacts, see figure 33. This switch (part of relay K501) operated by a ratchet lever much like a stepper relay. Although the volume switch has twelve positions, it operates entirely as a four circuit switch, since each fourth contact is connected in the same parallel circuit. When volume switch is operated, it successively repeats itself in steps from off or on, low volume, medium volume to full volume position.

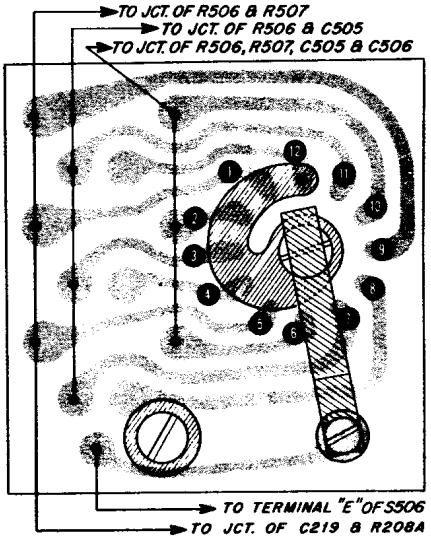


Figure 33. View of ETCHED CIRCUIT SIDE of Volume Switch S505 (part of Volume step relay K501). Gray area represents etched circuitry; black symbols and lines represent components and connections on opposite side.

Should the stationary contacts of volume switch require cleaning, great care must be exercised to prevent damage to surfaces of etched circuitry. Using moderate pressure, clean surface of etched circuitry with a soft piece of canvas cloth. CAUTION: Do not use a contact cleaner which may dissolve adhesive from etched circuit and thus cause it to peel.

IMPORTANT: Contact pressure of switch arm on etched wiring should be moderate (10 to 25 grams). A rough check for contact pressure can be made by inserting a piece of thin paper (such as a dollar bill) between the switch arm and contact surface. A slight pressure should be felt as the paper is withdrawn from between the switch arm and contact surface.

ADMIRAL Chassis 20G6, 20UG6, 20H6, 20J6, 20M6, Schematic Notes, etc., Continued

SCHEMATIC NOTES

Numbers and letters inside hexagons indicate alignment points.

Fixed resistor values shown in ohms ± 10% tolerance, ½ watt; capacitor values shown in micromicrofarads ± 20% unless otherwise specified.

NOTE: K = x 1000, MEG = x 1,000,000, MF = microfarad.

B+ Circuit Breaker or Fuse: The B+ supply of these receivers are equipped with a thermal type circuit breaker (having a manual reset button) or a type "N" slow-blow fuse, see Schematic symbol M504. Allow a few minutes for circuit breaker to cool off before pressing reset button. Replace fuse with same type used in set.

Heater Circuit Fuse: A one inch length of number 26 gauge bare annealed copper wire is used. Fuse wire is located at underside of chassis, adjacent to the power transformer.

CONDITIONS FOR OBSERVING WAVEFORMS

Warning: Pulsed high voltages are present at the caps of V405 and V407, and at pin 3 of V406. **Do not** attempt to observe waveforms at these points unless suitable test equipment is used.

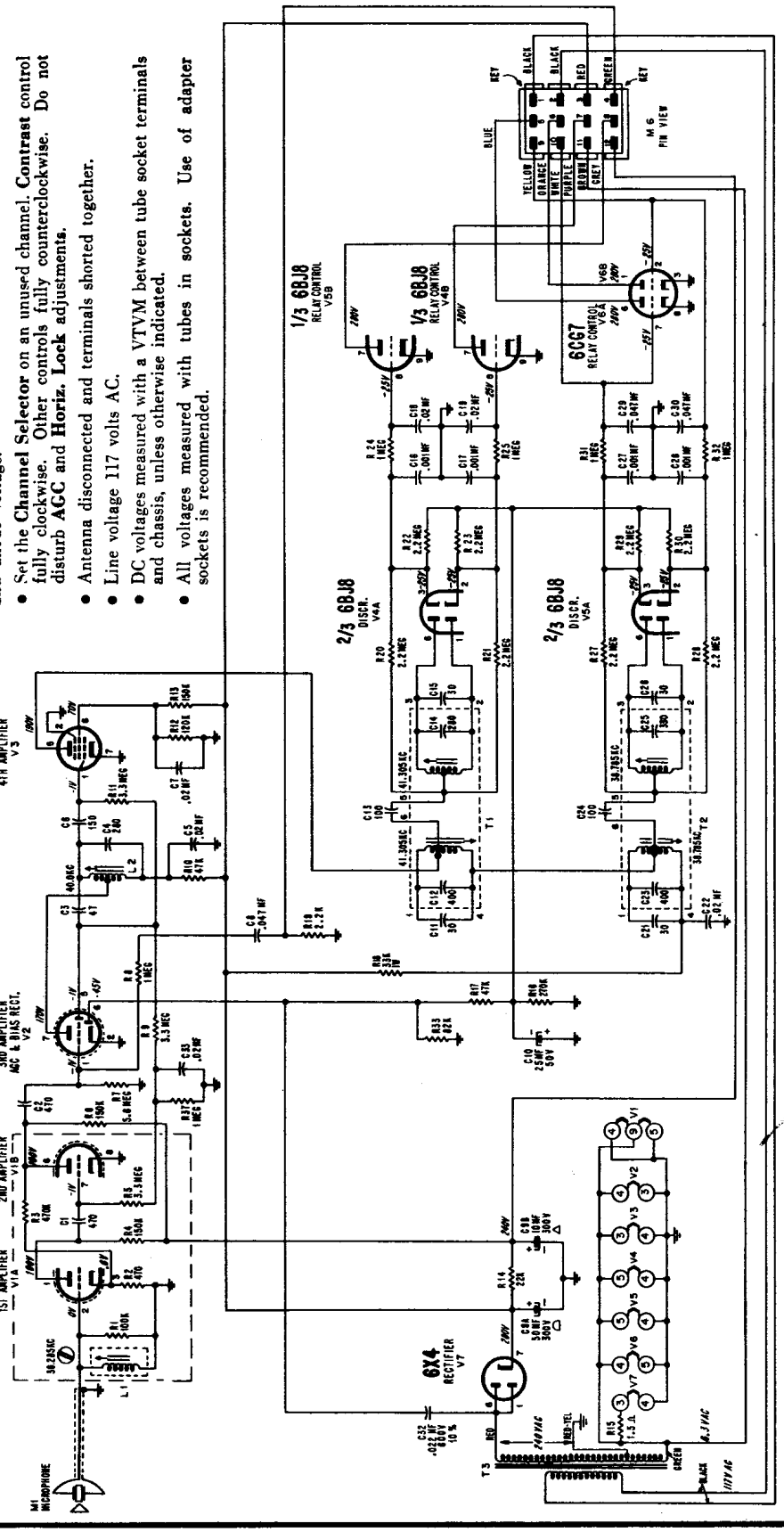
- Set tuning controls for normal picture. Set **Super Range Finder** control fully counterclockwise. Do not disturb **AGC** and **Horiz. Lock** adjustments. After the receiver is set for a normal picture turn the **Contrast** control fully clockwise.
- Oscilloscope sweep is set at 30 cycles for vertical waveforms and at 7,875 cycles for horizontal waveforms, to permit 2 complete cycles to be observed.
- Peak-to-Peak voltages will vary from those shown on the schematic depending on the input signal strength, test equipment employed and chassis parts tolerance.
- Waveforms were taken with a comparatively strong transmitted signal input to the television chassis.

CONDITIONS FOR MEASURING VOLTAGES

Warning: Pulsed high voltages are present at the caps of V405 and V407, and at pin 3 of V406. **Do not** attempt to measure voltages at these points without suitable test equipment. A VTVM with a high voltage probe should be used when measuring picture tube 2nd anode voltage.

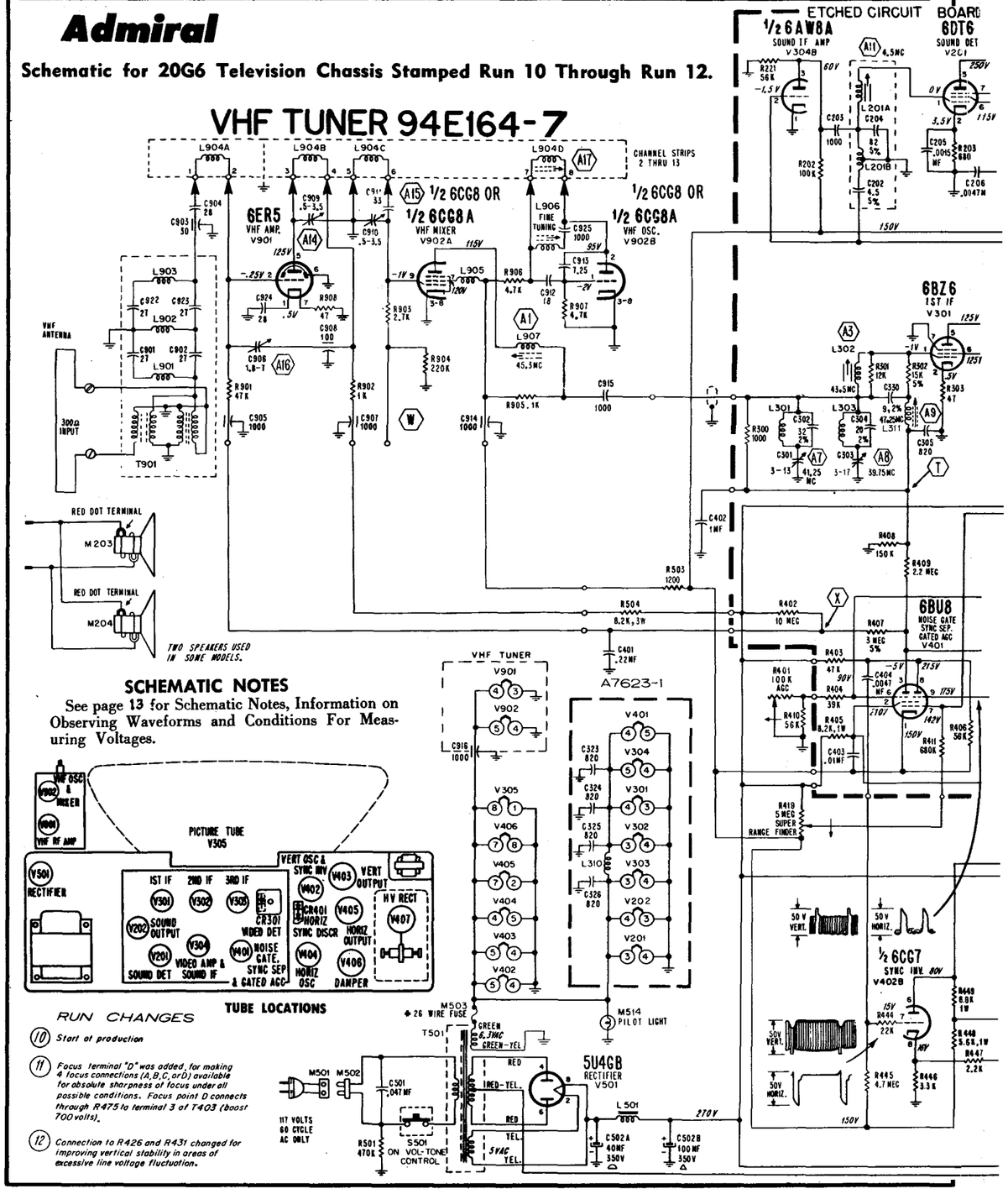
- Set the **Channel Selector** on an unused channel. **Contrast** control fully clockwise. Other controls fully counterclockwise. Do not disturb **AGC** and **Horiz. Lock** adjustments.
- Antenna disconnected and terminals shorted together.
- Line voltage 117 volts AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- All voltages measured with tubes in sockets. Use of adapter sockets is recommended.

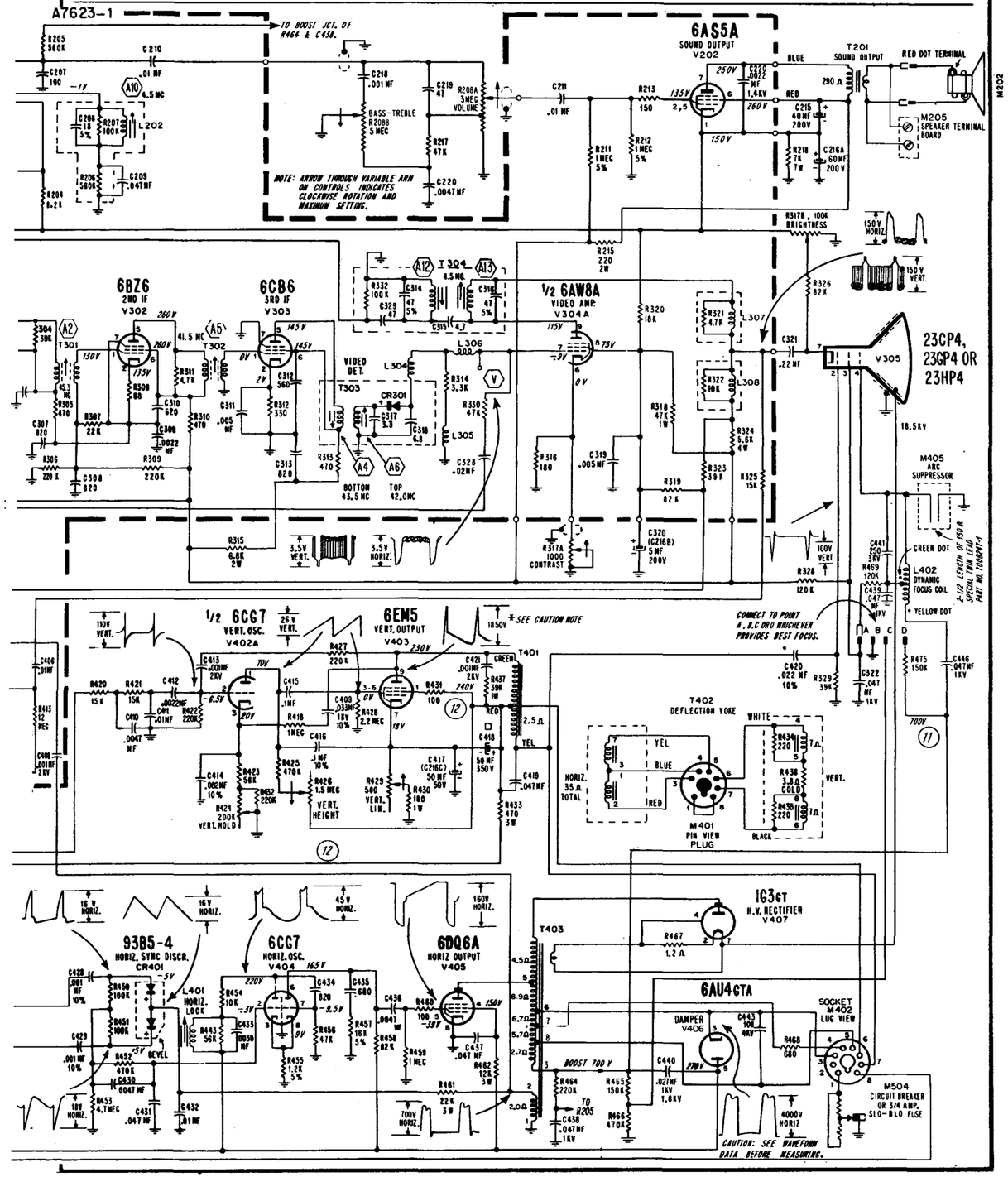
Schematic for 7T1 Remote Control Amplifier.



Admiral

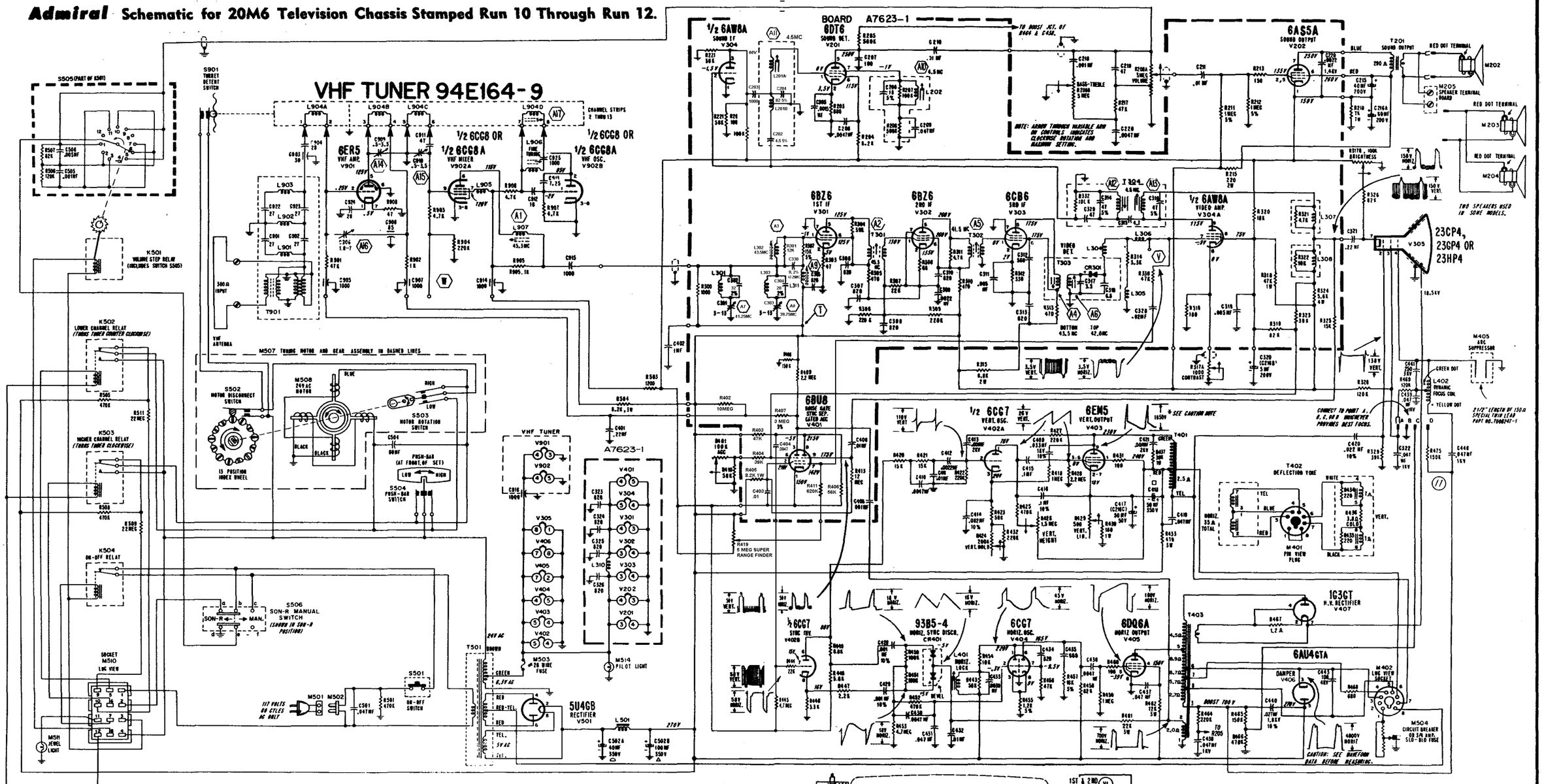
Schematic for 20G6 Television Chassis Stamped Run 10 Through Run 12.





VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

Admiral Schematic for 20M6 Television Chassis Stamped Run 10 Through Run 12.



SCHEMATIC NOTES, MEASURING VOLTAGES AND WAVEFORMS

See page 13 for Schematic Notes, Information on Observing Waveforms and Conditions For Measuring Voltages.

RUN CHANGES

(10) *Start of production.*

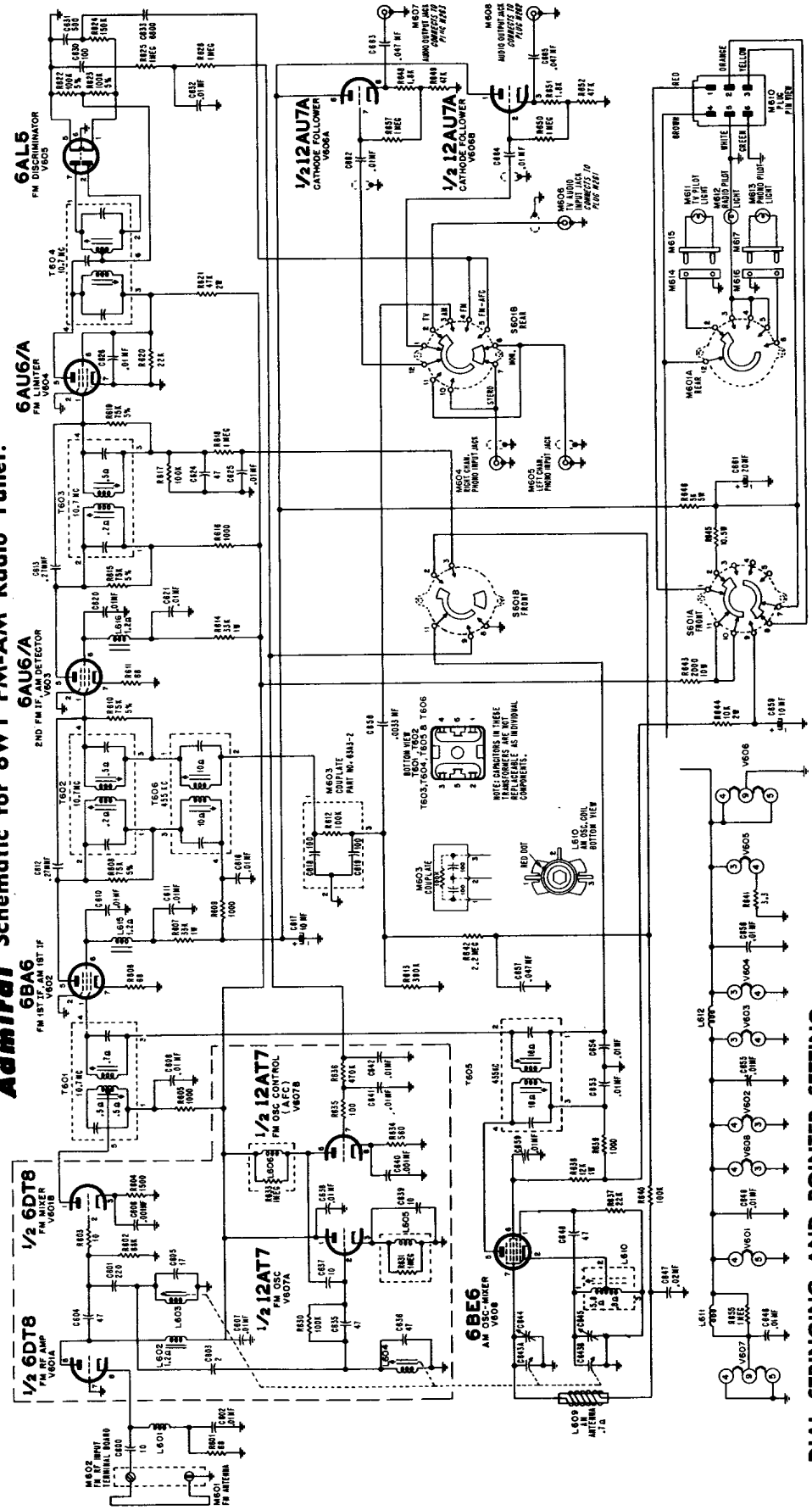
(11) *Focus terminal "D" was added, for making 4 focus connections (A, B, C or D) available for absolute sharpness of focus under all possible conditions. Focus point "D" connects through R475 to terminal 3 of T403 (boost 700 volts).*

(12) *Connection to R426 and R431 changed for improving vertical stability in areas of excessive line voltage fluctuation.*

TUBE COMPLEMENT

V1—12AX7	V202—6AS5A	V305—23CP4,	V405—6DQ6A
V2—6AV6	V301—6BZ6	23GP4 or	V406—6AU4GTA
V3—6AU6	V302—6BZ6	23HP4	V407—1G3GT
V4—6BJ8	V303—6CB6	V401—6BU8	V501—5U4GB
V5—6BJ8	CR301—1N87 or	CR401—9385-4	V901—6ER5
V6—6CG7	1N87A	V402—6CG7	V902—6CG8
V7—6X4	(Crystal Diode)	V403—6EM5	or 6CG8A
V201—6BT6	V304—6AW8A	V404—6CG7	

ADMIRAL
8W1 FM-AM Tuner
used in 20J6 Chassis



DESCRIPTION

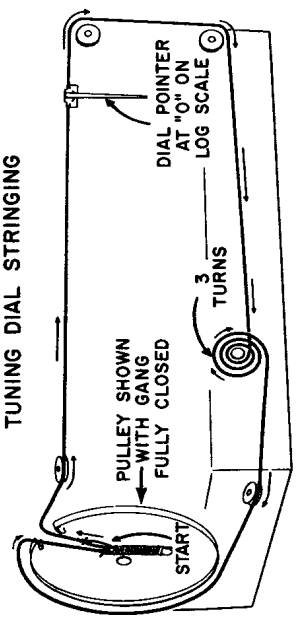
The 8W1 FM-AM radio tuner is a sub-chassis mounted separate from the television chassis. Since the radio sub-chassis utilizes the power supply of the television chassis, it cannot be operated separately. To remove radio sub-chassis for servicing, disconnect power supply plug from television chassis. Disconnect pilot light, phono and audio connector plugs from the radio sub-chassis. Remove radio tuning knobs and mounting nuts which mount radio sub-chassis to cabinet. Important: Before disconnecting connector plugs, note original connections to avoid error when reconnecting.

The 8W1 FM-AM radio tuner is used in combination models

DIAL STRINGING AND POINTER SETTING

A dial stringing and pointer setting diagram for the radio tuning dial is shown below. Arrows show starting point and direction of dial stringing.

TUNING DIAL STRINGING



Dial Stringing in 8W1 FM-AM Radio Tuner.

Admiral 18B7, 18UB7, 18B7B, 18UB7B, 20R6, 20UR6, 20S6, 20US6, and 20T6 CHASSIS

MODEL NUMBER	TV CHASSIS	VHF TUNER
T22M1, T22M2, T22M3	20R6	94E 163-4
T22UM1, T22UM2, T22UM3	20UR6	94E 163-5
T24K110, T24K111, T24K112, T24K113	18B7	94E 184-10
T24K110B, T24K111B, T24K112B, T24K113B	18B7B	94E 188-1
T24UK110, T24UK111, T24UK112, T24UK113	18UB7	94E 164-11
T24UK110B, T24UK111B, T24UK112B, T24UK113B	18UB7B	94E 188-2
C22M1, C22M2, C22M3	20R6	94E 163-4
C22UM1, C22UM2, C22UM3	20UR6	94E 163-5
C24K111, C24K112, C24K113	18B7	94E 184-10
C24K111B, C24K112B, C24K113B	18B7B	94E 188-1
C24UK111, C24UK112, C24UK113	18UB7	94E 164-11
C24UK111B, C24UK112B, C24UK113B	18UB7B	94E 188-2
C24K142, C24K145	18B7	94E 184-10
C24K142B, C24K145B	18B7B	94E 188-1
C24UK142, C24UK145	18UB7	94E 164-11
C24UK142B, C24UK145B	18UB7B	94E 188-2
L24K131, L24K132, L24K133	18B7	94E 184-10
L24K131B, L24K132B, L24K133B	18B7B	94E 188-1
L24UK131, L24UK132, L24UK133	18UB7	94E 164-11
L24UK131B, L24UK132B, L24UK133B	18UB7B	94E 188-2
L24K152, L24K157	18B7	94E 184-10
L24K152B, L24K157B	18B7B	94E 188-1
L24UK152, L24UK157	18UB7	94E 164-11
L24UK152B, L24UK157B	18UB7B	94E 188-2

Television chassis listed above and covered by material on pages 19 through 26 are similar mechanically and electrically. Cross reference between models and chassis types are given in tables at left and below.

The 18B7 and 18B7B VHF chassis and 18UB7 and 18UB7B VHF-UHF chassis are manually tuned sets using 23-inch picture tubes. The bass/treble and volume control of these sets are combined in a single dual control. The VHF channel indicator is

(Continued on page 20)

MODEL IDENTIFICATION CHART

NUMBER MODEL	TV CHASSIS	VHF TUNER
T22M10, T22M11, T22M12, T22M13	20S6	94E163-4
T22UM10, T22UM11, T22UM12, T22UM13	20US6	94E163-5
*TS22M40, TS22M41, TS22M42, TS22M43	20T6	94E164-6
C22M11, C22M12, C22M13	20S6	94E163-4
C22UM11, C22UM12, C22UM13	20US6	94E163-5
C22M22, C22M23, C22M24	20S6	94E163-4
C22UM22, C22UM23, C22UM24	20US6	94E163-5
*CS22M41, CS22M42, CS22M43, CS22M44	20T6	94E164-6
L22M22, L22M23, L22M24	20S6	94E163-4
L22UM22, L22UM23, L22UM24	20US6	94E163-5
*LS22M42, LS22M43, LS22M44	20T6	94E164-6

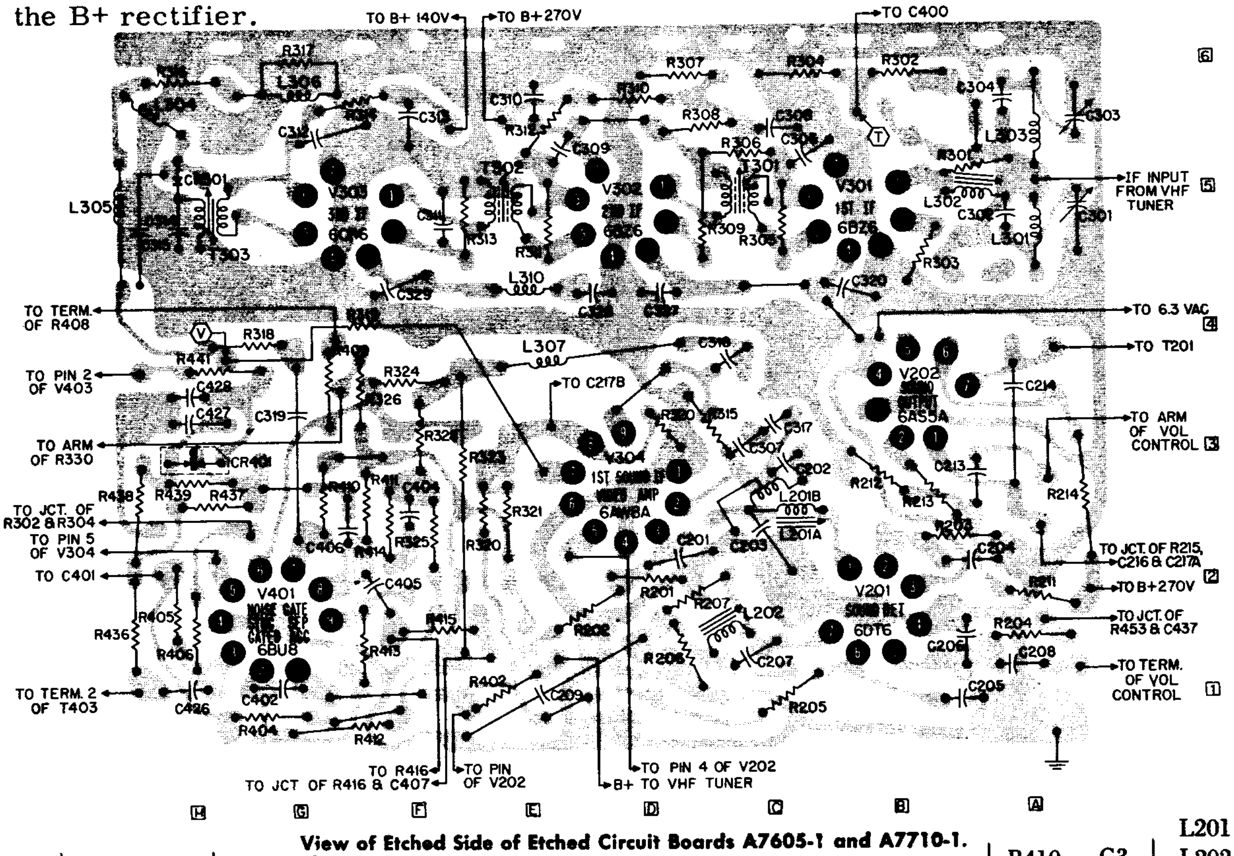
*Remote tuning model using S21A or S21B Son-r Tuner and 4 tube Amplifier.

ADMIRAL Chassis 18B7,-B, 18UB7,-B, 20R6, 20UR6, 20S6, 20US6, 20T6, Continued

a disc type. Note that the difference between chassis with suffix "B" and those without a suffix letter is in the use of a different tuner.

The 20R6 and 20S6 VHF chassis and the 20UR6 and 20US6 VHF-UHF chassis are manually tuned receivers utilizing a 21-inch picture tube. The basic difference between 20R6/20UR6 and 20S6/20US6 is that the 20R6 and 20UR6 chassis do not have a tone control, dial light, and dial indicator drum. A complete schematic diagram of the VHF version of these sets is printed on pages 24-25. A diagram of the UHF-VHF version of the 18-series sets is on pages 22-23. Circuitry of VHF chassis and VHF-UHF chassis is similar for the same series of sets with the exception of the addition of a separately mounted UHF tuner, use of a different VHF tuner, power transformer, and a few other parts.

The 20T6 VHF chassis is a manual and Son-r remote tuned receiver using a 21-inch tube. The four tube remote control amplifier is sub-chassis mounted at the left side of the main chassis. This chassis in the main is similar to 20S6, but uses a different tuner. This chassis uses a selenium rectifier for the B+ rectifier.

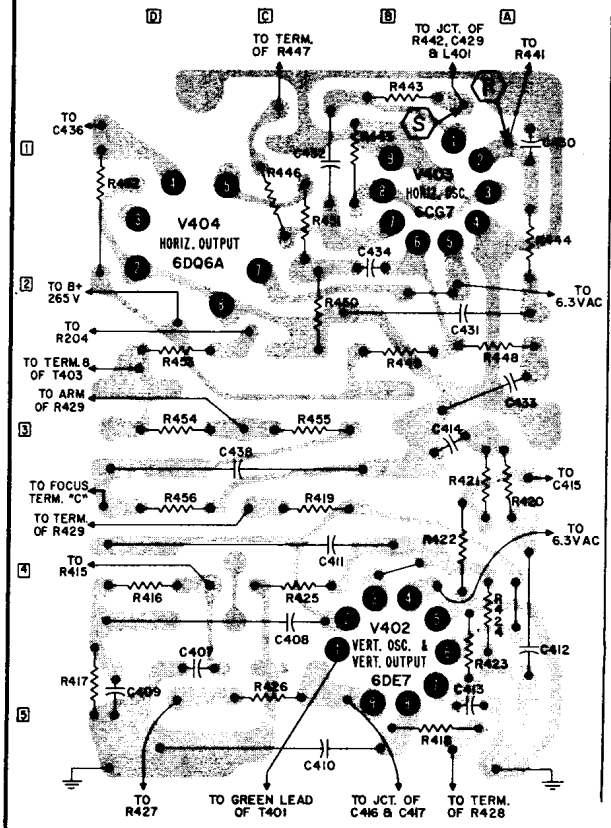


View of Etched Side of Etched Circuit Boards A7605-1 and A7710-1.

																L201	C2
Sym.	Loc.	C302	A5	Sym.	Loc.	C404	F3	Sym.	Loc.	R306	C5	Sym.	Loc.	R410	G3	L202	D1
C201	D2	C303	A6	C315	H5	C405	F2	R206	D1	R307	D6	R320	E2	R411	F3	L301	A5
C202	C2	C304	A6	C316	H6	C406	G2	R207	D1	R308	D6	R321	E2	R412	G1	L302	B5
C203	C2	C305	C6	C317	H6	C426	H1	R211	A2	R309	D5	R322	E3	R413	F1	L303	A6
C204	B2	C306	C5	C318	H6	C427	H3	R212	B3	R310	D6	R323	F2	R414	F2	L304	H6
C205	B1	C307	C6	C319	G3	C428	H3	R213	B3	R311	E5	R324	F3	R436	H1	L305	H5
C206	B1	C309	E6	C320	D3	CR301	H5	R214	A3	R312	E6	R325	F3	R437	H2	L306	G6
C207	D1	C310	E6	C326	C4	CR401	H3	R301	B5	R313	F5	R326	F3	R438	H2	L307	E4
C208	A1	C311	F5	C327	D4	R201	E2	R302	B6	R314	F6	R328	F3	R439	H3	T301	C5
C209	E1	C312	G6	C328	E4	R202	E2	R303	B5	R315	H6	R402	G1	R440	G3	T302	E5
C213	B3	C313	F6	C329	F4	R203	B2	R304	C6	R316	H6	R406	G1	R441	G4	T303	H5
C214	A3	C314	H5	C403	F2	R205	C1	R305	C5	R318	G4	R409	G4	R456	H2	T304	C3

ADMIRAL Chassis 18B7, -B, 18UB7, -B, 20R6, 20UR6, 20S6, 20US6, 20T6, Continued

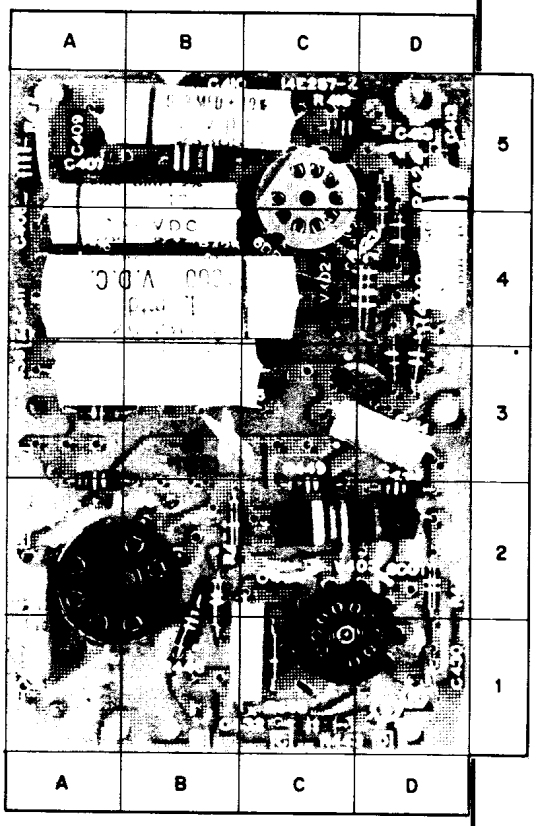
PARTS LOCATION TABLE "B"



Sym.	Loc.
C407	B5
C409	A5
C410	B5
C411	B4
C412	D4
C413	D5
C414	D3
C418	B4
C430	D1
C431	C2
C432	C1
C433	D3
C434	C2
C438	B3
R416	A4
R417	A5
R418	C5
R419	B4
R420	D3

Sym.	Loc.
R421	D3
R422	D4
R423	D4
R424	D4
R425	B4
R426	B5
R443	C1
R444	D2
R445	C1
R446	B1
R448	D2
R449	C2
R450	B2
R451	B2
R452	A1
R453	A2
R454	A3
R456	A4

View of Etched Side of Etched Circuit Boards A7610-1 and A7713-5. Refer to Parts Location Table "B".



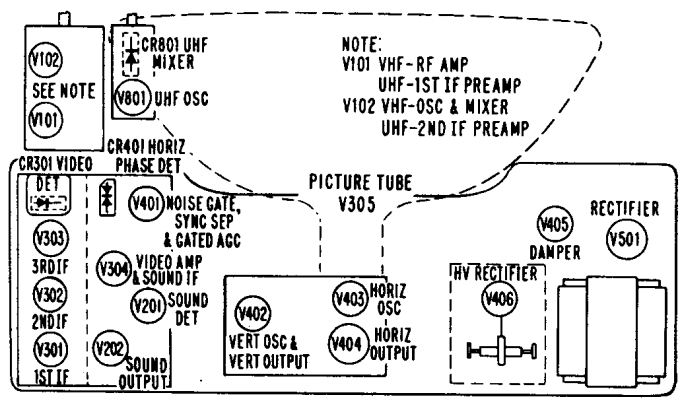
View of Component Side of Etched Circuit Boards A7610-1 and A7713-5. Refer to Parts Table "B"

SCHEMATIC NOTES

(2), (3), . . etc. indicate production changes covered by a Run number. Run numbers are stamped at the rear of the chassis. Brief description of Run changes given on schematic. (A1), (A2),.....(T), (V), etc. indicate alignment points and connections.

Fixed resistor values shown in ohms ±10% tolerance, ½ watt; capacitor values shown in micromicrofarads ± 20% tolerance unless otherwise specified.

NOTE: K=x 1000, MEG=x 1,000,000, MF=microfarad.



CONDITIONS FOR MEASURING VOLTAGES

Warning: Pulsed high voltages are present at the caps of V404 and V406, and at pin 3 of V405. **Do not** attempt to measure voltage at these points without suitable test equipment. A VTVM with a high voltage probe should be used when measuring picture tube 2nd anode voltage.

- Set the **Channel Selector** on an unused Channel. **Contrast** control fully clockwise. All other controls fully counterclockwise. Do not disturb **AGC, Horiz. Lock** or **Horiz. Range** adjustments.
- Antenna disconnected and terminals shorted together.
- Line voltage: 117 volts AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- All voltages measured with tubes in sockets, Use of adapter sockets is recommended.

CONDITIONS FOR OBSERVING WAVEFORMS

Warning: Pulsed high voltages are present at the caps of V404 and V406, and at pin 3 of V405. **Do not** attempt to observe waveforms at these points unless suitable test equipment is used.

- Set tuning controls for normal picture. Do not disturb **AGC, Horiz. Lock** or **Horiz. Range** adjustments. After the receiver is set for a normal picture turn the **Contrast** control fully clockwise.
- Oscilloscope sweep is set at 30 cycles for vertical waveforms and at 7,875 cycles for hozizontal waveforms, to permit 2 complete cycles tc be observed.
- Peak-to-peak voltages will vary from those shown on the schematic depending on the input signal strength, test equipment employed and chassis parts tolerance.
- Waveforms were taken with a comparatively strong transmitted signal input to the television chassis.

Tube Locations Chassis 18UB7, -B

ADMIRAL Chassis 18UB7 and 18UB7B Schematic Diagram (VHF Tuner for 18UB7B)

SCHEMATIC NOTES, MEASURING VOLTAGES AND WAVEFORMS.

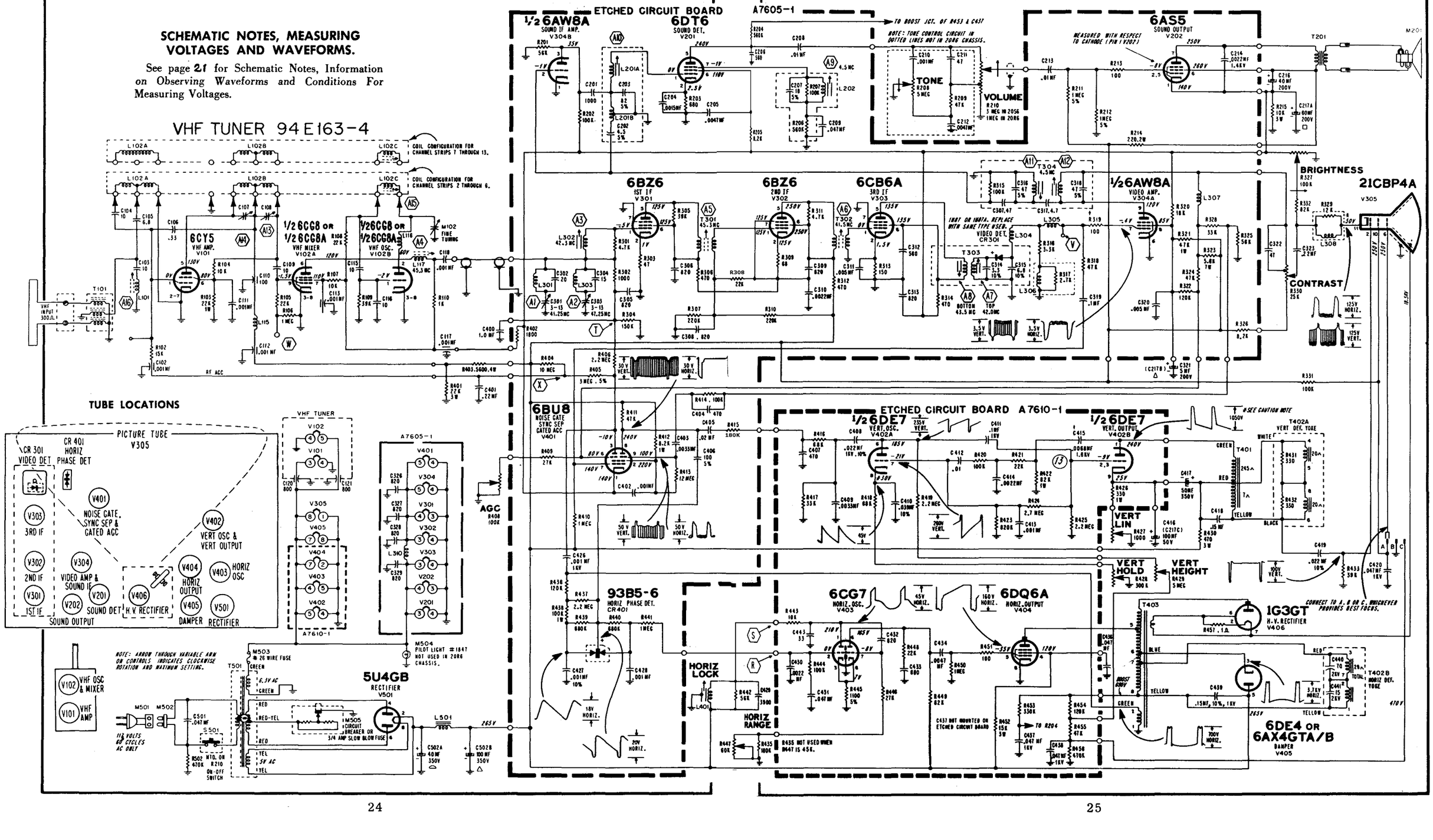
See page 21 for Schematic Notes, Information on Observing Waveforms and Conditions For Measuring Voltages.

Schematic for 18UB7 and 18UB7B Chassis Stamped Run 13. VHF Tuner for 18UB7B Chassis Shown.

ADMIRAL Chassis 20R6 and 20S6 Schematic Diagram (Continued)

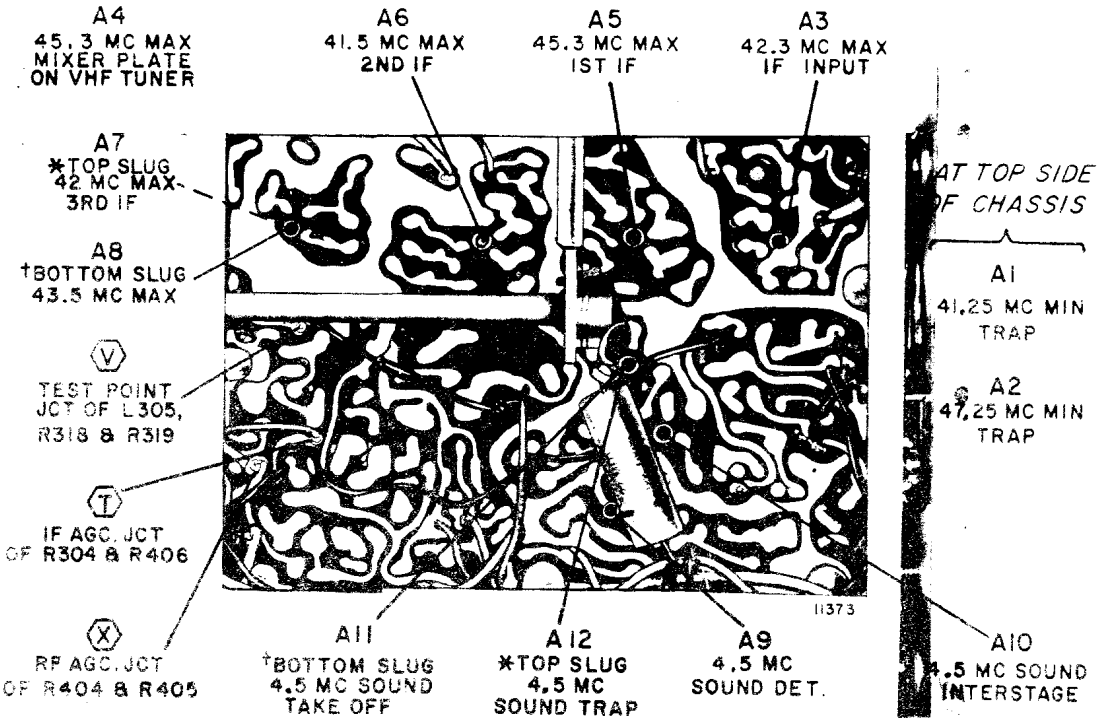
SCHEMATIC NOTES, MEASURING VOLTAGES AND WAVEFORMS.

See page **21** for Schematic Notes, Information on Observing Waveforms and Conditions For Measuring Voltages.

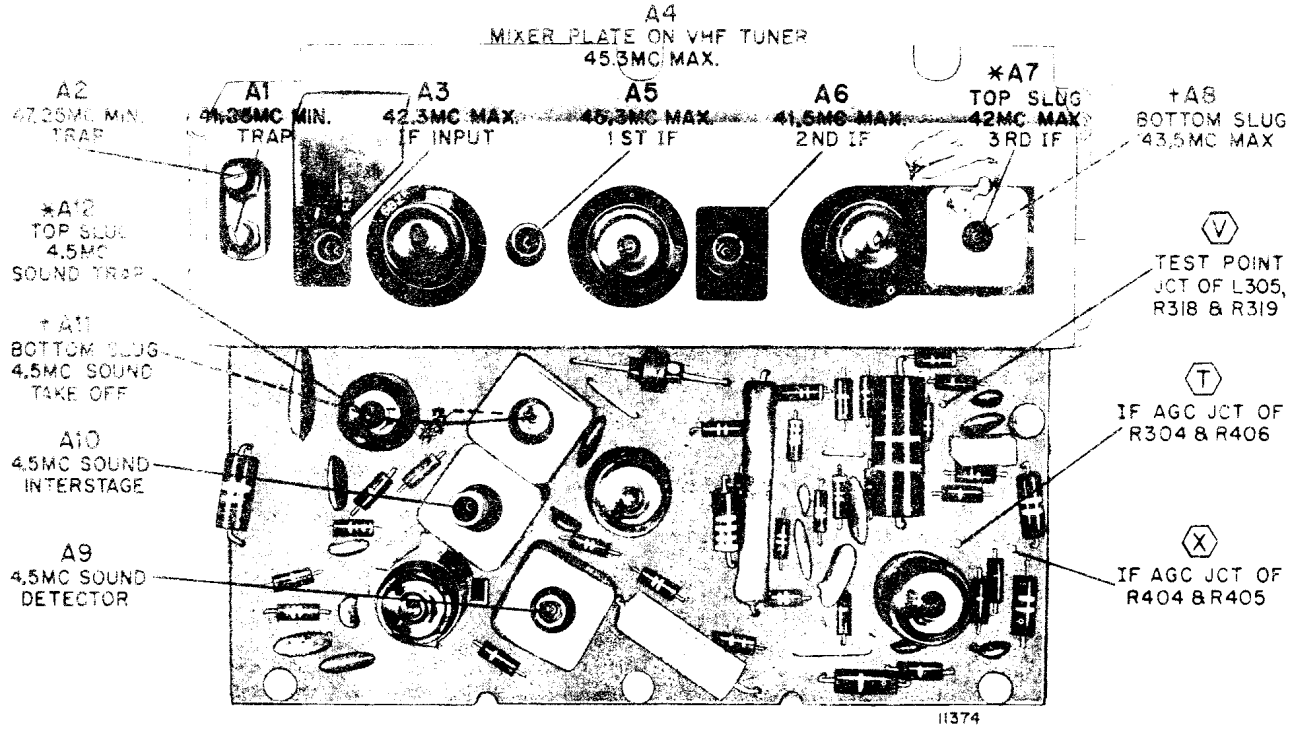


ADMIRAL **Schematic for 20R6 and 20S6 Chassis Stamped Run 10 Through Run 13.**

ADMIRAL Chassis 18B7, -B, 18UB7, -B, 20R6, 20UR6, 20S6, 20US6, 20T6, Continued



Bottom View of Chassis showing Test Point Locations and IF Alignment Data. VHF Tuner at Top.



Inside Chassis View of Etched Circuit Board Showing Test Point Locations and IF Alignment Data.

Emerson Television

TYPE	MODELS	STYLE	TV CHASSIS	RADIO CHASSIS	KINESCOPE	TUNER
VHF RECEIVER	1472	Portable T.M.	120424N		17BZP4	471148
	1482	Portable T.M.				
	1422	T.M., Bentwood	120434N		21DAP4	
	1460A	T.M. (Legs), Bentwood				
	1446	Low Boy Bentwood				
	1442	Console, Bentwood				
	1448	Lowboy-Combination		120476B		
	1480	Console-Combination		120477B		
UHF-VHF RECEIVER	1473	Portable T.M.	120425P		17BZP4	471149-VHF SECTION 471105-UHF SECTION
	1423	T.M., Bentwood	120435P		21DAP4	
	1447	Lowboy, Bentwood				
	1443	Console, Bentwood				
	1449	Console, Combination		120476B		

The material on pages 27 through 36 is exact for models as described in the table above. Two additional groups of sets released at a later date and listed in the two tables below are similar to Chassis 120424N and 120425P for most models but use different tuners. Models 1464 and 1465 are TV and Stereo Phono-radio combinations similar to 1448, 1449. Models using Chassis 120488A, 120489A, are remote control sets utilizing a separately mounted remote receiver chassis for this purpose.

TYPE	MODEL NO.	TV CHASSIS	REMOTE CHASSIS	STYLE	KINESCOPE	TUNER
VHF Receivers	1454	120496A		Table Model	17BZP4	471196
	1484			Portable T.M.		
	1486	120488A	471194	Portable T.M.*		471218
	1456	120498A		Bentwood Cons.	21DAP4	471196
	1458	120498A	471194	Bentwood Cons.*		471218
	1488	120498A		Bentwood Loboy		471196
	1490	120489A	471194	Bentwood Loboy*		471218
	1492	120498A		Console		471196
	1494	120489A	471194	Console*		471218
	1496	120498A		Console		471196
	1498	120489A	471194	Console*		471218
	1464	120498A		Combo-Loboy		471196
UHF-VHF Receivers	1455	120497B		Table Model	17BZP4	471197-VHF Section 471193-UHF Section
	1485			Portable T.M.		
	1457	120499B		Bentwood Cons.	21DAP4	
	1489			Bentwood Loboy		
	1493			Console		
	1497			Console		
	1465			Combo-Loboy		

* With wireless remote control.

TYPE	MODEL NO.	CHASSIS	STYLE	CRT	TUNER
VHF	1620	120498 A	CONSOLE	21 DAP 4	471218
UHF/VHF	1621	120499 B			471193-UHF SECT. 471197-VHF SECT.

DISASSEMBLY INSTRUCTIONS

Note 1: To prevent possible overload of the horizontal output tube, due to removal of negative grid voltage, do not operate power chassis with the cable disconnected from the board.

Note 2: Provide a grounding jumper between the board and the power chassis when servicing the chassis outside the cabinet.

MODELS 1472, 1473, 1482:

To Remove Plastic Lens and Mask (a single unit)

Remove 2 screws from the side of the knob-overlay and then remove overlay, control panel insert and all knobs. Remove 3 screws from bottom of cabinet front. Pull bottom of front away from cabinet to separate the plastic lens and mask.

NOTE: To clean the Plastic Lens use only a soft cloth dampened with water (a dry cloth may be abrasive). If necessary, a mild soap solution may be applied. DO NOT USE CLEANSERS, POLISHES, OILS OR WAXES.

To Remove Picture Tube (in its metal mtg. bracket & plate).

Remove Plastic Lens and Mask. Disengage cardboard barrier by unscrewing the 4 nut-and-washer combinations. Disconnect antenna leads, then remove back. Disengage CRT socket, clamp and yoke assembly and high voltage lead from CRT (after discharging H.V.). Carefully, so as not to mar the cabinet, pry up the 2 snap-on covers

Continued, Page 28

on either side of the handle. Remove the 4-screws securing the handle to the metal plate inside the cabinet. The CRT can now be removed from the front.

To Remove Chassis: (Etched Printed Circuit Board and Power Chassis)

Unscrew 2 screws from the side of the knob overlay, located in the front. Remove knob overlay, control panel insert and all knobs. Disconnect antenna leads and cabinet back.

(a) Etched Printed Circuit Board

The etched printed circuit board is kept in place by 5 screws thru the metal strap and into the cabinet at the rear of the board. The front of the board is positioned by 2 screws, set in the right hand CRT mounting brackets, and serve as locating pins. These screws do not screw into the board but fit into 2 clearance holes located in a bracket on the front of the board. To remove the circuit board, unscrew the rear 5 screws only. Do not remove the screws holding the tuner bracket to the board. The board can now carefully be removed from the cabinet. To remove the cardboard protector under the board, push up on the snap-on fasteners. NOTE: The complete receiver can be operated conveniently with the board out of the cabinet. To completely separate the board from the cabinet unplug 2 cables from the power chassis, disconnect the speaker leads, disengage the CRT socket. (Note: Yellow lead to cathode of CRT is taped to the speaker leads. Retain the lead dress in reassembly). Should you encounter any difficulty in inserting the printed board into the cabinet, it may be necessary to remove the Lens and Mask in order to line up the two guide screws for the board.

b) Power Chassis

From the underside, remove the six screws that secure the power chassis to the cabinet. Disengage the CRT socket, high voltage lead (after discharging the H.V.), CRT clamp yoke assembly. Reassembly can be accomplished in the reverse order.

ALL 21" MODELS:

To Remove glass and mask:

Remove retainer bracket from across glass. Glass can be brought forward, up and out. Mask is secured by 2 screws in top of mask.

To Remove TV chassis (Etched Printed Circuit Board and Power chassis):

a) Etched Printed Circuit Board:

Remove knob overlay and knobs from the front and the cabinet back. Disengage CRT cable and speaker leads. Board is mounted on the side wall bracket. The front of the Board is secured by 2 screws thru a plate attached to the Board. Remove these from the inside. Remove the screws securing the rear of the Board to the cabinet. Unsolder wires related to Stereo Hi-Fi switch operation.

b) Power Chassis:

Disengage H.V. lead (after discharging it), yoke clamp and assembly and 2 power cables. From the underside of the cabinet, remove six screws to free the power chassis.

MODELS 1448, 1449:

To remove AM Stereo Amplifier Chassis 120476B,

1. Remove masonite cabinet back.
2. Remove all chassis control knobs including speaker selector knob.
3. Disengage AC line cords, 5 prong phono plug, pilot light and leads connecting chassis to speaker system.
4. Remove four palnuts which secure chassis base to cabinet.
5. Remove chassis.

To Remove Record Changer:

1. Snap two toggle bolt spring clips into a vertical position. These spring clips secure changer hold-down toggle bolts to mounting board.
2. Remove plug (five-prong) from chassis.
3. Unsolder AC line cord from chassis.
4. Remove changer from cabinet.

MODEL 1480:

To remove Stereo AM/FM – Amplifier Chassis 120447-B

1. Remove masonite back cover.
2. Remove all knobs, including AFC ON-OFF knob.
3. Disengage the AFC Switch, the two AC line cords, 5-prong phono plug and leads connecting chassis to speaker system.
4. Remove pilot light, and FM Ant. terminal strip.
5. Remove the two palnuts which fasten the top of the dial backplates to the metal cross-member.
6. Remove four screws securing chassis to cabinet (from underside). Remove chassis.

DISASSEMBLY OF TUNERS 471148, 471149:

1. Detach tuner back cover.
2. Remove nut from end of fine tuning shaft.
3. Remove rotary channel disc.
4. Remove the fine tuning assembly bracket screw, remove rotary channel disc. retainer spring and slip off fine tuning shaft assembly.
5. Disengage detent spring from roller which, in turn, releases pressure from detent roller.
6. Push out selector shaft assembly.
Reverse procedure to reassemble.

VIDEO I.F. ALIGNMENT

1. Connect 3 volt bias to the AGC bias point with the negative terminal to junction of R-15 and C-15, positive terminal to chassis and R-43 (Local-Distance control) in extreme CCW position (maximum resistance in circuit).

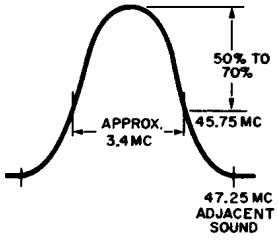


FIG. 1 OVERALL I.F. RESPONSE CURVE

2. Signal injection can easily be accomplished in the following manner: Paste a piece of thin copper or brass foil ½ x 2" on onion skin insulation.

The insulation should extend about 1/8" beyond the two long sides and one short side of the foil. At the other short side, the foil should extend approximately ½" beyond the insulation.

This shim assembly is then slipped in lengthwise between the mixer tube and its shield with the metal foil facing the tube. Set the short side with the extended insulation towards the chassis; this will permit the generator lead to be connected to the foil extending beyond the insulation at the other short side.

Inject the signal by connecting the I.F. marker generator to the metal foil wrapped about the mixer tube as suggested above and place a V.T.V.M. across junction of L-7 and L-8 (IF Test Point) to ground. Adjust output of signal generator so that peaking of coils does not produce more than -2V DC on V.T.V.M.

3. Peak the following for maximum response: T-5, 44.24 mc; T-4, 45.3 mc; T-3, 42.6 mc.
4. Adjust the following for minimum response, increasing generator output as necessary: L-5, 41.25 mc and L-3, 47.25 mc.

At this point set generator to 45.3 mc and adjust L-4 for minimum output on meter.

5. Peak T-10 on tuner at 45.3 mc for maximum output.
6. Peak L-4 at 43.1 mc for maximum output.

To observe the IF response curve, connect an oscilloscope, thru a 10,000 ohm isolation resistor, in place of the V.T.V.M. Inject a swept signal (40 to 50 mc) along with a loosely coupled marker generator at the mixer tube in the manner described above. Adjust the output of the sweep generator to produce about 2 volts peak to peak curve on the oscilloscope and reduce the marker signal so as not to upset the response curve. The 45.75 mc marker should appear between 50% and 70% down with respect to the peak.

4.5 mc Video Trap Alignment

Using a good signal, set the fine tuning control to the point where you begin to see 4.5 mc beat in the picture. Then adjust T-6, top, for minimum 4.5 mc beat in the picture.

Sound I.F. Alignment

1. Using a strong T.V. transmitted signal, adjust T-6, sound takeoff transformer, bottom, and T-1, sound interstage transformer, top and bottom, for the loudest sound.
2. Adjust L-2, quadrature coil, for clearest and loudest sound. If two peaks are encountered, use the position where the slug is closer to the circuit board.
3. With the antenna loosely coupled to the set, (simulating a weak signal) repeat step No. 1, tuning for maximum volume and minimum distortion.

EMERSON Chassis 120424N, 120425P, 120434N, 120435P, Service Information, Continued

4. If a V.T.V.M. is available, measure the voltage across R-7, 560K Ω resistor. Voltages should be between -3 and -10 volts and not vary by more than 3 volts between a strong and weak signal.
5. Check sound on all channels and repeat entire procedure if necessary.

Alignment of Horizontal Oscillator

This can be accomplished without removing circuit board from the cabinet as follows:

1. Tune receiver to a known "good" channel. Turn "Local-Distance" control, R-43, fully counter-clockwise (local position).
2. Short horizontal phasing coil (L-11) by placing a jumper lead across it. Insert a jumper wire across R-49.
3. Adjust the Horizontal Hold control, (R-6) until picture pulls into synchronization. (In most cases the picture will sway from side to side).
4. Remove short from horizontal phase coil (L-11) and then adjust L11 (use a hex-head tool) for the same synchronous condition as in step 3 above.
5. Remove short from across R-49. Horizontal circuit is now properly aligned. If area permits readjust "Local-Distance" control to distant position (fully clockwise). See below for "Local-Distance" control.

Adjustment of "Local-Distance" Control (R-43)

Sets are shipped out from the factory with this control set to its "distant" position (maximum clockwise). This position provides best signal to noise ratio (minimum snow) and should not be changed unless overload (streaking in picture, poor sync stability, high distorted contrast, etc.) is noted on the stronger channels. If overload exists, set contrast control to max. clockwise and adjust "Local-Distant" control in a counter clockwise direction to a point just under an overload condition.

Horizontal Size Adjustment (R-77)

Chassis included in this note have been designed to provide proper horizontal sweep under normally encountered line voltage variations. Should you, however, encounter insufficient sweep due to low line voltage, short out R-77, 3300Ω, 1 watt resistor, located on a terminal strip on the power chassis near the power transformer. If horizontal oversweep is present, as a result of high line voltage, remove the short from across R-77.

The shorting or the elimination of the short from across R-77 can be achieved without removing the power chassis from the cabinet. R-77 becomes accessible upon removal of the back.

Horizontal Drive Adjustment (R-76)

Normally, this control should be in the most counter-clockwise position (minimum resistance in the circuit). If overdrive bars (white vertical bars in the raster) are present, they can be eliminated by slowly advancing R-76, accessible thru the rear apron of the power chassis, in the clockwise direction until the lines just disappear.

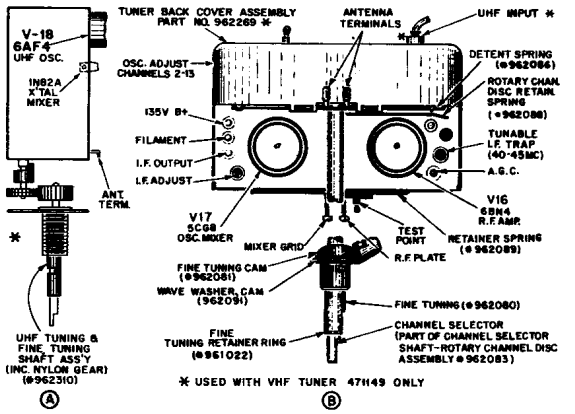


FIG. 2A, B – ALIGNMENT POINTS DIAGRAM, TUNERS: 471105, 471148, 471149

TUNER INFORMATION

VHF Tuner 471148 (see Figures 2B, 3A, page 29) is a 13 position (only 12 positions are usable) parallel filament, neutrode tuner. Channel 2 thru 13 adjustable coils are mounted in spoke fashion on a rotary disc. Channel selection is achieved by rotating the disc and bringing the appropriate coils into contact with sets of stationary contacts.

VHF Tuner 471149 (see Figures 2B, 3A, page 29) used in VHF-UHF chassis 120425P and 120435P is similar to Tuner 471148 except that a 40MC I.F. strip is mounted to the inside of the tuner back cover. Contact is made between this strip and the 13th position on the rotary disc by utilizing raised plugs which are inserted into the 13th position (See Fig. 2B). The 13th position is used for UHF operation and automatically converts the VHF tuner to an additional two stage I.F. amplifier.

UHF Tuner 471105 (see Figures 2A, 3B, page 29)–This 70 channel UHF tuner, which is used in some UHF-VHF models, is a separate tuner mechanically independent of its companion VHF tuner. The UHF tuner contains a tuned pre-selector stage, a 1N82A Mixer Crystal and a 6AF4A oscillator tube. To bring the UHF tuner into operation, the VHF tuner channel selector knob is set in UHF position. Continuous tuning of the entire UHF band is accomplished by the rotation of either the coarse or fine control shafts.

TUNER OPERATION (VHF-UHF TUNERS)

During VHF operation, B+ is supplied to the UHF tuner thru a stand-by resistor (100KΩ or 150KΩ), thus preventing UHF oscillation and yet permitting a minimum of 6AF4A activity. In this way, cathode contamination, possible during long periods of tube inactivity (during VHF reception) is avoided.

During UHF operation, however, proper B+ is applied to the UHF.

Continued, Page 30

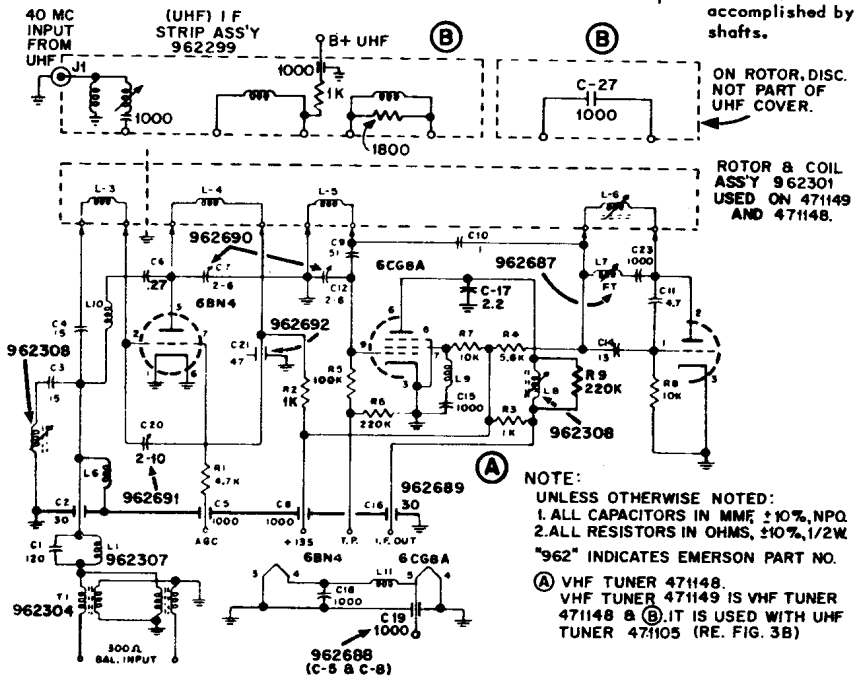


FIG. 3A – SCHEMATIC, VHF TUNERS 471148, 471149* (*USED WITH 471105)

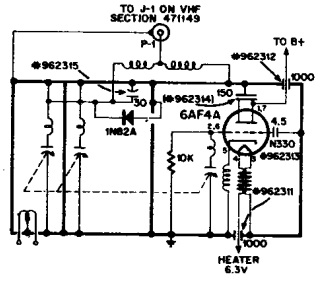


FIG. 3B – SCHEMATIC, UHF TUNER 471105 (USED WITH VHF TUNER 471149)

EMERSON Chassis 120424N, 120425P, 120434N, 120435P, Service Information, Continued

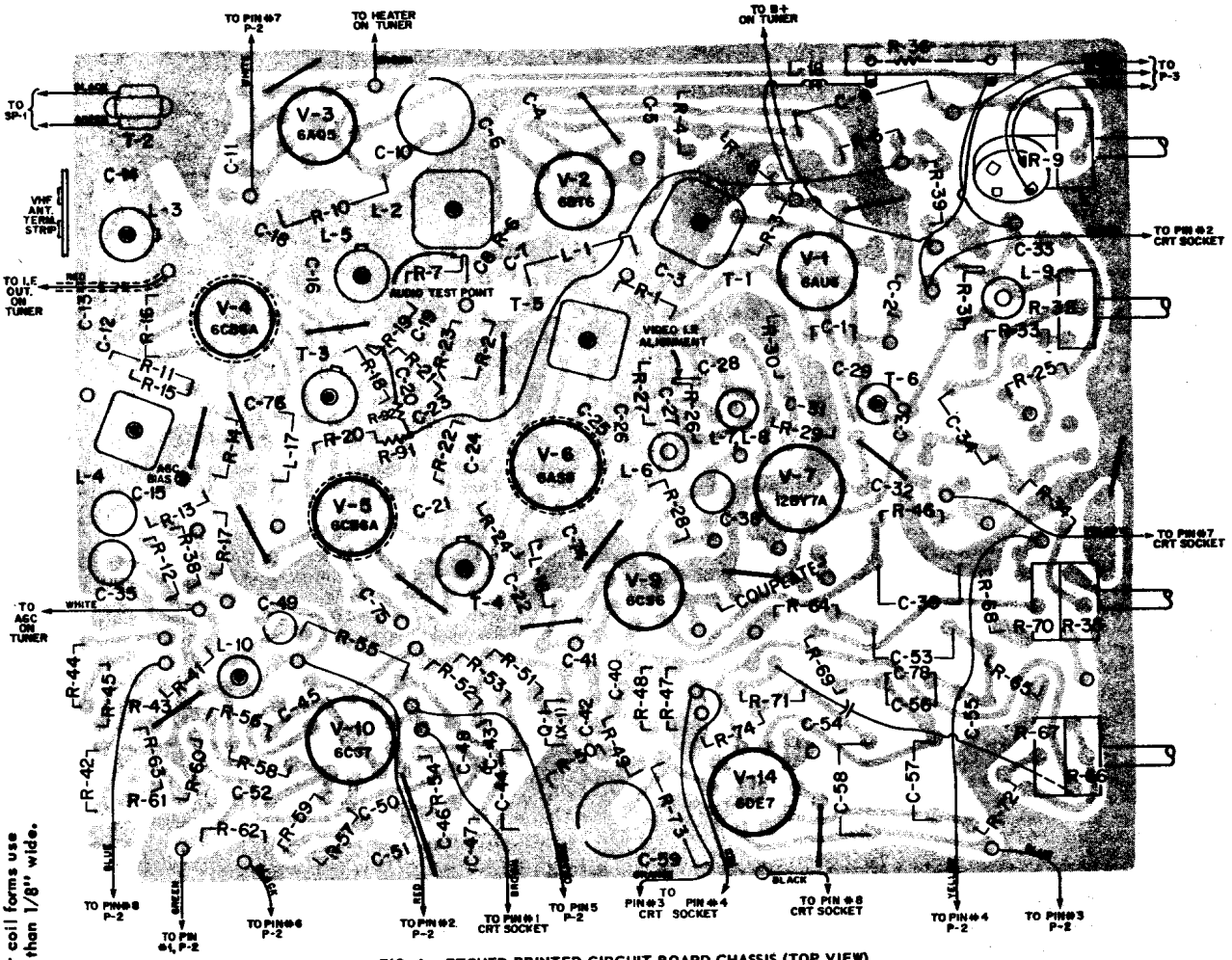


FIG. 4 – ETCHED PRINTED CIRCUIT BOARD CHASSIS (TOP VIEW)

In tuners 471148 and 471149 having distinct coils for each channel, adjust each oscillator coil as necessary if the oscillator tube is changed.

CAUTION: To prevent breakage of the oscillator coil forms use a non-metallic screw driver having a tip no more than 1/8" wide.

RESISTANCE READINGS (IN OHMS), CHASSIS 120424N (CONDITIONS INFORMATION, PG. 32)

Symbol	Tube Type	1	2	3	4	5	6	7	8	9
V-1	6AU6	100K*	100K*	0 Ω	0 Ω	54K*	54K*	100K*	–	–
V-2	6DT6	5 Ω	390 Ω	0 Ω	0 Ω	320K*	54K*	560K	–	–
V-3	6AQ5	20 Ω to 1 Meg.	330 Ω	0 Ω	0 Ω	58K*	58K*	20 Ω to 1 Meg.	–	–
V-4	6CB6	1.2 Meg.	56 Ω	0 Ω	0 Ω	66K*	66K*	0 Ω	–	–
V-5	6CB6	58K*	66K*	0 Ω	0 Ω	50K*	50K*	66K	–	–
V-6	6AS8	100K*	0 Ω	180 Ω	0 Ω	0 Ω	4.7K	0 Ω	0 Ω	100K*
V-7	12BY7-A	47 Ω	400K	0 Ω	0 Ω	0 Ω	0 Ω	50K*	54K*	0 Ω
V-8	17BZP4 or 21DAP4-A	0 Ω	58K*	54K*	54K*	N.C.	N.C.	110K to 290K	0 Ω	–
V-9	6CS6	400K to 820K	0 Ω	0 Ω	0 Ω	41K	58K*	1.7 Meg.	–	–
V-10	6CG7	140K*	200K	1.2K	0 Ω	0 Ω	60K*	1.3 Meg.	1.2K	0 Ω
V-11	6DQ6	58K*	0 Ω	N.C.	65K*	690K	0 Ω	0 Ω	0 to 25 Ω	Plate Cap 3.5 Meg.
V-12	1G3-GT	I	N	F	I	N	I	T	E	Plate Cap 3.5 Meg.
V-13	6DA4/6DE4	N.C.	N.C.	3.7 Meg.	N.C.	58K*	N.C.	0 Ω	0 Ω	–
V-14	6DE7	58K*	1 Meg. to 1.5 Meg.	1 Meg. to 1.5 Meg.	0 Ω	0 Ω	2.2 Meg. to 4.2 Meg.	560K to 2.2 Meg.	0 Ω	470 Ω
V-15	5U4-GB	430K (T.P.)	58K*	N.C.	20 Ω	N.C.	20 Ω	N.C.	58K*	–
S-2	Power Socket	690K	58K*	58K*	3.7 Meg.*	0 Ω	0 Ω	58K*	54K*	–

*Denotes varying resistance – allow meter 30 seconds to settle.
N.C. denotes no connection
T.P. denotes terminal used as tie post.

EMERSON Chassis 120424N, 120425P, 120434N, 120435P, Service Information, Continued

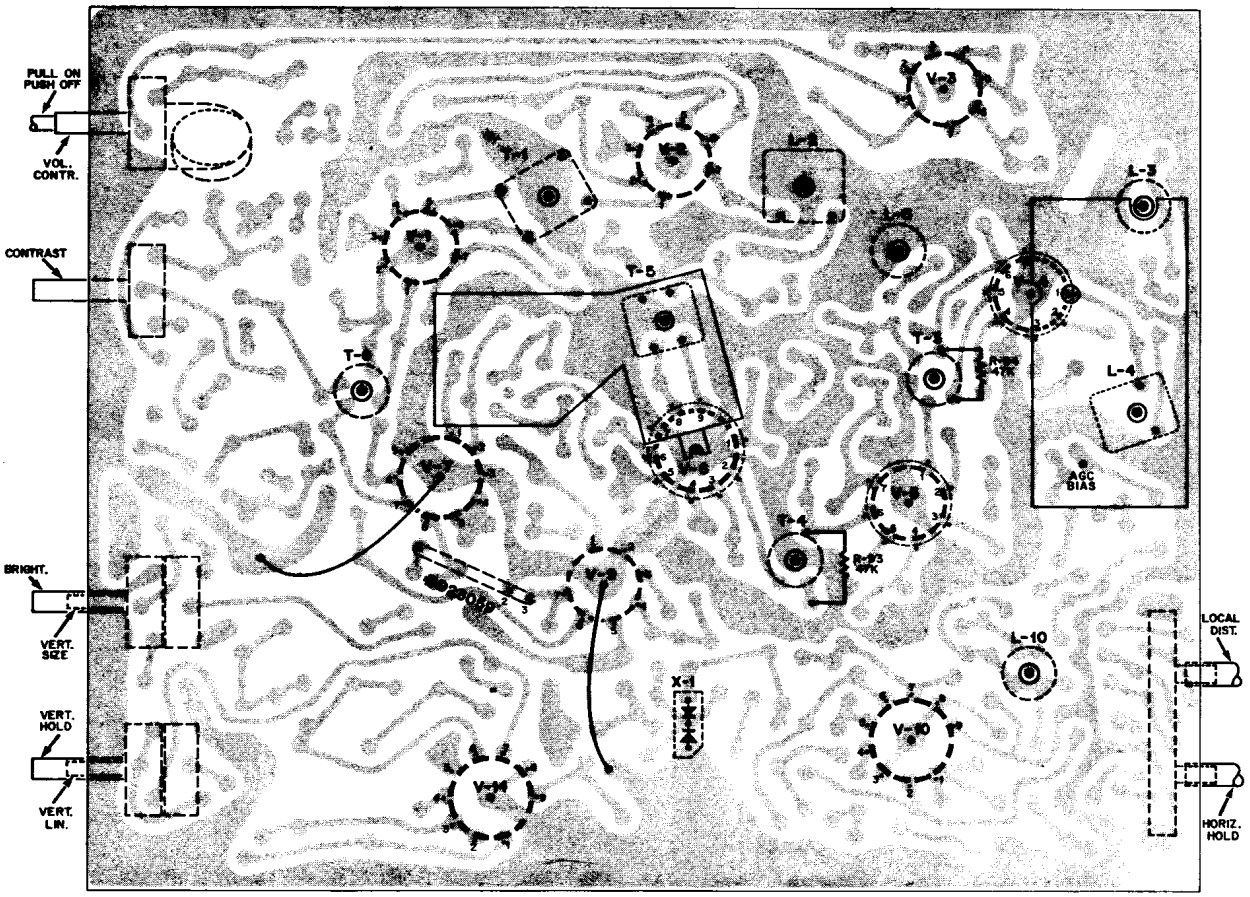


FIG. 5 – ETCHED PRINTED CIRCUIT BOARD CHASSIS (BOTTOM VIEW)

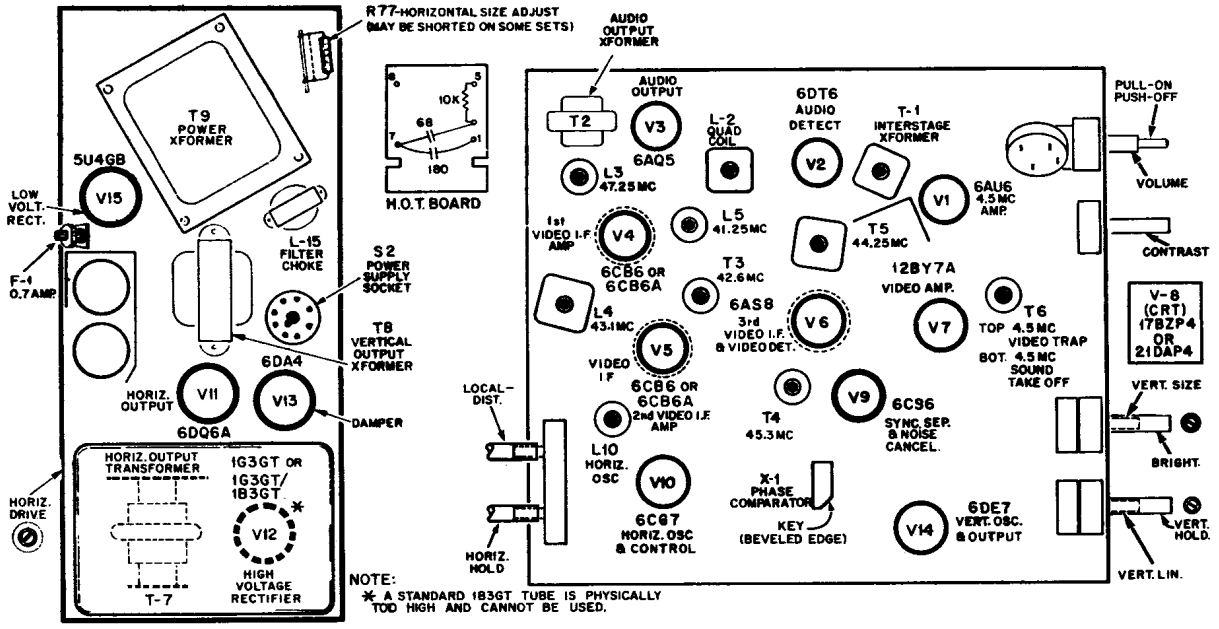


FIG. 6 – TUBE LOCATION AND ALIGNMENT POINTS DIAGRAM, POWER SUPPLY AND ETCHED PRINTED CIRCUIT BOARD CHASSIS

EMERSON Chassis 120424N, 120425P, 120434N, 120435P, Schematic Diagram

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS (Static Conditions)

The voltage and resistance measurements were taken on Chassis 120424NΔJ.

Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above. The picture tube, deflection yoke and high voltage circuits were in the circuit when the readings were taken.

1. Antenna disconnected and antenna terminals shorted on tuner and connected to chassis (use short leads).
2. Line voltage 117 volts (Disconnect power from resistance readings).
3. Bias battery (3V) connected to AGC Bias Point with negative terminal of battery to junction of R-15 and C-15 and positive terminal to chassis. (BIAS BATTERY USED FOR STATIC VOLTAGE READINGS ONLY).
4. Local-Distance control (R-43) is not varied but is kept at maximum clockwise (CW) position. All other controls in position for normal picture. (Varied when it directly affects reading).
5. All measurements taken with a vacuum tube voltmeter and ohmmeter.
6. All readings listed in table were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
7. N.C. denotes no connection.

WAVE SHAPE ANALYSIS CHART (Operational Conditions)

The peak to peak voltage given may also vary slightly depending on signal strength and component variations.

To accurately observe the wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. (Failure to do this will result in wrong wave shape readings). This is accomplished by using an Emerson low capacity probe as outlined previously in the service note for models 686L, 687L and 696L using chassis 120142-B which was issued at an earlier date.

1. Connect antenna and tune receiver to known "good" channel for best reception.
2. Adjust CONTRAST control for maximum undistorted contrast.
3. Set LOCAL-DISTANCE control for "Distant" location (i.e. maximum clockwise position).
4. Voltages (using V.T.V.M., with respect to chassis) noted at time of readings:
   AGC bias = 4.0V DC
   Tuner bias = 3.0V DC
   Sync. separator grid (Pin 7 of V-9) = 30V.
5. Connect low end of probe to chassis. The 30 and 7875 cps oscilloscope sweep settings are used so as to permit observation of two cycles of the wave shape.

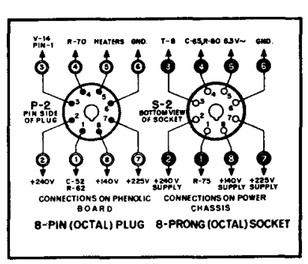
NOTE: A wave shape seen on your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.

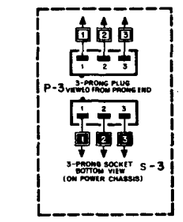
SERVICING OF PRINTED BOARDS

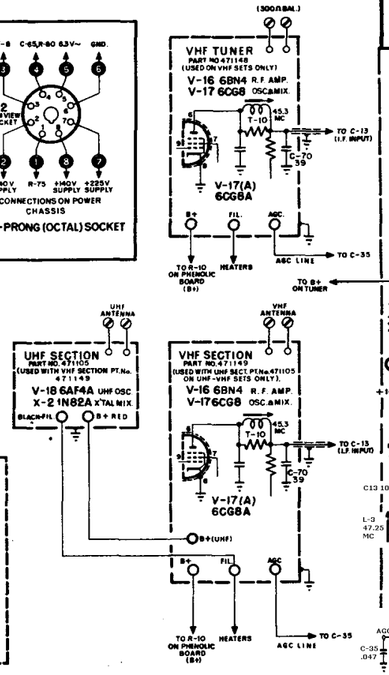
To remove defective components one of several methods may be used. A recommended method is to cut close to the body of the defective component and solder the new part to the remaining leads. Another method is to apply heat at the junction point of the component wire lead and the printed board and lift out the component. If the wire lead is bent over, first heat and pry lead wire up. A defective component with many terminals may be removed by clipping into several parts and removing a small section at a time.

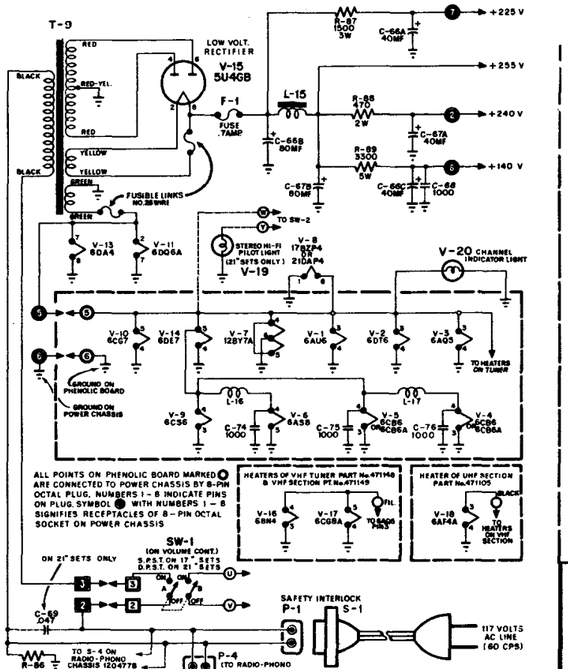
Use a low wattage (20 to30 watts) soldering iron. Be careful not to apply excessive heat since this may cause the printed foil to loosen. Broken foil leads may be repaired by soldering a piece of hookup wire across the break.

A small stiff bristled brush should be used to wipe away melted solder before it has a chance to accumulate or drip on adjacent parts or printed wiring.

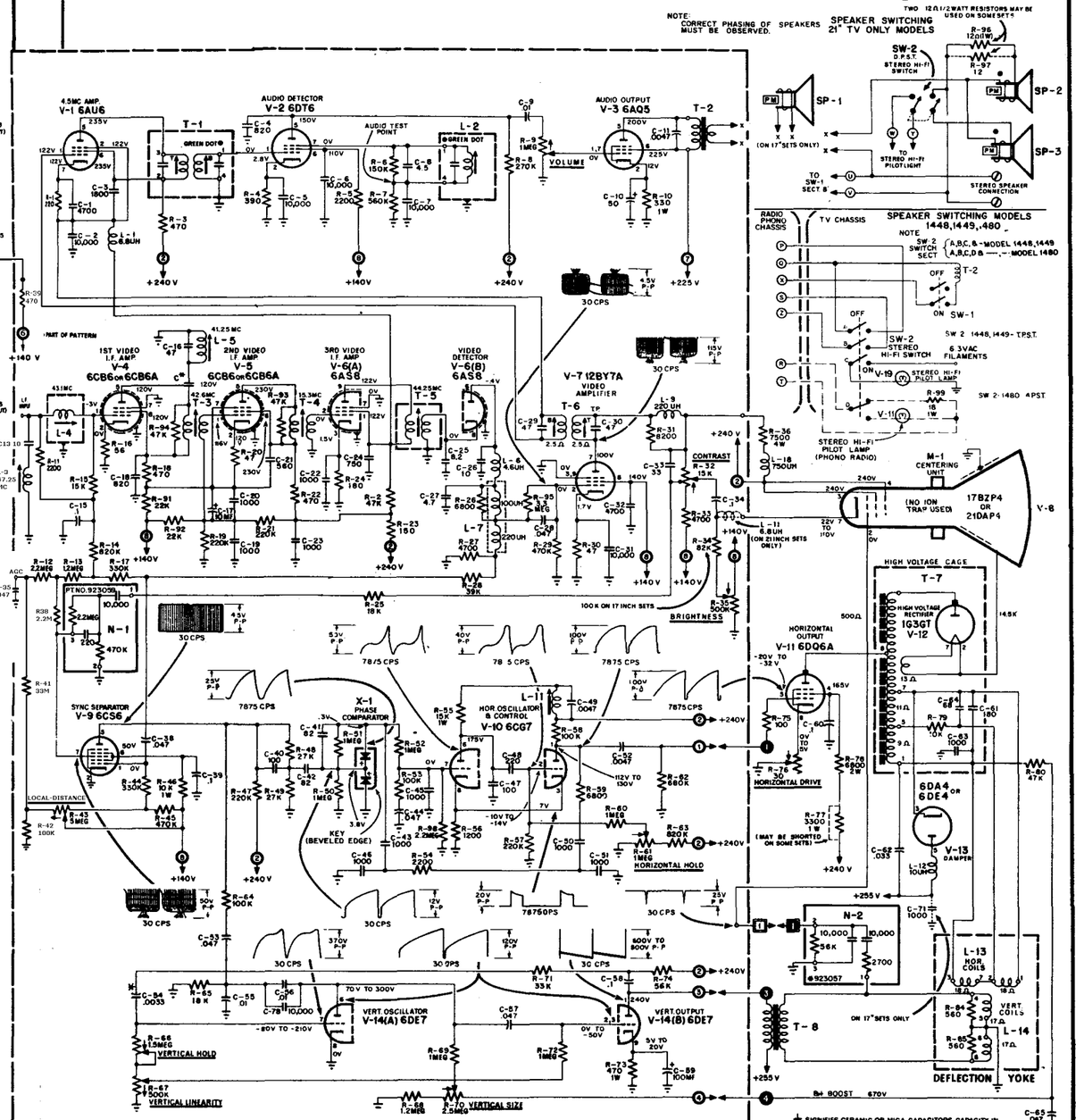








EMERSON Chassis 120424N, 120425P, 120434N, 120435P, Schematic Diagram

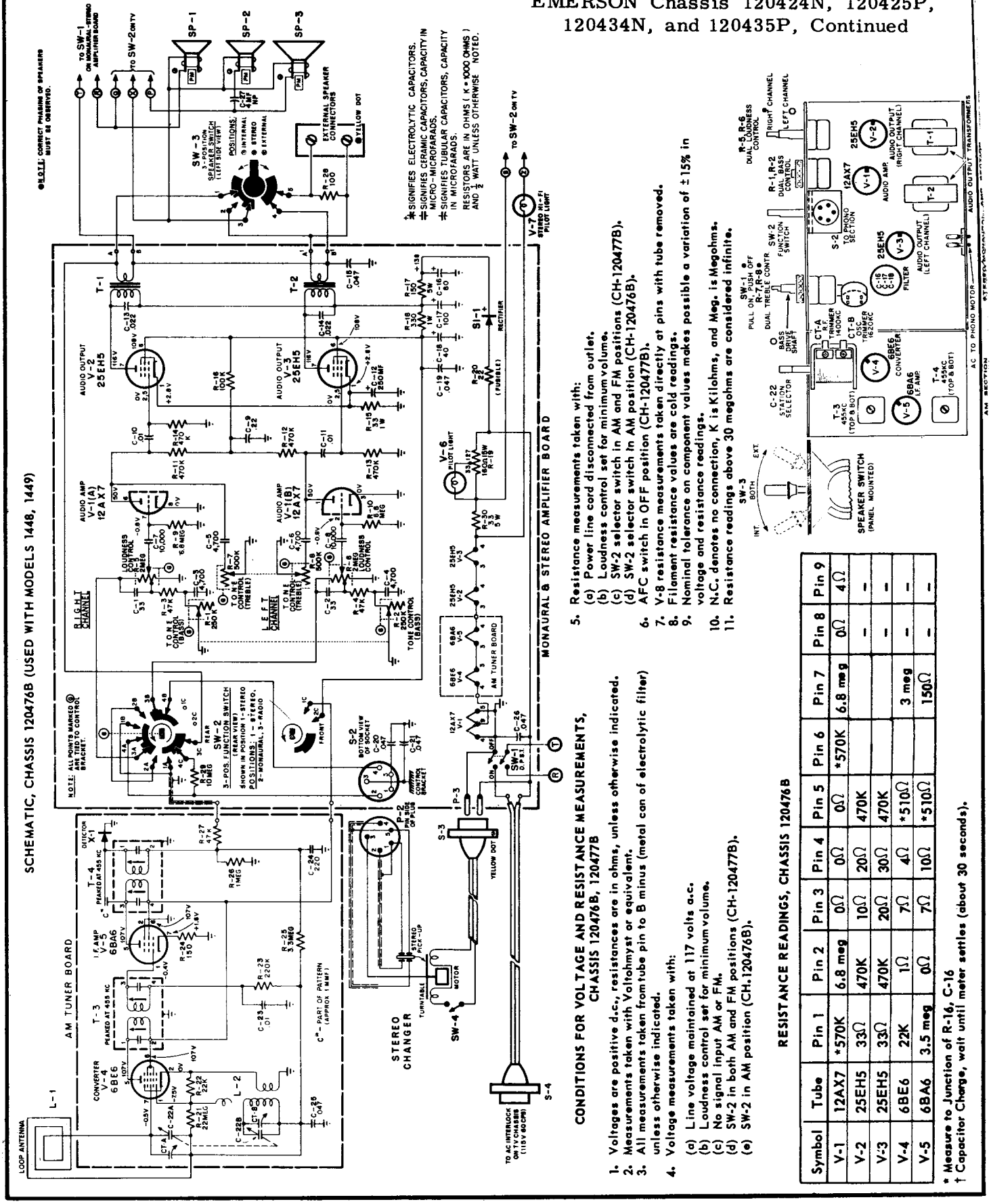


NOTE:
* C-54, A 0033 MFD CONDENSER, HAS BEEN RELOCATED TO PREVENT POSSIBILITY OF VERTICAL DRIFT DURING WARM-UP) AND IS HORIZONTALLY MOUNTED ON ETCHED CIRCUIT BOARD. (SEE FIG.④4, PG. 30)

CHASSIS Nos. 120424N, 434N, 425P, 435P

EMERSON Chassis 120424N, 120425P, 120434N, and 120435P, Continued

SCHEMATIC, CHASSIS 120476B (USED WITH MODELS 1448, 1449)



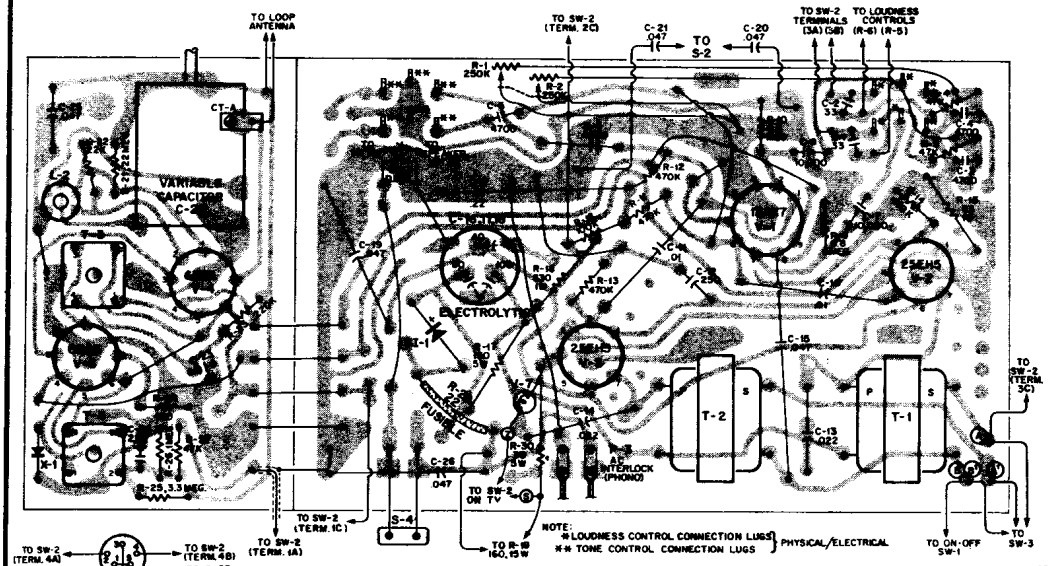
CONDITIONS FOR VOLTAGE AND RESISTANCE MEASUREMENTS, CHASSIS 120476B, 120477B

1. Voltages are positive d.c., resistances are in ohms, unless otherwise indicated.
2. Measurements taken with Voltohmyst or equivalent.
3. All measurements taken from tube pin to B minus (metal can of electrolytic filter) unless otherwise indicated.
4. Voltage measurements taken with:
   (a) Line voltage maintained at 117 volts a.c.
   (b) Loudness control set for minimum volume.
   (c) No signal input AM or FM.
   (d) SW-2 in both AM and FM positions (CH-120477B).
   (e) SW-2 in AM position (CH.120476B).
5. Resistance measurements taken with:
   (a) Power line cord disconnected from outlet.
   (b) Loudness control set for minimum volume.
   (c) SW-2 selector switch in AM and FM positions (CH-120477B).
   (d) SW-2 selector switch in AM position (CH-120476B).
6. AFC switch in OFF position (CH-120477B).
7. V-8 resistance measurements taken directly at pins with tube removed.
8. Filament resistance values are cold readings.
9. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
10. N.C. denotes no connection, K is Kilohms, and Meg. is Megohms.
11. Resistance readings above 30 megohms are considered infinite.

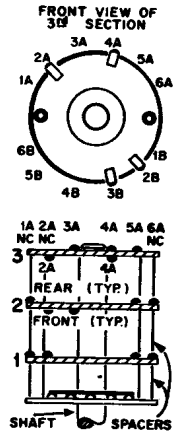
RESISTANCE READINGS, CHASSIS 120476B

Symbol	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-1	12AX7	*570K	6.8 meg	0Ω	0Ω	0Ω	*570K	6.8 meg	0Ω	4Ω
V-2	25EH5	33Ω	470K	10Ω	20Ω	470K			-	-
V-3	25EH5	33Ω	470K	20Ω	30Ω	470K			-	-
V-4	6BE6	22K	1Ω	7Ω	4Ω	*510Ω		3 meg	-	-
V-5	6BA6	3.5 meg	0Ω	7Ω	10Ω	*510Ω		150Ω	-	-

* Measure to Junction of R-16, C-16
† Capacitor Charge, wait until meter settles (about 30 seconds).

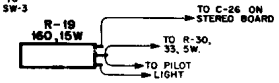


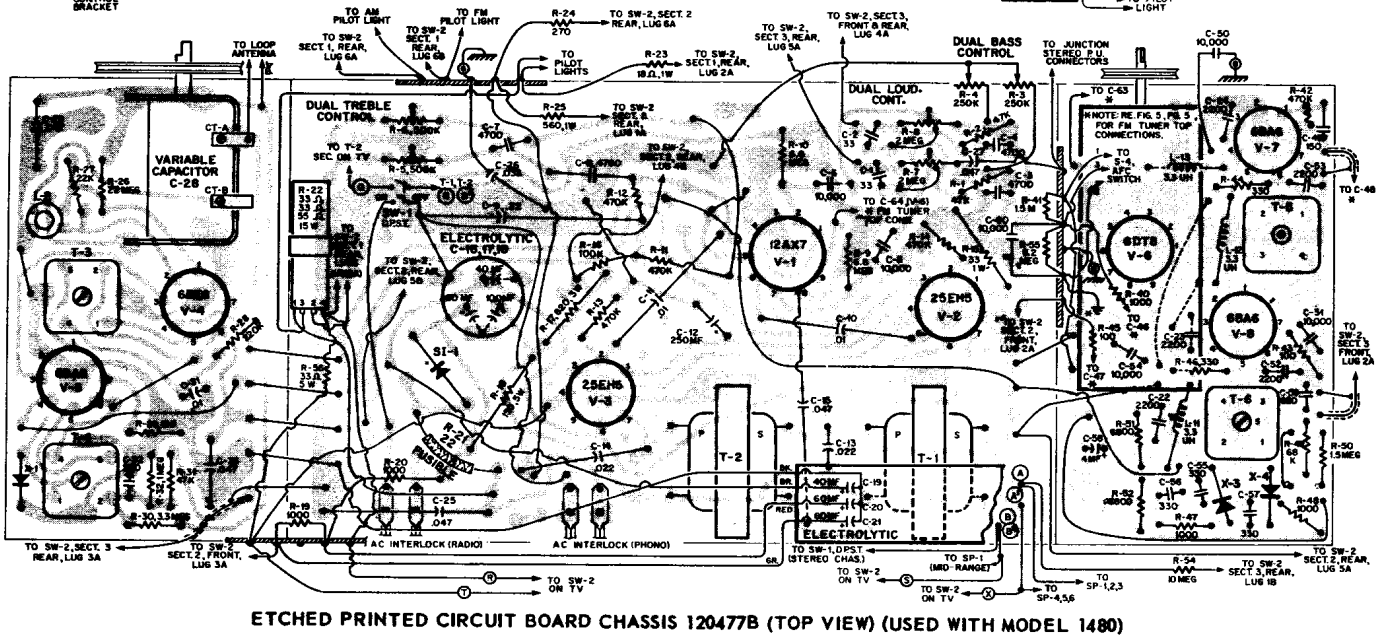
ETCHED PRINTED CIRCUIT BOARD CHASSIS 120476B (TOP VIEW)



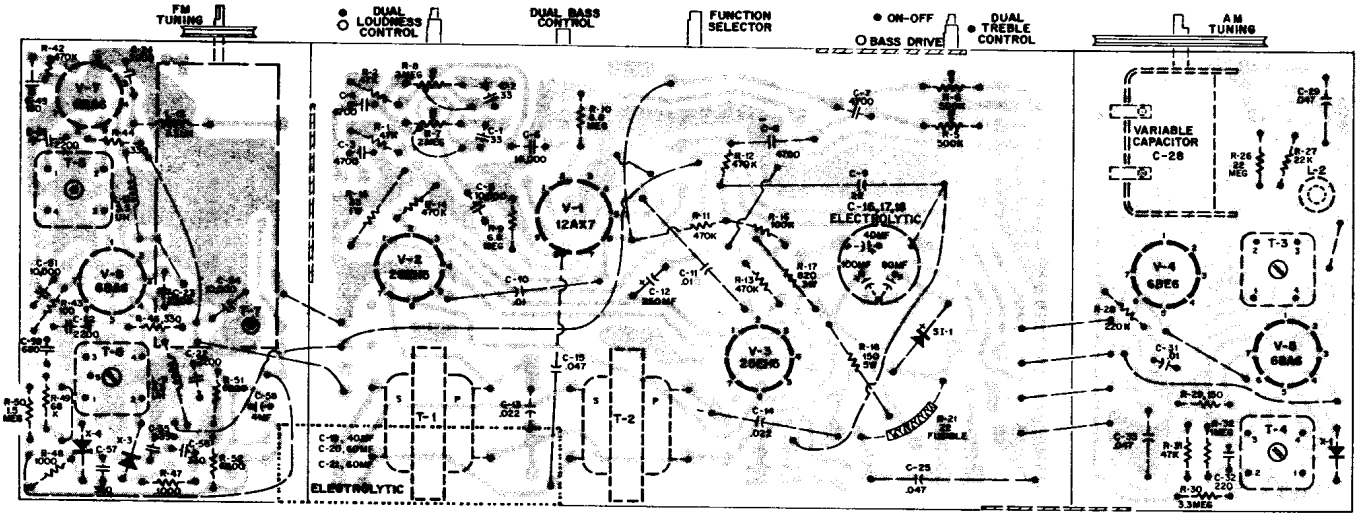
TOP VIEW OF SW-2

SW-2 FUNCTION SWITCH, CH. 120477B





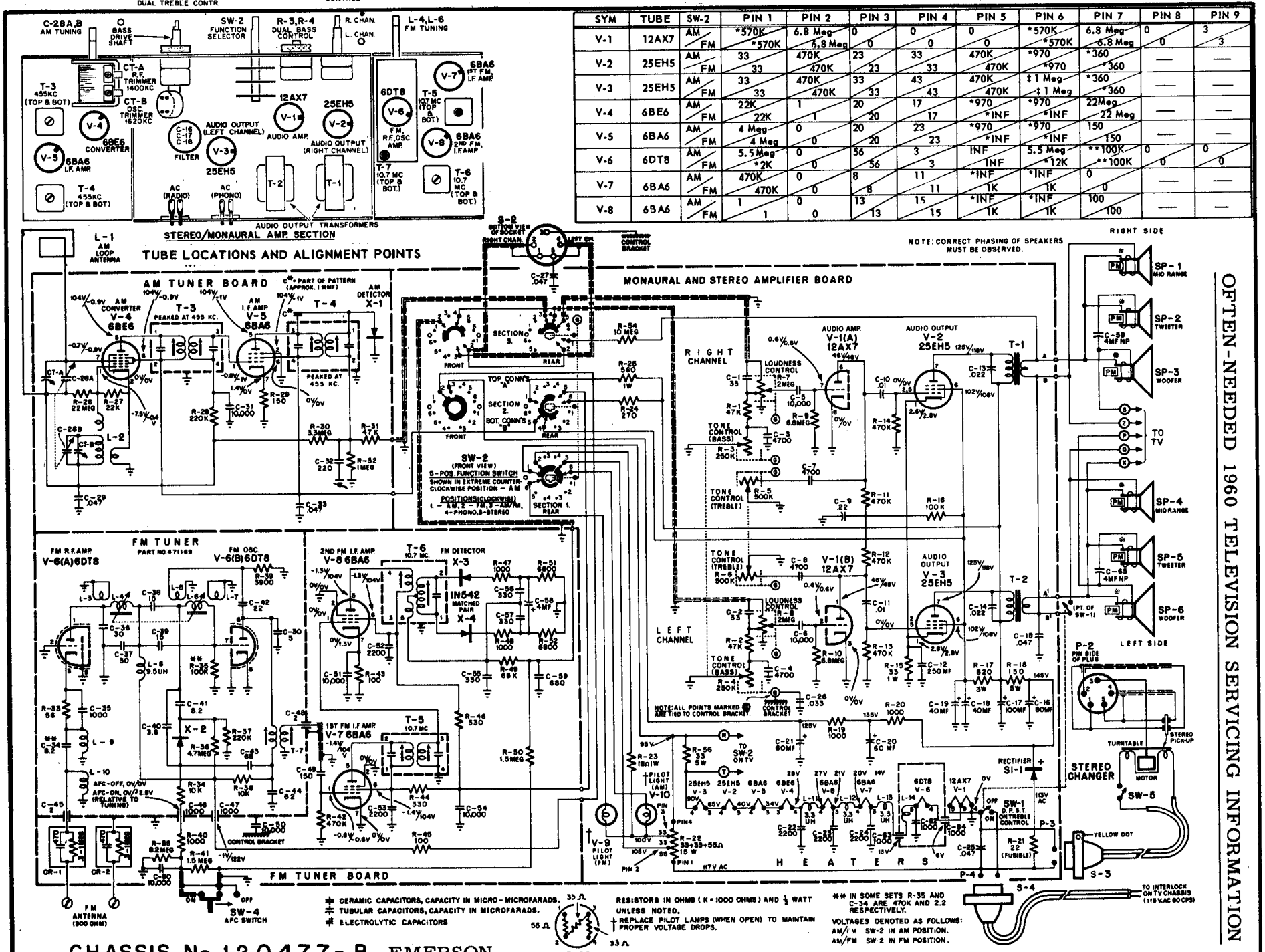
ETCHED PRINTED CIRCUIT BOARD CHASSIS 120477B (TOP VIEW) (USED WITH MODEL 1480)



ETCHED PRINTED CIRCUIT BOARD CHASSIS 120477B (BOTTOM VIEW)

RESISTANCE READINGS CHART, CH. 120477B

SYM	TUBE	SW-2	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	12AX7	AM	*570K	6.8 Meg	0	0	0	*570K	6.8 Meg	0	3
		FM	*570K	6.8 Meg	0	0	0	*570K	6.8 Meg	0	3
V-2	25EH5	AM	33	470K	23	33	470K	*970	*360	—	—
		FM	33	470K	23	33	470K	*970	*360	—	—
V-3	25EH5	AM	33	470K	33	43	470K	‡1 Meg	*360	—	—
		FM	33	470K	33	43	470K	‡1 Meg	*360	—	—
V-4	6BE6	AM	22K	1	20	17	*970	*970	22Meg	—	—
		FM	22K	1	20	17	*INF	*INF	22 Meg	—	—
V-5	6BA6	AM	4 Meg	0	20	23	*970	*970	150	—	—
		FM	4 Meg	0	20	23	*INF	*INF	150	—	—
V-6	6DT8	AM	5.5 Meg	0	56	3	INF	5.5 Meg	**100K	0	0
		FM	*2K	0	56	3	INF	*12K	**100K	0	0
V-7	6BA6	AM	470K	0	8	11	*INF	*INF	0	—	—
		FM	470K	0	8	11	1K	1K	0	—	—
V-8	6BA6	AM	1	0	13	15	*INF	*INF	100	—	—
		FM	1	0	13	15	1K	1K	100	—	—



CHASSIS No. 120477-B EMERSON

GENERAL ELECTRIC

"U4" Chassis used in Models 21T3559, 21C3567, 21C3570, 21C3571, 21C3573*, 21C3575, 21C3576, 21C3580*, 21C3581*, 21C3585*, 21C3586*

(Service material on pages 37 through 46)

ELECTRICAL ADJUSTMENTS

HEIGHT AND VERTICAL LINEARITY - These controls, R305 and R310, should be adjusted simultaneously to give proper vertical size consistent with good vertical linearity. Final adjustment should be made to allow the picture to extend approximately 1/8 inch beyond the top and bottom edges of mask.

HORIZONTAL HOLD -

1. Remove the cabinet back as described below.
2. Tune the receiver to a weak signal and adjust the controls for normal operation.
3. Short Test Point IX to the chassis with a jumper wire.
4. Connect a 1000 ohm resistor from Test Point X to Test Point XI (in parallel with L350).
5. Adjust horizontal hold potentiometer, R357 until picture just "Floats" back and forth across the screen. Leave R357 set in this position.
6. Remove the 1000 ohm resistor from Test Point X and Test Point XI. Adjust L350 stabilizer coil so that the picture again just "Floats" across the screen. Leave L350 set in this position.
7. Remove the jumper from Test Point IX and the chassis.

WIDTH

The width switch S351, located at the rear, has 3 positions. Select the position that fills the screen with approximately 1/4 inch beyond the mask

AGC CONTROL

Tune in the strongest TV station signal in the area for maximum gain. Adjust the AGC control clockwise until an overload condition exists which will appear as tearing of the picture. Turn control counterclockwise until overload conditions disappears and then slightly beyond this point is the appropriate setting of this control.

PICTURE TUBE ADJUSTMENTS

YOKE POSITION - The yoke is secured to the neck of the picture tube by a "U" shaped clamp and spring, Figure 1. To adjust the yoke for picture tilt, loosen the clamp by squeezing points C and D with long nose pliers until the eye of the spring slides over the bend in the clamp. The yoke can now be adjusted for correct picture tilt. To secure the yoke, the pliers are used in the same manner between points A and B until the spring eye slides over the bend to its clamping position.

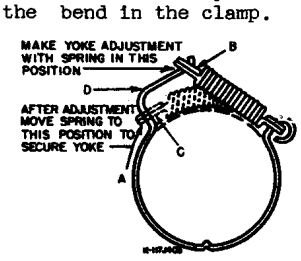


FIG. 1 YOKE CLAMP

PICTURE CENTERING - The picture centering device is located on the rear of the yoke assembly. The centering device consists of two rings each of which may be rotated separately. Each ring has two tabs with punched holes. The holes are provided so that an insulated alignment tool may be inserted in them to provide an easy means of rotating the rings. Rotate the rings so that the tabs move towards or away from each other to center the picture on the face of the tube.

FOCUS - The proper focus potential for the tube was chosen at the time the set was manufactured. If it becomes necessary to install a new picture tube or change the focus potential, any one of four potentials may be chosen for best focus.

The four connection points for focus potential are located on the horizontally mounted printed board behind the rear adjustment controls. The lead from R216 mounted on the picture tube socket may be connected to one of the following points to obtain best focus:

1. Ground potential (black lead) - wire wrap terminal to the right side and rear of the vertical linearity control as viewed from the rear of the chassis. This point also connects Pin 8 of picture tube to ground.
2. B+ 135V (orange lead) - wire wrap terminal to the left side of the vertical linearity control as viewed from the rear of the chassis.
3. B+ 280V (red lead) - the negative terminal (unpainted) of C363, Boost capacitor mounted on side of high voltage cage.
4. B+ Boost (red & white lead) - wire wrap terminal at spark gap to the rear and right side of the vertical linearity control as viewed from the rear of the chassis.

TO REMOVE THE CHASSIS FROM THE CABINET

Remove the knobs from the shafts on the front of the cabinet. Disconnect any antenna connected to the antenna terminal board. Remove the cabinet back by taking out the screws securing the back of the cabinet, the interlock bracket, and the antenna bracket. Remove the speaker leads from the speaker (or the speaker network terminal board on some models.) Connect one end of a lead to the chassis and touch the other end to the anode of the picture tube to discharge it. Remove the anode lead from the picture tube. Remove the four screws from the bottom of the cabinet which hold the chassis. Remove the picture tube socket. Loosen the yoke clamp and slide the yoke back over the neck of the picture tube. Remove the chassis from the cabinet.

* Models with power tuning and wireless remote control.

GENERAL ELECTRIC Chassis "U4" Service Information, Continued

TO REMOVE THE PICTURE TUBE

The chassis must be removed from the cabinet as previously described, before the picture tube can be removed.

After removing the chassis, remove the four screws which go through the bottom of the cabinet into the tube strap brackets. Remove the top left hand nut holding the tube bracket to the top left front of the cabinet. Hold the neck of the tube in the left hand and remove the top right hand nut holding the tube bracket to the top right front of the cabinet. Carefully remove the tube and tube strap bracket from the cabinet.

To remove the tube strap bracket from the picture tube, place the tube face down, on a clean cloth to prevent scratching the face plate of the tube. Loosen the nut on the spade bolt securing the picture tube in the tube strap bracket. Remove the tube strap from the tube.

Place the strap on the new tube in the same position it was in on the old tube. Be sure that the anode button is to the right when facing the back of the tube with the tube strap bracket ears at the top. Position the tape between the tube strap and picture tube. Tighten the nut on the spade bolt to secure the strap to the tube. Replace the tube assembly in the cabinet and observe if the tube aligns properly in the mask. If it does not, reposition the strap as necessary to effect proper alignment of the picture tube with the mask.

Reassemble picture tube into the cabinet by reversing the disassembly procedure.

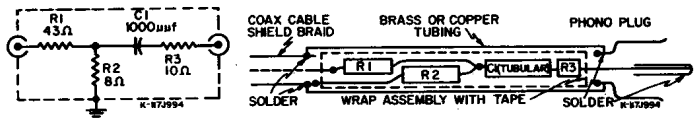


FIG. 2 I-F SWEEP INJECTION DIAGRAM AND PROBE CONSTRUCTION

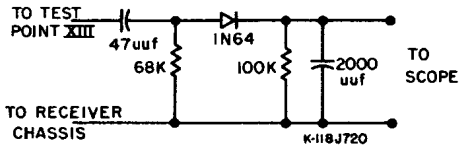


FIG. 3 DETECTOR NETWORK

VIDEO I-F SYSTEM

INTRODUCTION:

The video I-F system must be in alignment in order to align most other sections of the receiver and therefore it is treated first. A list of the frequencies of the tuned coils is given and may be used for pre-peaking these coils, but overall sweep alignment is necessary to correctly align the I-F system.

AM PRE-PEAKING AND TRAP FREQUENCIES	
L135	Max. at 45.75 MC
L151 Trap	Min. at 47.25 MC
L152	Max. at 42.50 MC
L153 Trap	Min. at 41.25 MC
L154 Trap	Min. at 47.25 MC
L155	Max. at 44.15 MC
T151	Max. at 42.90 MC
T152	Max. at 45.30 MC

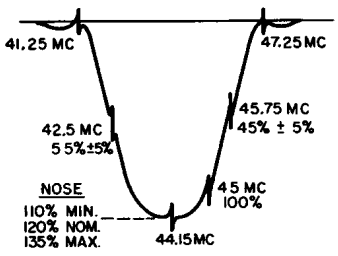


FIG. 4. DESIRED I-F RESPONSE CURVE

GENERAL NOTES:

1. Allow receiver and alignment equipment at least 20 minutes of warm-up time before proceeding.
2. Turn the volume control fully counter clockwise and the contrast control fully clockwise. Set the channel selector to channel 11 or some other high band channel where oscillator influences is not noted as the fine tuning control is turned. Turn the fine tuning control fully counter clockwise.
3. Adjust the AGC control, R254, to mid-range.
4. Connect the oscilloscope to Test Point IV through a 22,000 ohm resistor. The resistor should not be more than 2.5 inches away from Test Point IV.
5. Connect 4.5 volts bias between Test Point VII and the chassis with the positive side of the bias voltage on Test Point VII.
6. Inject signals from a properly terminated AM signal generator or sweep generator through the network in Figure 2 to the I-F injection jack.

The I-F injection jack is not a phono type receptacle. The connection is made by the end of the phono plug touching the contact inside the injection jack. The outside shell of the plug grips the injection jack firmly. Press the plug firmly into place without excess pressure. See Figure 2 for plug construction.

7. Align the receiver to produce the response curve shown in Figure 4.

Proceed as follows:

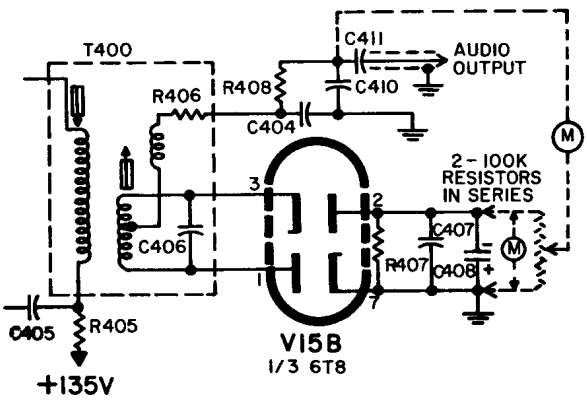


FIG. 5 AUDIO ALIGNMENT CONNECTION

NOTE: The top core of T200 has two positions showing minimum. The bottom core has two positions showing maximum. The correct position for each core is the position nearest the respective end of the coil.

GENERAL ELECTRIC Chassis "U4" Alignment Information, Continued

VIDEO I-F ALIGNMENT CHART

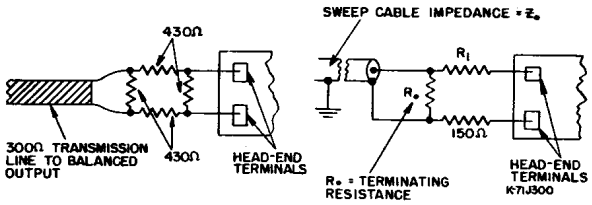
STEP	SIGNAL FREQUENCY	ADJUST	NOTES
1.	47.25 MC AM	L151 and L154 for minimum scope deflection.	Use maximum scope sensitivity and the lowest possible signal level for the 47.25 MC and 41.25 MC AM adjustments. The tuning cores of L153 and L154 must be positioned at the tuning point closest to the printed board. (It is possible to attain two tuning points).
2.	41.25 MC AM	L153 for minimum scope deflection.	
3.	38-48 MC sweep generator. Scope calibrated 3 volts peak to peak for 2 inch deflection.	T151 (1st I-F plate) for proper amplitude of the 42.5 MC marker.	Maintain as near as possible marker position and limits shown in desired response Fig. 4. Peak region of curve may vary from 110% to 135% using 45.0 MC point as 100% reference.
4.	Same	T152 (2nd I-F plate) for proper amplitude of the 45.75 MC marker.	
5.	Same	L155 (video detector) for maximum deflection of the 44.15 MC marker (nose).	
6.	Same	L135 (converter plate) for maximum amplitude of the 45.75 MC marker.	
7.	Same	L152 (1st I-F grid) for maximum amplitude of the 42.5 MC marker.	
8.	Same	L152 and L155 slightly to "rock the nose" for proper shape and symmetry.	T151 and T152 may require readjustment, after L152 and L155 are set, to bring the markers within tolerance. The curve should be symmetrical in appearance.

4.5 MC TRAP AND AUDIO TAKEOFF ALIGNMENT

1. Connect a -7.5 volt bias between Test Point VII and the chassis with the negative bias on Test Point VII.
2. Connect an accurate 4.5 MC AM signal to Test Point IV through a 1000 ufd. capacitor.
3. Connect the detector network, Figure 3, to Test Point XIII. Connect a scope to the network.
4. Connect AC VTVM to the speaker terminals.
5. Tune the top core of T200 for minimum deflection on the scope at Test Point XIII. (See Note below, Fig. 5.)
6. Tune the bottom core of T200 for maximum reading on the VTVM.
7. Retune the top core of T200 again for minimum deflection on the scope.

AUDIO I-F ALIGNMENT

1. Connect an antenna to the receiver and tune in a weak television signal. This will provide a 4.5 MC FM signal source for audio I-F alignment. Keep the volume control turned down unless the speaker is connected.
2. Connect two matched 100,000 ohm resistors in series between Pin 2 of V15B (6T8) and the chassis as shown in Figure 5.
3. Follow instructions in the Audio Alignment Chart.



Z_0	R_0	R_1
50Ω	56Ω	120Ω
72Ω	82Ω	110Ω
92Ω	110Ω	100Ω

FIG. 6 SWEEP EQUIPMENT TERMINATION

AUDIO ALIGNMENT CHART

STEP	CONNECT VTVM	ADJUST	METER INDICATION	NOTES
1.	Between Pin 2 of V15B and chassis.	T200 Secondary (Bottom)	Adjust for maximum.	Repeat Steps 1, 2, and 3 to assure proper alignment.
2.		T400 Primary (Top)	Adjust for maximum.	
3.	Between Junction of R408, C411, and the center of the two 100,000 ohm resistors.	T400 Secondary (Bottom)	Adjust for zero volts D-C output. Where possible set meter for zero center.	

GENERAL ELECTRIC Chassis "U4" Alignment Information, Continued

VHF TUNER OSCILLATOR ALIGNMENT

PROCEDURE:

The I-F system must be checked and in proper alignment before proceeding.

1. Connect the sweep generator to the antenna terminals (T101) using a balanced adapter to obtain 300 ohms output. When using test equipment of the unbalanced output type, a pad, as shown in Fig. 6, may be used instead. Set sweep generator to produce a sweep width of 10-15 mc.
2. Connect a 1 volt bias battery to tuner AGC connection with positive lead of battery connected to the tuner chassis.
3. Set fine tuning control to a point one-third from the maximum capacity stop and leave fixed in this position throughout the entire alignment procedure.
4. Observe the output response with oscilloscope connected to Test Point IV (video detector diode load) through 10,000 ohms.
5. Apply power to the receiver and test equipment. Allow at least 15 minutes warm-up time of all equipment before making adjustments.

NOTES:

1. In cases where the R-F tuner unit has the oscillator centering capacitor (C130) on the top deck, the capacitor should be set at the center of the tuning range.
2. Make indicated adjustments so that the picture carrier marker for the channel falls at 45% on the high frequency slope of the response curve.

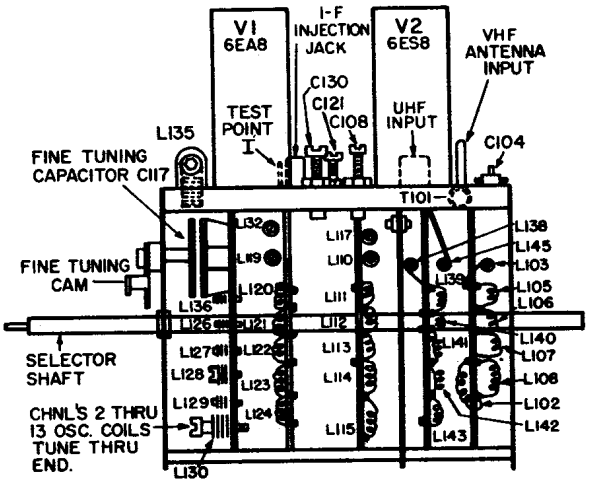


FIG. 7 ADJUSTMENT LOCATIONS

OSCILLATOR ALIGNMENT CHART

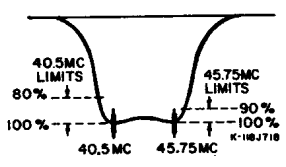
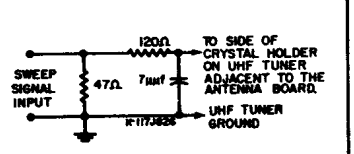
STEP	RECEIVER & SWEEP POSITION	MARKER GENERATOR FREQUENCY	OBSERVE RESPONSE CURVE AT	ADJUST (See Note 1)
1	Channel 13	211.25 MC	Test Point IV (Video detector diode load thru 10,000 ohms) See Note 2.	L136 Channel No. 13 oscillator adjustment.
2	Channel 12	205.25 MC		L131 Channel No. 12 oscillator adjustment.
3	Channel 11	199.25 MC		L131 Channel No. 11 oscillator adjustment.
4	Channel 10	193.25 MC		L131 Channel No. 10 oscillator adjustment.
5	Channel 9	187.25 MC		L131 Channel No. 9 oscillator adjustment.
6	Channel 8	181.25 MC		L131 Channel No. 8 oscillator adjustment.
7	Channel 7	175.25 MC		L131 Channel No. 7 oscillator adjustment.
8	Channel 6	83.25 MC		L130 Channel No. 6 oscillator adjustment.
9	Channel 5	77.25 MC		L129 Channel No. 5 oscillator adjustment.
10	Channel 4	67.25 MC		L128 Channel No. 4 oscillator adjustment.
11	Channel 3	61.25 MC		L127 Channel No. 3 oscillator adjustment.
12	Channel 2	55.25 MC		L126 Channel No. 2 oscillator adjustment.

ALIGNMENT OF 40 MC CHANNEL IN WT86X85 TUNER (UHF POSITION)

PROCEDURE:

1. Connect oscilloscope through a 10,000 ohm resistor to Test Point I on the VHF tuner to observe output curve.
2. Connect a 1 volt battery to the VHF tuner AGC with the positive lead of the battery to the tuner chassis.
3. Disconnect the I-F link from R150 on the main chassis and terminate the link cable with a 68 ohm resistor at the opened end only.
4. Remove the UHF crystal Y1 from the UHF tuner. Connect the sweep generator to the UHF converter through the resistor network as shown in the alignment chart.
5. Set the VHF tuner to the UHF position. Tune the UHF tuner for minimum tilt over the center tuning area (approximately 620 mc).
6. Apply power to the system - allow a minimum of 15 minutes warm-up to stabilize the equipment.

40 MC ALIGNMENT CHART

STEP	TUNE	TO OBTAIN	IDEAL CURVE	RESISTOR NETWORK
1	L119	40.5 mc marker position.		
2	L110	Maximum gain and symmetry.		
3	L138	Maximum gain and symmetry.		
4	T102	For maximum gain and zero tilt.		

GENERAL ELECTRIC Chassis "U4" Schematic Diagrams of Tuners (Continued)

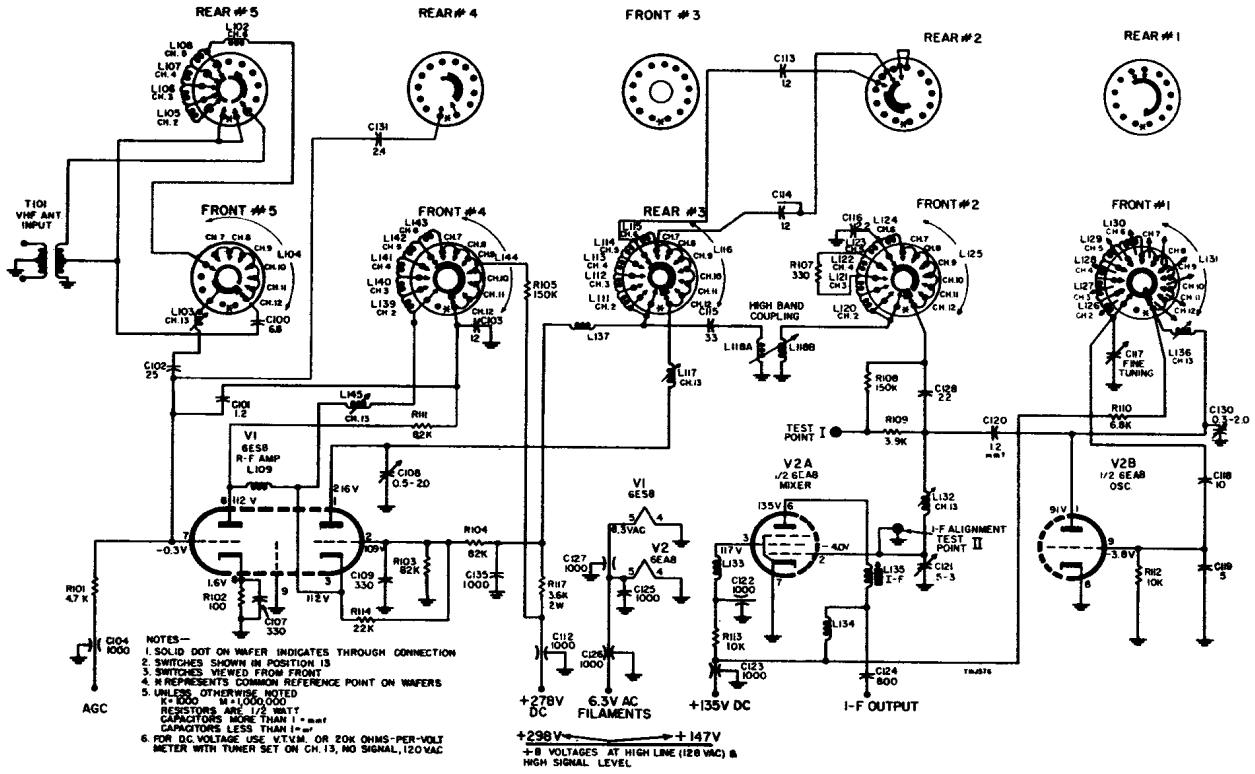


FIG. 8 12 POSITION TUNER SCHEMATIC WT86X84

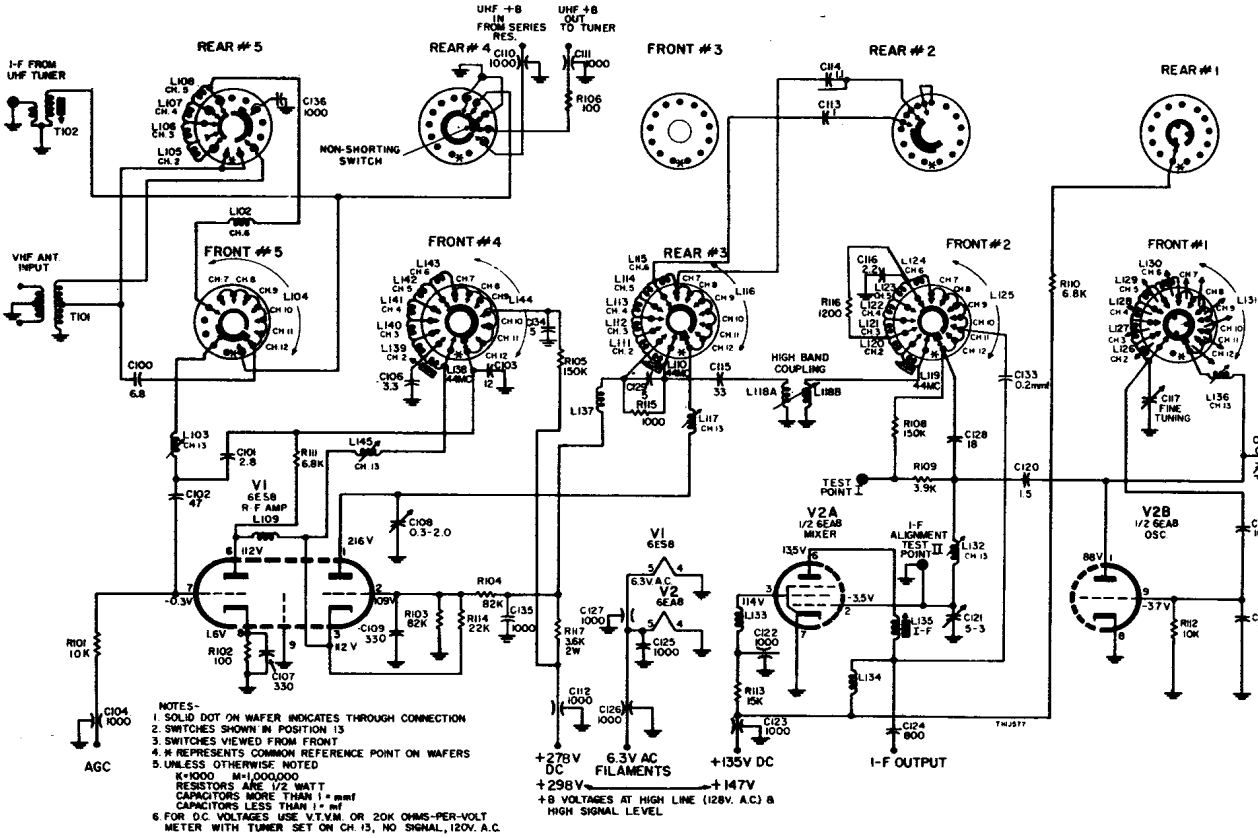
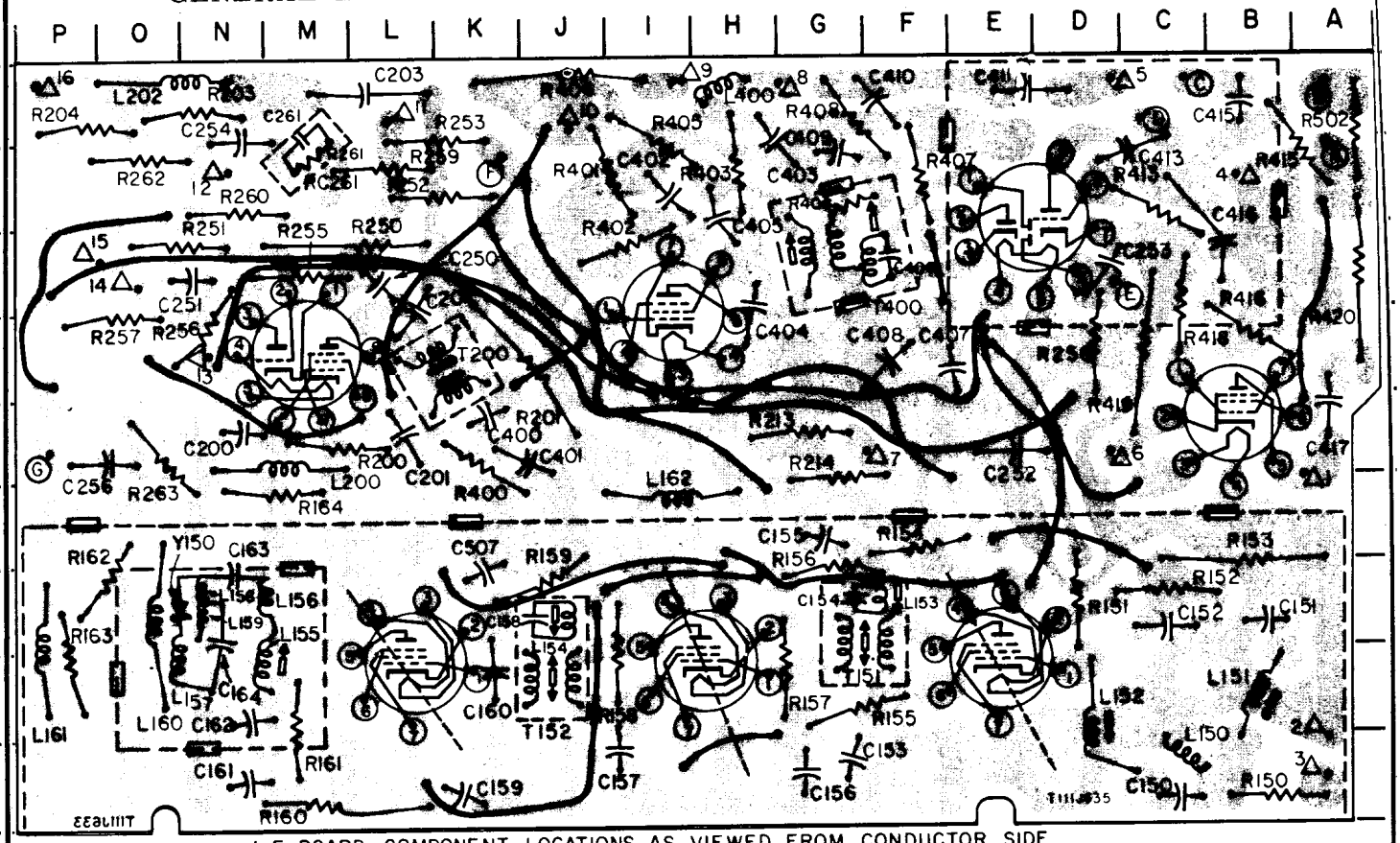


FIG. 9 13 POSITION TUNER SCHEMATIC WT86X85

GENERAL ELECTRIC Chassis "U4" Service Information, Continued



I-F BOARD COMPONENT LOCATIONS AS VIEWED FROM CONDUCTOR SIDE

COMPONENT LOCATION

FIG. 10 COMPONENT LOCATION

RESISTORS		RESISTORS		CAPACITORS		COILS		DIODES	
R150	B9	R400	K5	C200	N5	L150	C9	Y150	07
R151	D7	R401	I2	C201	L5	L151	B8	**TUBES**	
R152	C7	R402	I3	C202	L3	L152	D8		
R153	B7	R403	H2	C203	L1	L153	F7	V3	E8
R154	F6	R404	J1	C250	L3	L154	J7	V4	H8
R155	G8	R405	I1	C251	N3	L155	N8	V5	L8
R156	G7	R406	G2	C252	E5	L156	N7	V6	M4
R157	G8	R407	F2	C253	D3	L157	08	V14	I3
R158	I7	R408	G1	C254	N1	L158	N7	V15	E3
R159	J7	R413	C2	C256	P5	L159	N7	V16	B5
R160	M9	R415	A2	C261	M2	L160	07	**TEST POINTS**	
R161	M8	R416	B4	C400	K5	L161	P7		
R162	P7	R418	C3	C401	J5	L162	I6	IV	N5
R163	P8	R419	C4	C402	I2	L200	M5	V	04
R164	M6	R420	A3	C403	H1	L202	N1	VI Term.	16
R200	M5	R502	A1	C404	H3	L400	H1	VIII	P3
R201	J4	**CAPACITORS**		C405	H2				
R203	N1			C406	F3				
R204	01	C150	C9	C407	F4				
R213	G5	C151	B7	C408	F4				
R214	G5	C152	C7	C409	G2				
R250	L3	C153	G9	C410	F1				
R251	N3	C154	G7	C411	E1				
R252	K2	C155	G6	C413	C2				
R253	K1	C156	G9	C415	B1				
R255	M3	C157	I9	C416	B3				
R256	M4	C158	J7	C417	A5				
R257	04	C159	K9	C507	K7				
R258	D4	C160	K8	**TRANSFORMERS**					
R259	L2	C161	N9						
R260	N2	C162	N8	T151	G7				
R261	M2	C163	N7	T152	J8				
R262	02	C164	N7	T200	K4				
R263	05								

NUMBERED (▲) TRIANGLES

REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES FROM POINTS INDICATED.

- Δ 1. C418
- Δ 2. SHIELD OF SHIELDED LEAD FROM TUNER
- Δ 3. CENTER CONDUCTOR OF SHIELDED LEAD FROM TUNER
- Δ 4. S401, TERM. 2 - SHIELD ON SHIELDED LEAD CONTROL PANEL TERM. BRD. TERM 1 - SHIELD OF Ⓒ CONTROL PANEL TERM. BRD. TERM. 2 - SHIELD OF Ⓓ
- Δ 5. S401, TERM. 4
- Δ 6. C506B ▬
- Δ 7. BRIGHTNESS CONTROL - R212, TERM. 3
- Δ 8. S401, TERM. 9 FROM Δ9 ON NON-REMOTE TUNING MODELS - POINT "B" FROM REMOTE VOLUME CONTROL ON REMOTE TUNING MODELS
- Δ 9. FROM Δ8 ON NON-REMOTE TUNING MODELS - POINT "A" FROM REMOTE VOLUME CONTROL ON REMOTE TUNING MODELS
- Δ 10. Δ8 ON SWEEP BOARD R503
- Δ 11. Ⓓ ON SWEEP BOARD
- Δ 12. Δ7 ON SWEEP BOARD
- Δ 13. F501
- Δ 14. Δ15 ON SWEEP BOARD
- Δ 15. C503, GROUND TAB SHIELD OF SHIELDED LEAD ON Δ14 Δ6 ON SWEEP BOARD
- Δ 16. Ⓐ ON SWEEP BOARD (TEST POINT VI)

LETTERED Ⓐ CIRCLES

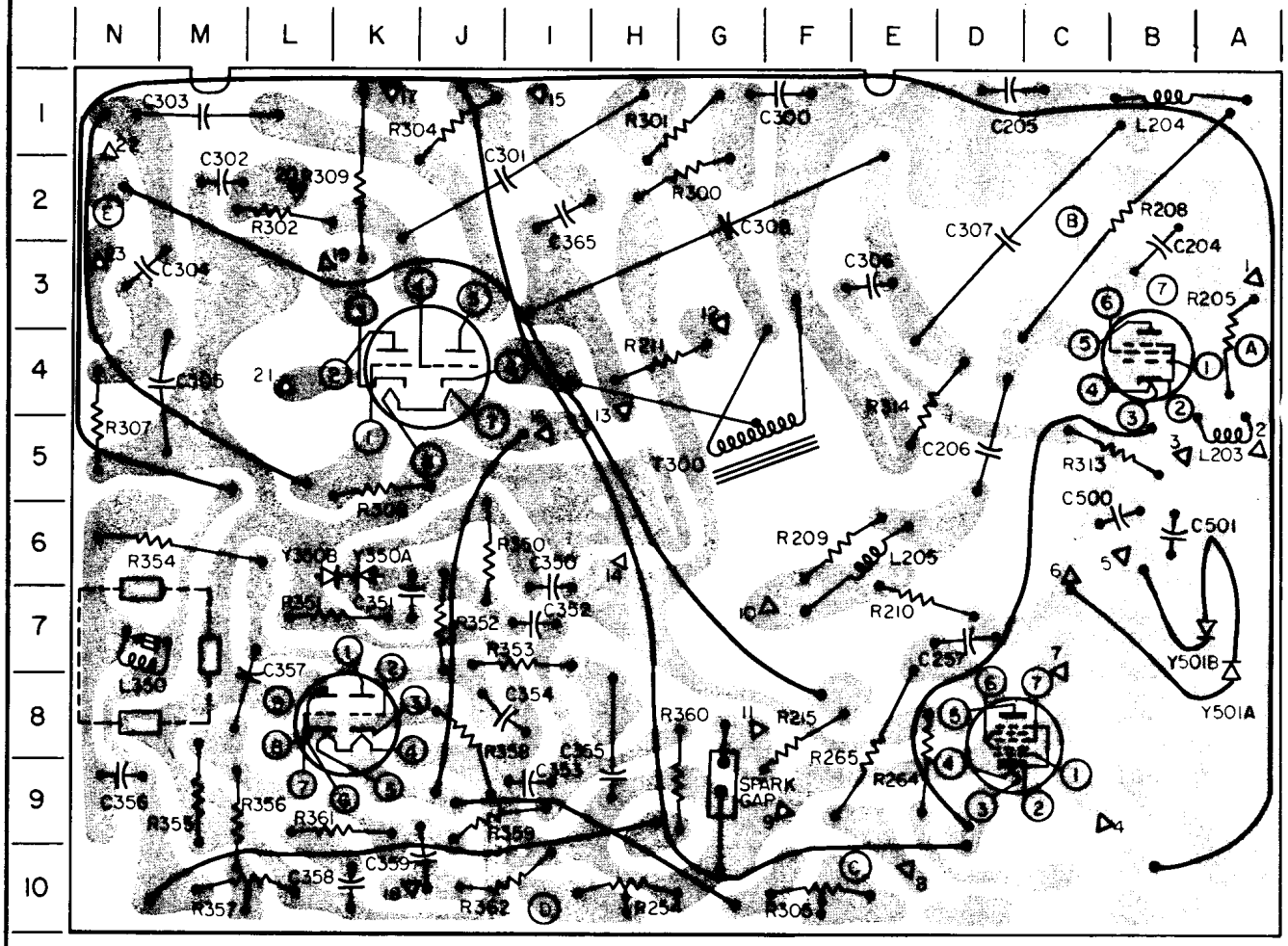
REPRESENT BOARD MOUNTED WIRES CONNECTED TO POINTS INDICATED.

- Ⓐ C505A ▲
- Ⓑ C505B ■
- Ⓒ TREBLE CONTROL - R417, TERM. 2
- Ⓓ VOLUME CONTROL - R410, TERM. 2
- Ⓔ AGC TERMINAL ON TUNER
- Ⓕ C505C ◓
- Ⓖ Δ4 ON SWEEP BOARD

ROMAN (V) NUMERALS

REPRESENT TEST POINTS.

GENERAL ELECTRIC Chassis "U4" Service Information, Continued



SWEEP BOARD COMPONENT LOCATIONS AS VIEWED FROM CONDUCTOR SIDE

COMPONENT LOCATION

RESISTORS		RESISTORS		CAPACITORS	
R205	A3	R360	G9	C359	J10
R208	B2	R361	K9	C365	I2
R209	F6	R362	L10	C500	B6
R210	E7			C501	B6
R211	H4	CAPACITORS			
R215	F8			COILS	
R254	H10	C204	B3		
R264	E8	C205	D1	L203	A5
R265	E8	C206	D5	L204	B1
R300	G2	C257	D7	L205	E6
R301	G1	C300	F1	L350	N7
R302	L2	C301	J2		
R304	J1	C302	M2	TRANSFORMERS	
R305	F10	C303	M1		
R307	N5	C304	N3	T300	G5
R308	K5	C305	M4		
R309	K2	C306	E3	DIODES	
R313	B5	C307	D2		
R314	E4	C308	G2	Y501A	A7
R350	J6	C350	I6	Y501B	A7
R351	L7	C351	K7	Y350A	K6
R352	J7	C352	I7	Y350B	K6
R353	I7	C353	I9		
R354	N6	C354	I8	TUBES	
R355	M9	C355	H8		
R356	M9	C356	N9	V7	B4
R357	L10	C357	L8	V8	D8
R358	L10	C358	K10	V9	J4
R359	J9			V10	K8

FIG. 11 COMPONENT LOCATION

LETTERED Ⓐ CIRCLES

REPRESENT BOARD MOUNTED WIRES CONNECTED TO POINTS INDICATED

- Ⓐ Δ16 ON I-F BOARD
- Ⓑ C505A ■
- Ⓒ R306
- Ⓓ Δ11 ON I-F BOARD
- Ⓔ C363+

ROMAN (Ⅹ) NUMERALS

REPRESENT TEST POINTS

IX	J6
X	M6
XI	M5

FOCUS POINTS

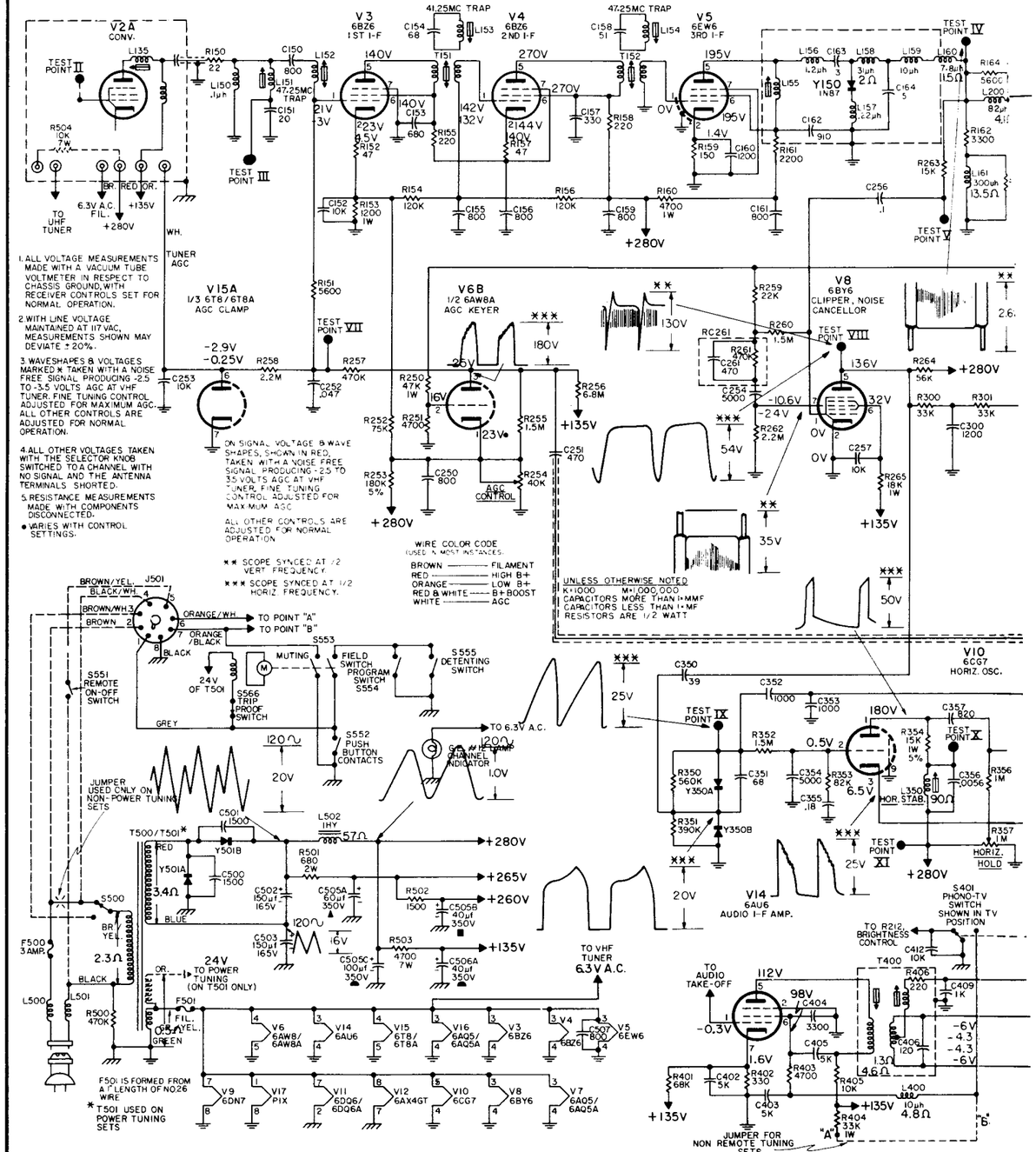
GROUND	Δ9
+135V	Δ8
+280V	C363-
+BOOST	Δ11

NUMBERED (Δ) TRIANGLES

REPRESENT WIREWRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES FROM POINTS INDICATED

- Δ 1. TERM. 1 OF CONTRAST CONTROL R206
- Δ 2. RED LEAD FROM T500/T501
- Δ 3. GREEN LEAD FROM T301
- Δ 4. Ⓔ ON I-F BOARD
- Δ 5. C502+
- Δ 6. GREEN LEAD FROM T500/T501
- Δ 7. Δ12 ON I-F BOARD
- Δ 8. Δ10 ON I-F BOARD
- Δ 9. PIN 8 OF PICTURE TUBE SOCKET
- Δ 10. PIN 6 OF PICTURE TUBE SOCKET
- Δ 11. PIN 3 OF PICTURE TUBE SOCKET
- Δ 12. TERM. 2 OF BRIGHTNESS CONTROL, R212
- Δ 13. PIN 7 OF PICTURE TUBE SOCKET
- Δ 14. TEST POINT VIII
- Δ 15. CENTER CONDUCTOR OF SHIELDED LEAD FROM Δ14 ON I-F BOARD
- Δ 16. PIN 1 OF PICTURE TUBE SOCKET
- Δ 17. VERTICAL LINEARITY CONTROL, R310
- Δ 18. R363 ON HOR. SWEEP SUB-CHASSIS
- Δ 19. C506D ■
- Δ 20. TERM 2 VERTICAL HOLD CONTROL, R303
- Δ 21. BLUE LEAD ON T301
- Δ 22. RED LEAD ON T301
- Δ 23. TERM. 4 ON YOKE, YELLOW LEAD ON T301

GENERAL ELECTRIC Chassis "U4" Schematic Diagram (Continued)



1. ALL VOLTAGE MEASUREMENTS MADE WITH A VACUUM TUBE VOLTMETER IN RESPECT TO CHASSIS GROUND, WITH RECEIVER CONTROLS SET FOR NORMAL OPERATION.
2. WITH LINE VOLTAGE MAINTAINED AT 117 VAC, MEASUREMENTS SHOWN MAY DEVIATE ± 20%.
3. WAVESHAPES & VOLTAGES MARKED * TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5 VOLTS AGC AT VHF TUNER. FINE TUNING CONTROL ADJUSTED FOR MAXIMUM AGC. ALL OTHER CONTROLS ARE ADJUSTED FOR NORMAL OPERATION.
4. ALL OTHER VOLTAGES TAKEN WITH THE SELECTOR KNOB SWITCHED TO A CHANNEL WITH NO SIGNAL AND THE ANTENNA TERMINALS SHORTED.
5. RESISTANCE MEASUREMENTS MADE WITH COMPONENTS DISCONNECTED.
- VARIES WITH CONTROL SETTINGS.

* ON SIGNAL, VOLTAGE & WAVE SHAPES, SHOWN IN RED, TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO 3.5 VOLTS AGC AT VHF TUNER. FINE TUNING CONTROL ADJUSTED FOR MAXIMUM AGC.

ALL OTHER CONTROLS ARE ADJUSTED FOR NORMAL OPERATION.

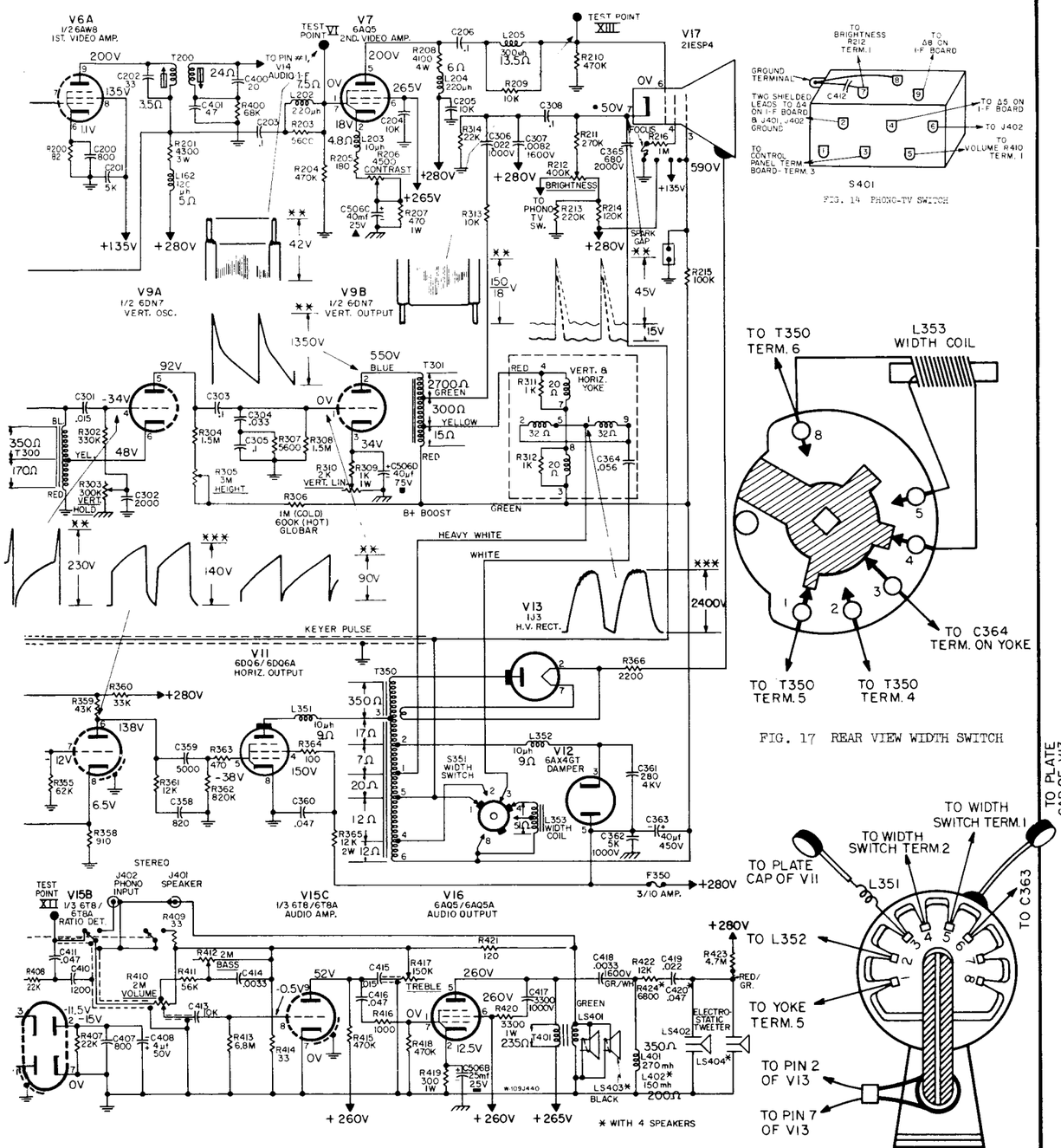
** SCOPE SYNCED AT 1/2 VERT. FREQUENCY.

*** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY.

* T501 USED ON POWER TUNING SETS

FIG. 18 MAIN SCHEMATIC WITH VOLTAGES AND WAVESHAPES

GENERAL ELECTRIC Chassis "U4" Schematic Diagram (Continued)



"U4" WITH VOLTAGES AND WAVESHAPES

FIG. 14 PHONO-TV SWITCH

FIG. 17 REAR VIEW WIDTH SWITCH

FIG. 15 HORIZONTAL OUTPUT TRANSFORMER

GENERAL ELECTRIC Chassis "U4" Service Information, Continued

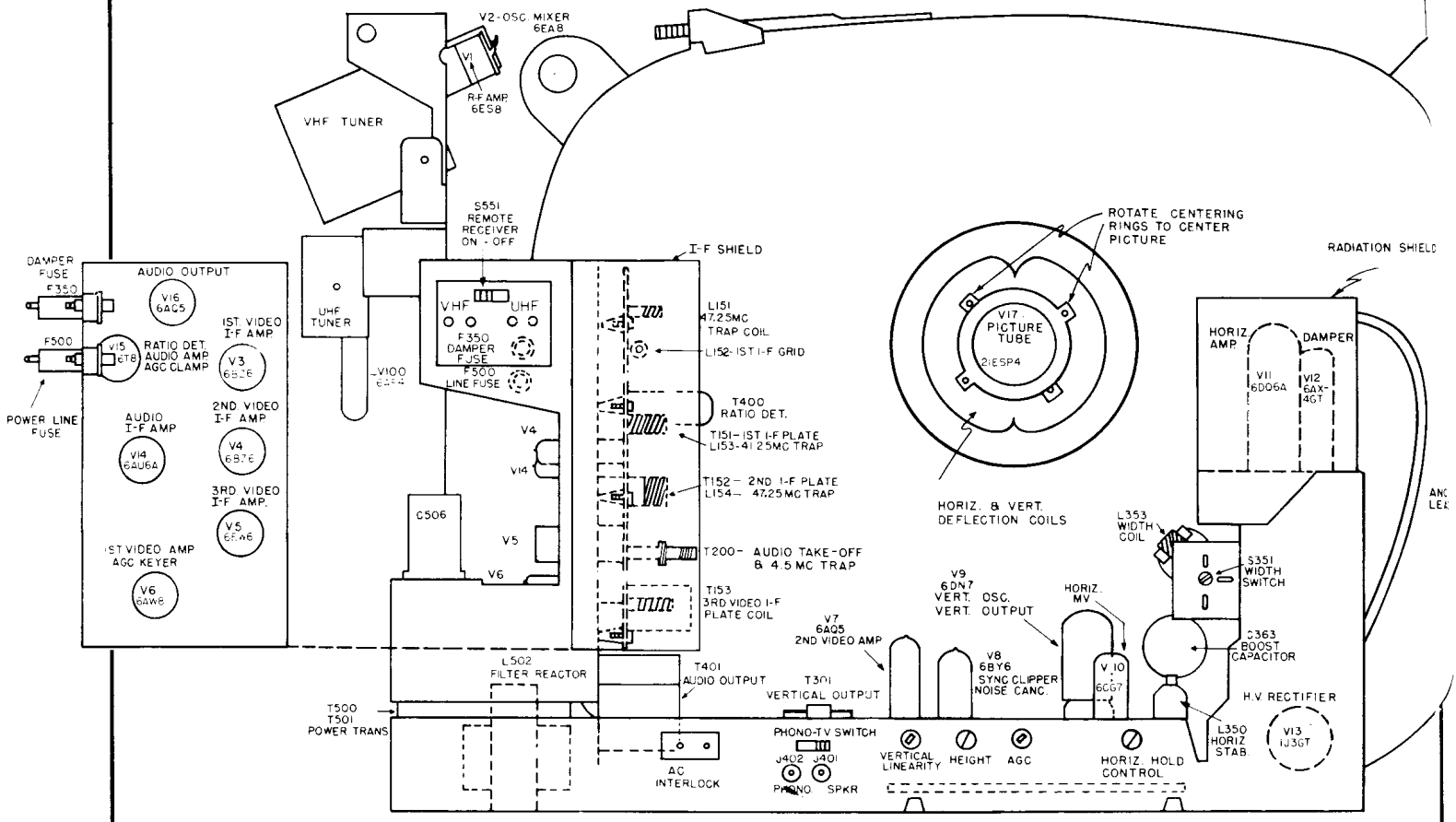


FIG. 12 TUBE AND TRIMMER LOCATION

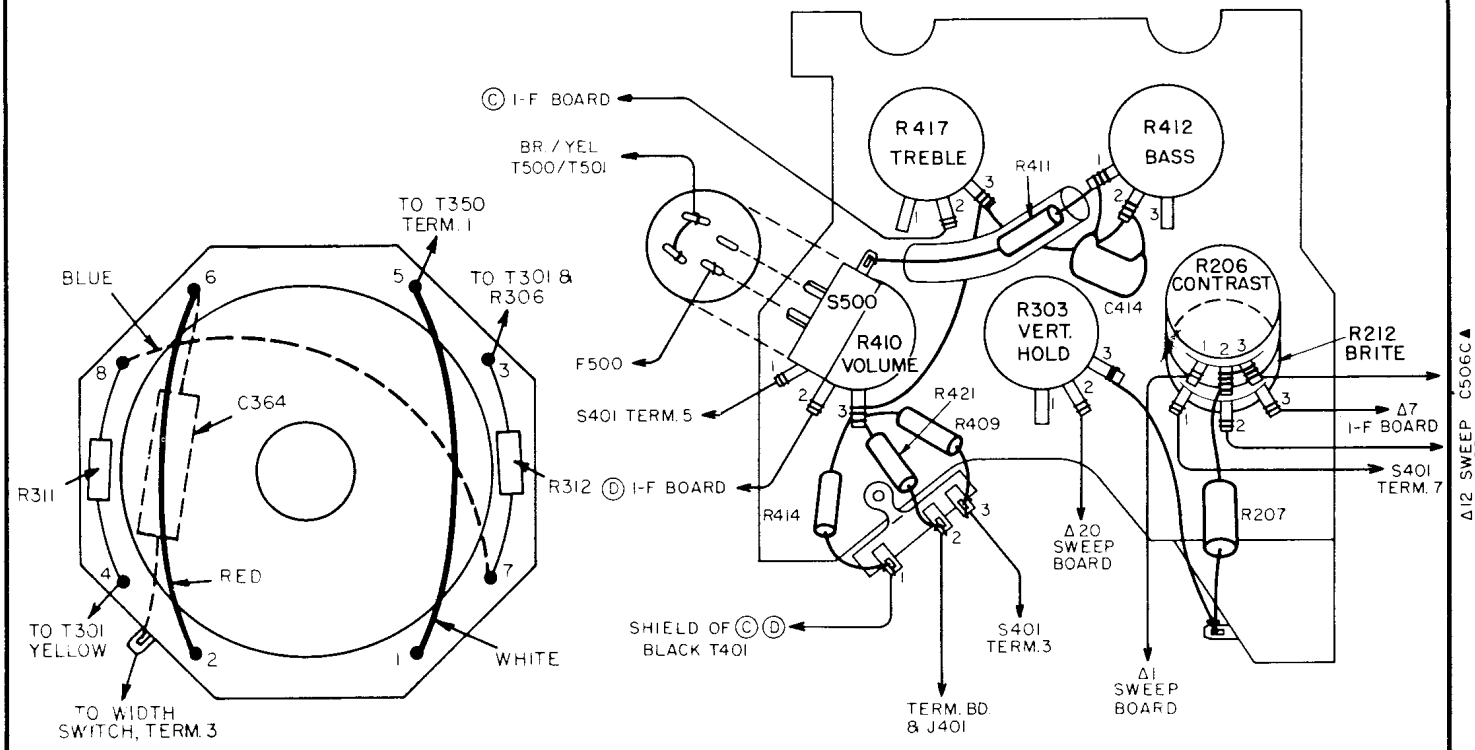


FIG. 16 DEFLECTION YOKE

FIG. 13 REAR VIEW OF CONTROL PANEL

Hoffman

HOFFMAN ELECTRONICS CORPORATION

Chassis 348, 350, Models 3653, 3663, 3673, 3683, 3733, Diagram on pages 50-51;
Chassis 351, 352, Models 1367, R1367, 1371, R1371, Diagram on pages 52-53;
Chassis 353, Models 3723, 3743, 3753, Circuit diagram on pages 48-49.
Alignment information for all these models presented below and on page 54.

The chassis 348, 351, 352, 353 and 354 are covered by the following alignment procedure. All chassis have the same basic Picture IF. Chassis 351, 352 and 353 incorporate a quadrature sound detector while the 348 and 354 chassis use the conventional ratio detector.

GENERAL SET UP CONDITIONS

1. Use a 117 volt AC power source.

2. Set the tuner between channels.

3. Bias the grid (pin 5) of the horizontal output tube with a -60 volt DC source. If this is not feasible, remove the 1B3 High Voltage rectifier or tape the end of the HV anode lead. UNDER NO CIRCUMSTANCES SHOULD THE YOKE PLUG BE PULLED TO KILL THE HIGH VOLTAGE. This would open the cathode of the horizontal output tube and raise the B+ voltages on the rest of the set, resulting in non-operative alignment conditions.

4. Adjust the CONTRAST CONTROL to its maximum clockwise rotation

5. Allow the receiver chassis and alignment equipment to warm up for several minutes.

SOUND ALIGNMENT - QUADRATURE

1. Connect a VTVM between point "B" (Pin 2 of V102, 6DT6 sound detector) and chassis ground. Use a 10K, 1/2 watt composition resistor in series with the meter lead and point "B." Set the VTVM on the -10 Volt DC scale.

2. Apply an unmodulated 4.5MC signal to point "A" (grid of Video Amplifier tube). Use a .005MFD capacitor in series with the generator lead to point "A."

3. Detune the quadrature coil (L102) by adjusting the core to the maximum outward position (away from chassis).

4. Adjust the sound take-off coil (L101) and the sound transformer (T101) for maximum voltage reading on the VTVM. Reduce the generator output as necessary to keep the voltage at point "B" about 3-1/2 to 4-1/2 volts at all times.

5. Switch the VTVM to its -150 volt DC scale. Move the VTVM lead from point "B" to point "C" (Pin 5 of V102, 6DT6 sound detector).

6. Increase the generator output at 4.5MC to maximum. Adjust the core of the sound quadrature coil (L102) inward toward the chassis until the VTVM reads MINIMUM. Continue turning the core inward until the VTVM reads from +97 to +103 volts.

7. Tune in a TV station. If sound is distorted, tune the core of the quadrature coil slightly in and out until undistorted sound is obtained. In a weak signal area, tune the quadrature coil carefully to obtain the least amount of noise while keeping the sound free of distortion.

SOUND ALIGNMENT - RATIO DETECTOR

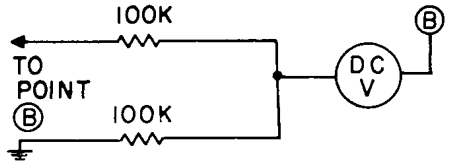
1. Same GENERAL SETUP CONDITIONS as before.

2. Connect a DC voltmeter between point "B" and chassis ground. Polarity of the meter leads should be such that the meter reads negative. Use a 10K, 1/2 watt composition resistor in series with the meter lead and point "B".

3. Apply an unmodulated 4.5MC signal to the grid of the Video Amplifier (Point A) through a .005MFD capacitor.

4. Adjust the ratio detector primary (bottom slug in T101) and the sound take-off coil (L101) for maximum meter reading with the generator output set to give about - 10 volts on the voltmeter.

5. Connect two matched 100K, 1/2 watt composition resistors in series. Solder these series resistors from point "B" to chassis ground. Now move the ground lead of the meter up to the junction of the two 100K resistors. The meter will now be between point "B" and the junction of the two 100K resistors.



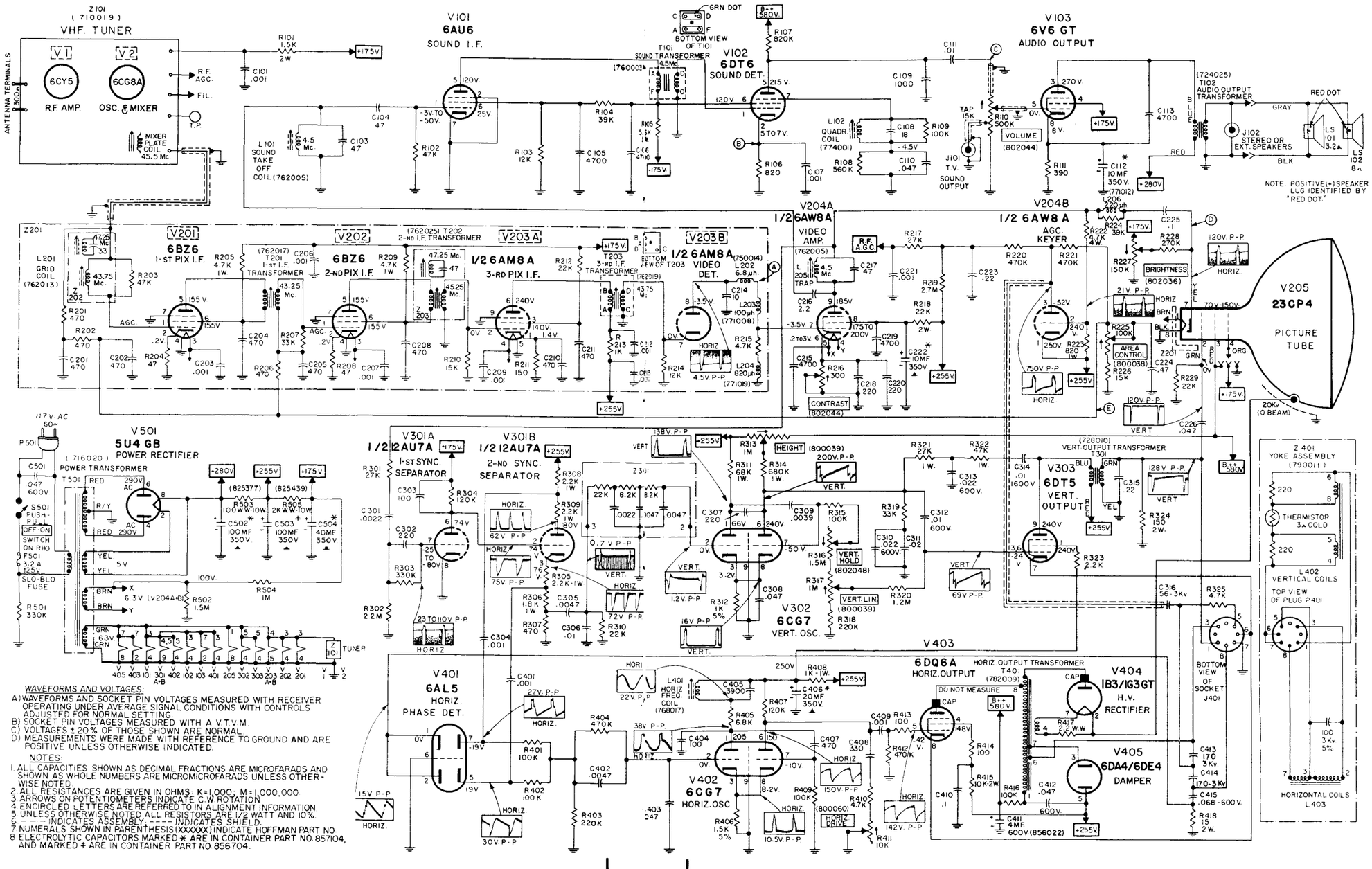
SOUND ALIGNMENT NETWORK

6. Adjust the ratio detector secondary (top slug of T101) until the meter reads zero. Use the 2.5 volt scale for the final setting of zero to obtain a more precise adjustment.

HOFFMAN CHASSIS 353

Exact Models using Chassis listed above:

B3723
M3723
SP3723
W3723
B3743
M3743
SP3743
W3743
B3753
M3753
SP3753
W3753



WAVEFORMS AND VOLTAGES:

A) WAVEFORMS AND SOCKET PIN VOLTAGES MEASURED WITH RECEIVER OPERATING UNDER AVERAGE SIGNAL CONDITIONS WITH CONTROLS ADJUSTED FOR NORMAL SETTING.
B) SOCKET PIN VOLTAGES MEASURED WITH A.V.T.V.M.
C) VOLTAGES ± 20% OF THOSE SHOWN ARE NORMAL.
D) MEASUREMENTS WERE MADE WITH REFERENCE TO GROUND AND ARE POSITIVE UNLESS OTHERWISE INDICATED.

NOTES:

1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN AS WHOLE NUMBERS ARE MICROMICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTANCES ARE GIVEN IN OHMS. K=1,000; M=1,000,000.
3. ARROWS ON POTENTIOMETERS INDICATE C.W. ROTATION.
4. ENCIRCLED LETTERS ARE REFERRED TO IN ALIGNMENT INFORMATION.
5. UNLESS OTHERWISE NOTED ALL RESISTORS ARE 1/2 WATT AND 10%.
6. — — — INDICATES ASSEMBLY; - - - - INDICATES SHIELD.
7. NUMERALS SHOWN IN PARENTHESIS (XXXXXX) INDICATE HOFFMAN PART NO.
8. ELECTROLYTIC CAPACITORS MARKED * ARE IN CONTAINER PART NO. 857104, AND MARKED ± ARE IN CONTAINER PART NO. 856704.

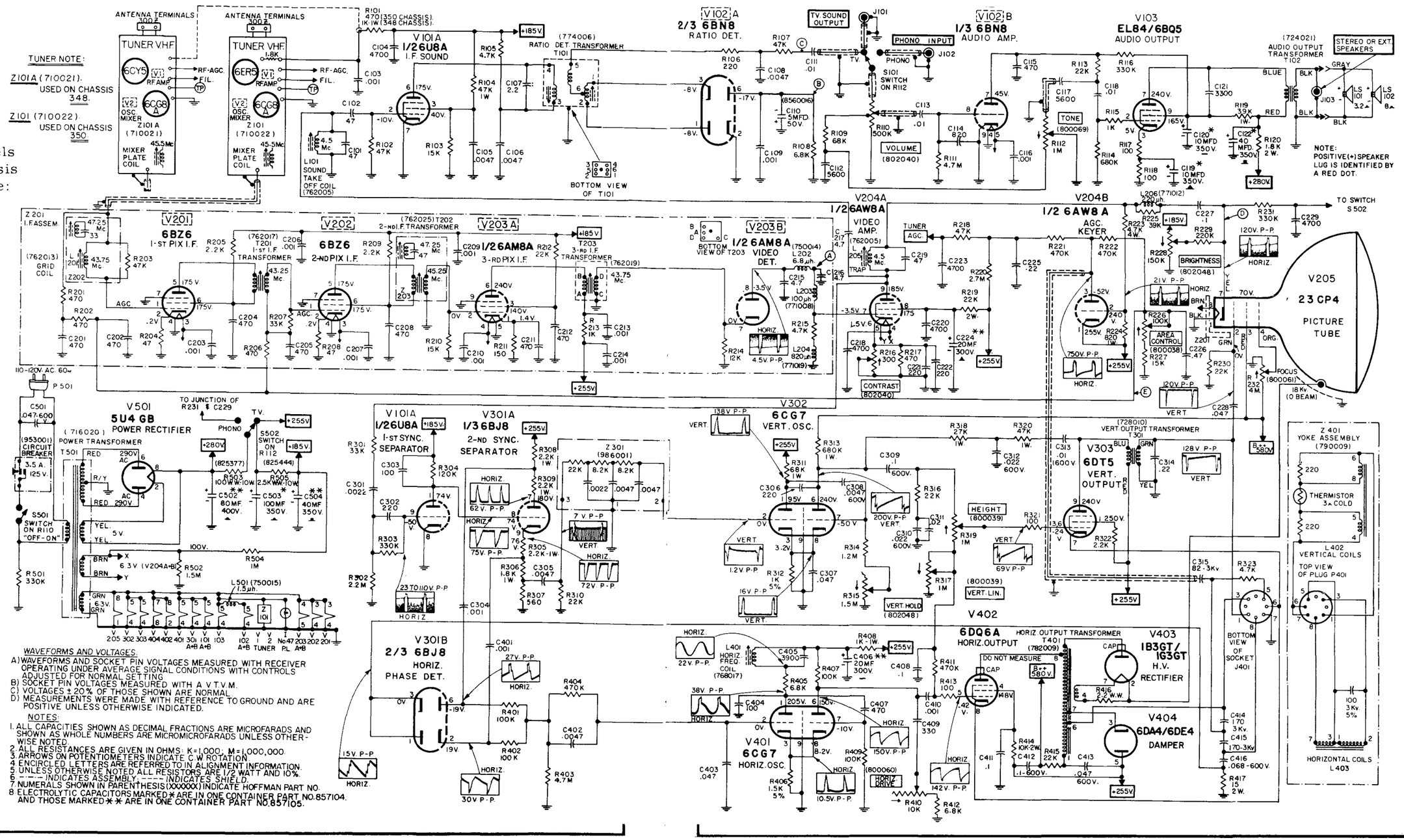
VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

MODELS 3723, 3743, 3753

HOFFMAN CHASSIS 348, 350

Exact Models using Chassis listed above:

B3653
M3653
SP3653
W3653
B3663
M3663
SP3663
W3663
B3673
M3673
SP3673
W3673
B3683
M3683
SP3683
W3683
B3733
M3733
SP3733
W3733



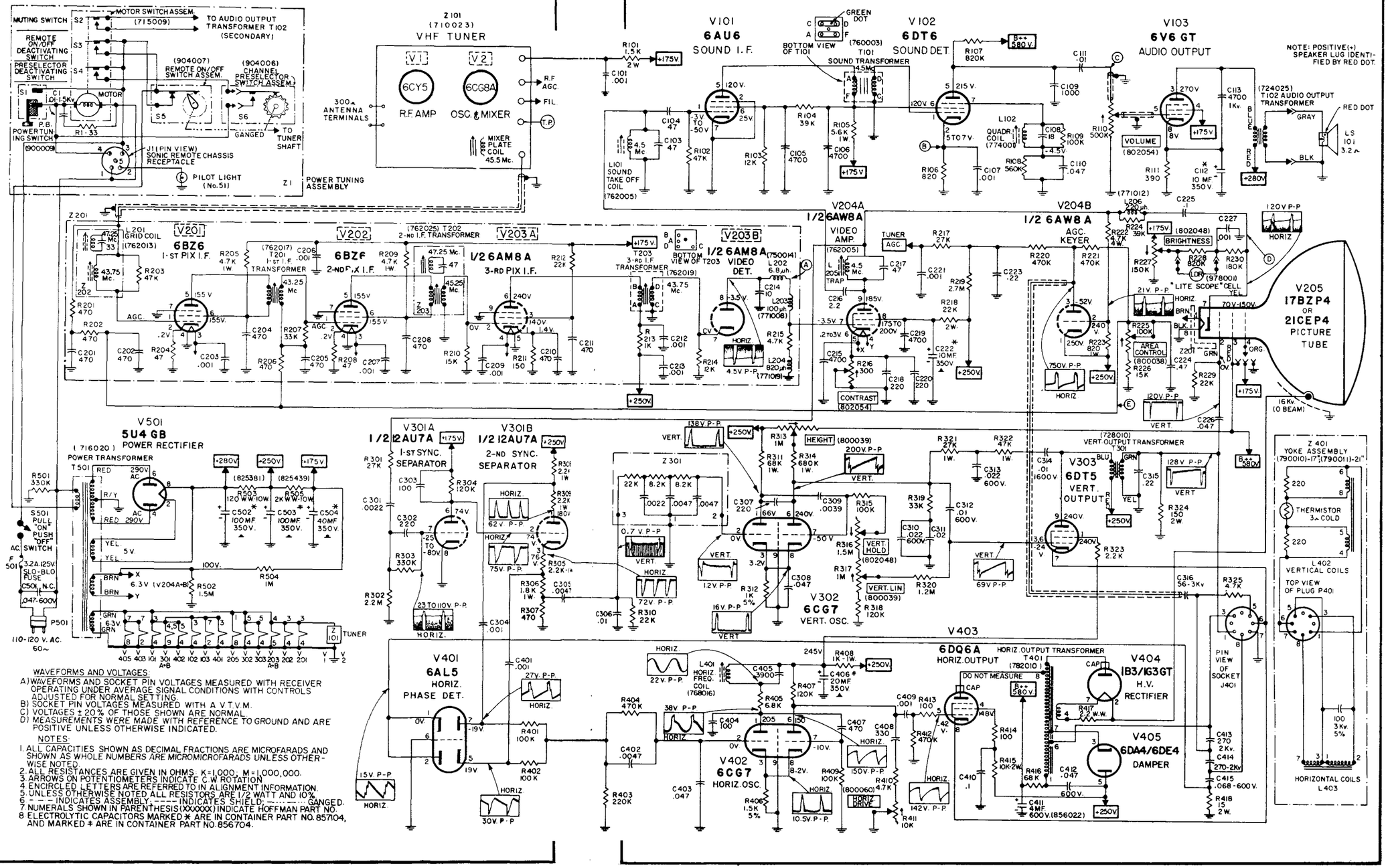
VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

MODELS 3653, 3663, 3673, 3683, 3733

HOFFMAN CHASSIS 351, 352

Exact Models using Chassis listed above:

K1367
W1367
M1367
B1367
SP1367
KR1367
WR1367
MR1367
BR1367
SPR1367
K1371
W1371
M1371
B1371
SP1371
KR1371
WR1371
MR1371
BR1371
SPR1371



WAVEFORMS AND VOLTAGES:

A) WAVEFORMS AND SOCKET PIN VOLTAGES MEASURED WITH RECEIVER OPERATING UNDER AVERAGE SIGNAL CONDITIONS WITH CONTROLS ADJUSTED FOR NORMAL SETTING.
B) SOCKET PIN VOLTAGES MEASURED WITH A V.T.V.M.
C) VOLTAGES ± 20% OF THOSE SHOWN ARE NORMAL.
D) MEASUREMENTS WERE MADE WITH REFERENCE TO GROUND AND ARE POSITIVE UNLESS OTHERWISE INDICATED.

NOTES:

1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN AS WHOLE NUMBERS ARE MICROMICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTANCES ARE GIVEN IN OHMS. K=1,000; M=1,000,000.
3. ARROWS ON POTENTIOMETERS INDICATE C.W. ROTATION.
4. ENCIRCLED LETTERS ARE REFERRED TO IN ALIGNMENT INFORMATION.
5. UNLESS OTHERWISE NOTED ALL RESISTORS ARE 1/2 WATT AND 10%.
6. - - - INDICATES ASSEMBLY; ——— INDICATES SHIELD; ——— GANGED.
7. NUMERALS SHOWN IN PARENTHESIS (XXXXXX) INDICATE HOFFMAN PART NO.
8. ELECTROLYTIC CAPACITORS MARKED * ARE IN CONTAINER PART NO. 857104, AND MARKED ≠ ARE IN CONTAINER PART NO. 856704.

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

MODELS 1367, R1367, 1371, R1371

HOFFMAN Alignment Information Continued for Chassis 348, 350, 351, 352, 353

4.5 MC VIDEO TRAP

1. Same GENERAL SETUP CONDITIONS as before.

2. Connect a voltmeter across a detector network. An R. F. probe will also serve. Connect the other end of the detector network (or probe) to point "D" (Cathode lead to picture tube).

3. Apply an unmodulated 4.5 MC signal to the control grid of the video amplifier (point "A") through a .005MFD capacitor.

4. Adjust the 4.5MC VIDEO TRAP in the plate circuit of the video amplifier tube for the MINIMUM reading on the voltmeter.

VIDEO IF ALIGNMENT

1. Same GENERAL SETUP CONDITIONS as before.

2. Connect a DC voltmeter to point "A" (Control grid of the Video amplifier tube) using a 10K, 1/2 watt composition resistor in series with the meter lead and a 1000 MMF capacitor across the meter leads (see diagram titled "ISOLATION NETWORK"). Meter polarity will be negative.

3. Apply a -3 volt DC fixed bias (battery or bias supply) to the IF AGC bus at point "E".

4. Adjust the CONTRAST CONTROL to MINIMUM setting (fully counter-clockwise).

5. Apply an unmodulated RF signal as follows: Push down the shield on the 6CG8A mixer tube, and fit a tube shield over the top of the tube. Couple the output from the signal generator directly to this shield. Set the tuner in between channels. Other methods of coupling the signal can be used, capacative coupling to the mixer tube results in the least toward spurious oscillation. This method should be used whenever possible.

6. Set the generator frequency to 43.75 mc and adjust the 3rd IF transformer to MAXIMUM reading. Keep the generator output setting so that the meter reads 2.5 volts or less.

7. Set the generator frequency to 45.25 mc and adjust the 2nd IF transformer to MAXIMUM reading. Set the generator to 47.25 mc and adjust the trap (coil away from chassis) to MINIMUM reading.

8. Set the generator frequency to 43.25 mc and adjust the 1st IF transformer to MAXIMUM reading, keeping the meter reading below 2.5 volts.

9. Set the generator frequency to 43.75 mc and adjust the grid coil to MAXIMUM. Set the generator to 47.25 mc and adjust the trap (coil away from chassis) to MINIMUM reading.

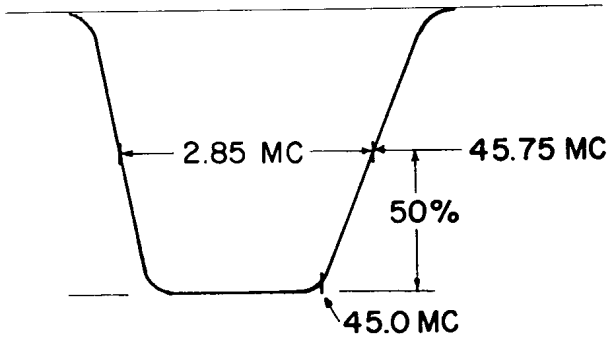
10. Set the generator frequency to 45.5 mc and adjust the convertor plate coil on the tuner to MAXIMUM. See sketch below.

SWEEP ALIGNMENT

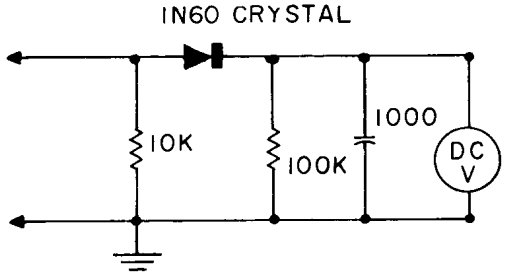
1. Connect the vertical input leads of an oscilloscope across the voltmeter leads. Set the horizontal frequency of the scope to 60 cycle sweep-locked to the line.

2. Turn OFF the unmodulated RF signal from the generator, and replace it with the signal from the SWEEP generator. Set the SWEEP control of the generator to zero sweep. Set the frequency of the sweep generator to 44 mc and adjust the sweep generator output to provide a reading of about 1 volt on the meter. Next set the SWEEP control on the generator to 10 or 12 MC sweep deviation. The meter reading should drop to about .25 volts, and an IF response curve should appear on the scope.

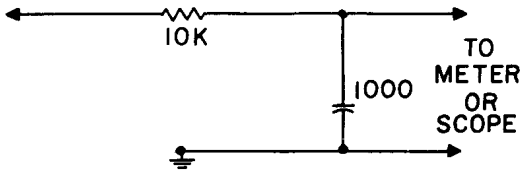
3. The optimum IF response curve should be as shown in the sketch. Slight touch up of the IF transformers T201, T202 and T203 may be necessary to approximate the optimum curve shown. If the rough alignment was carefully done, it should not be necessary to readjust the 47.25MC trap or converter plate coil or IF input coil. Be sure the marker output is kept below the point where the IF curve is affected.



OPTIMUM I-F RESPONSE CURVE



DETECTOR NETWORK



ISOLATION NETWORK

FREQUENCY	ADJUST
43.75 mc	3rd IF, T203 for max.
45.25 mc	2nd IF, T202 for max.
47.25 mc	Trap on T202, slug away from chassis for min.
43.25 mc	1st IF, T201 for max.
43.75 mc	Grid Coil, L201 for max.
47.25 mc	Trap on L201, slug away from chassis for min.
45.50 mc	Plate coil on tuner for max.

MONTGOMERY WARD & CO.

Models WG-4087A, WG-4187A, WG-5081A, WG-5091A, WG-5181A, WG-5191A

INSTRUCTIONS
CHASSIS ASSEMBLY REMOVAL

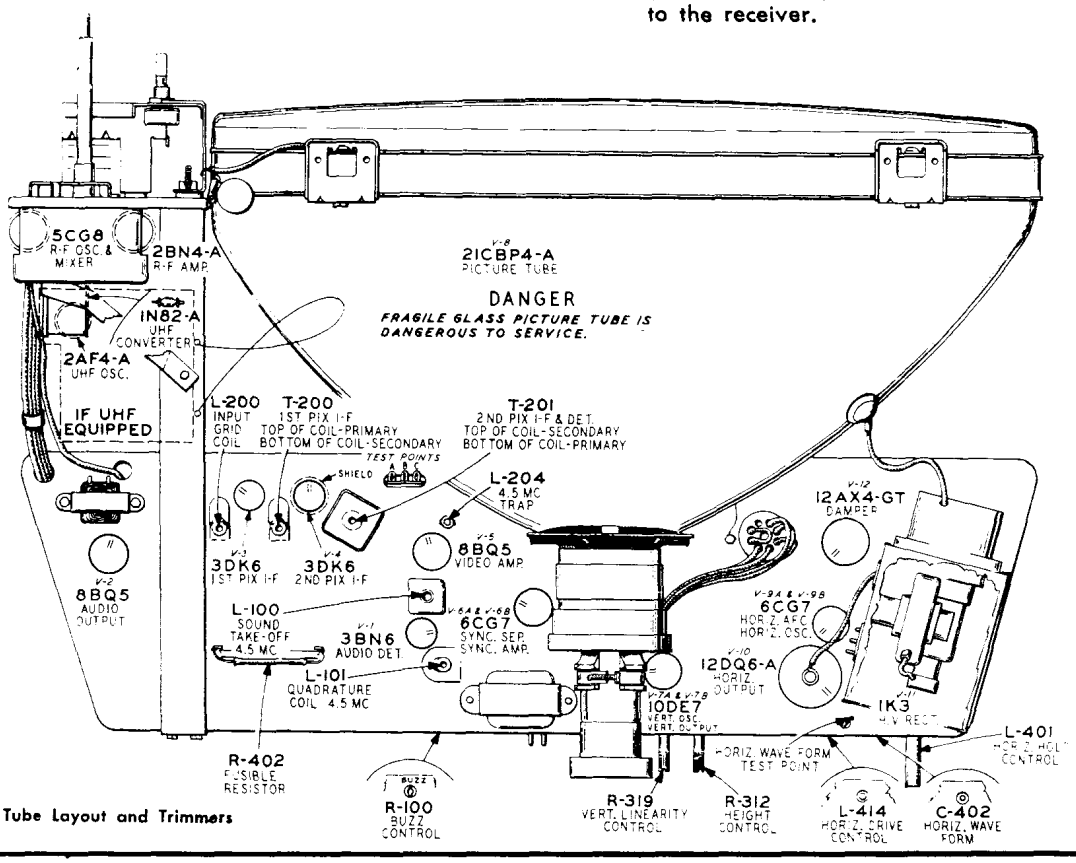
1. Remove knobs from the front of cabinet.
2. Remove the cabinet back and disconnect the speaker leads. If equipped with monople antenna, disconnect also the monopole antenna lead.
3. Remove the antenna terminal board assembly from side of cabinet. If equipped with monopole antenna remove also the monopole antenna from top of cabinet.
4. Remove four screws holding top pix tube anchor brackets to top of cabinet frame.
5. Remove screws holding the tuner brace brackets to the cabinet. In later models only one brace bracket is used.
6. There are four chassis mounting screws located underneath the chassis. Two screws are accessible through the holes in the perforated bottom panel and the other screws are located at the end of each chassis rail. Remove the four screws and carefully remove the chassis assembly.

MAGNET ADJUSTMENT—The picture tube used on these receivers is of the electrostatic type, and occasionally, to bring about best focus, it is necessary to use a beam aligner. The beam aligner fits on the neck of the picture tube and appears to be an ion trap. In many cases, the beam aligner is not needed to properly focus the tube and therefore is not mounted on the tube.

DEFLECTION YOKE ADJUSTMENT—The deflection yoke should be positioned as far forward on the neck of the tube as the bell will allow. Then, if the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Upon completion of this adjustment, tighten the clamp at the rear of the deflection yoke.

CENTERING ADJUSTMENT — If horizontal or vertical centering is required, adjust each ring in the centering device until proper centering is obtained. If a clamp type centering device is used, rotate the device to the left or right and turn the knob located at the top of the device until the picture is centered correctly.

ADJUSTMENT OF RANGE CONTROL—Tune the receiver to the strongest station in the area in which the receiver will be used. While observing the picture and listening to the sound, turn the control clockwise until signs of overloading (buzz in sound washed-out picture, sync instability) appear. Then turn the control a few degrees counter-clockwise from the point at which overloading occurs. (The stronger the signal input, the more counter-clockwise this setting will be.) In areas where the strongest signal does not exceed 1000 MV the setting will usually be maximum clockwise. With the control set correctly, the AGC will automatically adjust the bias on the R-F and I-F amplifiers so that the best possible signal to noise ratio (minimum snow) will be obtained for any signal input to the receiver.



Chassis Tube Layout and Trimmers

MONTGOMERY WARD Chassis WG-4087A, etc., Service Material, Continued

SERVICE SUGGESTIONS

SIGNAL ON PICTURE TUBE GRID AND VERTICAL SYNC ONLY

1. V-9 defective. Replace.
2. Improper setting of horizontal hold control.
3. Check setting of horizontal wave form adjustments.
4. Check V-9 socket voltages.
5. Capacitor C-303 defective.

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

1. Defective yoke.
2. V-12 defective.
3. R-419 or C-417 defective.

SMALL RASTER—This condition can be caused by:

1. Low + B or line voltage. Check silicon rectifiers.
2. Insufficient output from V-10. Replace tube.
3. Insufficient output from V-7 and V-9. Replace tubes.
4. Incorrect setting of horizontal drive control.
5. V-12 defective.

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

1. Defective pix 1-F tubes V-3 & V-4.
2. Defective pix detector crystal. (Part of T-201.)
3. V-5 defective.
4. Defective picture tube.
5. Open video peaking coil. Check all peaking coils L-203, L-205, L-206 for continuity.

Note that L-206 has a shunting resistor.

OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope.

SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS

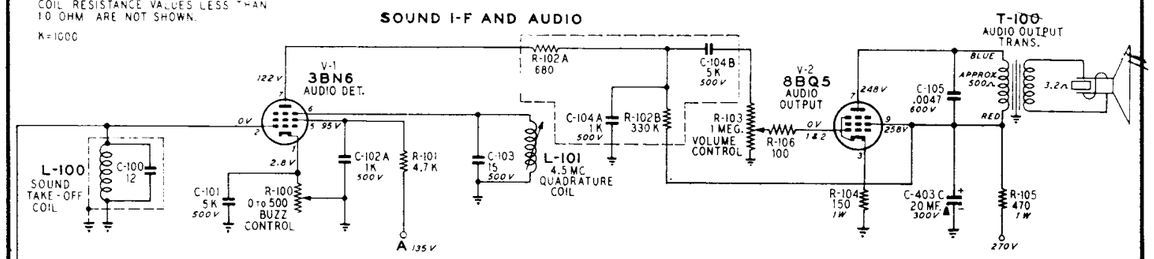
ALL RESISTANCE VALUES IN OHMS AND ½ WATT UNLESS OTHERWISE SPECIFIED

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

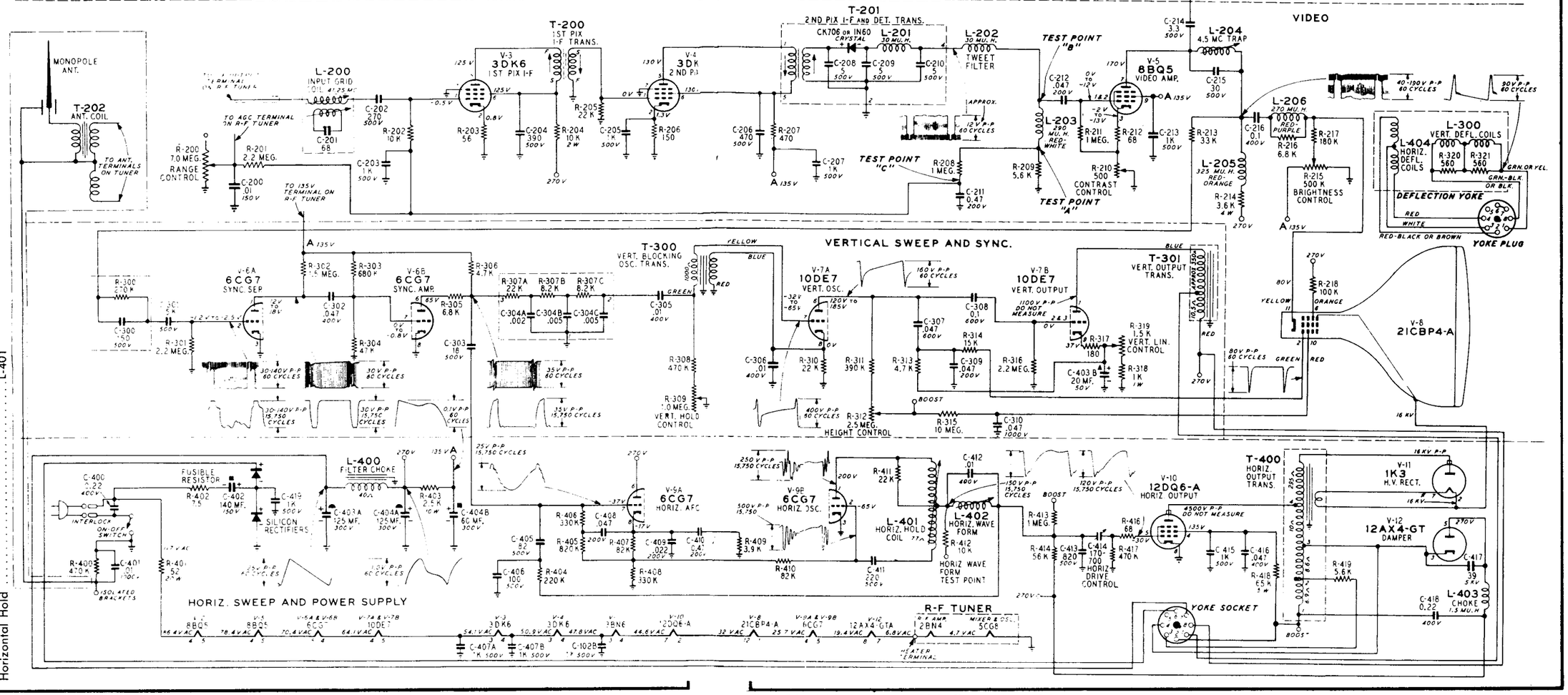
COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

K=1000

SOUND I-F AND AUDIO



VIDEO



CONTROLS FRONT OF CHASSIS

Brightness	R-215
Vertical Hold	R-309
Range	R-200

CONTROLS REAR OF CHASSIS

Horizontal Centering	Centering Device
Vertical Centering	C-414
Horizontal Drive	R-319
Vertical Linearity	R-312
Height	L-402
Horizontal Wave Form	R-100
Buzz	L-401
Horizontal Hold	

NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes.

MONTGOMERY WARD Chassis WG-4087A, etc., Alignment Information, Continued

ALIGNMENT PROCEDURE

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

R-F SWEEP GENERATOR meeting the following requirements:

(a) Frequency range:
38-90 mc, 10 mc sweep width

(b) A source of the following markers:
45.75 mc
44.5 mc
43.5 mc
42.4 mc
41.25 mc

CATHODE-RAY OSCILLOSCOPE with good low frequency response in vertical amplification and an input calibrating source.

BIAS SOURCE —1.5V to —10.0V.

PROCEDURE

1. Connect sweep output to 2nd I-F grid (pin #1-V4), oscilloscope to diode load resistor R-209 (Test Point "A"). Set output of sweeper so that some output is indicated on oscilloscope. Adjust 2nd PIF transformer (T-201) primary (bottom) and secondary (top) simultaneously for maximum output and symmetry. Readjust sweeper output for 4.0V P-P on oscilloscope. Touch-up to give the waveform shown in figure 4.

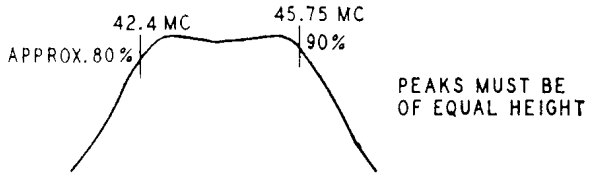


Fig. 4—2nd Pix I-F Response

2. With approximately —5.5V bias on AGC line junction of R-208 and C-211 (Test Point "C") connect sweeper to 1st I-F grid (Pin #1-V3). Reduce sweeper output to compensate for additional gain of 1st stage (4.0V. P-P on oscilloscope). Adjust 1st I-F transformer primary (top) and secondary (bottom) for maximum gain and symmetry with 45.75 mc marker. (See Figure 5.)

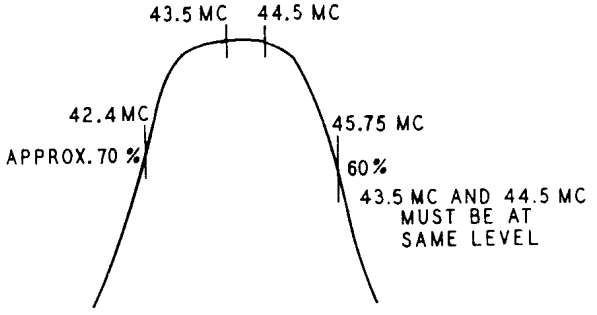


Fig. 5—Pix I-F Response From 1st Pix I-F Grid

3. Set channel selector to Channel 13. Connect sweeper with very short leads through a 10 K mmf disc ceramic capacitor to mixer grid (lead of a 10 K resistor which is accessible through a hole located on front of the tuner). Readjust sweep output for 4.0V P-P, adjust 41.25 mc trap (bottom of L-200) so that notch is at marker, adjust mixer plate coil (L-8 primary) and input grid coil (top of L-200) for maximum gain and symmetry with 45.75 mc marker at 50%. (Figure 6.)

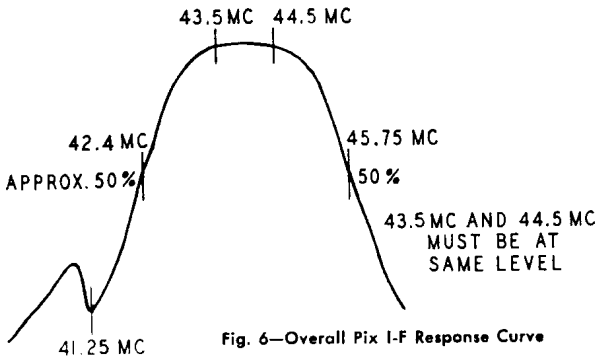


Fig. 6—Overall Pix I-F Response Curve

In all positions, final touch up should be made with 4.0V. P-P amplitude on oscilloscope. Once a stage has been adjusted, do not readjust with the sweeper connected to another stage. For instance, after adjusting the output stage and moving the sweeper to the 1st grid to adjust 1st I-F transformer, do not move the slugs in the output stage, etc.

In general, the position of the 45.75 mc marker should be set with the primary and the symmetry adjusted with the secondary. An approximate setting of the input grid coil may be obtained by adjusting for maximum amplitude of the 45.75 marker. This amplifier **cannot** be adjusted for bandwidth. It must be adjusted for maximum gain, symmetry and position of 45.75 marker.

VIDEO

With 4.5 Mc unmodulated signal into grid of the video amplifier tube (Test Point "B") and VTVM on picture tube cathode, tune 4.5 Mc trap for minimum response. VTVM on O-10 V AC scale. This adjustment can also be made while observing a picture from a station. Tune trap for least 4.5 Mc beat (grainy appearance) in picture.

AUDIO

1. Tune in a TV station and reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.
2. Adjust sound take-off coil (L-100) quadrature coil (L-101) and buzz control (R-100) for maximum undistorted sound and minimum buzz.
3. If "hiss" disappears during step 2, further reduce signal strength.

MOTOROLA

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner	TAC-1	Remote Control
21K131CW	Console	TS-558	OPTT-123	-	-	-
Y21K131CW	Console	TS-558Y	OPTT-123Y	TT-111	-	-
A21K131CW	Console	WTS-558	4ATT-117	-	-	TR-6
21K132W	Console	TS-558	OPTT-123	-	-	-
Y21K132W	Console	TS-558Y	OPTT-123Y	TT-111	-	-
A21K132W	Console	WTS-558	4ATT-117	-	-	TR-6
21K134W	Console	TS-558	OPTT-123	-	TAC-1	-
Y21K134W	Console	TS-558	OPTT-123Y	TT-111	TAC-1	-
A21K134W	Console	WTS-558	4ATT-117	-	TAC-1	TR-6
21K135W	Console	TS-558	OPTT-123	-	TAC-1	-
Y21K135W	Console	TS-558Y	OPTT-123Y	TT-111	TAC-1	-
A21K135W	Console	WTS-558	4ATT-117	-	TAC-1	TR-6
21K136W	Console	TS-558	OPTT-123	-	TAC-1	-
Y21K136W	Console	TS-558Y	OPTT-123Y	TT-111	TAC-1	-
A21K136W	Console	WTS-558	4ATT-117	-	TAC-1	TR-6

ADDENDA TO RECEIVER MODEL BREAKDOWN CHART

Model	Cabinet	Chassis	VHF Tuner	UHF Tuner	Remote Control
23K4 W	Console	TS-558	OPTT-123	-	-
Y23K4W	Console	TS-558Y	OPTT-123Y	TT-111	-

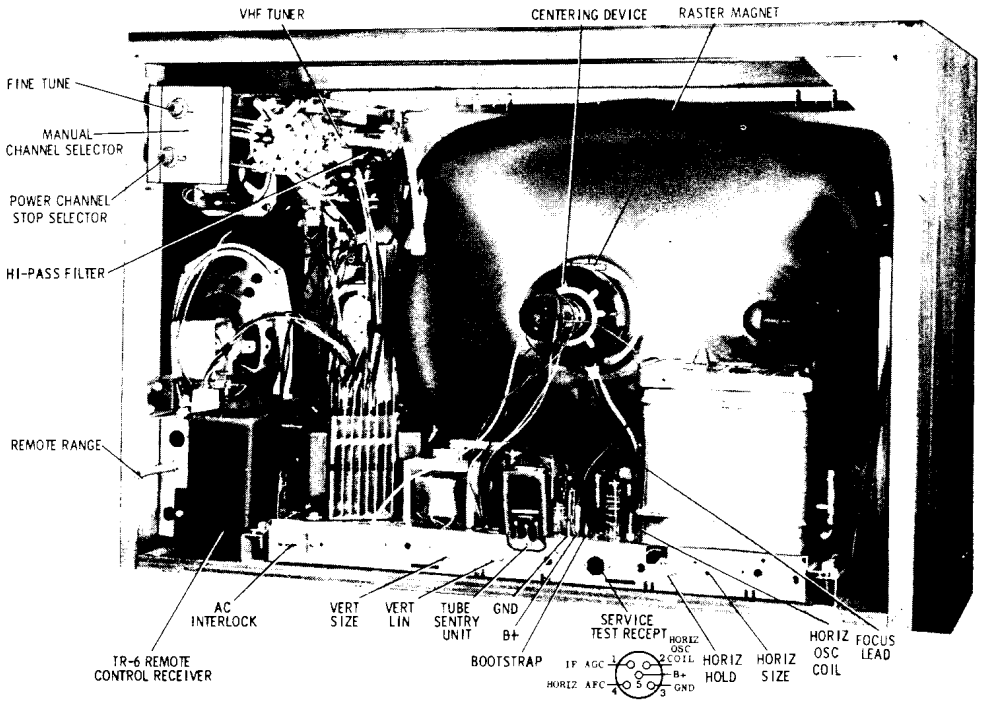
CHASSIS TS-558 & WTS-558

Models using these chassis are listed at left in the breakdown chart. Complete circuit diagram of original version of this chassis is on pages 60-61. These chassis are very similar to Chassis TS-564, pages 67 through 76, and much service material on these pages can be applied directly to TS-558, etc. Some facts of important differences and production changes are covered below and on page 62.

CHASSIS DESCRIPTION

The TS-558 Super Golden M chassis is of the horizontally mounted type utilizing 19 tubes plus the 21DAP4, 110-degree picture tube, germanium plug-in type video detector and transformer power supply. UHF models contain one additional UHF tuner tube.

The WTS-558 Super Golden M chassis is identical, electrically, with the TS-558, differing only by the tuner type (Custom-Matic 4ATT-117) which is a motorized version of the OPTT-123 used in the TS-558 chassis. An additional audio amplifier stage with continuously variable bass and treble controls is offered in some receiver models.



REAR VIEW OF RECEIVER

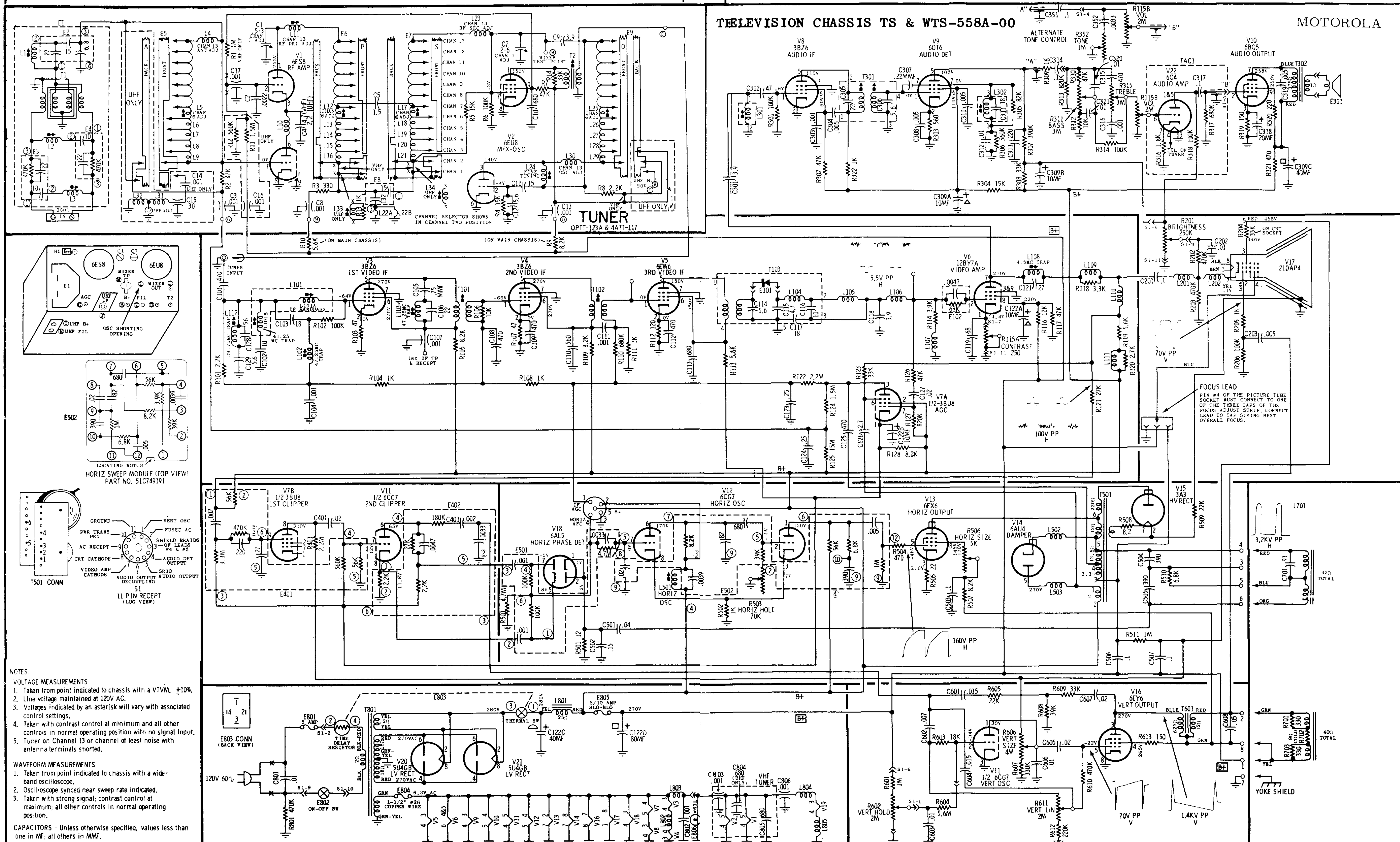
An unpleasant high voltage, low current, shock may result at the second anode of the picture tube. Use care when working in this general area. If the second anode plug is to be removed, short the anode to ground through a well-insulated piece of wire, after the power has been turned off.

Use extreme care in handling the picture tube, as rough handling may cause it to implode due to atmospheric pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection. Discharge tube as described above.

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

TELEVISION CHASSIS TS & WTS-558A-00

MOTOROLA



NOTES:

VOLTAGE MEASUREMENTS

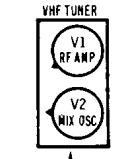
1. Taken from point indicated to chassis with a VTVM. ±10%.
2. Line voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.
5. Tuner on Channel 13 or channel of least noise with antenna terminals shorted.

WAVEFORM MEASUREMENTS

1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced near sweep rate indicated.
3. Taken with strong signal; contrast control at maximum; all other controls in normal operating position.

CAPACITORS - Unless otherwise specified, values less than one in MF; all others in MMF.

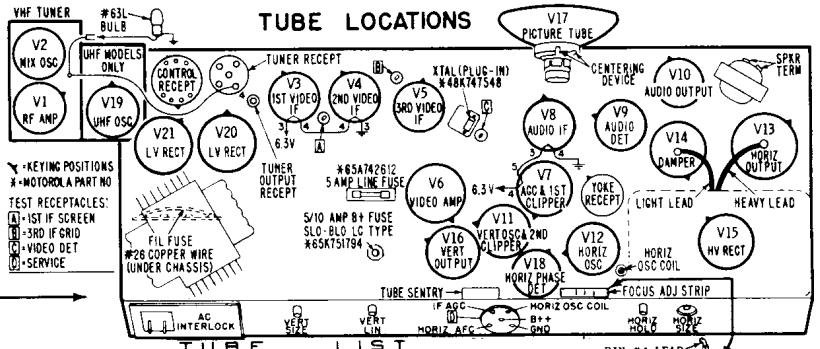
MOTOROLA
Chassis TS-558 and WTS-558
(Continued)



CHASSIS WTS-558

(Same as TS-558 except VHF Tuner Tubes are reversed)

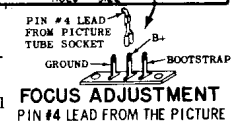
CHASSIS TS-558 →



TUBE LOCATION, FUSE GUIDE AND FOCUS INFORMATION

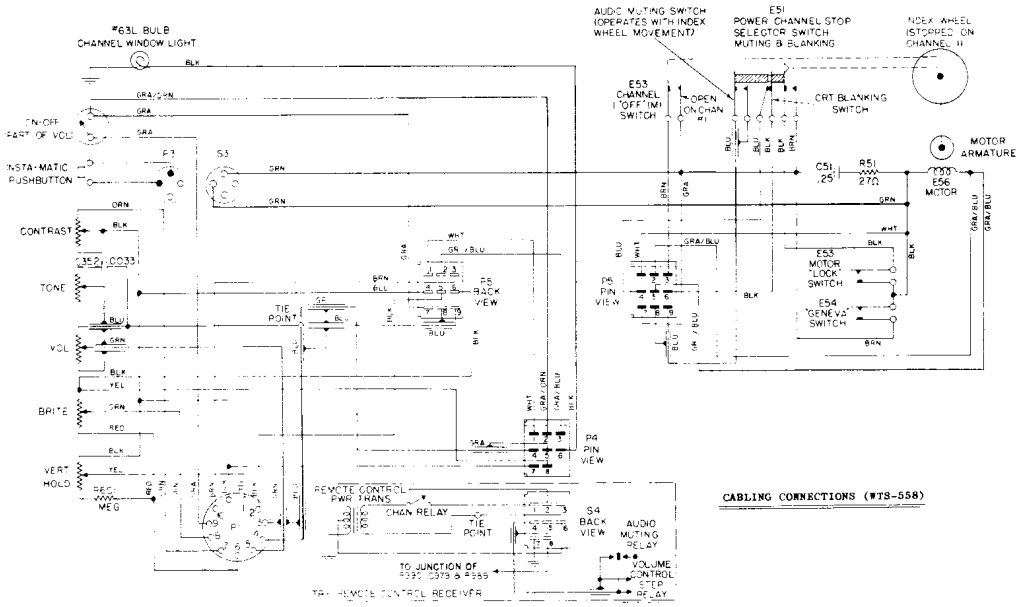
TUBE LIST

TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER
V1	6ES8	278A01	V8	3BZ6	146A01	V15	3A3	144A01
V2	6EU8	269A02	V9	6DT6	148A02	V16	6EY6	281A01
V3	3BZ6	146A01	V10	6BQ5	247A01	V17	21DAP4	196T106A01
V4	3BZ6	146A01	V11	6CG7	159A01			
V5	6EW6	266A03	V12	6CG7	159A01	V18	6AL5	111A05
V6	12BY7A	164A01	V13	6EX6	244A02	V19	6AF4A	142A02
V7	3BU8	145A01	V14	6AU4GTA	152A03	V20	5U4GB	129A02
						V21	5U4GB	129A02



FOCUS ADJUSTMENT

PIN #4 LEAD FROM THE PICTURE TUBE SOCKET MUST CONNECT TO ONE OF THE THREE TAPS OF THE FOCUS ADJUST STRIP. CONNECT LEAD TO TAP GIVING BEST FOCUS.



CABLING CONNECTIONS (WTS-558)

PRODUCTION CHANGES
Chassis TS-558A-01 thru A-06

Chassis Coding	Changes
A-01	TO IMPROVE MODULE RESISTANCE TO HIGH HUMIDITY: The Horizontal module is given additional wax impregnation treatment preventing the possibility of moisture developing.
A-02	TO ALLOW FOR WIDE VARIATIONS IN VERTICAL OUTPUT TUBE CHARACTERISTICS: C-604 (.015 mfd) changed to .0018 mfd; C-606 (.01 mf) changed to .015 mfd; C-607 (.02 mfd) changed to .01 mfd; R-614 (27K-10-1/2) addedbetween ground and C-606. The arm of the Vertical size control is also connected to pin 1 (plate) of the 6CG7 Vertical oscillator.
A-03	TO IMPROVE SIGNAL TO NOISE RATIO ON MODERATELY STRONG SIGNALS: R-122 (2.2 meg) changed to 1.5 meg; R-125 (15 meg) changed to 10 meg. This change improves the noise factor by increasing the gain in the tuner while decreasing the gain in the IF system. TO INCREASE TUBE SENTRY DELAY TIME: Part number of thermostat assembly changed from 6C749855 to 6K753334, which is recommended as replacement.
	DESIGN CHANGE: C-801 (.01 mf) deleted; R-116 (12 K) relocated from C-122D (output filter) to C-122C (input filter).
A-04	DESIGN CHANGE: R-102 (100K) deleted; C-102 (10 mmf) changed to 6.8 mmf; one side of L-102 (47.25 mc trap) relocated from IF AGC Buss to ground.
A-05	TO REDUCE THE POSSIBILITY OF REGENERATION IN THE UHF TUNER: R-129 (3.3K) added in series with the AGC lead at pin 1 of the tuner power receptacle. C-130 (2x .001 mfd) added to tuner power receptacle on chassis. The common lead connects to chassis; one .001 mfd lead goes to pin 2 (RF B+). The other .001 mfd lead goes to pin 5 (B+) of the tuner power receptacle.
A-06	TO IMPROVE RASTER BLANKING WHEN CHANGING CHANNELS ON AUTOMATIC RECEIVERS: R-202 (470K) changed to 220K; R-203 (470K) deleted.

MOTOROLA

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner	Remote Control
21K124B	Console	TS-561	OMTT-123	-	-
Y21K124B	Console	TS-561Y	OMTT-123Y	TT-111	-
21K124M	Console	TS-561	OMTT-123	-	-
Y21K124M	Console	TS-561Y	OMTT-123Y	TT-111	-
21K124W	Console	TS-561	OMTT-123	-	-
Y21K124W	Console	TS-561Y	OMTT-123Y	TT-111	-
A21K137B	Console	WTS-561	2ATT-117	-	TR-5
A21K137M	Console	WTS-561	2ATT-117	-	TR-5
21T66BZ	Table	TS-561	OMTT-123	-	-
Y21T66BZ	Table	TS-561Y	OMTT-123Y	TT-111	-
21T66CH	Table	TS-561	OMTT-123	-	-
Y21T66CH	Table	TS-561Y	OMTT-123Y	TT-111	-
A21T69BG	Table	WTS-561	2ATT-117	-	TR-5
A21T69MG	Table	WTS-561	2ATT-117	-	TR-5

Additional models released:

MODEL	CABINET	CHASSIS	VHF TUNER	UHF TUNER
21K142M	Console	TS-561	OMTT-123	None
Y21K142M	Console	TS-561Y	OMTT-123Y	TT-111

NOISE GATE CONTROL -
This supplementary control located at the back and is used to adjust the receiver for the signal strength in the area in which the set is to function. To adjust, tune in a channel that receives a satisfactory picture. Turn the Noise Gate control counterclockwise until picture becomes unstable (rolls, bounces, flip-flops, etc.). Then turn control clockwise until picture returns to normal. Check all channels; if any are unstable, continue turning control in a clockwise direction until the picture is normal on all channels.

CHASSIS TS-561 & WTS-561

Models using these chassis are listed at left in the breakdown chart. Circuit diagram of the latest revised chassis (at time of printing) is on pages 64-65. These chassis are very similar in most respects to Chassis TS-564, pages 67 through 76, and much service material on these pages can be applied directly to TS-561, etc. Some facts of important difference are covered below and on page 66.

CHASSIS DESCRIPTION

The TS-561 Golden M chassis is of the horizontally mounted type utilizing 16 tubes plus the 21CBP4A picture tube, germanium plug-in type video detector and transformer power supply.

The WTS-561 Golden M chassis is identical electrically with the TS-561, differing only by the tuner type (Custom-Matic 2ATT-117) which is a motorized, Insta-Matic version of the OMTT-123 tuner used in the TS-561 chassis. Both tuners are electrically identical. All receiver models using the WTS-561 chassis are equipped with the TR-5, single-function, remote control system.

The motorized Custom-Matic tuner provides individual channel oscillator adjustment by means of a rear panel, Pre-set Fine Tuning control.

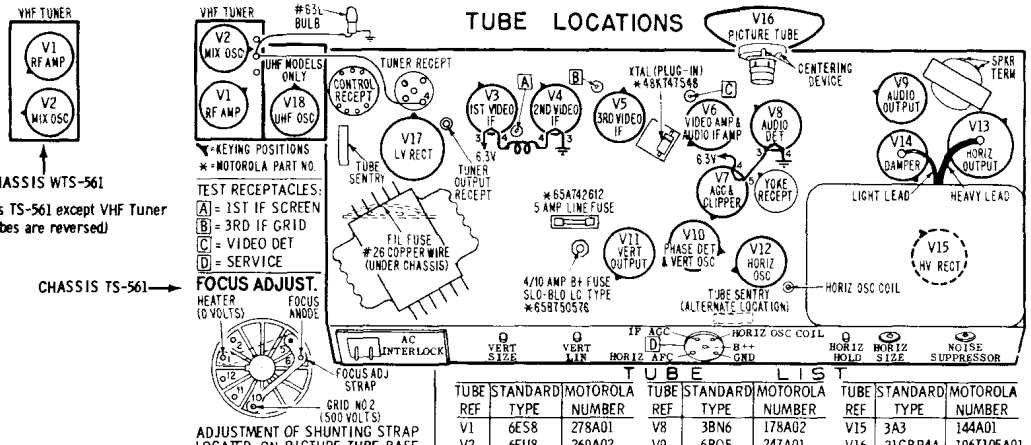
It is very unlikely that the Motorola tuner will need alignment unless it has been damaged, is being replaced, or has had components replaced in the tuned circuits. Tubes may be changed in most cases without realignment, but care must be used in selection or realignment may be required.

The tuner operates by adding antenna, RF, mixer and oscillator coil sections consecutively for each lower channel.

NOISE SUPPRESSOR

The Noise Suppressor control allows perfect balance of the sound system to eliminate or reduce noise and buzz from the sound.

TO ADJUST... Tune in a picture and adjust for best picture and sound conditions. Insert an insulated screwdriver-type tool into the back cover opening and rotate control for least noise or buzz with good sound. Check all available channels, making any minor required adjustments to give least noise on all channels.



ADJUSTMENT OF SHUNTING STRAP LOCATED ON PICTURE TUBE BASE PROVIDES OPTIMUM FOCUSING. TEMPORARILY CONNECT STRAP BETWEEN PINS 6 AND 10, THEN 6 AND 1. LOCATE STRAP PERMANENTLY IN POSITION PRODUCING BEST OVERALL FOCUS.

TUBE LIST

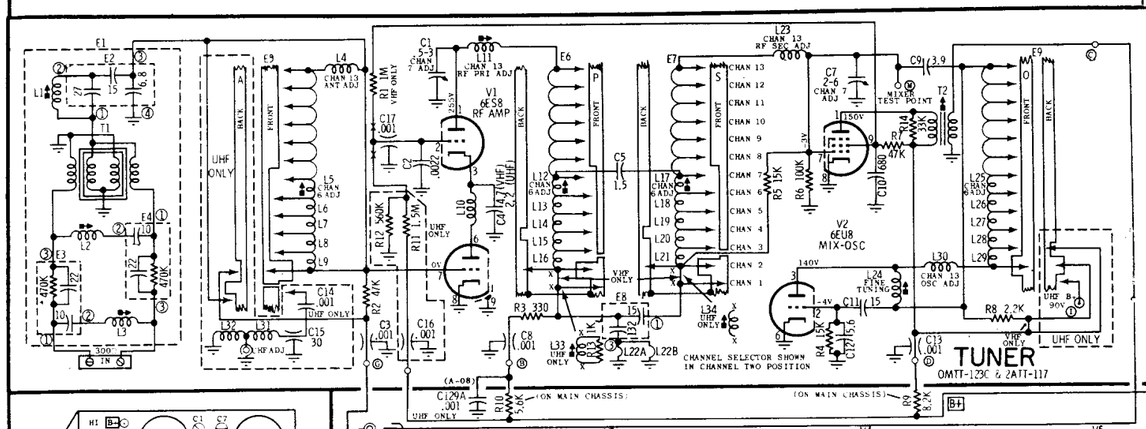
TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER
V1	6ES8	278A01	V8	3BN6	178A02	V15	3A3	144A01
V2	6EU8	269A02	V9	6BQ5	247A01	V16	21CBP4A	196T105A01
V3	3BZ6A	146A03	V10	6CN7	273A01	V17	5U4GB	129A02
V4	3BZ6	146A01	V11	6AQ5	101A03	V18	6AF4A	142A02
V5	6EW6	266A03	V12	6CG7	159A01			
V6	6EB8	263A02	V13	6DQ6	162A01			
V7	3BU8	145A01	V14	6AF3	264A01			

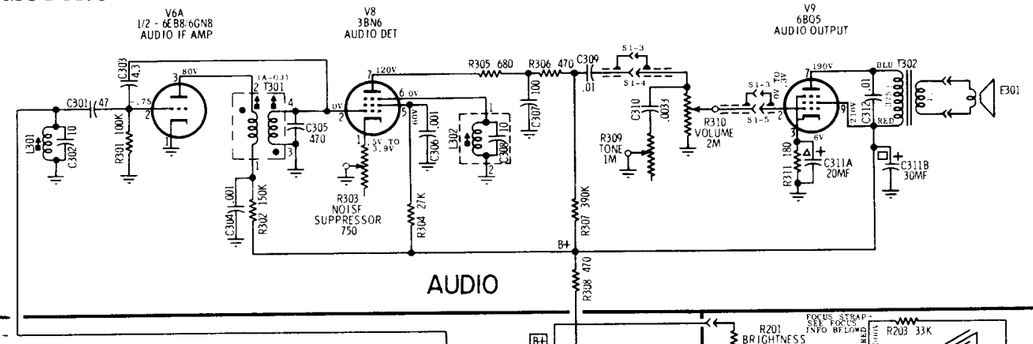
TUBE LOCATION, FUSE GUIDE AND FOCUS INFORMATION

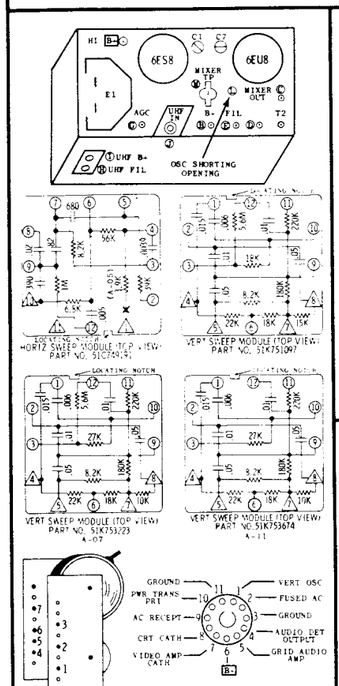
VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

MOTOROLA

TELEVISION CHASSIS TS & WTS-561A-11







NOTES:

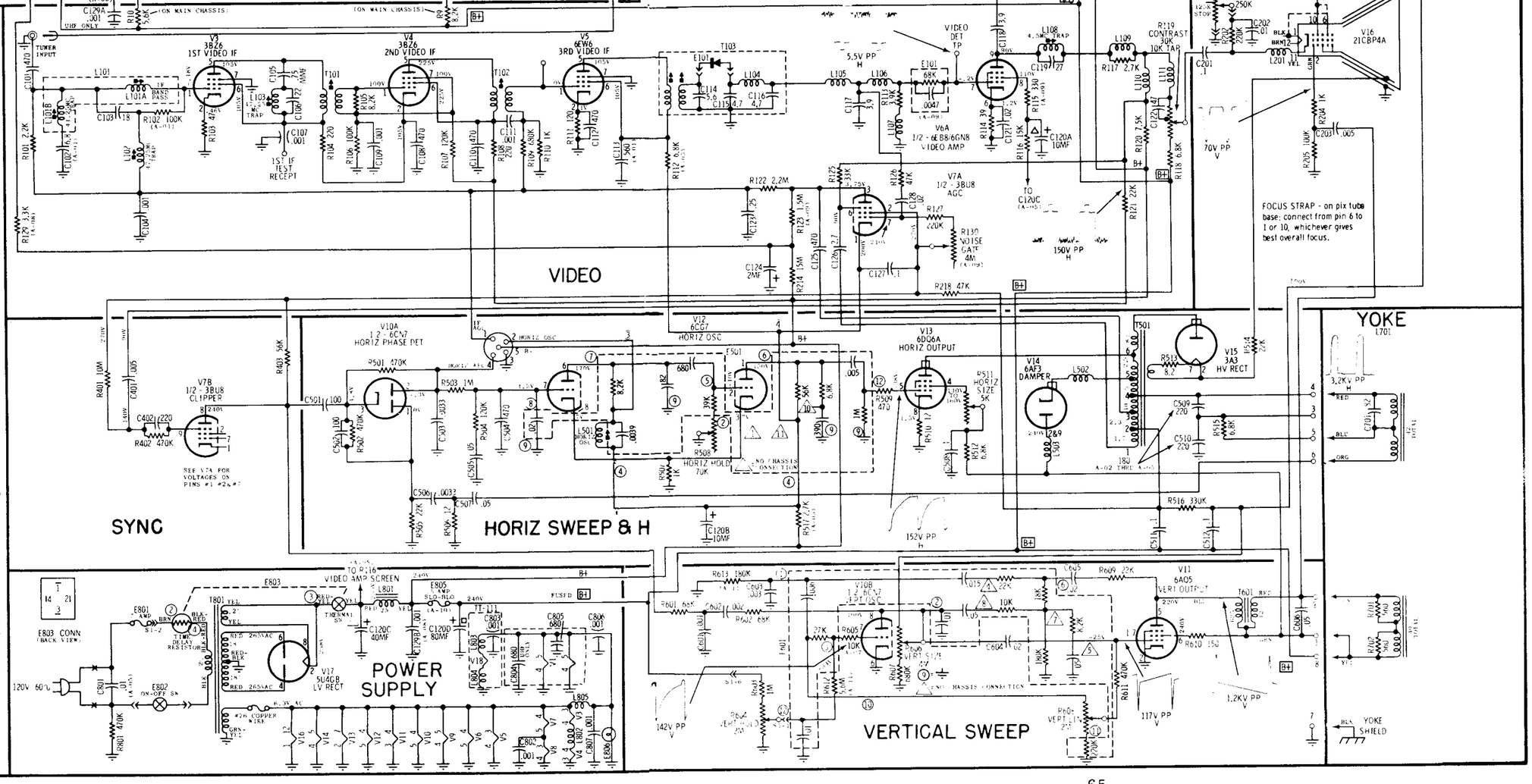
VOLTAGE MEASUREMENTS

1. Taken from point indicated to chassis with a VTVM, ±10%.
2. Line voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.
5. Tuner on Channel 13 or channel of least noise with antenna terminals shorted.

WAVEFORM MEASUREMENTS

1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced near sweep rate indicated.
3. Taken with strong signal; contrast control at maximum; all other controls in normal operating position.

CAPACITORS - Unless otherwise specified, values less than one in MF; all others in MMF.



MOTOROLA Chassis TS-561 & WTS-561, Service Information, Continued

SOUND ALIGNMENT

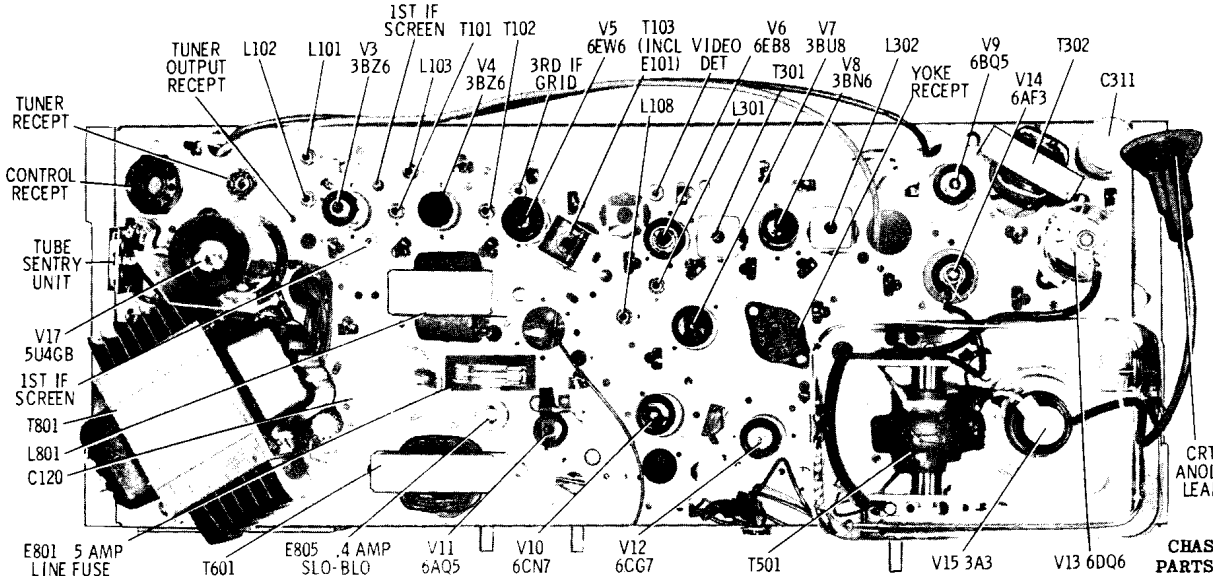
The sound system used in these receivers consists of an audio IF amplifier stage, a quadrature grid detector and output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stage. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils.

PROCEDURE

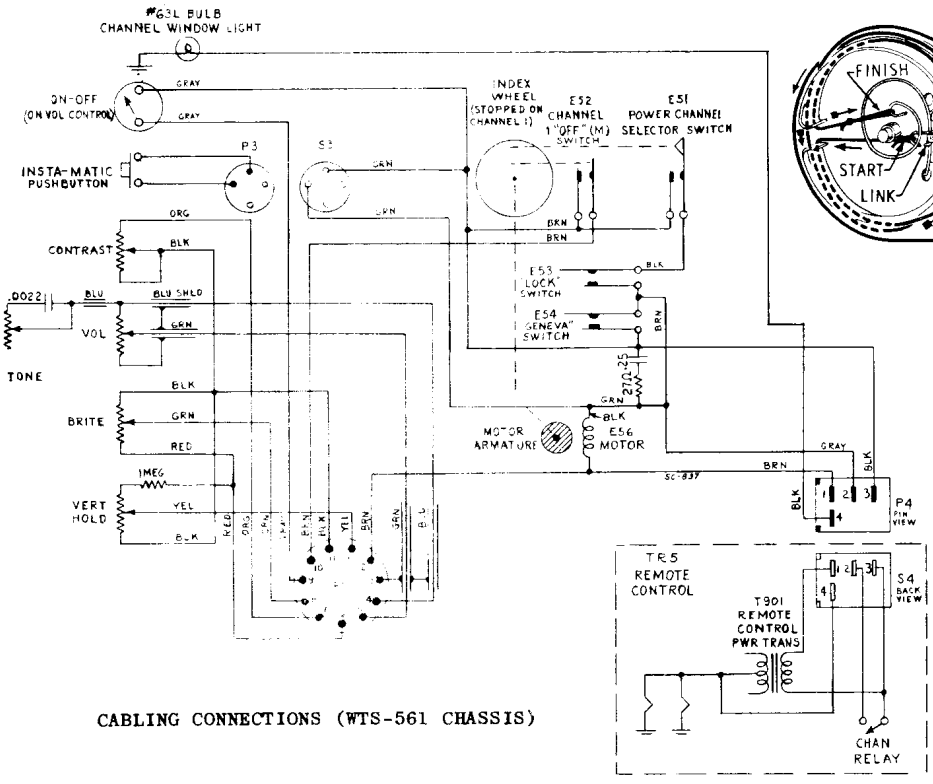
The signal to the receiver antenna terminals must be reduced to a level that is below the limiting point of the audio detector... this level produces a characteristic "hiss". You may use the most practical method available to reduce the signal level to the "hiss" point. However, a step attenuator is the most preferable. Maintain "hiss" level at all times by reducing the signal level as required.

Tune in a tone modulated TV signal and reduce the signal level until the characteristic "hiss" is heard.

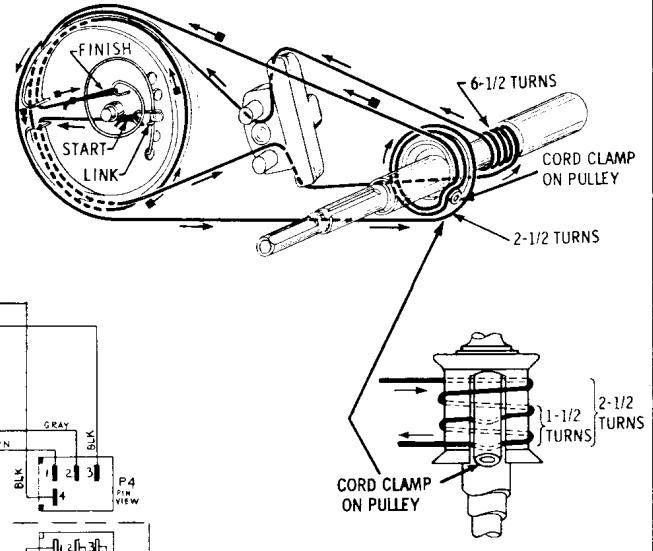
Adjust the sound take-off coil (L-301), the interstage transformer (T-301), the quadrature coil (L-302) and the Noise Suppressor control for the best quality sound with minimum buzz.



CHASSIS TS-561A-00 PARTS LOCATIONS (TOP)



CABLING CONNECTIONS (WTS-561 CHASSIS)



START RESTRINGING WITH LARGE UHF PULLEY IN MAX COUNTERCLOCKWISE POSITION (AS VIEWED FROM FRONT OF TUNER).

UHF DIAL RESTRINGING DETAIL

MOTOROLA

MODEL BREAKDOWN CHART

Model	Type	Chassis	VHF Tuner	UHF Tuner	Remote Control
21C10CW	Consolette	TS-564	OPTT-123	-	-
Y21C10CW	Consolette	TS-564Y	OPTT-123Y	TT-111	-
A21C11B	Consolette	WTS-564	4ATT-117	-	TR-6
A21C11M	Consolette	WTS-564	4ATT-117	-	TR-6
21K125B	Console	TS-564	OPTT-123	-	-
Y21K125B	Console	TS-564Y	OPTT-123Y	TT-111	-
21K125M	Console	TS-564	OPTT-123	-	-
Y21K125M	Console	TS-564Y	OPTT-123Y	TT-111	-
21K126B	Console	TS-564	OPTT-123	-	-
Y21K126B	Console	TS-564Y	OPTT-123Y	TT-111	-
21K126M	Console	TS-564	OPTT-123	-	-
Y21K126M	Console	TS-564Y	OPTT-123Y	TT-111	-
21K126W	Console	TS-564	OPTT-123	-	-
Y21K126W	Console	TS-564Y	OPTT-123Y	TT-111	-
21K127CW	Console	TS-564	OPTT-123	-	-
Y21K127CW	Console	TS-564Y	OPTT-123Y	TT-111	-
21K129B	Console	TS-564	OPTT-123	-	-
Y21K129B	Console	TS-564Y	OPTT-123Y	TT-111	-
21K129M	Console	TS-564	OPTT-123	-	-
Y21K129M	Console	TS-564Y	OPTT-123Y	TT-111	-
21K129MC	Console	TS-564	OPTT-123	-	-
Y21K129MC	Console	TS-564Y	OPTT-123Y	TT-111	-
21K130CW	Console	TS-564	OPTT-123	-	-
Y21K130CW	Console	TS-564Y	OPTT-123Y	TT-111	-
A21K138M	Console	WTS-564	4ATT-117	-	TR-6
A21K139B	Console	WTS-564	4ATT-117	-	TR-6
A21K139M	Console	WTS-564	4ATT-117	-	TR-6
A21K139W	Console	WTS-564	4ATT-117	-	TR-6
A21K140B	Console	WTS-564	4ATT-117	-	TR-6
A21K140M	Console	WTS-564	4ATT-117	-	TR-6
A21K141CW	Console	WTS-564	4ATT-117	-	TR-6
21T67BG	Table	TS-564	OPTT-123	-	-
Y21T67BG	Table	TS-564Y	OPTT-123Y	TT-111	-
21T67MG	Table	TS-564	OPTT-123	-	-
Y21T67MG	Table	TS-564Y	OPTT-123Y	TT-111	-
21T68B	Table	TS-564	OPTT-123	-	-
Y21T68B	Table	TS-564Y	OPTT-123Y	TT-111	-
21T68M	Table	TS-564	OPTT-123	-	-
Y21T68M	Table	TS-564Y	OPTT-123Y	TT-111	-
21T68W	Table	TS-564	OPTT-123	-	-
Y21T68W	Table	TS-564Y	OPTT-123Y	TT-111	-

ADDENDA TO MODEL BREAKDOWN CHART

Model	Type	Chassis	VHF Tuner	UHF Tuner
23K1MA	Console	TS-564	OPTT-123	-
Y23K1MA	Console	TS-564Y	OPTT-123Y	VTT-111
23K1WA	Console	TS-564	OPTT-123	-
Y23K1WA	Console	TS-564Y	OPTT-123Y	VTT-111
23K2M	Console	TS-564	OPTT-123	-
Y23K2M	Console	TS-564Y	OPTT-123Y	VTT-111
23K2B	Console	TS-564	OPTT-123	-
Y23K2B	Console	TS-564Y	OPTT-123Y	VTT-111
23K3CW	Console	TS-564	OPTT-123	-
Y23K3CW	Console	TS-564Y	OPTT-123Y	VTT-111

CHASSIS DESCRIPTION

TS-564 Super Golden M chassis is of the horizontally mounted type utilizing 18 tubes plus the 21CBP4A picture tube, germanium plug-in type video detector and transformer-type power supply.

These chassis feature the Custom-Matic 4-wafer cascode tuner, noise-and-signal gated automatic gain control, modular componentry in the horizontal and vertical sweep systems and the Golden Tube Sentry unit.

The Custom-Matic manually operated tuner provides individual channel oscillator adjustment by means of the front panel fine tuning control.

WTS-564 Super Golden M chassis is identical electrically with the TS-564, differing only by the tuner type (Custom-Matic 4ATT-117) which is a motorized, Insta-Matic version of the OPTT-123 used in the TS-564 chassis. Both tuners are electrically identical. All receiver models using the WTS-564 chassis are equipped with the TR-6, three-function, remote control system.

The motorized Custom-Matic tuner provides individual channel oscillator adjustment by means of a rear panel control.

CHASSIS TS-564 and WTS-564

Service material on these chassis is on pages 67 through 76. Model-chassis breakdown charts are at left.

APPLYING POWER TO AUTOMATIC RECEIVERS

The TV receiver is turned "on" and "off" in the usual manner by use of the front panel pushbutton marked ON-OFF-VOLUME; this switch controls power to the TV chassis and remote control receiver.

In addition to the above ON-OFF switch, the TV chassis is designed to automatically shut-off when the set is tuned to the channel designated "M" (channel #1). This channel position places the TV in a stand-by condition.... that is, the TV set is "off" but the remote control section is still operable. Thus, you can turn the TV "on" or "off" with the remote control transmitter by selecting the proper channel. Power is applied to the TV chassis only in channel positions other than "M".

RASTER CORRECTOR MAGNETS (Not On All Models)

The Raster Corrector Magnets are correctly set at the factory but, if moved in shipping, or if the yoke has been moved or replaced, they may require readjustment.

To adjust, reduce the raster size so all four sides are visible, then bend the magnet arms so the top of the raster is parallel with the bottom, the left and right sides are parallel and the corners of the raster are right angles.

HORIZONTAL OSCILLATOR ADJUSTMENT

The Horizontal Hold control should have a sync range of approximately 30 degrees. If the control is too critical, or if the Horizontal sync system seems unusually susceptible to noise, adjust the Horizontal Oscillator Coil as follows:

Adjust the receiver for a normal picture, then short out the AFC voltage by connecting a clip lead from pin #4 (Serv Test Recept) to chassis and disable the oscillator coil by connecting a .1 mfd 400 volt capacitor from pin #2 (Serv Test Recept) to chassis.

Adjust the Horizontal Hold so picture is as close to horizontal sync as possible, then remove the .1 mfd capacitor and adjust the Horizontal Oscillator Coil so the picture is as close to horizontal sync as possible.

Remove the clip lead from pin #2 and chassis; adjust the Horizontal Hold control until the picture is properly synchronized horizontally.

VERTICAL SIZE AND LINEARITY ADJUSTMENTS

Adjust the Vertical Size and Vertical Linearity controls for best overall linearity with desired picture size. The Vert Lin primarily affects the upper picture portion while while the Vert Size primarily affects the lower portion.

PICTURE CENTERING

Position the magnetic centering device arms together (for minimum field strength) so they lie in a horizontal plane, then separate the arms of the device to center the picture vertically. Adjust horizontal centering by rotating the magnetic centering device, as a unit, one way or the other.

MOTOROLA Chassis TS-564 & WTS-564, Service Information, Continued

DEFLECTION YOKE ADJUSTMENT

To adjust the yoke compress the ends of the yoke wedge clamp and move the clamp and rubber retainer away from yoke for free movement. Position yoke as far forward as possible and rotate until picture is straight. When satisfactory, loosen wedge clamp and slide wedge back into position to lock yoke.

FOCUS

After centering the picture, adjust the focus shunting strap located on picture tube socket. Temporarily connect strap between pins #6 and #10, then between pins #6 and #1: leave strap in position affording best overall focus. In some cases, focus may be improved by rotating the magnetic centering device 180 degrees and repeating the entire centering and focus procedure. Never position the focus strap in any manner other than that specified since it could cause damage to the receiver.

REMOTE RANGE CONTROL(AUTOMATIC MODELS)

The Remote Range control adjusts the sensitivity of the remote control receiver. Clockwise rotation increases the sensitivity: Counterclockwise rotation decreases the sensitivity. Too high a sensitivity can cause random and undesired channel changing, continuous channel changing or channel skipping. The optimum adjustment is with the lowest (counterclockwise) setting possible while still maintaining the required operating distance.

TO ADJUST...Turn the Remote Range control fully counterclockwise, then slowly increase clockwise until transmitter will operate the TV receiver within the required operating area. Keep control at lowest possible sensitivity.

ADJUSTING THE CUSTOM-MATIC FINE TUNING

This control is a semi-permanent adjustment and requires one setting only for each channel. Each usable channel should be adjusted at the time of initial installation of the TV receiver and may require slight touch-up after a period of break-in operation. No further adjustments should then be required until after a prolonged period of usage necessitating compensation for mechanical wear and aging of the tuner tubes. The Fine Tuning mechanism is illustrated in Figures 5 and 6.

It is preferable to adjust the Fine Tuning control immediately after the receiver has been turned "on" as follows: With the receiver operating, tune to the channel you wish to adjust. Now, push the Fine Tuning control (at back on automatics) inward and rotate until you feel it engage with the gear internally. Hold the knob in this engaged position and rotate to obtain the clearest and most stable picture with sound (tune towards "burble" of picture and back off). Do not force knob...when it becomes hard to turn, start back in the opposite direction. After desired picture and sound have been obtained, release knob. Repeat this procedure on all channels you wish to adjust.

NOTE: Should it accidentally occur that the Channel Selector button is pushed while the Fine Tuning control knob is held inward, the entire tuning mechanism may jam. To release mechanism, momentarily remove power. If the mechanism remains jammed, remove power and turn the Manual Channel Selector (located at back) to another channel by means of a screwdriver.

INDEXING THE TUNER FOR PROPER CHANNEL STOPPING (AUTOMATICS ONLY)

The receiver should be adjusted at the time of initial installation so it will stop at the desired channels and skip any undesired channels. Always index channel #1 ("M" in channel window) for stopping, since this is the "off" position for remote control. The indexing operation is performed at the back of the cabinet and involves two exposed controls: the Manual Channel Selector and the Power Channel Stop Selector.

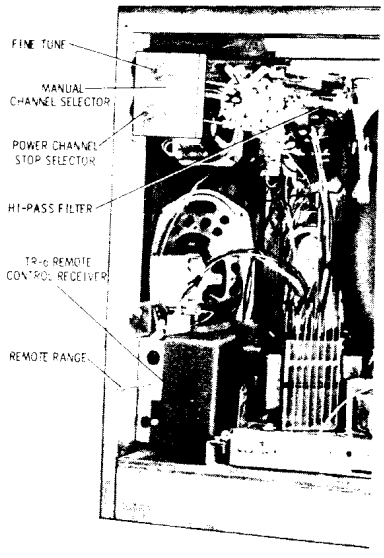
PROCEDURE

IMPORTANT: Remove all power from the TV by removing the power plug from the wall outlet.

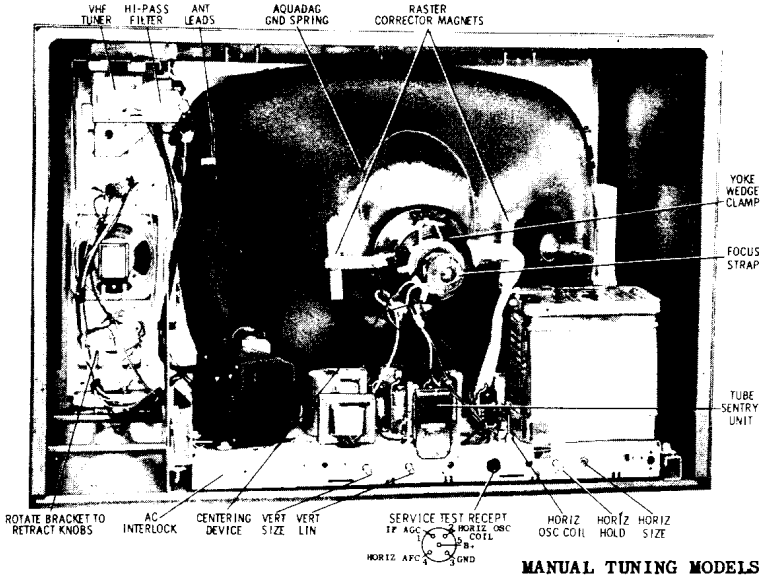
TO INDEX CHANNELS: Using a screwdriver, turn the Manual Channel Selector disc so the slot points to the desired channel number. Push the Power Channel Stop Selector knob inward and rotate until you feel it engage with the gears internally. Now, turn the knob clockwise as far as it will go to index station into tuner (STOP) or counterclockwise as far as it will go to skip the station. Repeat this procedure for each channel number.

NOTES: Should it occur that all channel numbers are removed from the index system, the tuner will run continuously once started. To stop motor, turn set "off"...then index any one channel. Continuous running of tuner may also be due to misadjustment of the Remote Range control (see appropriate section).

Should it occur that the Power Channel Selector knob is pushed inward while the tuner is power driven, the tuning mechanism may jam. To release mechanism, momentarily remove power. If mechanism remains jammed, remove power and turn the Manual Channel Selector (located at back) to another channel by means of a screwdriver.



INSTA-MATIC MODELS



MANUAL TUNING MODELS

FIGURE 2. REAR VIEW OF RECEIVER

MOTOROLA Chassis TS-564 & WTS-564, Service Information, Continued

SERVICE INSTRUCTIONS

SAFETY GLASS REMOVAL

Remove the screws holding the retainer strip located at the top edge of the glass. Hold glass so it does not fall out then allow top of glass to move outward. Grasp at left and right-hand sides and lift up and out of bottom glass retaining channel.

NOTE: When replacing glass, make sure protective channel is in proper position on glass before installation.

TO REMOVE THE CHASSIS

Disconnect chassis cables from other TV components and remove the four bolts holding chassis to the metal framework: two on either side. To operate the chassis, the front panel control bracket, tuner and deflection yoke should be connected.

TO REMOVE THE TUNER AND FRONT PANEL CONTROLS

To remove the tuner(s), remove the complete control bracket assembly to which the tuner and front panel control potentiometers are mounted. This is accomplished by removing all front panel knobs except the Brightness, Vertical Hold, Insta-Matic "Channel" pushbutton and the microphone assembly...the latter two components are on automatic models only. Remove the remote control chassis on automatic models and unplug all tuner and control cables. Retract the Brightness and Vertical Hold control knobs by rotating the associated potentiometers counterclockwise as an assembly...from the rear of the cabinet. Remove the three mounting screws of the control bracket and pull bottom end of bracket toward rear of cabinet until the Vert Hold and Brightness knobs are clear of openings. Slide out of flange at upper left-hand corner and remove bracket and tuner from cabinet.

Remove the projection disc from channel selector shaft of tuner and disengage tuner from control bracket by removing screws.

TO REPLACE THE PICTURE TUBE MASK

It is possible to replace the entire mask from the front of the cabinet...without removing any items from the rear of the cabinet. However, it is necessary to remove the cabinet back cover and retract the Brightness and Vertical Hold controls by rotating them counterclockwise as a unit to clear mask openings.

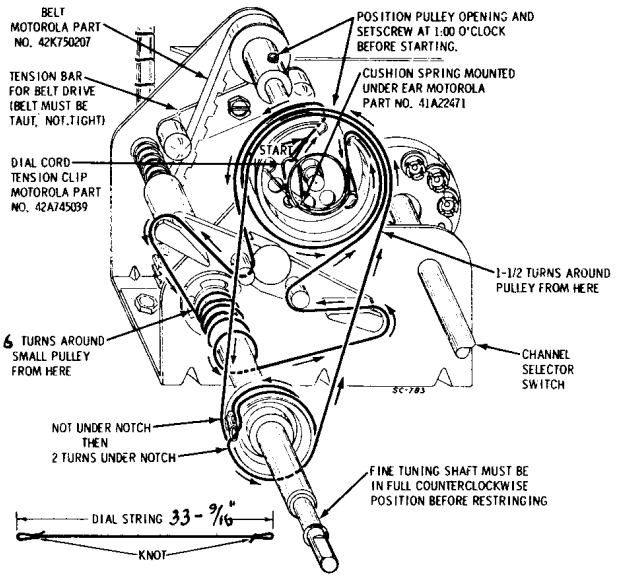


FIGURE 4. UHF DIAL RESTRINGING DETAIL

Remove cabinet rear cover, reach inside, and rotate Brightness and Vertical Hold potentiometers counterclockwise as a unit. Remove all front panel knobs except the Brightness, Vertical Hold, Channel-On-Off Pushbutton, and the microphone and its retainer...the latter two components are on automatic models only. Carefully note the position and type of any return, or compression-type springs associated with the knobs so they may be correctly positioned when the knobs are replaced. Remove the safety glass (see "Safety Glass Removal" section). The mask may now be pulled away from the cabinet at the top. Then, carefully lift mask up and out of the bottom retainer. On automatic models, there will be wire connections running to the Channel button and the microphone. When sufficient room has been obtained, reach behind the mask and unplug the microphone and the Channel button.

TO REMOVE THE PICTURE TUBE

Disconnect all cables from TV chassis and remove the entire TV chassis picture tube and picture tube mounting framework as an assembly...the assembly is held into the cabinet by four retaining bolts.

After picture tube and chassis assembly have been removed from the cabinet, loosen left and right-hand strap mounting bolts to release picture tube.

TO REPLACE THE PICTURE TUBE

Prepare the new picture tube by placing duplicate pieces of tape at the flare and around the screen edges, as found on the original picture tube. Insert replacement picture tube into framework and secure with strap bolts. After all leads have been re-connected, adjust Focus, Centering and Size of the picture in accordance with the instructions given in the "Initial Installation" section.

MOTOR DRIVING SYSTEM

The motorized tuner mechanism used on these receivers uses a "Geneva" type drive system. This system provides a driving method that is self-detenting within the gear box. The result: precision stopping of the tuner on each channel. Since the detent action is provided within the gear drive system, rather than by the tuner, less driving power is required and the system performs smoothly and quietly. Also, the precision detent action of the system allows an advanced method of individual channel oscillator adjustment (fine tuning). (See Figure 7.)

REPLACEMENT OF THE DRIVE MOTOR

Should it be necessary to replace, or disengage the motor from the tuner for service reasons, certain precautions must be observed in the replacement of the motor and shaft to the tuner. They are as follows:

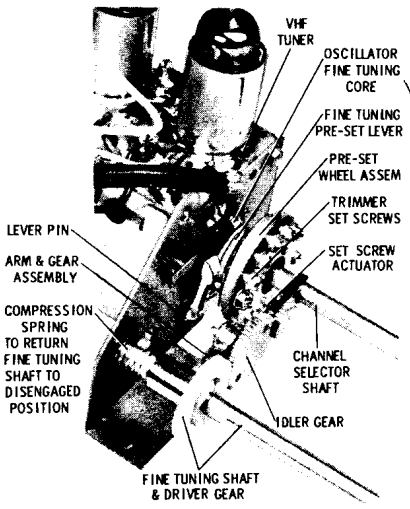


FIGURE 5. FINE TUNING SYSTEM (MANUAL MODELS)

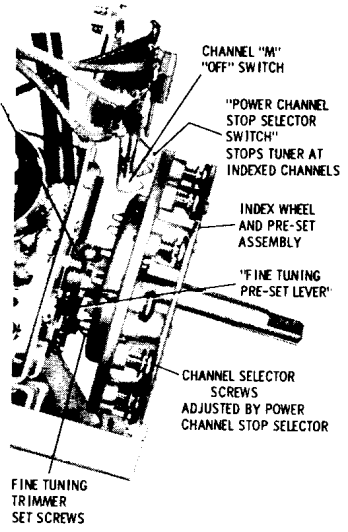


FIGURE 6. FINE TUNING SYSTEM (AUTOMATIC MODELS)

MOTOROLA Chassis TS-564 & WTS-564, Service Information, Continued

1. The tuner must be on channel #1 ("M" in channel window). Channel #1 may also be determined by the "off" cam located on the index wheel (see Figure 6).

2. The nylon gear, through which the tuner shaft will project and which is visible on the side of the gear box away from the tuner, must be positioned so that the timing notch lines up with the timing notch on the gear box (see Figure 8).

3. The drive-coupling (metal) must be positioned into the depressions in the nylon gear (of step #2) so that the timing notch lines up with the timing notch on the gear box (see Figure 8).

4. The bushing-coupling which secures the shaft to the driver coupling by means of an Allen head screw must not be pressed too tightly against the drive-coupling. Merely slide the drive faces together and tighten the Allen screw.

NOTES: If the motor is incorrectly replaced, it is possible for the indexing mechanism to stop the tuner between channels. If step #4 is not observed, it will cause binding of the gear train and motor jamming.

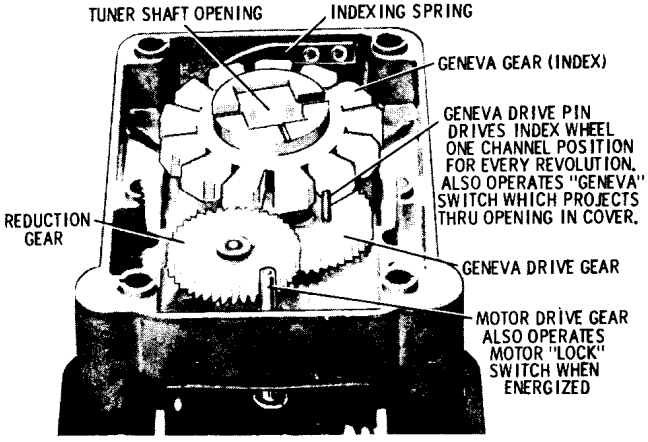


FIGURE 7. GENEVA DRIVE SYSTEM (GEAR BOX)

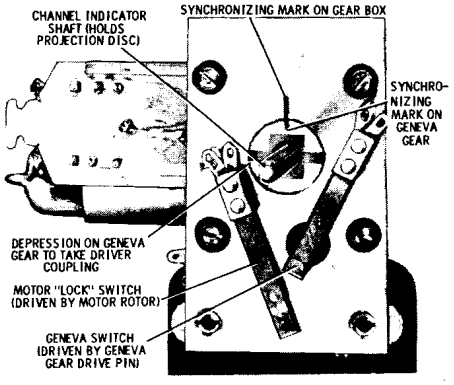


FIGURE 8. SYNCHRONIZING MOTOR GEAR BOX WITH TUNER

MODULE REPAIR

It is not necessary to replace an entire module merely because the module contains a defective component. It is an easy matter to remove the defective module component from the circuitry by cutting the appropriate leads and then substituting conventional capacitors or resistors back into the circuitry. When this method is used, it is always desirable to replace the circuitry in such manner that the defective module component is removed entirely from the system. In other words, do not bridge the defective component with the replacement unit. This is to avoid any detrimental effect that the defective component might inject into the system. An example of this would be an open coupling or bypass capacitor...which you would normally think could be bridged by an external capacitor with no ill effects. However you should keep in mind that it is possible for the modular capacitor to intermittently cure itself causing the total capacity to intermittently double. On the other hand, it is just as possible for the defective capacitor to short-out in the near future. Therefore, when replacing modular components with external parts, remove the modular component completely from the circuit. In some cases, two or more module components are connected internally to a riser wire and when the riser wire is removed from the circuit, more than one component is disconnected. In these cases, it will be necessary to replace the remainder of the module components with external parts and/or connecting leads even though they are not defective.

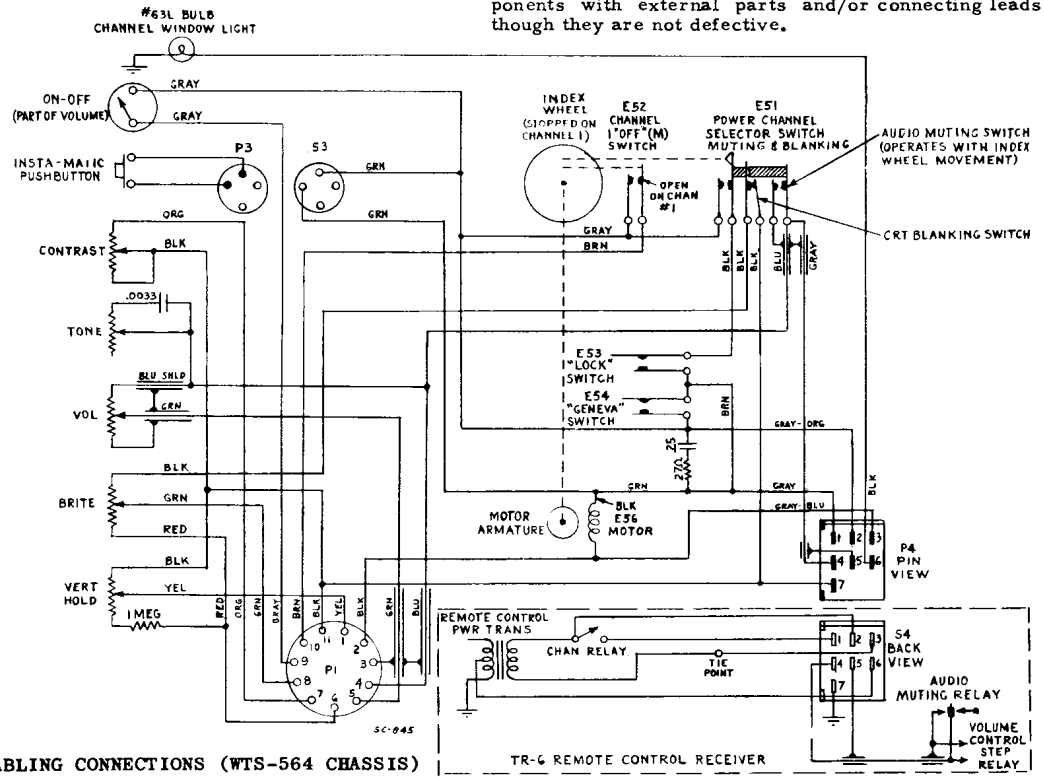


FIGURE 11. CABLING CONNECTIONS (WTS-564 CHASSIS)

MOTOROLA
Chassis TS-564, and WTS-564
(Continued)

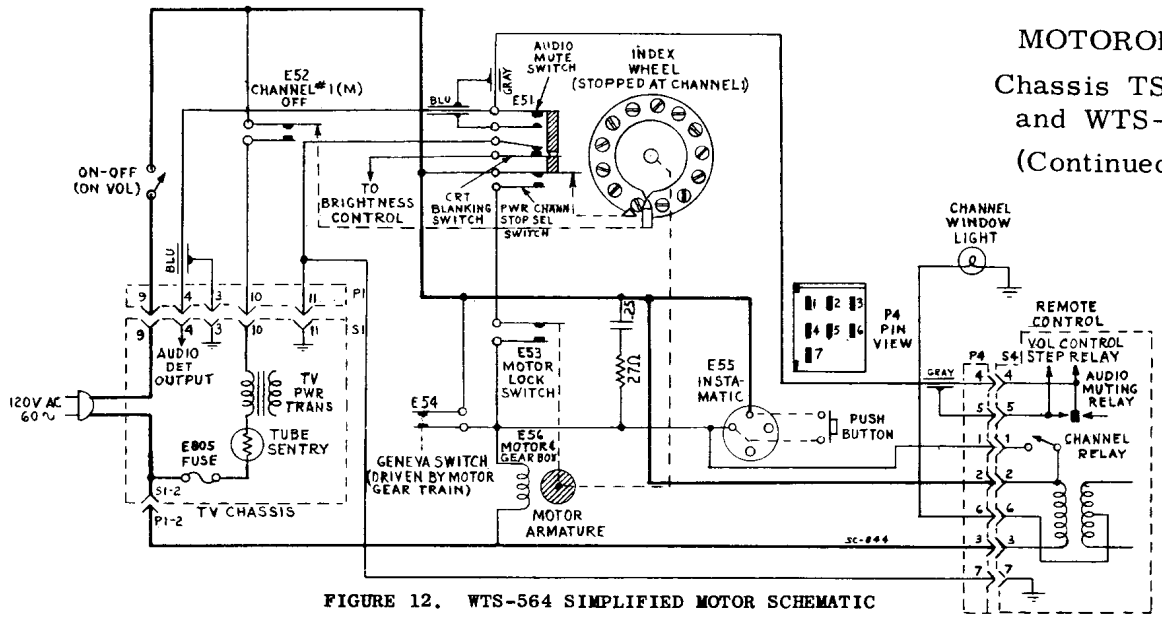


FIGURE 12. WTS-564 SIMPLIFIED MOTOR SCHEMATIC

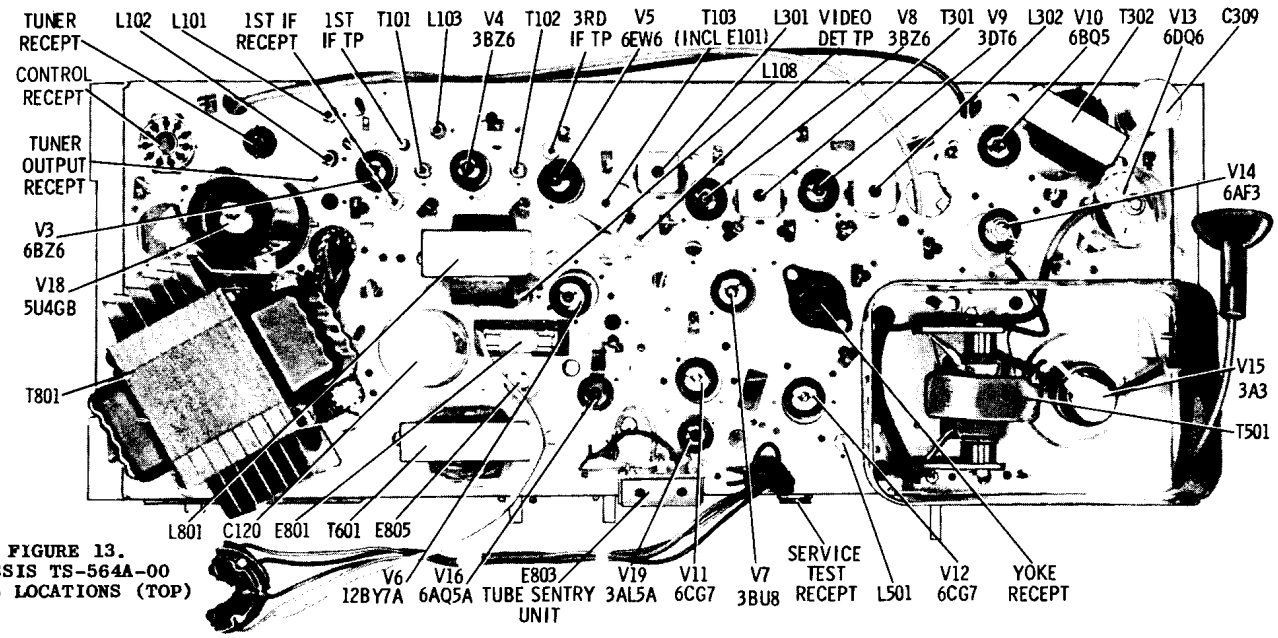


FIGURE 13.
CHASSIS TS-564A-00
PARTS LOCATIONS (TOP)

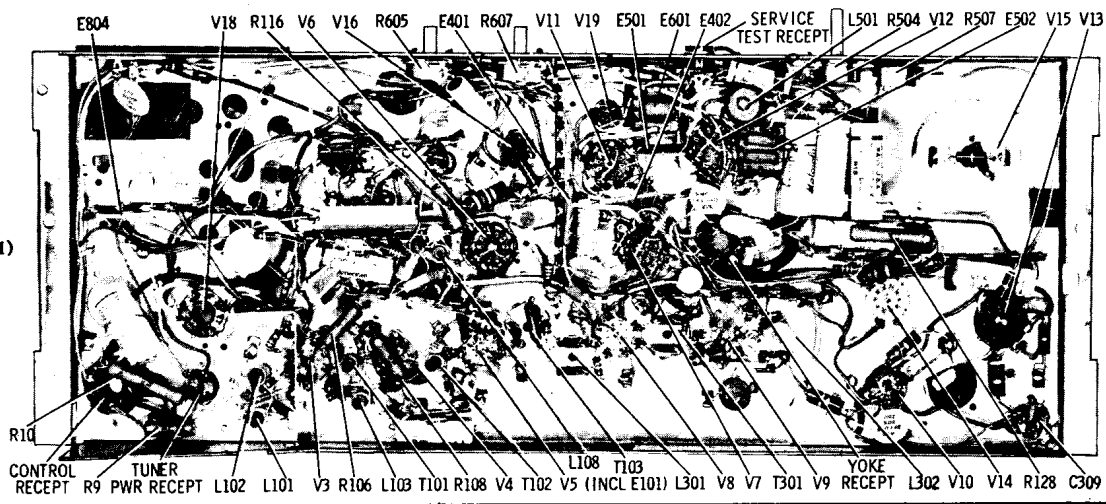


FIGURE 14.
CHASSIS TS-564A-00
PARTS LOCATIONS (BOTTOM)

MOTOROLA Chassis TS-564 & WTS-564, Alignment Information, Continued

VIDEO IF & MIXER ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

Pre-Alignment Steps

1. Maintain line voltage at 120 with variac.
2. Remove the deflection yoke plug to eliminate RF interference radiation.
3. Disable oscillator by shorting point "L" located near oscillator tube V-2, to chassis. See Figure 15.
4. Apply the negative lead of a 6 volt bias supply to pin #1 (IF AGC) of the SERVICE TEST RECEPTACLE and the positive lead to pin #3 (chassis ground).
5. All coil slug tuning positions, in relation to chassis, are given in the procedure chart and in the separate detail of Figure 16.
6. Set channel selector on channel #13 and connect a 1500 ohm 50W voltage normalizing resistor from B+ to chassis (use pins #5 (B+) and #3 (ground) of the SERVICE TEST RECEPTACLE.
7. Set the contrast control at minimum (extreme counter-clockwise position).
8. Short across tuner input terminals.
9. Maintain 2 to 5 volts peak-to-peak at the diode load (Det TP) except when specific values are given in the procedure chart.
10. Refer to Video IF & Sound Alignment Detail for component and test point locations (Figure 15).

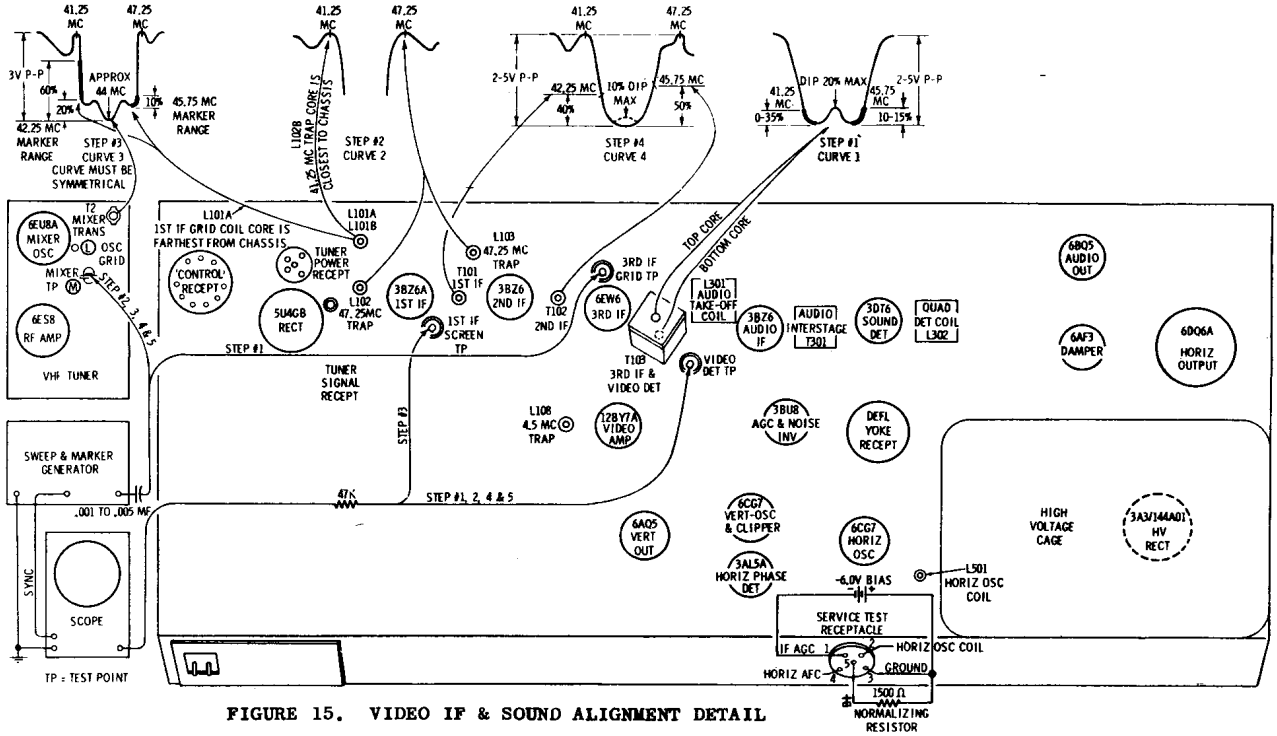


FIGURE 15. VIDEO IF & SOUND ALIGNMENT DETAIL

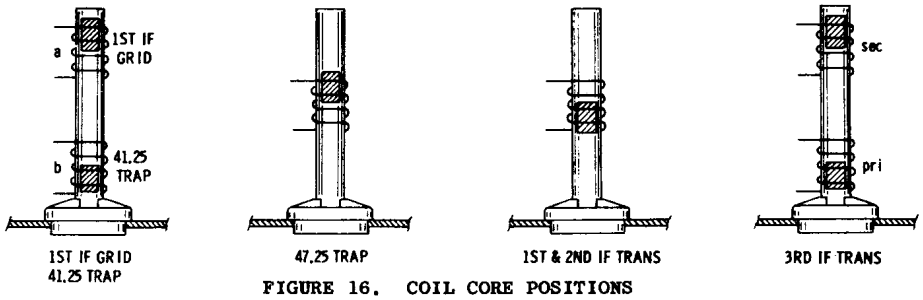


FIGURE 16. COIL CORE POSITIONS

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 3rd IF grid test recept thru a .001 mmf capacitor. Set sweep approx. to 44 Mc: markers as required	Scope thru a 47K ohm resistor to Video Det test recept	Both slugs of 3rd IF coil (T-103)	Equal peaks and 45.75 Mc marker as shown on curve #1. Note: Slug at crystal end can be reached by inserting tool through unobstructed slug. Tune both slugs near the ends of their respective coils. See detail for slug position Note: Temporary removal of bias or increased generator input may be required to see traps.

MOTOROLA Chassis TS-564 & WTS-564, Alignment Information, Continued

VIDEO IF & MIXER ALIGNMENT PROCEDURE (CONT'D)

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
2.	To mixer TP thru .001 mf capacitor. (Terminal adjacent to mixer. Set sweep to approx. 44 Mc. a. Set marker to 47.25 Mc b. Set marker to 41.25 Mc	Scope connection same as step #1	a. 47.25 Mc trap (L-102 & L-103) b. 41.25 Mc trap (L-101B)	a. Minimum response (tune slug at end of coil away from chassis) b. Minimum response (tune slug at end of coil toward chassis) See curve #2 for above responses.
3.	Generator connection same as step #2, except set output for 3V P-P on scope	Scope to "1st IF screen test recept or test point." Pin #6 of tube	a. Mixer trans, located on tuner (T-2)	Tune both T-2 & L-101A for curve shown in curve #3, step #3. Pri affects the center peak and the sec affects the two outside peaks.
			b. 1st IF grid coil (L-101A) slug located away from chassis	If a suck-out (trap effect) occurs, detune 1st IF transformer (T-101). Tune both coil slugs at end of coil away from chassis.
4.	Generator connection same as step #2. Reset for 2-5V P-P on scope.	Scope thru a 47K ohm resistor to Video Det test recept	1st IF trans (T-101)	Proper 42.25 Mc marker placement (tune slug at end of coil toward chassis)
			2nd IF trans (T-102)	Proper 45.75 Mc marker placement (tune slug at end of coil toward chassis) See curve #4.
5.	Same as step #4.	Same as step #4.		If a tilt occurs, readjust the mixer pri coil (T-2 on tuner) and if necessary touch-up the 1st and 2nd IF trans (T-101 & T-102) for response shown in curve #4.

SOUND ALIGNMENT (Station Signal Method)

The sound system used in this TV chassis consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.
2. Adjust all controls for normal picture and sound.
3. Refer to Video IF & Mixer Alignment Detail for coil and test point locations.

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to jct of R-307 (560K) and R-306 (82K) located on L-302 (under chassis).	L-302 (quad coil)	Maximum deflection (coarse adj.). Of two possible maximum tuning points, use that giving the largest voltage reading.**
2.	"	Listening test	"	Maximum sound with minimum distortion (fine adj.).
3.	Weak signal*	"	T-301 (interstage)	Maximum sound with minimum distortion (maintain hiss level).**
4.	"	"	L-301 (take-off)	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

**The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be misadjusted by previous service work, merely re-set near top end of coil and tune for maximum.

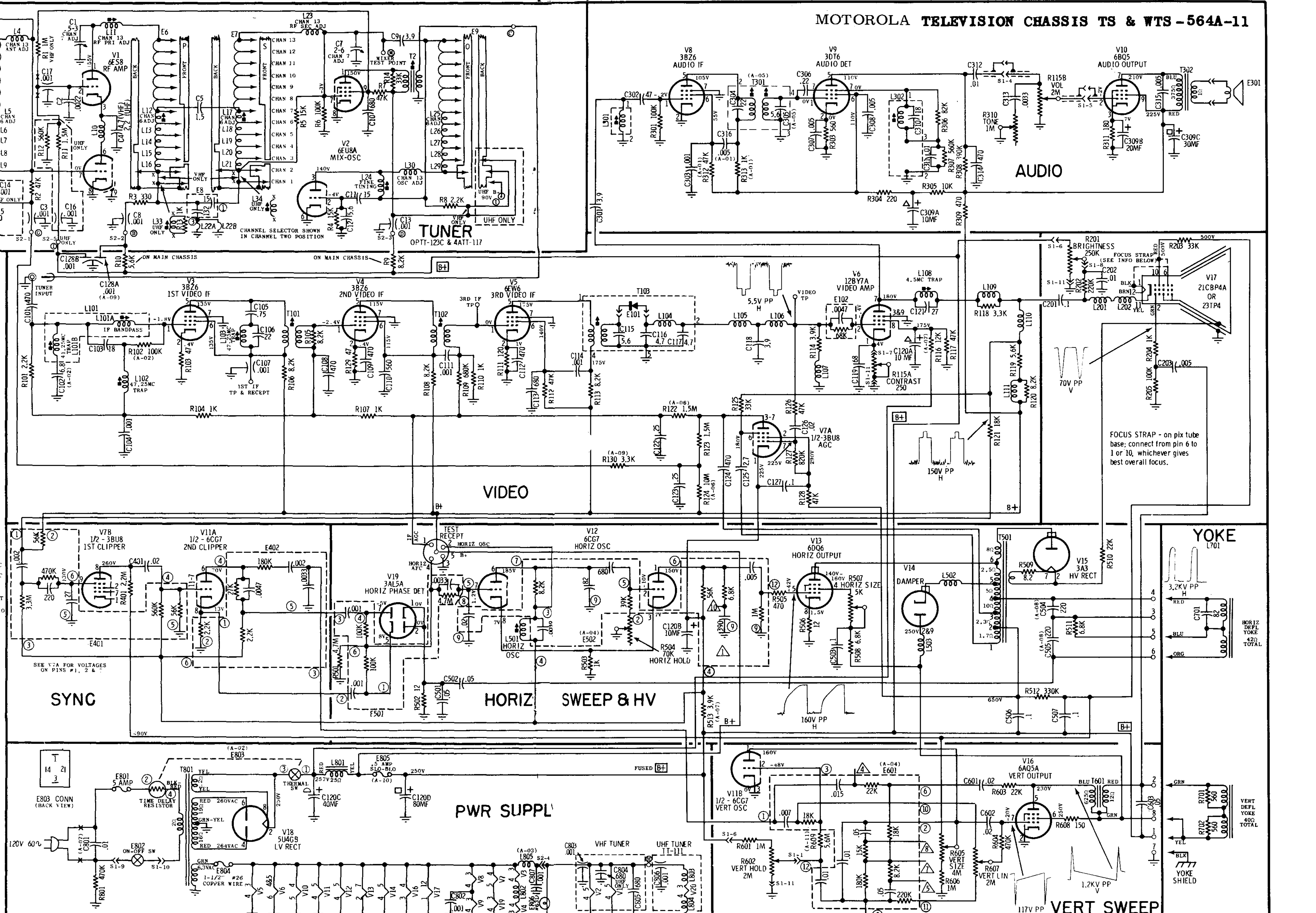
4.5 MC TRAP ADJUSTMENT

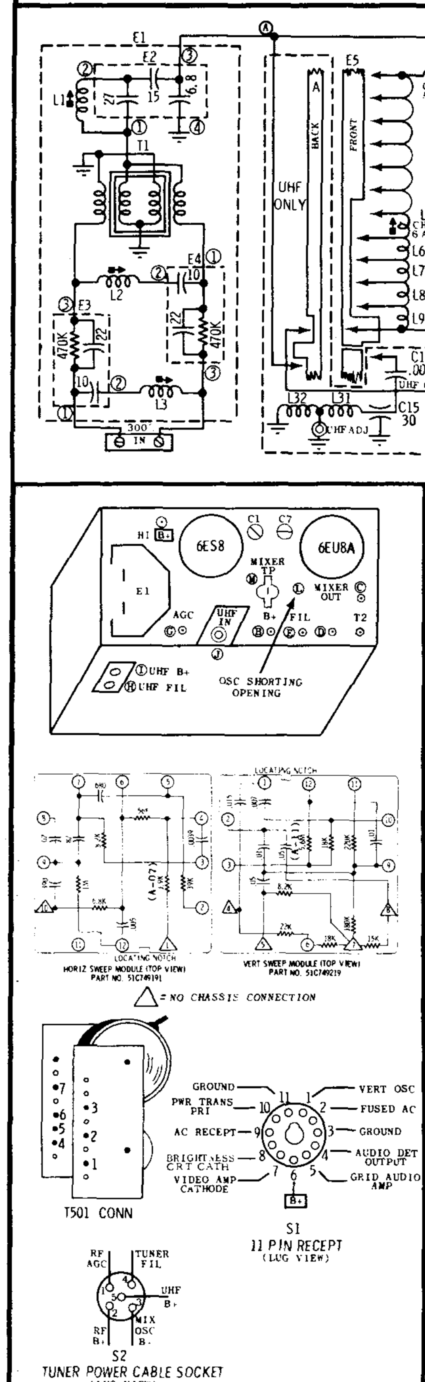
1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control) to bring 4.5 Mc interference strongly into the picture.

3. ADJUST...sound trap (L-108) to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

MOTOROLA TELEVISION CHASSIS TS & WTS-564A-11





NOTES:

VOLTAGE MEASUREMENTS

1. Taken from point indicated to chassis with a VTVM. ±10%.
2. Line voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated *control settings.*
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.
5. Tuner on Channel 13 or channel of least noise with antenna terminals shorted.

WAVEFORM MEASUREMENTS

1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced near sweep rate indicated.
3. Taken with strong signal; contrast control at *maximum; all other controls in normal operating* position.

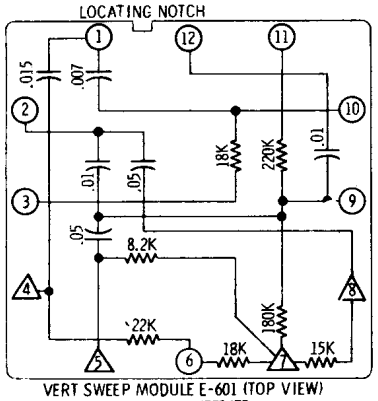
CAPACITORS - Unless otherwise specified, values less than *one in MF; all others in MMF.*

MOTOROLA Chassis TS-564 & WTS-564, Service Information, Continued

CHASSIS PRODUCTION CHANGES

TS-564A-00 thru A-11

Chassis Coding	Changes
A-00-1	Same as the A-03 production change.
A-01	TO INCREASE AUDIO SENSITIVITY: Plate and screen voltage feed points of the 1st audio IF stage changed from a common resistor B+ feed to individual B+ feed points by the following revisions: R-302 (10K) changed to R-312 (47K), C-316 (.005 mf) added; R-313 (1K) added, and resistors separated by removal of jumper wire between screen and lug 1 of T-301.
A-02	TO FACILITATE VIDEO IF ALIGNMENT: R-102 (100K) removed and C-102 (10 mmf) changed to 6.8 mmf. DESIGN CHANGE: E-803 (Tube Sentry) changed to a different style and the unit relocated from rear edge of chassis to a position near the power transformer.
A-03	TO REDUCE THE POSSIBILITY OF REGENERATION IN THE UHF TUNER: L-805 (filament choke) added between pin 4 of S-2 (tuner power cable socket) and filament line; C-807 (.001 mf 1KV) added between pin 4 of S-2 (tuner power cable socket) and ground.
A-04	TO REDUCE EFFECT OF HIGH HUMIDITY ON THE MODULES: The horizontal module (E-502) and the vertical module (E-601) have additional wax impregnation.
A-05	TO REDUCE DRIFT OF THE SOUND DETECTOR WITH TEMPERATURE CHANGES: C-305 (5.6 mmf) replaced with a capacitor of improved temperature coefficient characteristic. C-305 is part of the assembly comprising the 1st audio IF transformer T-301. A new assembly number is listed for T-301 which includes the new capacitor.
A-06	TO IMPROVE SIGNAL TO NOISE RATIO ON MODERATELY STRONG SIGNALS: R-122 (2.2 meg) changed to 1.5 meg; R-124 (15 meg) changed to 10 meg. This change improves the noise factor by increasing the gain in the tuner while decreasing the gain in the IF system.
A-07	DESIGN CHANGE: AC-line bypass capacitor C-801 (.01 mf) removed. B+ feed point for the video amp screen resistor R-116 (12K) moved from output end of filter choke (L-801) to input end. MODULE RELIABILITY CHANGE: To protect the majority of the module components from damage in the event of filter capacitor short or leakage, the B+ dropping resistor of 3.9K ohms (located between riser wires 1 and 4) of the horizontal module E-502 is removed from the circuitry and an external resistor wired in its place. This is accomplished by cutting off riser 1 and wiring a 3.9K resistor (R-513) from riser wire 4 to the proper B+ point.
A-08	TO INSURE SUFFICIENT HORIZONTAL SIZE AT LOW LINE VOLTAGES: C-504 and C-505 (180 mmf) changed to 220 mmf.
A-09	FOR INCREASED UHF TUNER STABILITY BY REDUCING POSSIBILITY OF REGENERATION: Additional filtering added to the VHF tuner's AGC system by addition of R-130 (3.3K) resistor. Also, additional bypass filtering added at the VHF tuner's UHF, and RF-Amp B+ points by inclusion of C-128 (dual .001 mf capacitor).
A-10	TO REDUCE FUSE FAILURES IN HIGH LINE VOLTAGE AREAS: The B+ fuse E-805 (.4 amp, slo-blo) changed to .5 amp slo-blo. The .5 amp fuse is recommended as a replacement for all field sets.
A-11	FOR INCREASED VERTICAL SWEEP STABILITY: The 5.6 meg resistor between the vertical hold control and grid of the vertical oscillator tube replaced with an external resistor of 5.6 meg ohms. This change is applicable to module No. 51C749219 which is equivalent to module No. 51C753673 when the 5.6 meg resistor is eliminated by cutting off the proper riser wires between the wafers. The external resistor that takes its place is noted as R-609 (5.6 meg) on the schematic.



VERT SWEEP MODULE E-601 (TOP VIEW)
PART NO. 51K753673

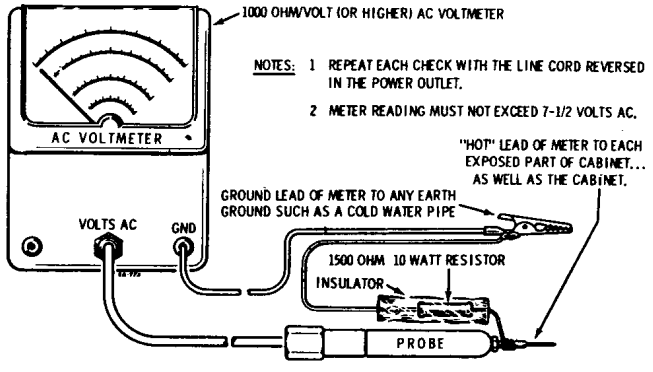
△ INDICATES NO RISER WIRE CONNECTION

PRODUCTION CHANGE A-11 VERTICAL MODULE

SAFETY TESTING OF THE RECEIVER AFTER SERVICING TO INSURE MAINTENANCE OF CONSUMER PROTECTION AGAINST ELECTRICAL SHOCKS.

Before returning a serviced receiver (of any type) to the owner, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock.

In reference to the illustration, a 1000 ohm per volt AC voltmeter is prepared by shunting it with a 1500 ohm, 10W resistor. The safety test is made by contacting one meter probe to any portion of the receiver exposed to the consumer or operator such as the cabinet trim, hardware, controls, knobs, etc., while the other probe is held in contact with a good "earth" ground such as a cold water pipe.



VOLTMETER HOOK-UP

MOTOROLA

CHASSIS TS-433 and TS-433Y, Models 17P6 Series

MODEL BREAKDOWN CHART

MODEL	CHASSIS	VHF TUNER	UHF TUNER
17P6-1	TS-433	CMTT-122	WTT-111
Y17P6-1	TS-433Y	CMTT-120Y	-
17P6-2	TS-433	CMTT-122	WTT-111
Y17P6-2	TS-433Y	CMTT-120Y	-
17P6-3	TS-433	CMTT-122	WTT-111
Y17P6-3	TS-433Y	CMTT-120Y	-

TUBE LIST

TUBE REF	STANDARD TYPE	MOTOROLA NUMBER
V1	4ES8	278A02
V2	5EU8	269A01
V3	3BZ6A	146A03
V4	3BZ6	146A01
V5	6AU8	153A03
V6	8EB8	263A02
V7	3BU8	145A01
V8	3DT6	148A01
V9	8BQ5	247A02
V10	5EA8	270A02
	OR 5U8	150A05
V11	12GC6	283A01
V12	12AF3	264A02
V13	1S2A	254A01
V14	7EY6	245A01
V15	17DTP4	196T110A01
V16	2AF4A	142A01

V16 UHF OSC — UHF TUNER (UHF MODELS ONLY)

↙ = KEYING POSITION
✳ = MOTOROLA PART NO.
TP = TEST POINT

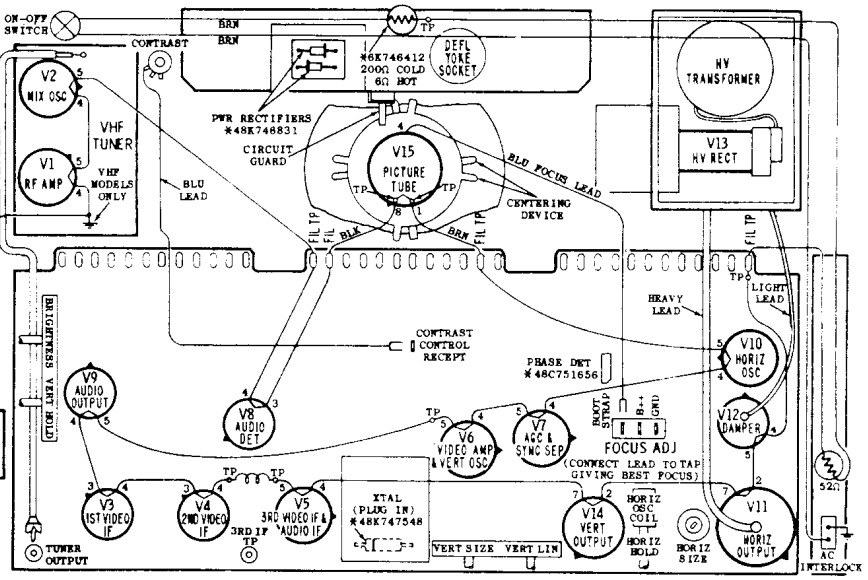


FIGURE 1. TUBE LOCATION, FILAMENT GUIDE AND FOCUS INFORMATION

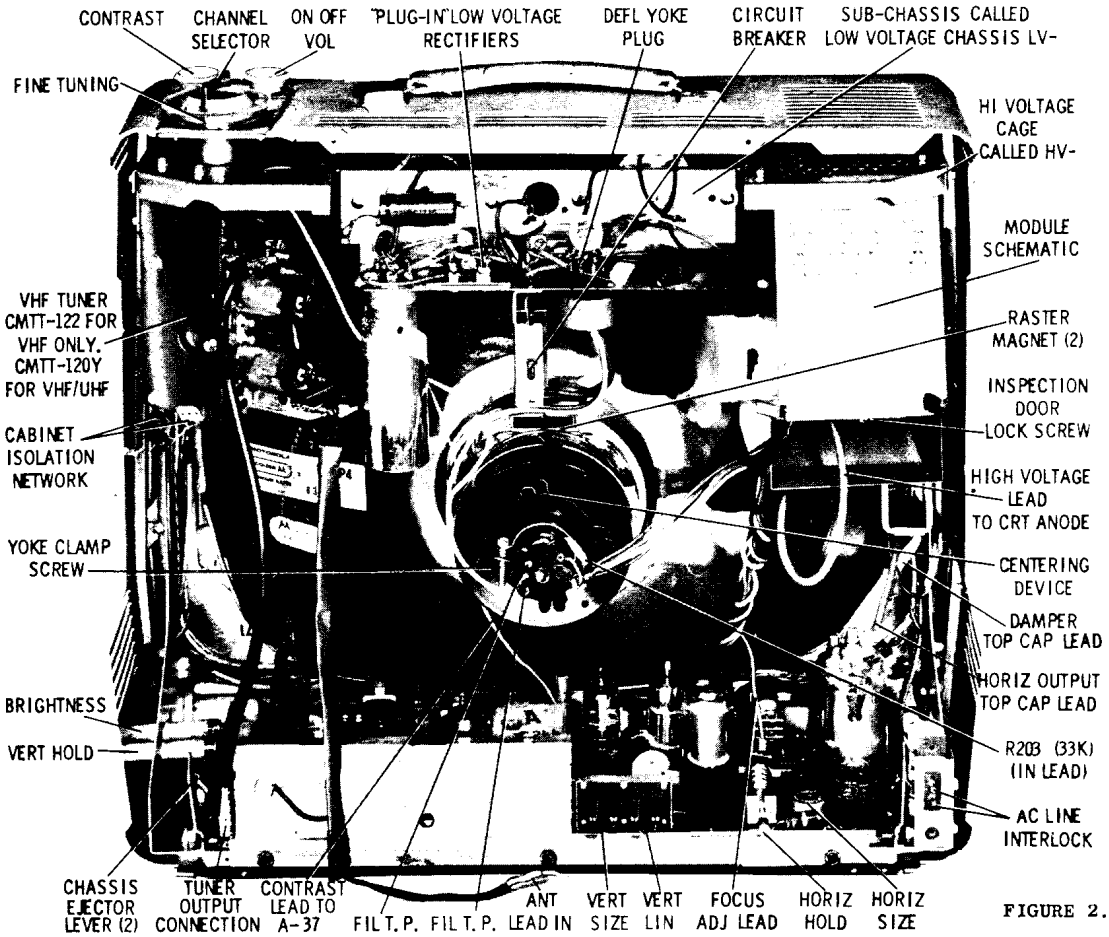


FIGURE 2. REAR VIEW OF RECEIVER

(Continued on pages 78 through 88)

MOTOROLA
Chassis TS-433
(Continued)

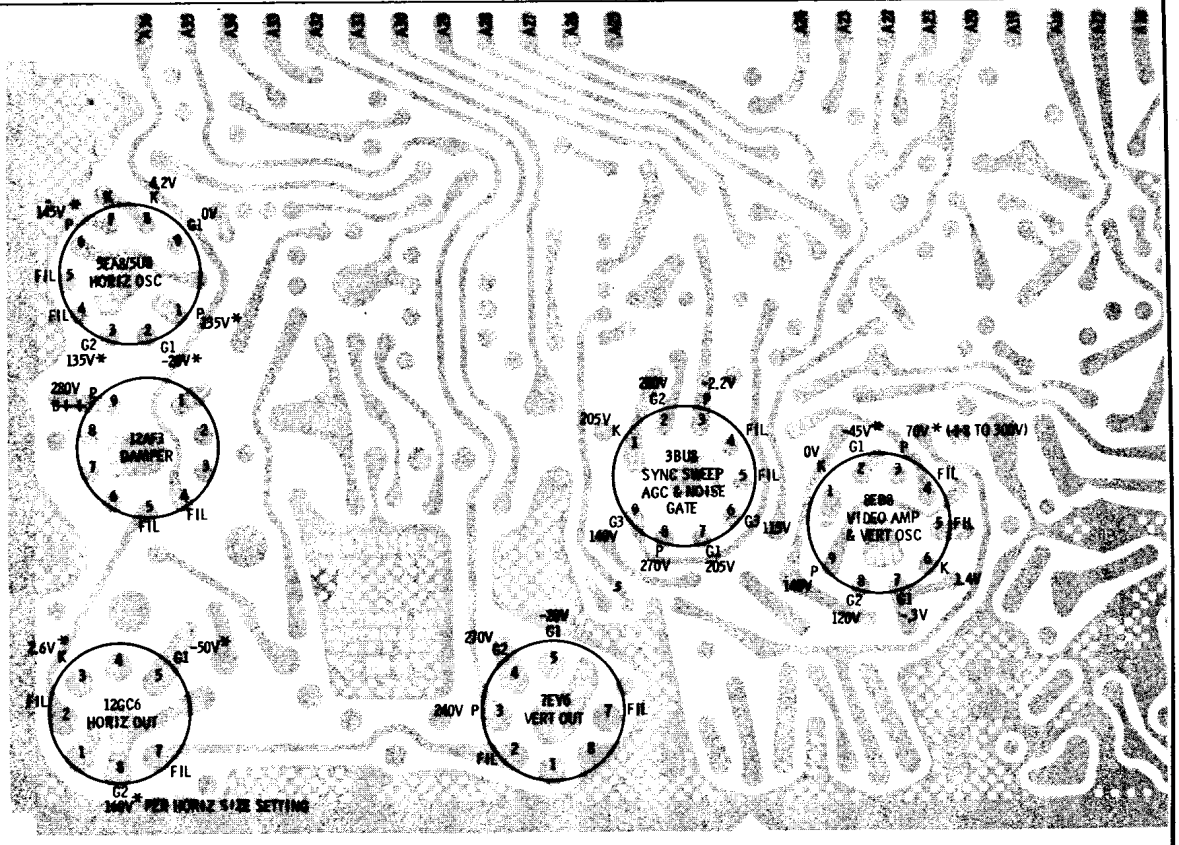


FIGURE 7. VOLTAGE READINGS TAKEN FROM UNDERNEATH SIDE OF PLATED CHASSIS.

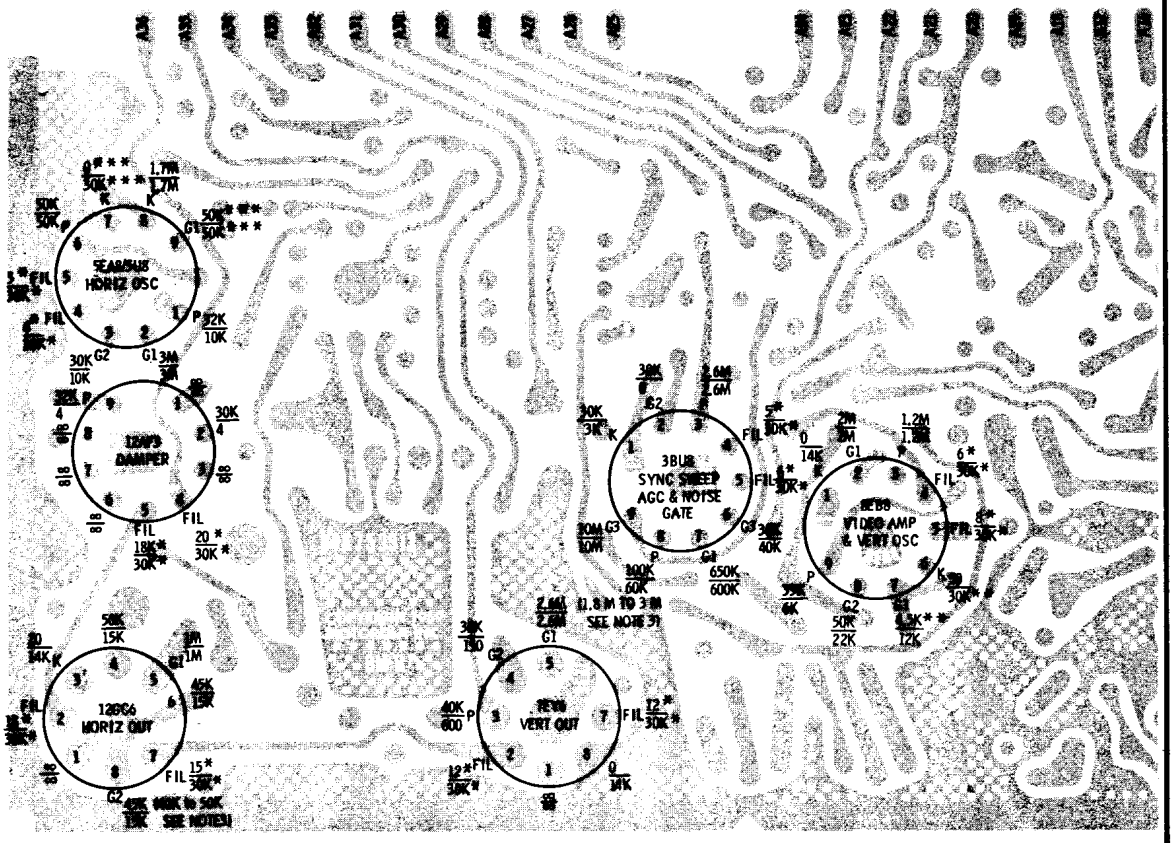
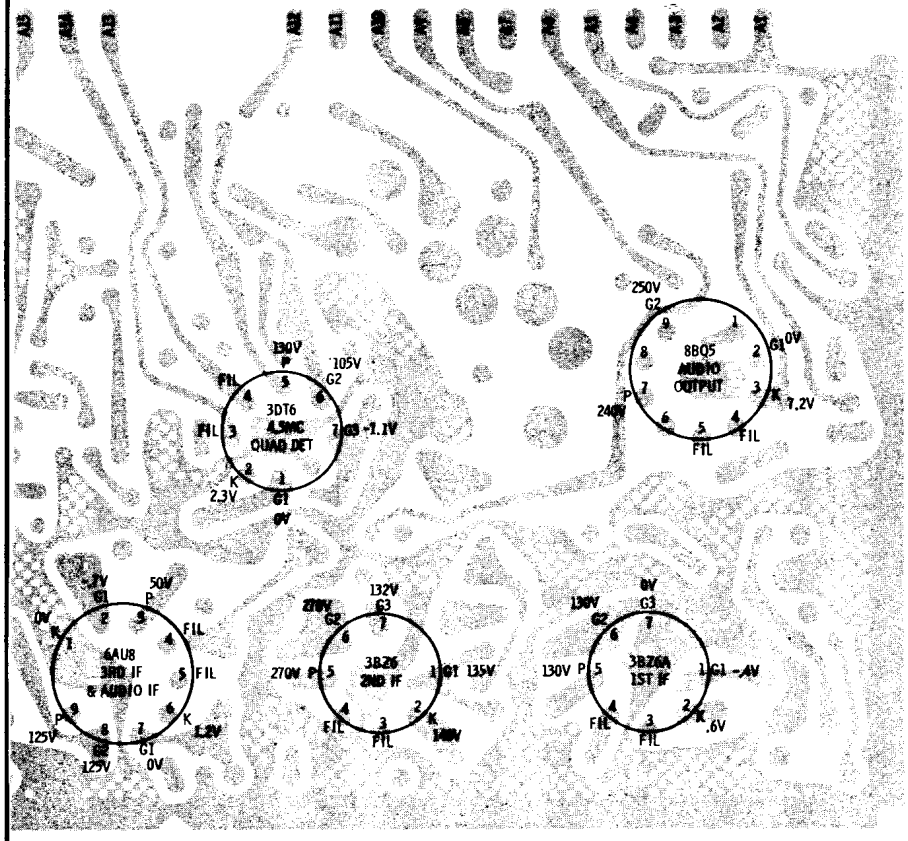
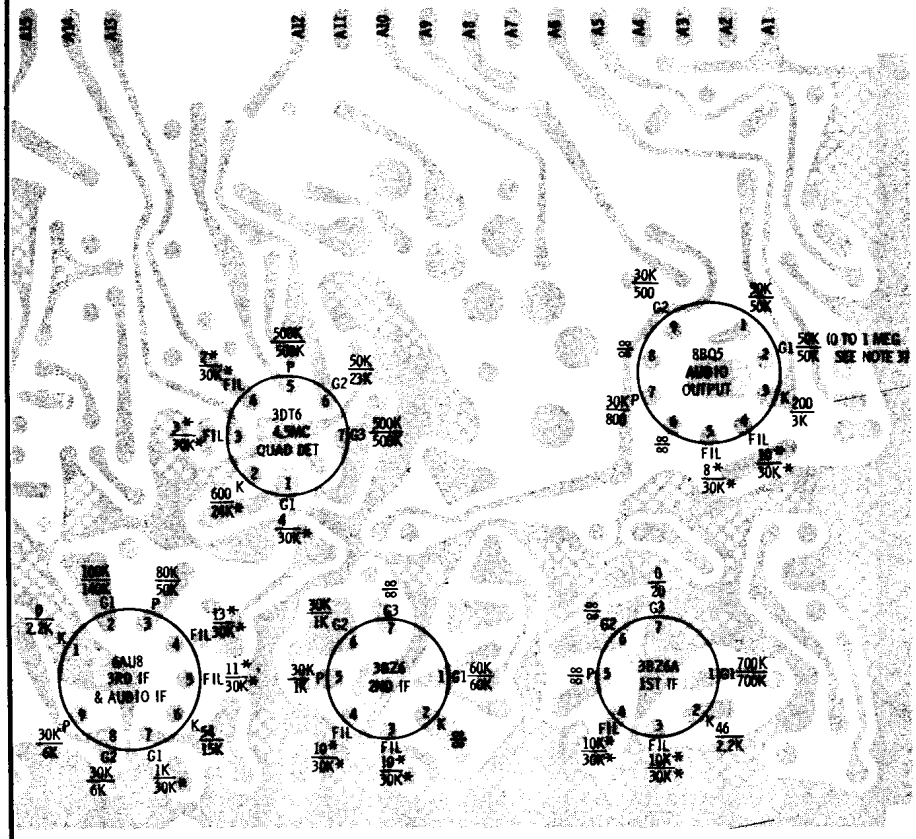


FIGURE 8. RESISTANCE READINGS TAKEN FROM UNDERNEATH SIDE OF PLATED CHASSIS





MOTOROLA
Chassis TS-433, -Y
(Continued)

NOTES (VOLTAGE READINGS)

1. **Taken from point indicated to chassis with a VTVM, ± 10%.**
2. **Line voltage maintained at 120V AC.**
3. **Voltages indicated by an asterisk will vary with associated control settings.**
4. **Taken with contrast control at minimum and all other controls in normal operating positions with no signal input.**
5. **Tuner on Channel 13 or channel of least noise with antenna terminals shorted.**

RESISTANCE READINGS

IMPORTANCE OF RESISTANCE READINGS

Resistance readings can play a vitally important part in servicing those sets which fail to respond to the usual tests. One reason for this is the fact that the effect of the tube is removed from the related circuitry since the readings are made with no power to the receiver.

METHOD OF PRESENTATION

In practically all cases, the resistance readings required for evaluation of a receiver can be taken in relation to the various tube elements. Therefore, the resistance readings are shown on a bottom view of the plated panel board in the exact position of the tube elements. This method is convenient because it eliminates the usual steps of: (1) Locating the resistance to be checked from the schematic, (2) Computing the resistance value that should be indicated, and (3) Finding the physical location of the test points.

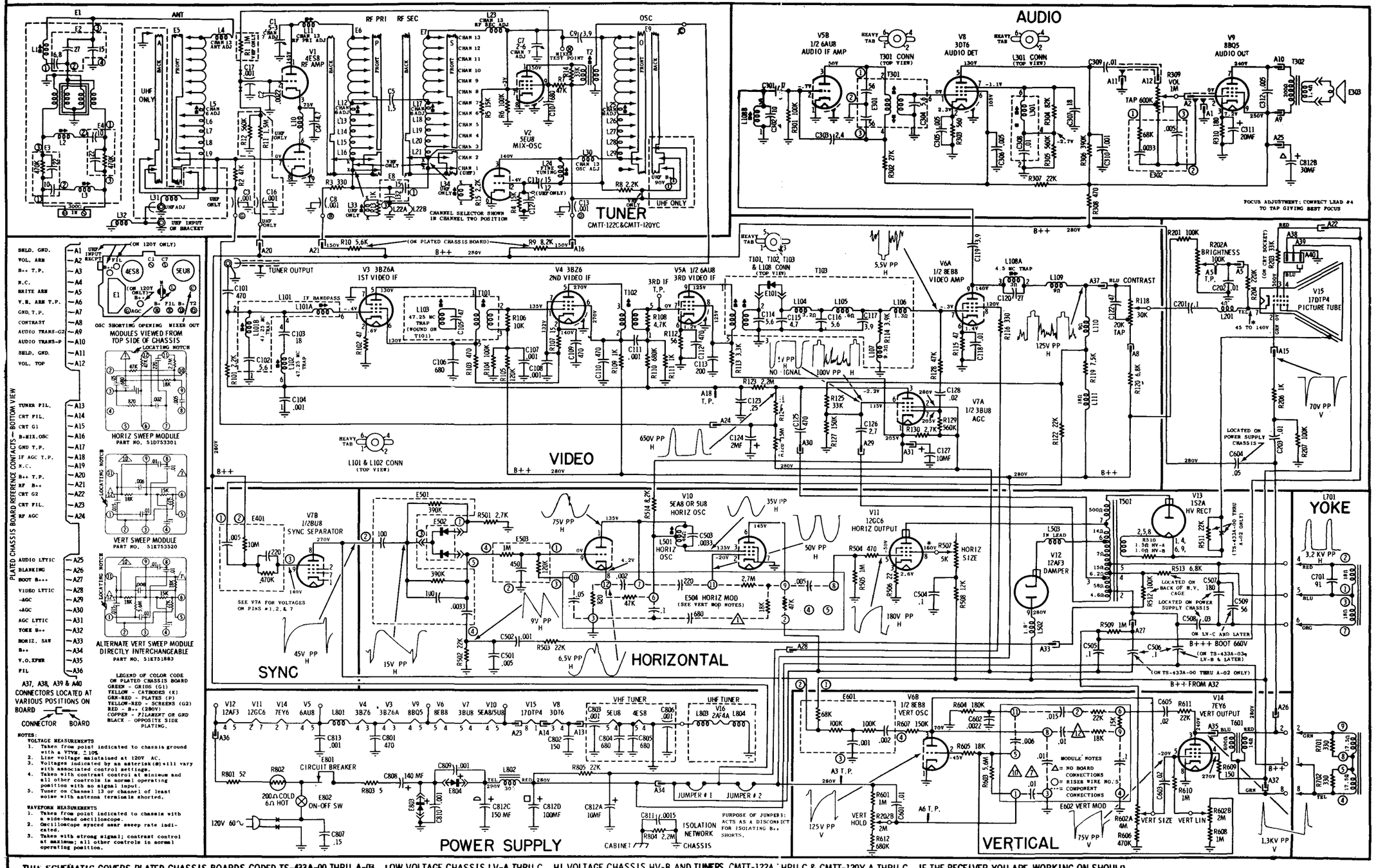
TWO READINGS ARE REQUIRED ON EACH TUBE ELEMENT

A resistance reading is required from the tube element to ground to check for shorted bypass capacitors and bleeder type circuits. A reading to B++ is required for plate and screen dropping resistors as well as peaking coils and "load" resistors. The two readings are shown above and below a divider bar with the upper reading indicating resistance to ground and the lower reading indicating resistance to B++.

IMPORTANT NOTES (RESISTANCE READINGS)

1. **Completely remove all power to the receiver by removing the power cord from the interlock.**
2. **Readings above the divider bar show resistance to ground: Readings below the divider bar indicate resistance to B++.**
3. **In circuits containing controls, the readings above and below the divider bar taken with controls in normal operating positions. The individual reading gives maximum and minimum readings.**

*** Readings taken with power rectifiers (E-803 & E-804) removed. (unplugged)**
**** Readings taken with video detector crystal (E-101) removed.**
***** Readings taken with phase detector crystal (E-502) removed.**



Chassis Coding	Changes
TS-433A-02	HIGH VOLTAGE SECTION. To reduce the possibility of break-down in the high voltage rectifier socket assembly, R-511 (22K) removed from pins #4 and #7 and the 2nd anode (HV) lead relocated from pin #7 to pin #9. R-510 (1.5 ohms) repositioned between socket pins 1 and 3 instead of on the outer edge of the socket (also used pins 1 and 3).
TS-433A-02-1	VHF TUNER. The temperature coefficient of C-12 (5.6 mmf) changed to improve oscillator compensation

Chassis Coding	Changes
LV-C	HORIZONTAL SWEEP MODIFICATION. To reduce the possibility of breakdown, C-507 (180 mmf) changed from 3KV to 5KV. To increase horizontal size range, C-509 (56 mmf, 5KV) added in parallel with C-507; it is wired between deflection yoke socket lugs 4 and 6.
HV-B	HORIZONTAL SWEEP MODIFICATION. To reduce changes in horizontal size with temperature changes, R-510 (1.5 ohms) changed to 1 ohm. Also junction of R-510 and filament lead from T-501 changed from tie point at pin #3 to pin #7 of HV rect socket.

Chassis Coding	Changes
TS-433A-00	VERTICAL SWEEP SECTION. To modify the vertical sweep oscillator characteristics, the 18K ohm resistor between riser wires 5 and 7 and the 5.6 meg resistor between riser wires 1 and 7 of the vertical module E-602 (#51K751883) removed by clipping the riser wires between the wafers. The two resistors are then replaced on the plated panel board as individual components. The 18K becomes R-506 and the 5.6 meg becomes R-603. When module #51K751883 is modified in this manner, it is equivalent to module #51D753520

MOTOROLA Chassis TS-433, Servicing Information, Continued

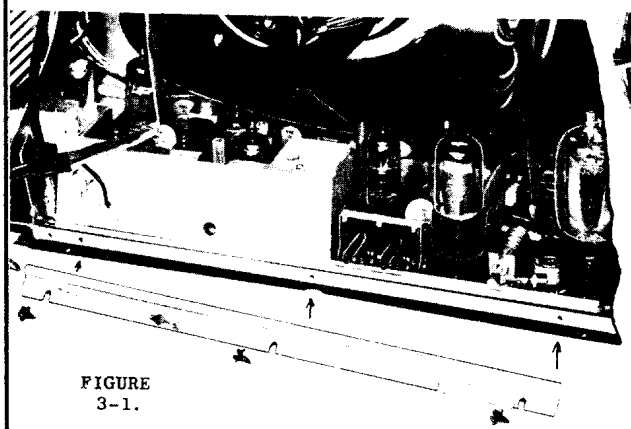
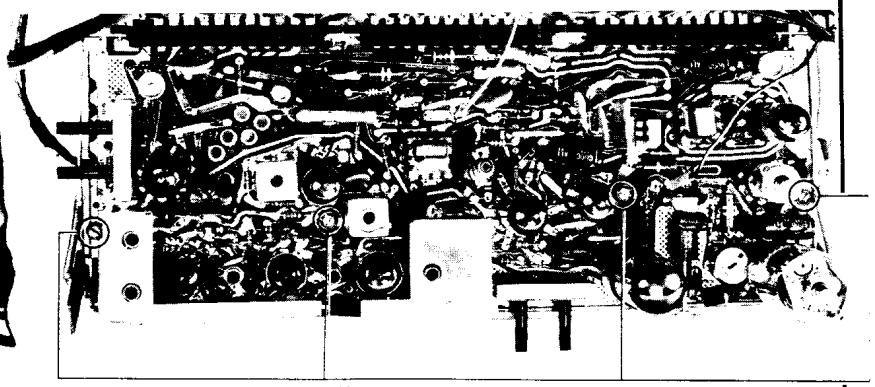


FIGURE 3-1.



LOCATIONS OF THE FOUR (4) TIE DOWN SCREWS HOLDING PLATED CHASSIS BOARD TO THE FRAMEWORK

PHASE I

This phase covers repairs that necessitate removal of the plated panel chassis. Repairs that must be made as speedily as possible without complex texts...and with a minimum of receiver disassembly.

THE FIRST STEP IN REMOVING THE CHASSIS BOARD is to remove the three (3) screws at the rear edge of the chassis and the metal strip they secure. Now remove the four (4) tie down screws that hold the board to the framework. These four screws are distributed along the top of the board in the positions shown in the photograph above.

THE SECOND STEP IN REMOVING THE CHASSIS BOARD is ejection of the chassis out of the framework by thumb pressure on the ejector levers, located at the left and right hand sides of the plated chassis board, as shown in Figure 3-2.

WARNING: Do not put pressure on the ejector levers until all seven (7) screws are completely removed.... otherwise, the plated panel can be damaged.

THE CHASSIS BOARD IN SEMI-REMOVED POSITION is shown in figure 3-3. You will notice that the tuner's output cable as well as the horizontal output and damper tube's plate caps are off. Only two remaining leads hold the chassis to the framework; the focus and contrast wires. They have been left connected in the photo for two reasons: to help locate their connections on the board and to remind you that they should be replaced first when returning the chassis board back into the cabinet; they are easier to reach in this position.

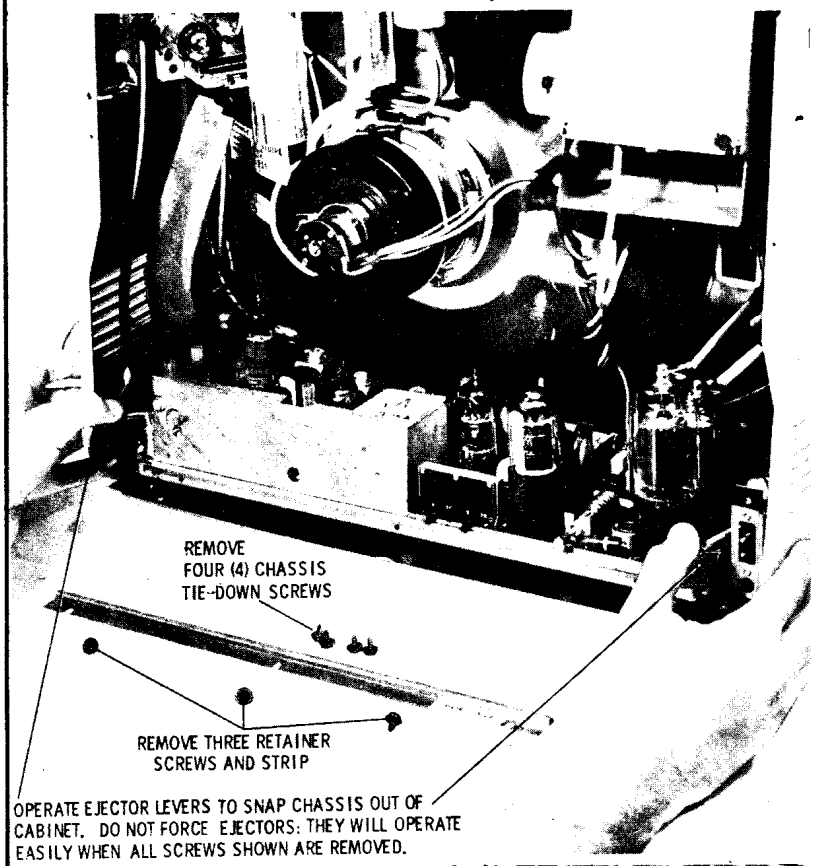


FIGURE 3-2

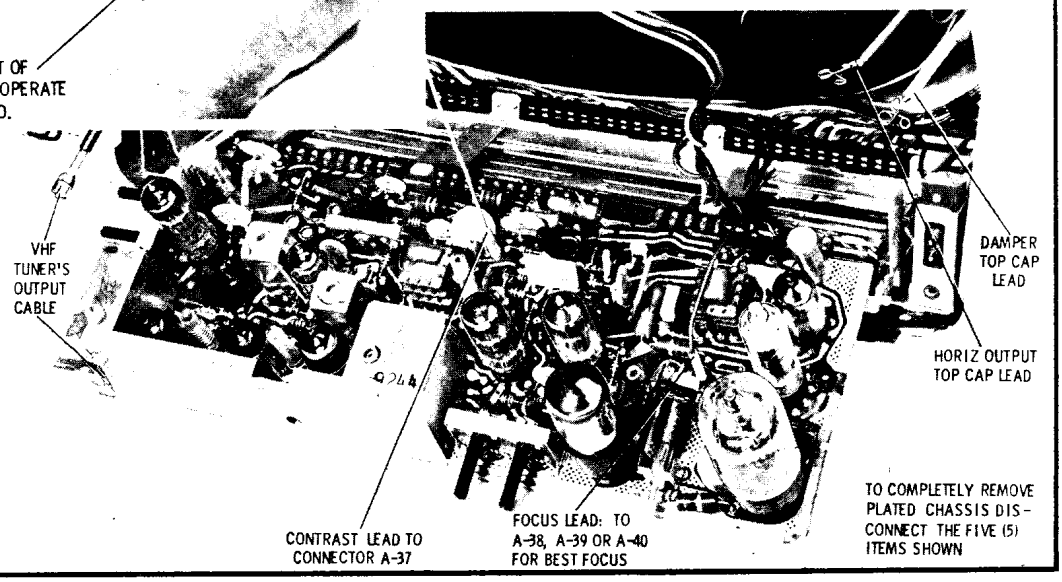


FIGURE 3-3

MOTOROLA Chassis TS-433, Servicing Information, Continued

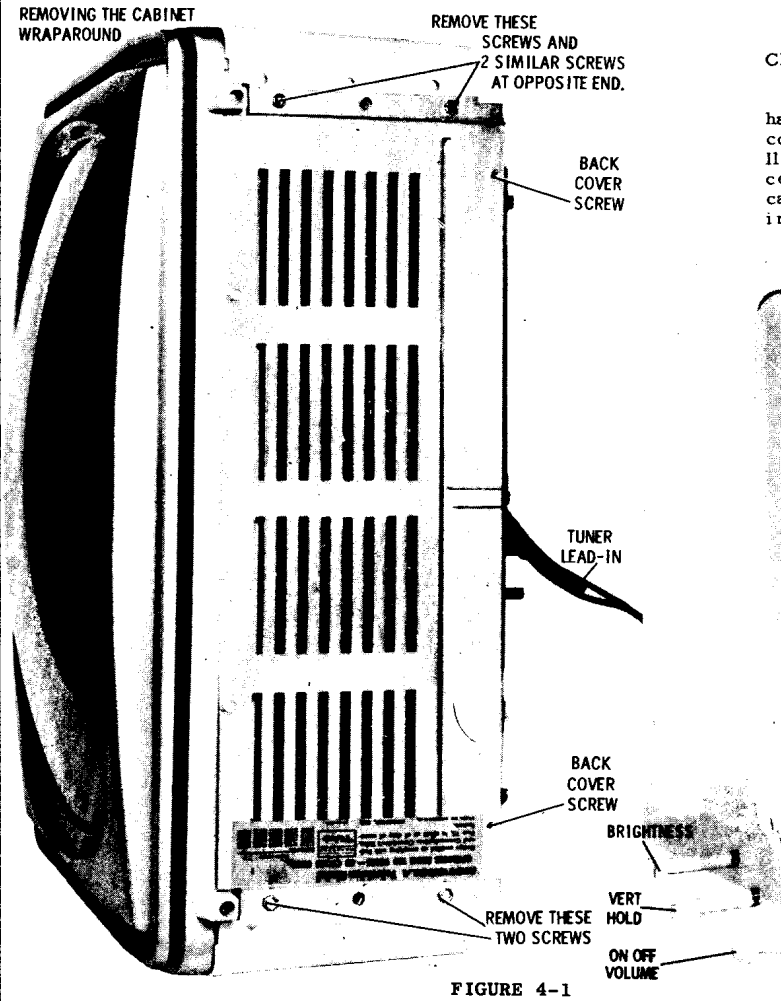


FIGURE 4-1

TO BEGIN REMOVAL OF THE CABINET WRAPAROUND, place the set in the position shown in figure 4-1 and remove the four screws called-out in the illustration. This position is best because it avoids scratching the safety window by laying the set on its face. It is assumed that the back cover has already been removed which eliminates the two screws that would otherwise be located along the rear edge.

REMOVE ALL KNOBS FROM THE CABINET as shown in figure 4-2. These knobs include the channel selector, on-off volume and contrast knobs located near the handle as well as the brightness and vertical hold knobs located at the side of the cabinet.

PHASE II

CHECKING VOLTAGES, RESISTANCES AND WAVEFORMS

Phase II servicing covers the stage after the serviceman has performed all tests possible by removal of the back cover and plated chassis board as described previously. Illustrations 4-1, 4-2, 4-3, 4-4 and 4-5 show how the receiver has been designed, so that merely by removal of the cabinet wraparound the chassis is exposed for absolute ease in making these "hot" tests.

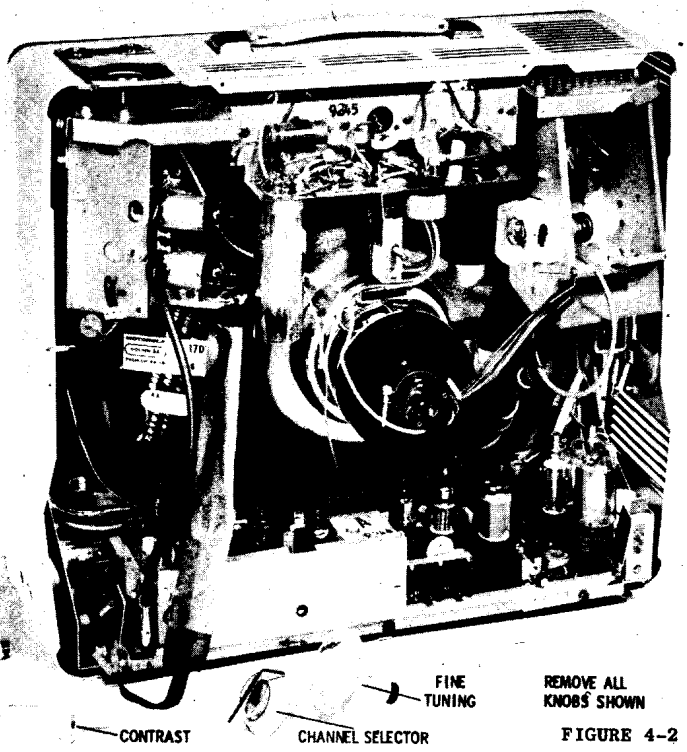


FIGURE 4-2

THE REMAINDER OF THE ITEMS HOLDING THE WRAPAROUND are the two captivated screws shown near the carrying handle in figure 4-3. These screws cannot be completely removed due to the captivation. The cabinet isolation network must now be released from the tuner by opening the jaws with a screwdriver. Unplugging the speaker leads will complete the process.

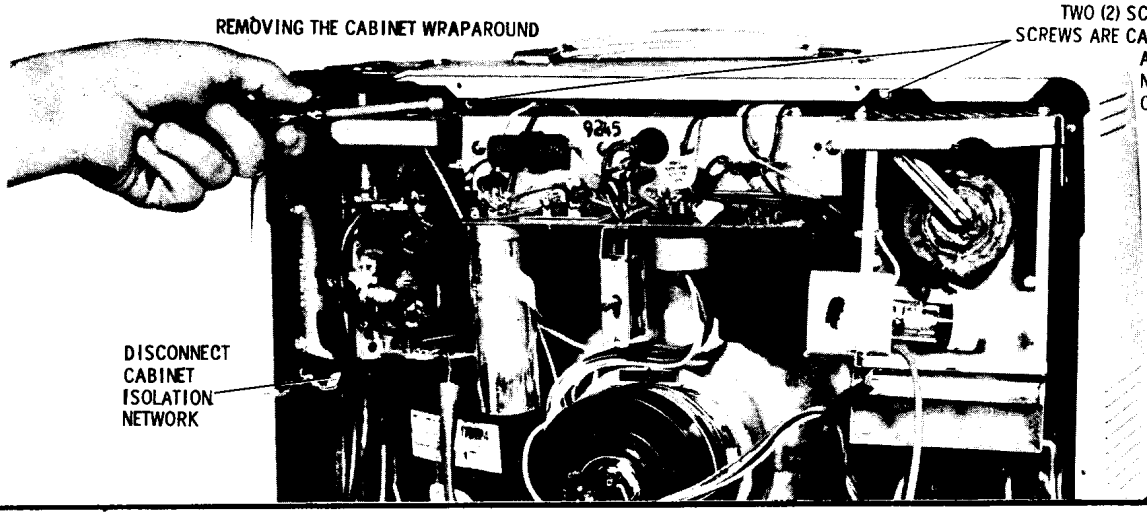


FIGURE 4-3

MOTOROLA Chassis TS-433, Servicing Information, Continued

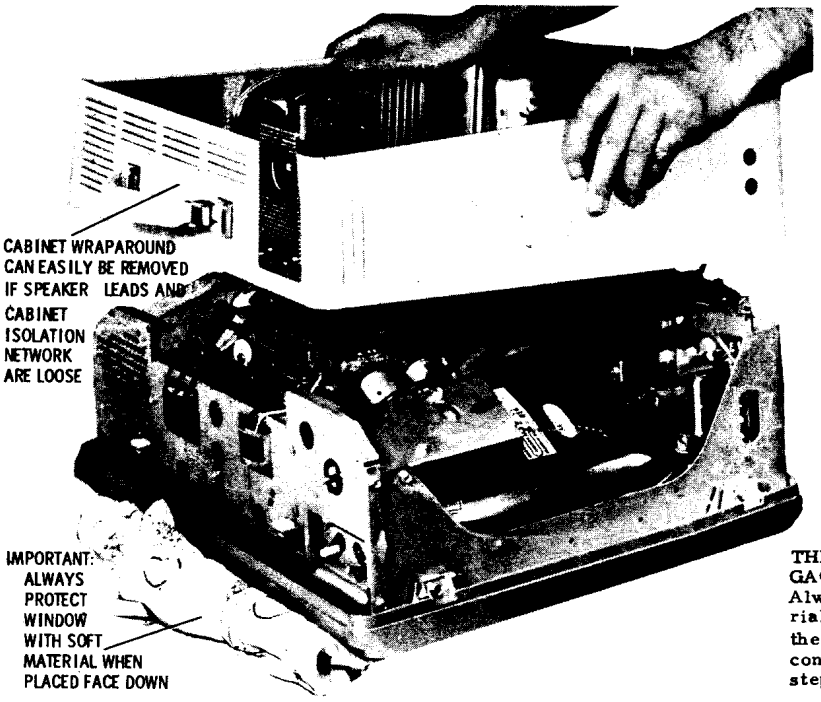


FIGURE 4-4

THE CABINET WRAPAROUND CAN EASILY BE DISENGAGED from the rest of the receiver as shown in figure 4-4. Always be sure to place some kind of soft, grit-free material under the safety shield window to avoid scratching. If the wraparound does not come off easily, check for retaining connections that may have been overlooked in the preceding step.

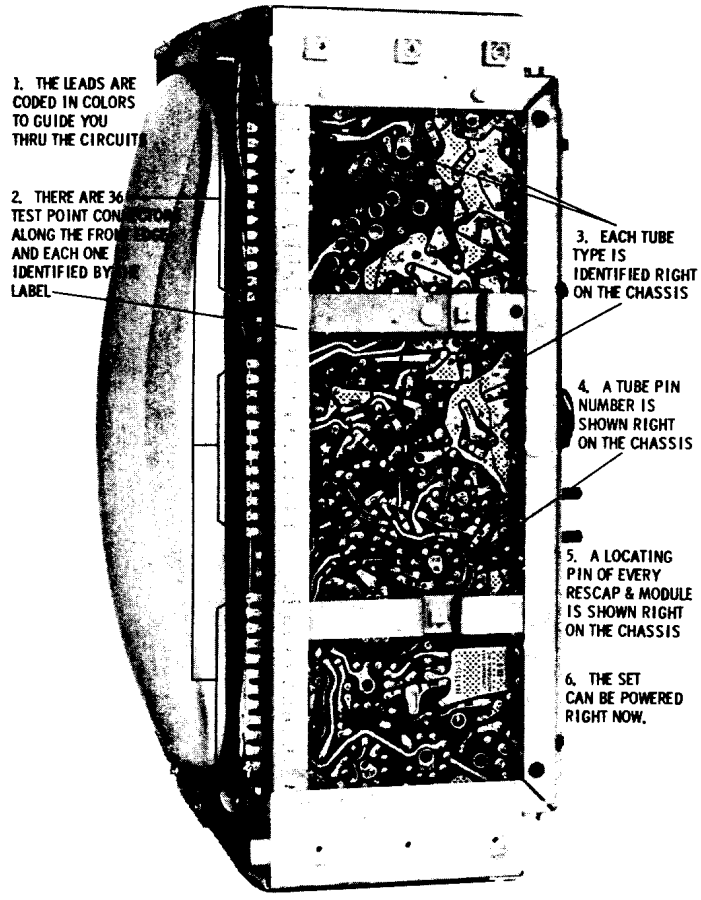


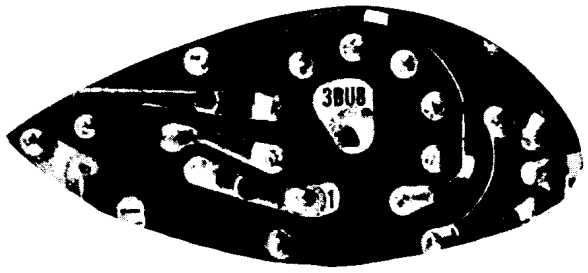
FIGURE 4-5

FIGURE 4-5 ILLUSTRATES THE RECOMMENDED RECEIVER POSITION for servicing.

THE EXPOSED CHASSIS IS NOW READY TO OPERATE so that you can make any kind of a check required. It is at this point, as illustrated in figure 4-5, that every one of the well-thought-out service aids will serve you the most.

All leads are coded in colors to guide you through the circuit pattern. The chassis board is practically its own schematic. The color code legend is as follows:

Red.....B+
Green and Red.....Plates (P)
Yellow and Red.....Screen grids (G2)
Yellow.....Cathodes (K)
Copper.....Filament wiring
Checkerboard copper.....ground
Black.....duplicates the route of the plating on the opposite side of the plated board to give an X-ray-like view



Every tube type is identified right on the chassis as well as its pin #1 for rotational position.

There are 36 exposed test points and each one is identified by the label affixed to the bottom of the framework.

Every rescap and module can be orientated easily from underneath the board since at least one pin number is identified on the board.

MOTOROLA Chassis TS-433, Servicing Information, Continued

PHASE III

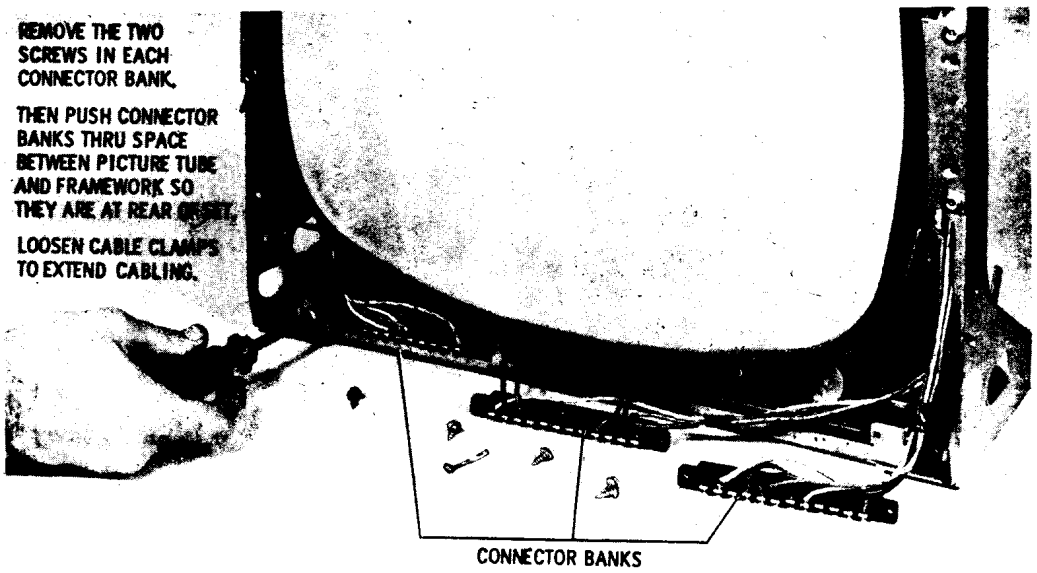


FIGURE 5-1

A FEW SIMPLE STEPS ARE ALL THAT ARE REQUIRED to prepare the receiver for operation of the chassis board in a completely exposed position out the back of the set. Begin by removing the three banks of chassis connectors shown in figure 5-1 by removal of two screws in each bank. The center bank contains a cable retaining clip which should be replaced when re-assemblying the set.

After the connector banks have been released, carefully insert them through the space between the bottom of the picture tube and the framework so they extend out the rear of the receiver. Loosen any cable retaining clips necessary to extend cables to the required length. NOTE: An extension cable assembly is available.

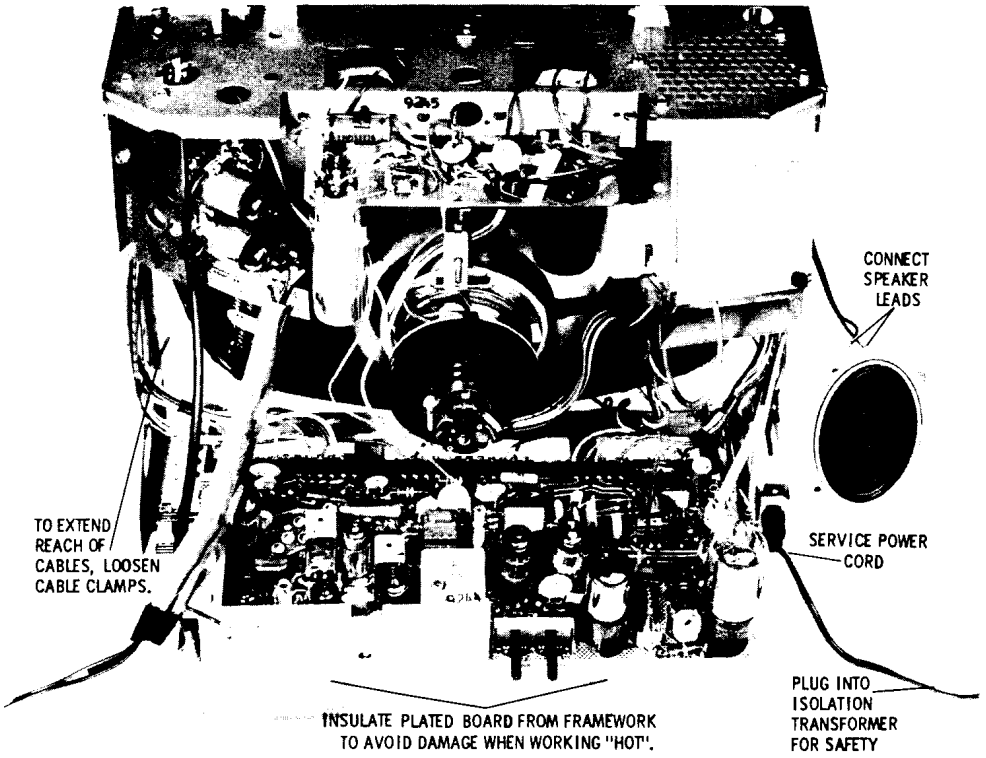


FIGURE 5-2

THE COMPLETELY EXPOSED AND OPERABLE CHASSIS BOARD ready to be worked on from the top of the board is shown in figure 5-2. Merely re-connect the connector banks to the chassis. Make sure the focus, contrast and tuner cable leads are plugged in, that the speaker is connected and that the top cap leads of the damper and horizontal output tubes are in place. If it is desired, the top cap leads may be extended by clip leads.

WARNING: Before this chassis is energized, make certain that you have the plated chassis board completely insulated from the framework at any voltage points. Otherwise, the chassis may be seriously damaged.

When working on an exposed receiver always use an isolation transformer for the power source. This will avoid damage to the equipment and the receiver, as well as aid in protecting the technician from shock hazard.

MOTOROLA Chassis TS-433 (Continued)

THE TUNER IS AS ACCESSIBLE AS THE CHASSIS when it is removed from the framework as shown in figure 5-3. After the cover and bracket are removed, voltage and/or resistance measurements may be easily taken. For better grounding of the tuner to all sections, add a grounding clip lead from the tuner to the receiver framework.

It is neither advisable nor necessary to remove the tuner cover for tuner alignment.

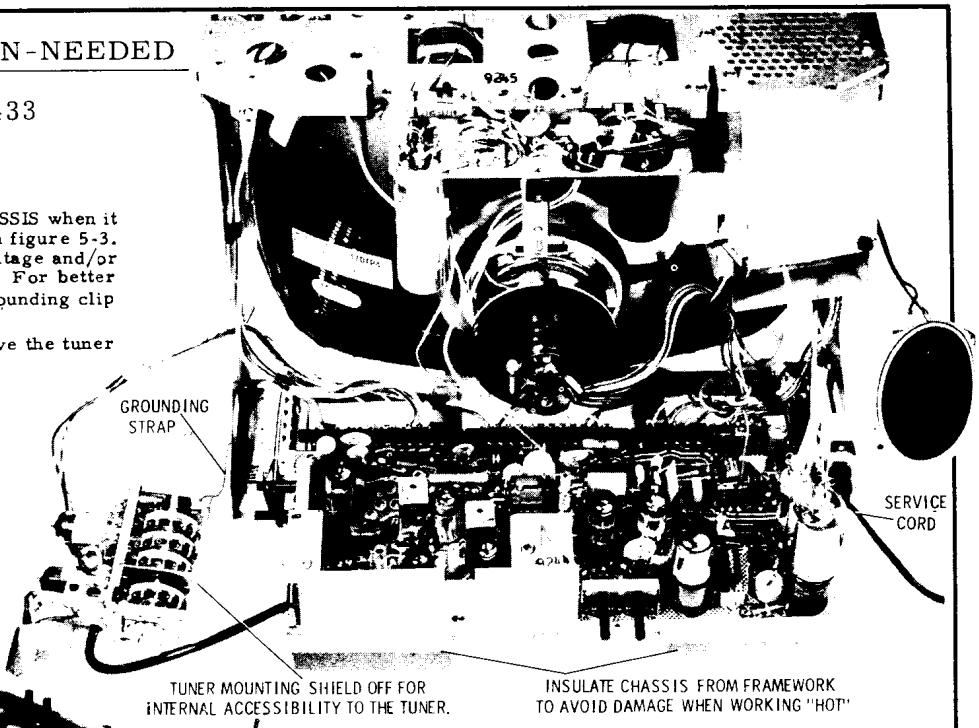


FIGURE 5-3

PHASE IV

Phase IV is the natural progression of servicing events that may follow a service job, such as removal of the safety window for cleaning of the picture tube screen or complete replacement of the safety window.

THE FIRST STEP IN REMOVING THE SAFETY SHIELD WINDOW is by removal of the four bolts located on the left and right-hand sides of the framework shown in figure 6-1.

Make certain that a soft material is used to protect the face of the window against scratching.

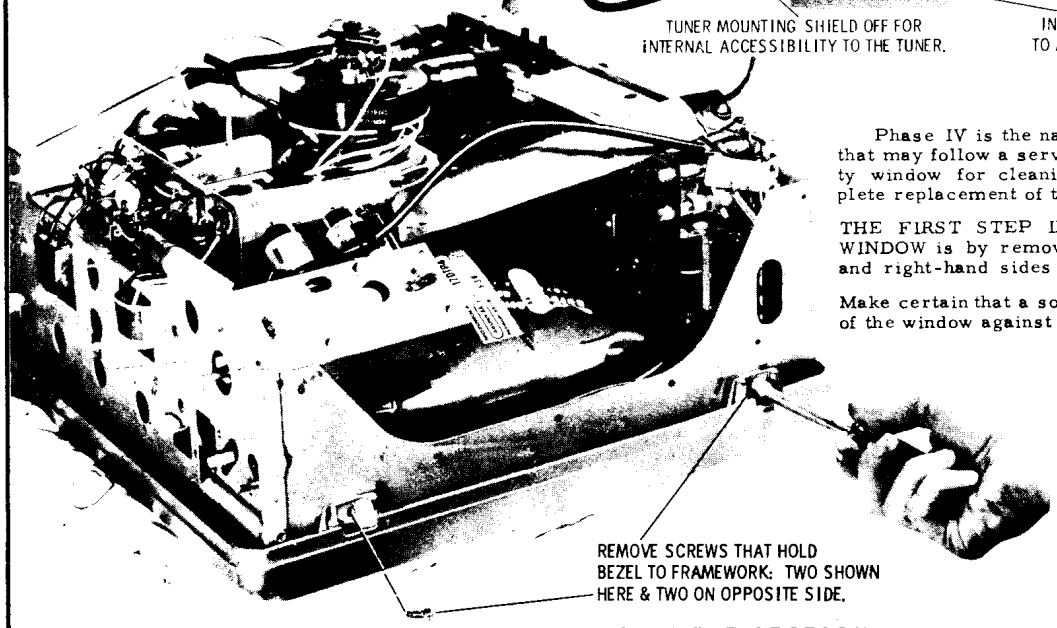


FIGURE 6-1

ALIGNMENT SECTION

VIDEO IF & SOUND ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections, and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

Pre-Alignment Steps

1. Remove the cabinet wrap-around as illustrated in Figures 4-1 thru 4-4 of the Service section. Now, remove the four hex-head insulated screws visible from underneath the chassis: these four screws hold the plated panel board to the framework. Move the plated panel toward the rear of the framework until it can be re-mounted to the framework and the two front holes of the chassis.

2. Set the Channel Selector on channel 13 and the Contrast control to minimum (extreme counterclockwise rotation).

3. Disable the tuner's local oscillator by shorting point "L", located near oscillator tube V-2, to the tuner chassis with a piece of wire. See Alignment Detail for location.

4. Short across the tuner's antenna with a piece of wire.

5. Remove the deflection yoke plug to eliminate RF interference radiation. Then connect a 1500 ohm 50 watt resistor from B++ (contact A-3) to ground (contact A-7) for normalization of the receiver's voltages.

6. Apply the negative lead of a 4.5 volt bias supply to contact A-18 (IF AGC test point) and the positive lead to contact A-17 (chassis ground) of the plated chassis board. Do not disconnect the connector banks to the chassis.

7. Maintain line voltage at 120 volts AC by use of a variac: Important...use an isolation transformer to protect the test equipment, the receiver and yourself from shock hazard.

8. Make all alignment adjustments from the top (component side) of the plated panel board.

9. Refer to the Video IF & Sound Alignment Detail for component and test point locations: For proper positions of the coil cores, see the Coil Core Positions Detail.

MOTOROLA Chassis TS-433, Alignment Information, Continued

Alignment Section (Contd)

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GEN AND MARKER	INDICATOR (OSCILLOSCOPE)	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To grid of 3rd IF amp (use test recept) thru a .001 mmf capacitor. Set sweep to approx. 44 Mc: Markers to 45.75 and 41.25 Mc. Set gen output for 2 to 5 volts P to P waveform on oscilloscope.	Connect thru a 47K ohm resistor to grid (pin 7) of video amp. See Alignment Detail for location	Top and bottom slugs of 3rd IF coil (T-103)	Equal peaks with 45.75 and 41.25 Mc markers as shown on curve #1. Tune both cores away from each other & near the ends of their respective coils. See Core Detail for core positions.
2.	To tuner's mixer TP (M) thru a .001 mmf capacitor. The TP is adjacent to mixer tube...see Alignment Detail. See Note in last column.	Same as step #1		
	a. Set marker gen for 47.25 Mc.		a. 47.25 Mc trap coils: L-102 & L-103	a. Minimum response (tune both cores at end of coil away from plated chassis). See curve #2 of Alignment Detail.
	b. Set marker gen for 41.25 Mc.		b. 41.25 Mc trap coil, L-101B (top core)	b. Minimum response (tune core at end of coil away from plated chassis). See curve #2 of Alignment Detail. Note: Temporary removal of bias battery or increased generator amplitude may be required to see trap responses.
3.	Connect same as step #1 except set output for exactly 3 volts P to P waveform on scope.	Connect to plate (pin #5) of 1st IF tube. It may be expedient to connect from underneath side of board: See Align. Detail for location.	Mixer trans. (T-2) located on tuner: Also 1st IF grid coil slug (L-101A) located at bot of coil form.	Tune both T-2 and L-101A for response shown in curve #3, step #3 of the Alignment Detail. T-2 affects the center peak and L-101A affects the two outside peaks. If a suck-out (trap effect) occurs, detune 1st IF trans (T-101). Tune both coil cores at end of coil toward plated chassis.
4.	Same as step #1 with same output and markers.	Same as step #1	1st IF trans (T-101)	Tune for proper 42.25 Mc marker placement (tune core toward plated chassis).
			2nd IF trans (T-102)	Tune for proper 45.75 Mc marker placement (tune core toward plated chassis).
5.	Same as step #4	Same as step #4		If a tilt occurs, readjust the mixer trans (T-2, loc on tuner) and if necessary touch-up the 1st and 2nd IF trans (T-101 & T-102) for the response shown in curve #4 of the Alignment Detail.

4.5 MC TRAP ADJUSTMENT

1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control) to bring 4.5 Mc interference strongly into the picture.

3. ADJUST...sound trap (L-108A) bottom core to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interence.

SOUND ALIGNMENT (Station Signal Method)

The sound system used in the TS-433 receiver consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.

2. Adjust all controls for normal picture and sound.

3. Refer to Video IF & Sound Alignment Detail for coil and test point locations (Figure 13).

MOTOROLA Chassis TS-433, Alignment Information, Continued

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to jct of R-305 (560K) and R-304 (82K) located near L-301 (See fig 13).	L-301 (quad coil)	Maximum deflection (coarse adj.). Of two possible maximum tuning points, use that giving the largest voltage reading. **
2.	"	Listening test	"	Maximum sound with minimum distortion (find adj.).
3.	Weak signal*	"	T-301 (interstage)	Maximum sound with minimum distortion (maintain hiss level). *
4.	"	"	L-108B top core (take-off)	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

**The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be misadjusted by previous service work, merely re-set near top end of coil and tune for maximum.

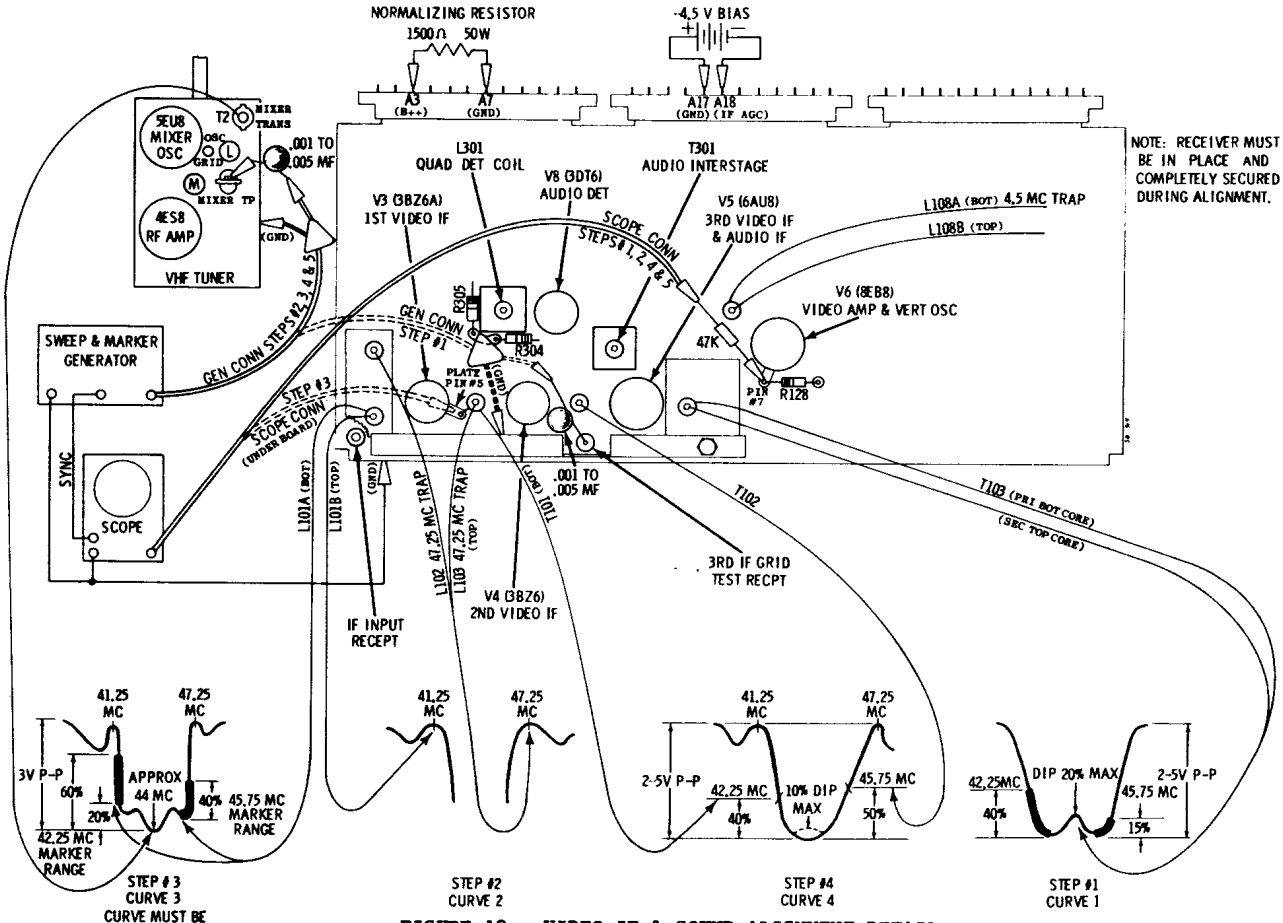


FIGURE 13. VIDEO IF & SOUND ALIGNMENT DETAIL

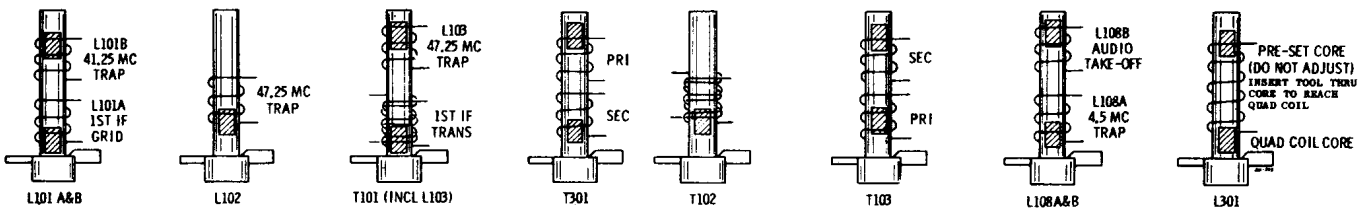


FIGURE 14. COIL CORE POSITIONS

Muntz TV INC.

Model Number	Chassis No.
21CM, 21CB, 21CW, 21TM, 21TB 21TW, 21LBM, 21LBB, 21LBW	T37L05 *
21CM82, 21CB82, 21CW82, 21TM82, 21TB82, 21TW82, 21LBM82, 21LBB82, 21LBW82	T37L04U *
S17PS	T37M05
S17PS82	T37M04U
S17PD	T37005
S17PD82	T37004U
24CM, 24CB, 24CW, 24TM, 24TB, 24TW	T37P05 *
24CM82, 24CB82, 24CW82, 24TM82, 24TB82, 24TW82	T37P04U *
21TS	T37Q05
21TS82	T37Q04U
24TS	T37R05
24TS82	T37R04U
21CS	T37S05 *
21CS82	T37S04U *

An "E" prefix before model number indicates U.L. approved sets. An "S" prefix indicates set was manufactured prior to formal U.L. approval.

All models listed at left are very similar electrically. The schematic on pages 90 and 91 is exact for chassis marked with *. Alignment information is on page 92.

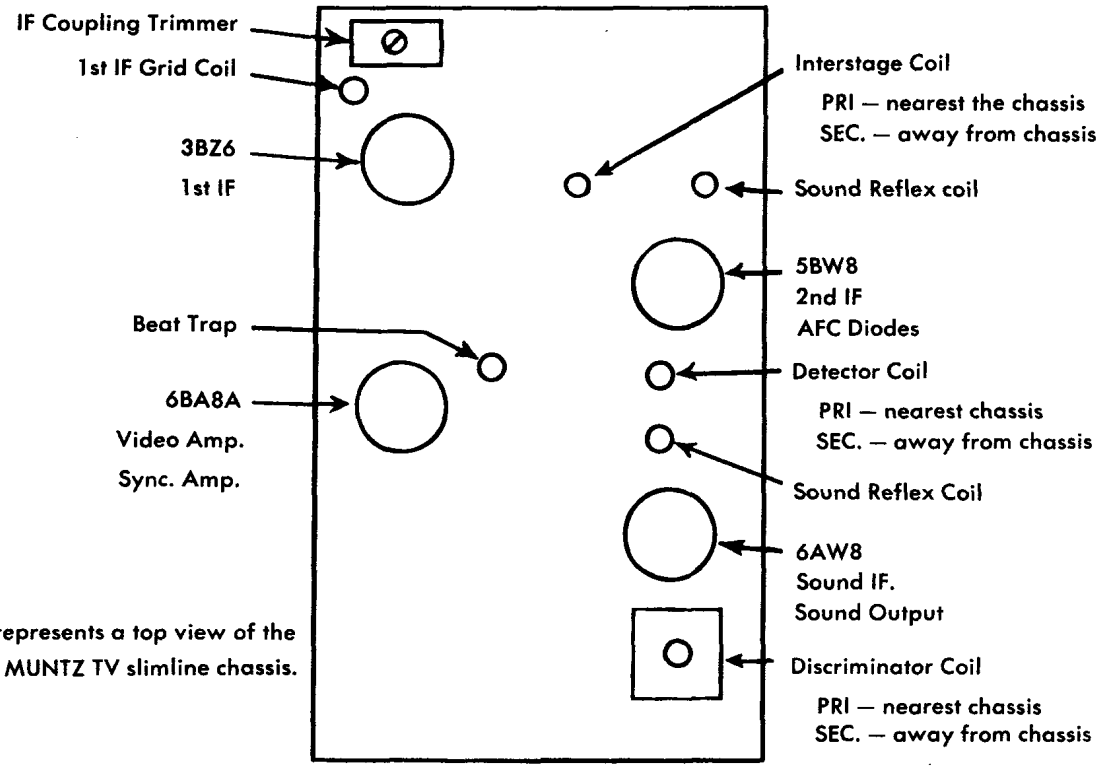
Two basic tuner types are used in these sets. The latest Sarkes Tarzian tetrode tuner which is now of turret construction is used in the majority of the sets. As a general rule, UHF models use the Standard Coil Fireball tuner in conjunction with a separate UHF tuner.

FOCUS

On portable models a connecting wire is available at the base of the CRT to obtain best focus and line detail. This wire connects between Pin 6 and Pin 2 or 10. On all 110° sets, focusing anode (Pin No. 4-Orange Wire) is connected at the factory to a B+ point. Some tubes may focus better at a different voltage. This can be determined experimentally by connecting the orange focus lead mentioned above to the boost voltage or ground.

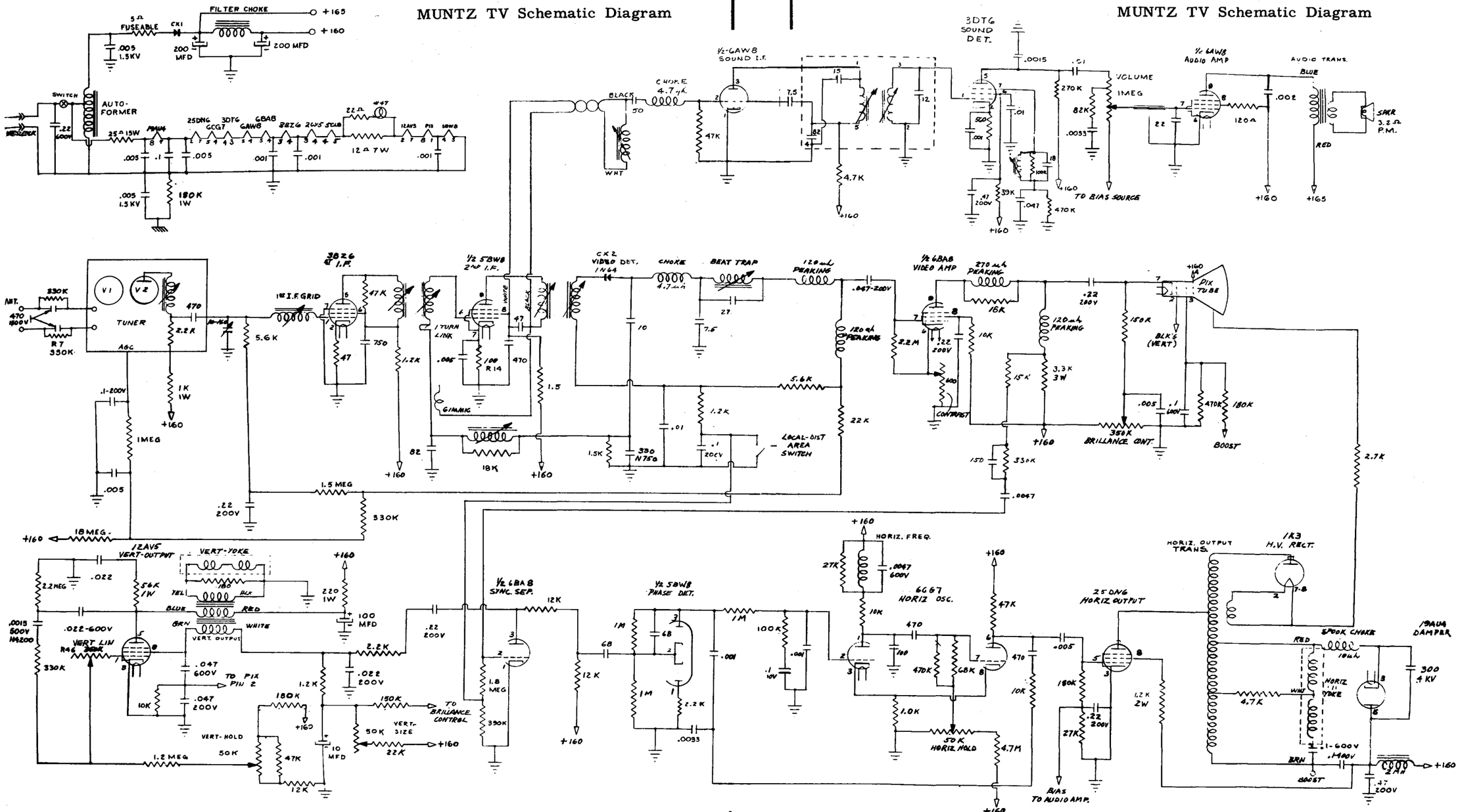
CENTERING

Two beam adjuster rings are provided on the yoke cover for centering purposes. Rotate the rings individually until the picture is properly centered.



The above diagram represents a top view of the vertical portion of the MUNTZ TV slimline chassis.

MUNTZ TV Schematic Diagram



VOLTAGE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10
V3	3BZ6	.25	.85	38.0 AC	35.0 AC	140	140	GND			
V4	5BW8	GND	3.7	0	4.4 AC	GND	0	1.5	140	140	TP
V5	6BA8A	GND	-3.0	78	38.0 AC	44.0 AC	*4.5	*4.0	100	90	TP
V6	6AW8	GND	-.4	100	44.0 AC	50.0 AC	GND	-3.1	161	162	TP
V7	12AV5	-6.0	22.5 AC	GND	TP	148	NC	10.6 AC	*43		

VOLTAGE MEASUREMENTS, Cont'd

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10
V8	6CG7	125	-.1	4.1	50.0 AC	56.0 AC	115	-8.0	4.1	GND	TP
V9	25ON6	NC	81.0 AC	GND	NC	-23	NC	56.0 AC	124		
V10	19AV4	NC	NC	†510	NC	160	NC	81.0 AC	99.0 AC		
V11	1K3							12.7KV			
P1X		4.4 AC		335					10.6 AC		

MUNTZ TV Schematic Diagram

NOTES

1. All voltages D.C. unless otherwise noted. Reading taken with a VTVM.
2. All readings taken at 117 VAC line.
3. All readings taken to chassis gnd. No signal applied and local-distant switch in local position.
4. All readings subject to 20% variations.
5. *Voltage varies with setting of controls.
6. †Measure boost voltage on terminal strip at junction of 180K OHM resistor, .luf 600V and .luf 400V capacitors.

MUNTZ

MODEL NO. 21CM, 21CB, 21CW, 21TM, 21TB, 21TW, 21LBM, 21LBB, 21LBW, 21CM82, 21CB82, 21CW82, 21TM82, 21TB82, 21TW82, 21LBM82, 21LBB82, 21LBW82, 24CM, 24CB, 24CW, 24TM, 24TB, 24TW, 24CM82, 24CB82 24CW82, 24TM82, 24TB82, 24TW82, 21CS, 21CS82

MUNTZ TV Alignment Information on Various Models (Continued)

VIDEO IF ALIGNMENT

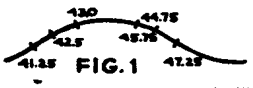
Step No.	*Sweep Generator Coupling*	*Sweep Gen. Freq.*	*Marker Gen. Freq.*	*Channel*	*Scope Connections*	*Adj.*	*Remarks*
1.	To Pin 6 of 5BW8 thru .001 MFD	44 MC (10 MC Sweep)	41.25 42.75 44.75 45.75 47.25	Channel 11, 12, or 13, whichever has least interference.	Thru a 15K resistor in series with a High Freq. Scope Lead to junction 4.7 uh choke, 7.5 uuFD Cap. 270 uh Peaking coil.		See pre-alignment instructions.  FIG. 1
2.	Same	Same	Same	Same	Same	DET. coil PRI & SEC	Per Fig. 1 Peaking at approximately 44.25 MC.
3.	To Pin 1 of 3BZ6 thru .001 MFD	Same	Same	Same	Same	Interstage coil PRI & SEC.	Per Fig 2.
4.	Thru floating tube shield over converter tube*	Same	Same	Same	Same	1st IF Grid Coil.	Per Fig 2, Peaking at approximately 44.5 MC.
						IF output on tuner.	For Max. gain consistent with specifications of Fig 3. Use the Coupling trimmer to control bandwidth. See Note.
						IF coupling trimmer.	

FIG. 2

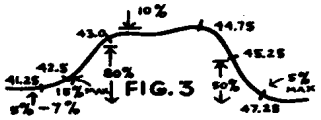


FIG. 3

Note: The one turn coupling adjustments on the interstage coil is set at the factory and cemented in place. This should be adjusted only if it has been accidentally moved.

*An alternate method is to cut a strip of thin metal ¼ inch wide and 2 inches long, insulating it with one layer of plastic tape and inserting it between the mixer tube and shield. Connect the sweep generator to portion extending above tube shield.

SOUND IF ALIGNMENT

Step No.	*Signal Gen. Coupling*	*Signal Gen. Freq.*	*Channel*	*Meter Connection*	*Adjust*	*Remarks*
1.	To junction 4.7 uh choke, 7.5 uuFD Cap and 270 uh Choke thru .01 MFD Cap.	4.5 megacycle unmodulated.	Any noise free unused channel on VHF	VTVM thru 10K to junction of Pin 1 of discriminator coil and crystal Diode. See Schematic.	Both reflex coils and PRI of discriminator coil.	ADJUST FOR MAX DEFLECTION. Keep input low so that max. deflection is no more than 1 volt.
2.	Same	4.5 megacycle unmodulated. Increase level so voltage measured in step 1 is 5 to 10 volts.	Same	VTVM thru 10K to junction crystal diode, 180K, .005 MFD .005 MFD	Discriminator secondary.	Adjust for zero on meter. A positive and negative reading should be obtained if secondary core is rocked back and forth thru the zero reading.

ALTERNATE SOUND ALIGNMENT PROCEDURE (WITHOUT EQUIPMENT)

To re-align the sound IF using a TV station as a signal source, follow the procedures outlined below.

Step No.	*Signal*	*Adjustment*	*Remarks*
1.	Weak	Reflex coils and discriminator PRI for Max sound and Min. Hiss.	Maintain a weak signal by loosely coupling the antenna to the receiver.
2.	Strong	Discriminator secondary for Max. sound and Min. buzz.	
3.			Repeat Step 1 for optimum performance and elimination of buzz and distortion.
4.	Strong	Beat Trap to eliminate 4.5 MC from picture, (Sound Beat Trap). Adjust trap for MINIMUM beat in the picture.	Tune to the station that is transmitting black and white and *not color*. Adjust the FINE TUNING control until the beat appears. 4.5 MC (like a Sound Beat) in the picture. Be careful of the adjustment as it is critical.

To operate set without picture tube, insert a 10 OHM, 2 Watt resistor between pins 1 & 8 of picture tube socket in 110° sets and pins 1 & 12 on 90° sets.

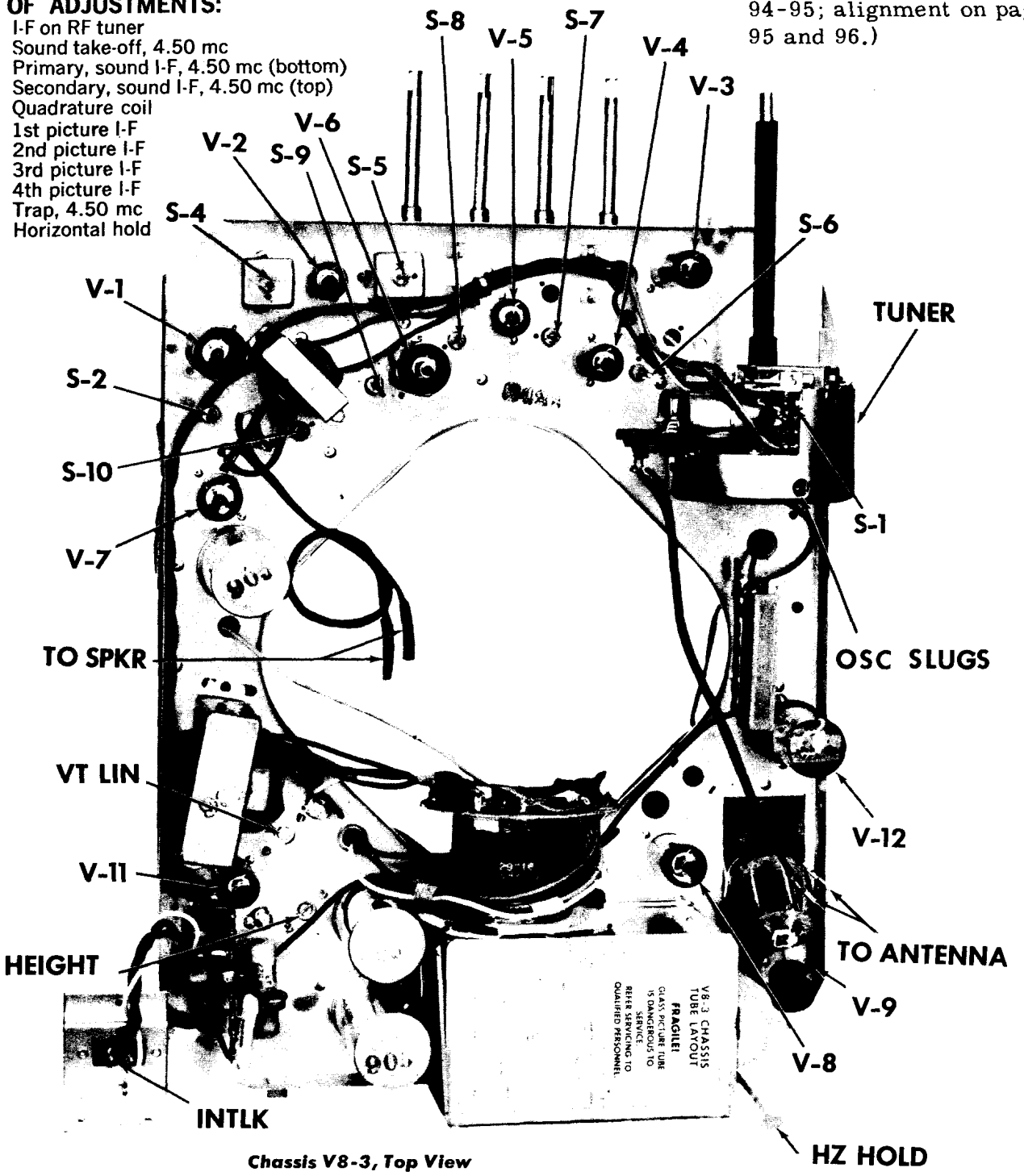
PACKARD BELL

MODELS 17VT10, 21VT6, & 21VC8
(CHASSIS V8-3)

(Circuit diagram on pages 94-95; alignment on pages 95 and 96.)

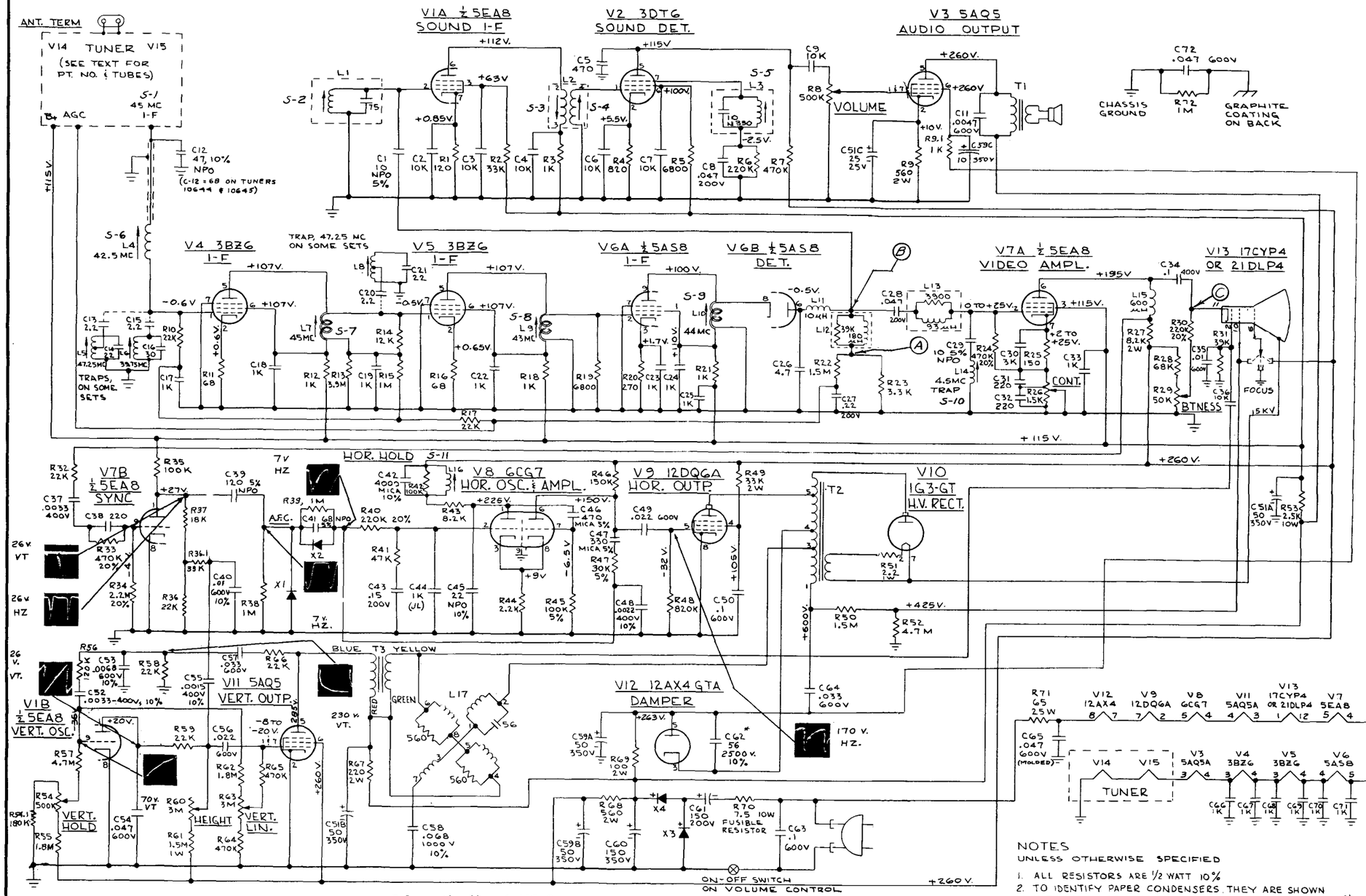
LIST OF ADJUSTMENTS:

S-1	I-F on RF tuner
S-2	Sound take-off, 4.50 mc
S-3	Primary, sound I-F, 4.50 mc (bottom)
S-4	Secondary, sound I-F, 4.50 mc (top)
S-5	Quadrature coil
S-6	1st picture I-F
S-7	2nd picture I-F
S-8	3rd picture I-F
S-9	4th picture I-F
S-10	Trap, 4.50 mc
S-11	Horizontal hold



Chassis V8-3, Top View

PACKARD BELL Models 17VT10, 21VT6, 21VC8, Schematic Diagram



Schematic, Chassis V8-3

CAUTION, HOT CHASSIS

Chassis is connected to one side of AC line.
Use an isolation transformer to connect power to set.
Do not plug two sets into the same transformer.

Add a capacitor, ceramic, 1000 mmf (PB-23860) across rectifier X-3. This capacitor will prevent radiation from the rectifier, which in some sets caused horizontal bars in the picture.

PACKARD BELL Chassis V8-3, Continued

NOTES
UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE ½ WATT 10%
2. TO IDENTIFY PAPER CONDENSERS, THEY ARE SHOWN WITH A NUMBER LESS THAN ONE. (FOR EXAMPLE .0015 μf)
3. MICA AND CERAMIC CONDENSERS ARE SHOWN IN NUMBERS GREATER THAN ONE. (FOR EXAMPLE 10K IS 10,000 $\mu\mu f$)
4. VALUES FOR ELECTROLYTIC CONDENSERS ARE SHOWN IN μf)
5. VOLTAGES ARE MEASURED WITH NO SIGNAL.
6. SWEEP FREQUENCY (HORIZ. OR VERT.) AND PEAK TO PEAK VOLTAGE GIVEN BY WAVEFORM PHOTO.

*C62 IS .82 μf IN MODEL 17VT10

PROCEDURE, PICTURE I-F ALIGNMENT:

Connect VTVM to point "A".

Lift tube shield on mixer tube in RF tuner (5CG8).

Connect signal generator between shield and ground, keeping leads shorter than 1½ in.

Connect the three volt battery across capacitor C-27 with the positive lead going to ground.

Adjust signal generator output so as to produce minus 1½ to minus 2 volts at point "A" as read by the VTVM.

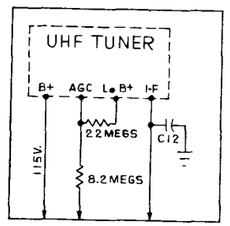
Follow the steps below.
(In step one, S-1 is adjusted through hole in tuner)

STEP	SIGNAL GEN CONNECTION	FREQUENCY SIGNAL GEN	VTVM CONNECTION	ADJUST	FOR
1.	Mixer tube In RF tuner	45.00 mc	Point "A"	S-1	MAX
2.	"	42.50 mc	"	S-6	MAX
3.	"	45.00 mc	"	S-7	MAX
4.	"	43.00 mc	"	S-8	MAX
5.	"	44.00 mc	"	S-9	MAX

REPEAT STEPS ONE THROUGH FIVE

6. Connect scope to point "A" through the 22,000 ohm resistor.
7. Connect sweep generator to antenna terminals through the impedance matching network.

(Alignment continued on page 96)



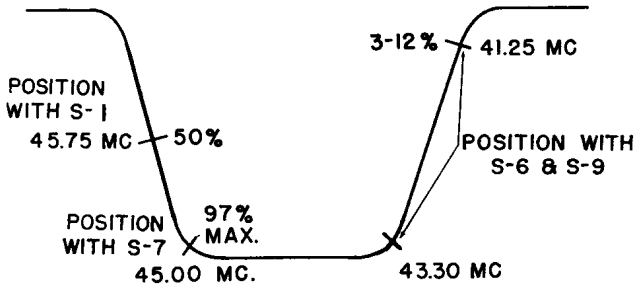
Models 17VT10, 21VT6 and 21VC8, UHF ONLY: In case of insufficient sensitivity do the following:
add resistor PB-73731, 5600 ohms, 5%, 7 w, in parallel with resistor R-53 (2500 ohms, 10 w). Or, instead, remove R-53 and replace with PB-73717, 1600 ohms, 10 w.

Also change cathode resistor R-25 from 150 to 180 ohms.

To increase the signal to noise ratio, two resistors, 8.2 megohms and 22 megohms were added as shown.

PACKARD BELL Chassis V8-3 Alignment Information, Continued

8. Rotate tuner to channel three, and set sweep generator to center frequency of channel (63 mc). With a sweep width of eight mc, adjust generator output to develop about three volts peak-to-peak on scope or about 1 volt on the VTVM.
9. Replace tube shield on mixer tube in tuner but leave signal generator connected between shield and chassis. (Reason: removal of shield alters response curve, hence signal must be injected with shield in place.)
10. Adjust generator output to provide the markers shown on the illustrated response curve. Check position of markers one at a time. A slight touching-up of the I-F adjustments may be needed to make the curve correspond to the illustration.



Response Curve, V8-3 Chassis

The adjustments have the following effects:

S-1 moves the 45.75 mc marker up or down the curve (should be 50%).

S-6 controls the overall band width, and with S-8, controls the 41.25 mc position.

S-7 controls the position of the 45.00 mc marker, which should be at a maximum of 97% response.

S-9 controls tilt of bottom portion of response curve.

S-8 controls the 41.25 mc position, which should be between 3% and 12% response.

IMPORTANT: The 45.00 mc marker must not exceed 97% response on channel three or picture may smear on higher channels.

TRAP ALIGNMENT (4.50 MC):

1. Connect signal generator between point "B" and ground through the .001 mfd capacitor.
2. Turn contrast control to maximum.
3. Connect RF probe of VTVM to point "C".
4. Set signal generator to 4.50 mc, with output at one volt or more. (If possible, check frequency with a crystal controlled oscillator.)
5. Adjust trap, S-10, for minimum VTVM reading.

NOTE: If generator is not capable of a one volt output, the trap may be adjusted visually while receiving a TV signal. Detune the signal to exaggerate the 4.50 mc beat, then adjust S-10 for minimum beat in the picture.

SOUND I-F and QUADRATURE DETECTOR ALIGNMENT:

The sound detector consists of a 3DT6 used as a quadrature grid detector.

EQUIPMENT NEEDED:

a) Signal generator, modulated or unmodulated, crystal controlled.
b) VTVM with RF probe.
c) An adjustable attenuator with a 300 ohm impedance at both input and output. See note after step eight for alternate equipment.

PROCEDURE:

1. Connect the crystal controlled signal generator to point "B".
2. Connect RF probe of VTVM to pin 7 of the 3DT6.
3. Detune quadrature coil with adjustment S-5 so that the 3DT6 does not oscillate. (Oscillation can be detected by reducing the generator output to zero. If the VTVM indicates any voltage at pin 7, the circuit is oscillating.) Note that when the circuit is correctly aligned the 3DT6 should oscillate at no signal or low level input.
4. Increase generator output until a voltage is indicated. Adjust S-2 and S-3 for a maximum reading.
5. Reduce output to a low level and adjust S-4 for maximum. (Be sure the circuit is not oscillating.) If S-4 does not tune or has a broad tuning, reduce generator output until sharp tuning is obtained. Due to grid current loading, S-4 will not tune sharply unless the input to the 3DT6 is below the limiting level.
6. Remove signal generator and VTVM. Tune set to a station and adjust S-5 for loudest and clearest sound.
7. Insert attenuator in antenna input and reduce input with attenuator until sound becomes noisy or distorted. Then adjust S-4 for best sound.
8. Remove attenuator and readjust S-5 as in step 6. Then reinsert attenuator and repeat step 7.

NOTE: In lieu of an adjustable RF attenuator, the technician may use a 1000 ohm potentiometer. Connect one end of this control to pin 2 of V-1 (grid of 5EA8 sound I-F) and the center terminal to ground. Rotate control until the sound begins to distort and then adjust S-4 to eliminate or minimize the distortion.

In making the adjustment outlined in step 5, the technician should remember that this circuit operates as a locked oscillator detector at low signal levels. Therefore when the input to the detector is reduced below the point where it will lock the oscillator, distortion will be heard even though the circuit is correctly aligned.

PACKARD BELL

MODELS 17T1, 21T2, & 21C3
CHASSIS TVT-1 (TUNER)
CHASSIS TVP-1 (POWER)
88 SERIES

Combination Radio-Phono-TV Model 21K2 uses Tuner Chassis TVT-2 and Power Chassis TVP-2, which correspond to TVT-1 and TVP-1 except for changes made in order to add radio and phono. Material on pages 97 through 100.

INTERMEDIATE FREQUENCIES:

Picture I-F: 45.75 mc
Sound I-F: 41.25 mc
Intercarrier sound: 4.50 mc

ELECTRICAL RATINGS:

Line voltage: 110-120 volts, 60 cycles
Power consumption: 210 watts

CONTROLS AND CONTROL SETTINGS:

Controls located at front of set: VOLUME w/ON-OFF switch, CHANNEL SELECTOR, FINE TUNING, BRIGHTNESS, CONTRAST, and VERTICAL HOLD.

Controls located at the rear of the cabinet are: AGC (LOCAL-DIST), PIX LOCK, VERTICAL LINEARITY, HEIGHT, HZ DRIVE, HZ HOLD, & FOCUS.

Operation of controls not mentioned below is considered self-explanatory.

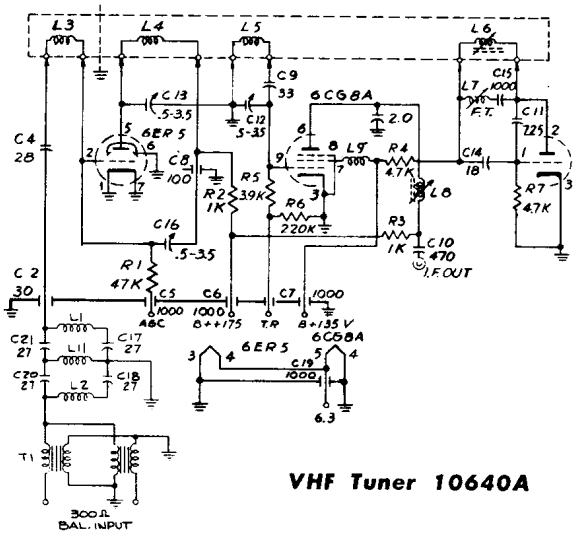
PIX LOCK control should normally be left as set at the factory, in the counterclockwise position. In fringe areas, if noise affects the sync stability, the control should be set as far clockwise as possible without pulling or tearing the picture. When switching from a local to a distant station, the control may require resetting.

HORIZONTAL DRIVE control is turned counterclockwise until drive bar appears and then clockwise until drive bar just disappears.

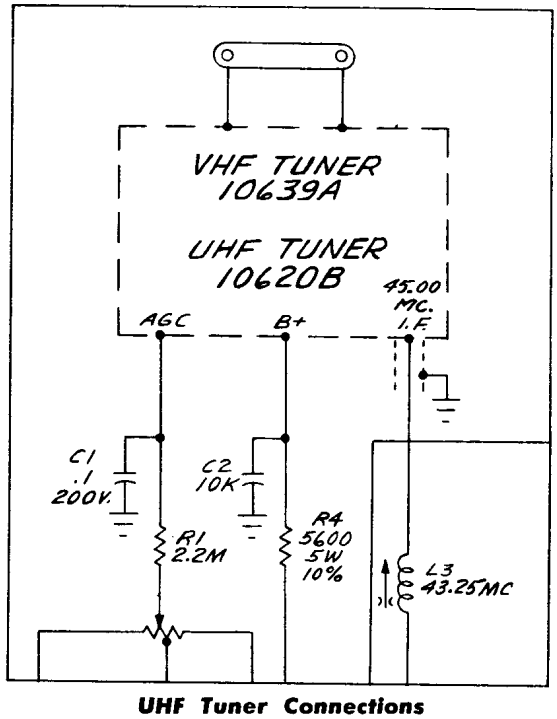
CIRCUIT BREAKER:

A circuit breaker, instead of a fuse, protects against voltage surges or component failure. If set becomes non-operative, push red button at rear to reset circuit breaker.

*Instructions for removal of safety glass will be found on back panel.

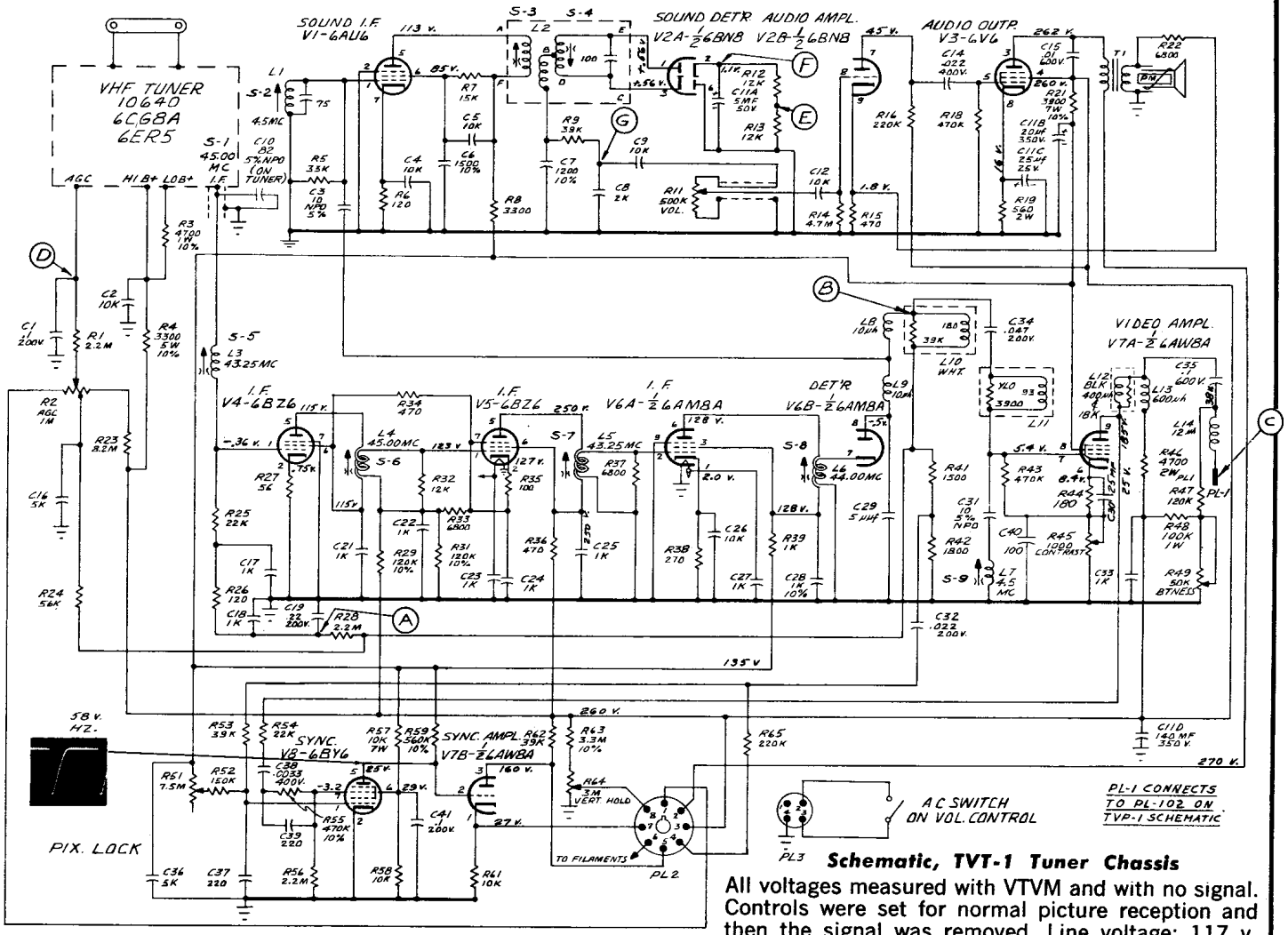


VHF Tuner 10640A



UHF Tuner Connections

PACKARD BELL Models 17T1, 21T2, 21C3, Service Information, Continued



Schematic, TVT-1 Tuner Chassis

All voltages measured with VTVM and with no signal. Controls were set for normal picture reception and then the signal was removed. Line voltage: 117 v.

REPLACEABLE PARTS

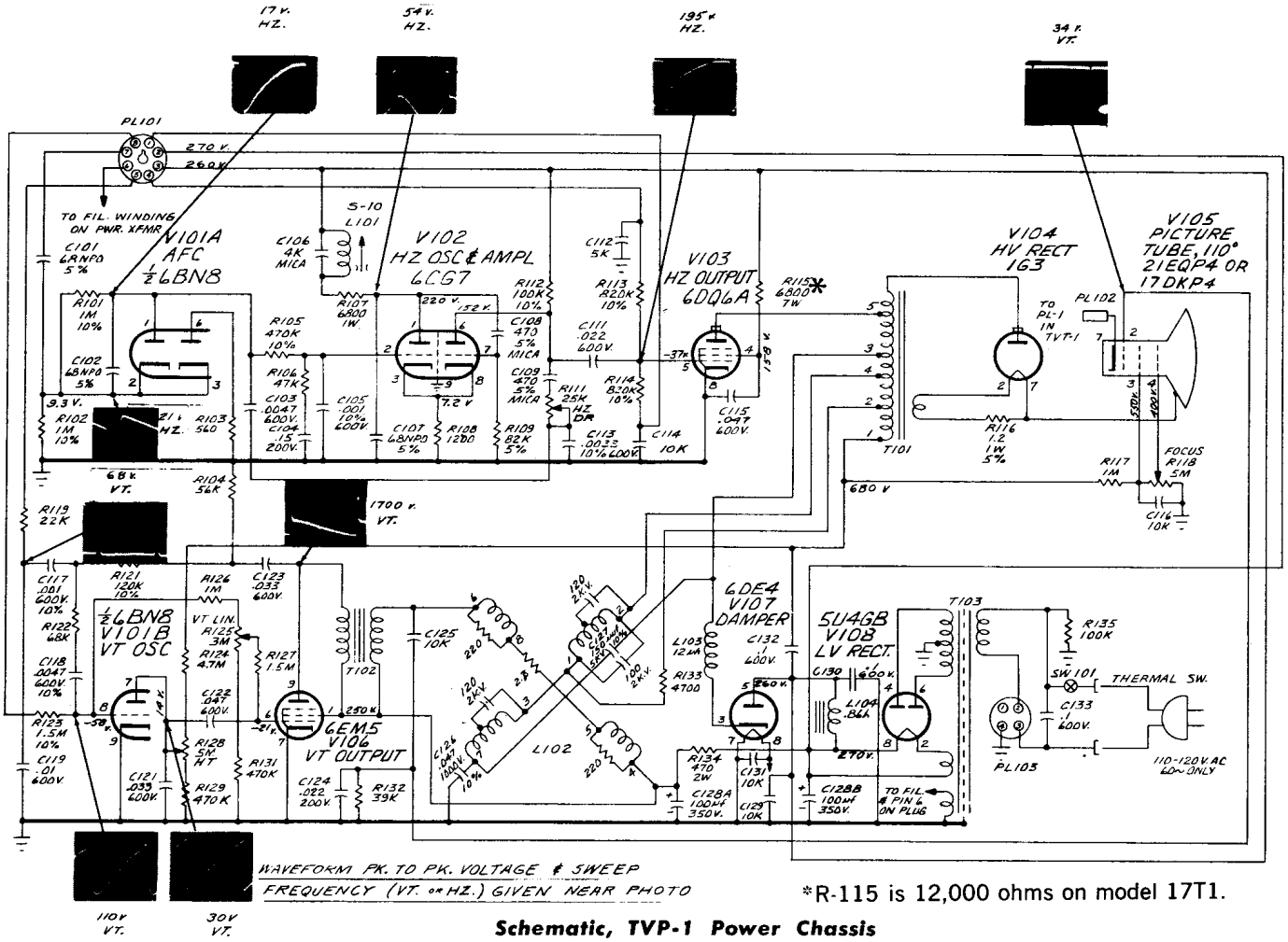
CAPACITORS

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
C-1	Paper, .1 mfd, 200 v	23107
C-2	Ceramic, 10,000 mmf, GMV	23939
C-3	Ceramic, 10 mmf, 5%, NPO	23636
C-4	Ceramic, 10,000 mmf, GMV	23939
C-5	Ceramic, 10,000 mmf, GMV	23939
C-6	Ceramic, 1500 mmf, 10%, RMC type JL	23639
C-7	Ceramic, 1200 mmf, 10%	23889
C-8	Ceramic, 2000 mmf, 20%	23974
C-9	Ceramic, 10,000 mmf, GMV	23939
C-10	Ceramic, 82 mmf, 5%, NPO (on tuner)	23628
C-11A	Electrolytic, 5 mfd/50 v	24186
C-11B	Electrolytic, 20 mfd/350 v	
C-11C	Electrolytic, 25 mfd/25 v	
C-11D	Electrolytic, 140 mfd/350 v	
C-12	Ceramic, 10,000 mmf, GMV	23939
C-14	Paper, .022 mfd, 400 v	23122
C-15	Paper, .01 mfd, 600 v	23139
C-16	Ceramic, 5000 mmf, GMV	23931
C-17	Ceramic, 1000 mmf, GMV	23860
C-18	Ceramic, 1000 mmf, GMV	23860
C-19	Paper, .22 mfd, 200 v	23109
C-21	Ceramic, 1000 mmf, GMV	23860
C-22	Ceramic, 1000 mmf, GMV	23860
C-23	Ceramic, 1000 mmf, GMV	23860
C-24	Ceramic, 1000 mmf, GMV	23860
C-25	Ceramic, 1000 mmf, GMV	23860
C-26	Ceramic, 10,000 mmf, GMV	23939
C-27	Ceramic, 1000 mmf, GMV	23860
C-28	Ceramic, 1000 mmf, 10%, RMC type JL	23983
C-29	Ceramic, 5 mmf, 20%, GP, insulated	23672
C-30	Electrolytic, 25 mfd/25 v	24006A
C-31	Ceramic, 10 mmf, 5%, NPO	23636
C-32	Paper, .022 mfd, 200 v	23103
C-33	Ceramic, 1000 mmf, GMV	23860
C-34	Paper, .047 mfd, 200 v	23105
C-35	Paper, .1 mfd, 600 v	23145
C-36	Ceramic, 5000 mmf, GMV	23931
C-37	Ceramic, 220 mmf, 20%, GP	23915
C-38	Paper, .0033 mfd, 400 v	23117
C-39	Ceramic, 220 mmf, 20%, GP	23915
C-40	Ceramic, 100 mmf, 20%, GP	23914
C-41	Paper, .1 mfd, 200 v	23107

CONTROLS

R-2	1 megohm, AGC	25991
R-11	500,000 ohms, vol, w/push-pull sw	25078
R-45	1000 ohms, contrast	25904A
R-49	50,000 ohms, brightness	25906A
R-51	7.5 megohms, pix lock	25911
R-64	3 megohms, vertical hold	25984

PACKARD BELL Model 17T1, 21T2, 21C3, Service Information, Continued



*R-115 is 12,000 ohms on model 17T1.

Schematic, TVP-1 Power Chassis

REPLACEABLE PARTS

CAPACITORS

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
C-101	Ceramic, 68 mmf, 5%, NPO	23992
C-102	Ceramic, 68 mmf, 5%, NPO	23992
C-103	Paper, .0047 mfd, 600 v	23137
C-104	Paper, .15 mfd, 200 v	23108
C-105	Paper, 10%, .001 mfd, 600 v	23333
C-106	Mica, 4000 mmf, 10%	23208
C-107	Ceramic, 68 mmf, 5%, NPO	23992
C-108	Mica, 470 mmf, 5%	23236
C-109	Mica, 470 mmf, 5%	23236
C-110	Not used	
C-111	Paper, .022 mfd, 600 v	23141
C-112	Ceramic, 5000 mmf, GMV	23931
C-113	Paper, 10%, .0033 mfd, 600 v	23336
C-114	Ceramic, 10,000 mmf, GMV	23939
C-115	Paper, .047 mfd, 600 v	23143
C-116	Ceramic, 10,000 mmf, GMV	23939
C-117	Paper, 10%, .001 mfd, 600 v	23333
C-118	Paper, 10%, .0047 mfd, 600 v	23337
C-119	Paper, .01 mfd, 600 v	23139
C-120	Not used	
C-121	Paper, .033 mfd, 600 v	23142
C-122	Paper, .047 mfd, 600 v	23143
C-123	Paper, .033 mfd, 600 v	23142
C-124	Paper, .022 mfd, 200 v	23103
C-125	Ceramic, 10,000 mmf, GMV	23939
C-126	Paper, .047 mfd, 10%, 1000 v	23075
C-127	Ceramic, 150 mmf, 10%, 5000 v	23665
C-128A	Electrolytic, 100 mfd/350 v (dual)	24166
C-128B	Electrolytic, 100 mfd/350 v (dual)	24166
C-129	Ceramic, 10,000 mmf, GMV	23939
C-130	Paper, .1 mfd, 600 v	23145
C-131	Ceramic, 10,000 mmf, GMV	23939
C-132	Paper, .1 mfd, 600 v	23145
C-133	Paper, molded case, .1 mfd, 600 v	23745

CONTROLS

R-111	25,000 ohms, horiz drive	25992
R-118	5 megohms, focus	25910
R-125	3 megohms, vertical linearity	25867
R-128	5 megohms, height	25910

COILS

L-101	Horiz oscillator coil	29715A
L-102	Deflection coils (yoke)*	29696
L-103	Choke, RF, 12 uh	29646
L-104	Choke, filter	27012A

PLUGS & SOCKETS

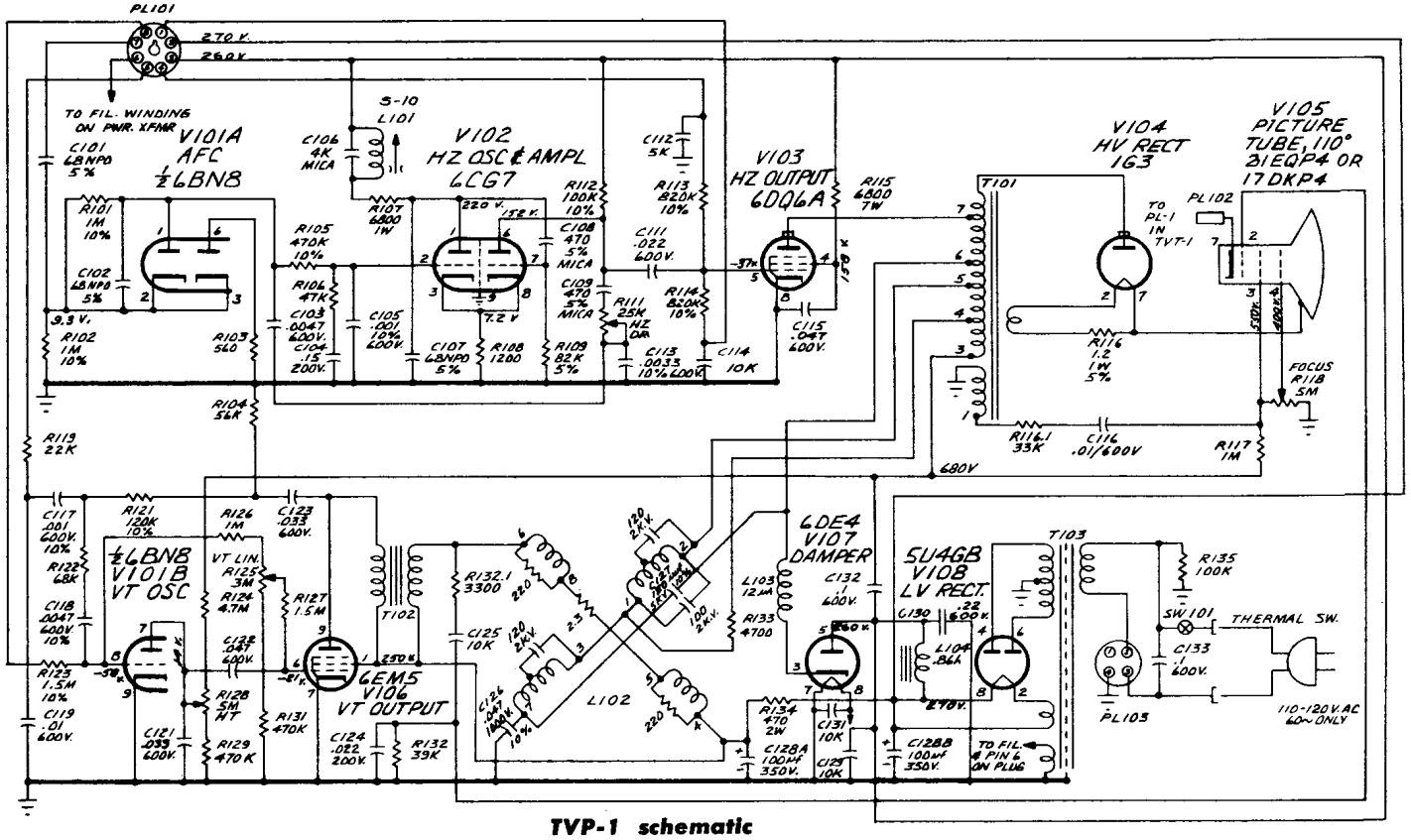
PL-101	Power socket, octal	79216
PL-102	Clip, terminal, cathode lead	28257
PL-103	Power socket, four terminal	79180

TRANSFORMERS

T-101	Horiz output	89489A
T-102	Vertical output	89501
T-103	Power	89084

Pri: 117 v
Sec: 555 v at 300 ma, CT
6.3 v at 10 amp
5.0 v at 3 amp

PACKARD BELL Models 17T1, 21T2. 21C3, Service Information, Continued



TVP-1 schematic

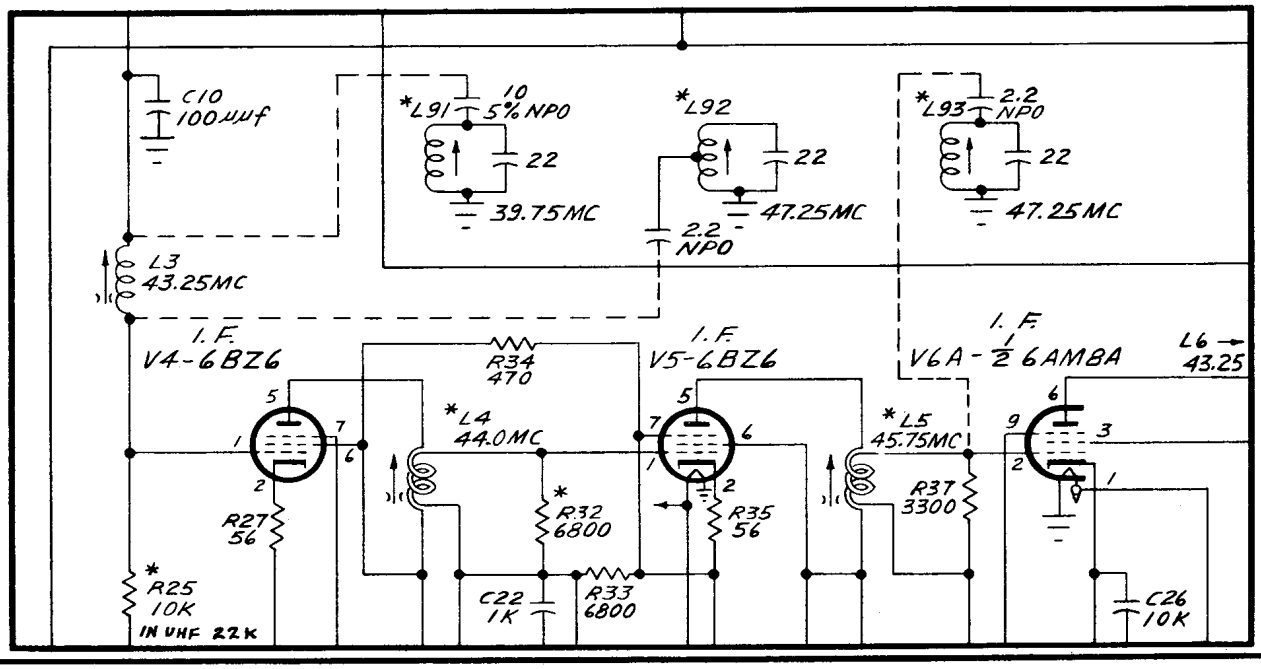
Models 17T1, 21T2, 21C3, 21C4, 24T2 (88 series): To provide horizontal retrace blanking, the horizontal output transformer was changed from part 89489A to part 89503A. At the same time capacitor C-116 was changed to paper (.01/600) and relocated. See new schematic of the TVP-1 chassis, page 100.

Also, to minimize shading bars at left of picture, resistors 116.1 (33K) and 132.1 (3300) were added as shown in the schematic.

To reduce picture width, C-127 was changed from 150 mmf to 120 mmf (both 5000 v, 10%). New part number: 23681. The new value is shown on the schematic.

Capacitor C-130 was changed from .1/600 to .22/600 in order **to reduce line conducted radiation.** The new value is shown on the schematic.

The circuitry for models containing adjacent-channel traps was altered. Sets stamped 2669 (or higher) contain this change.



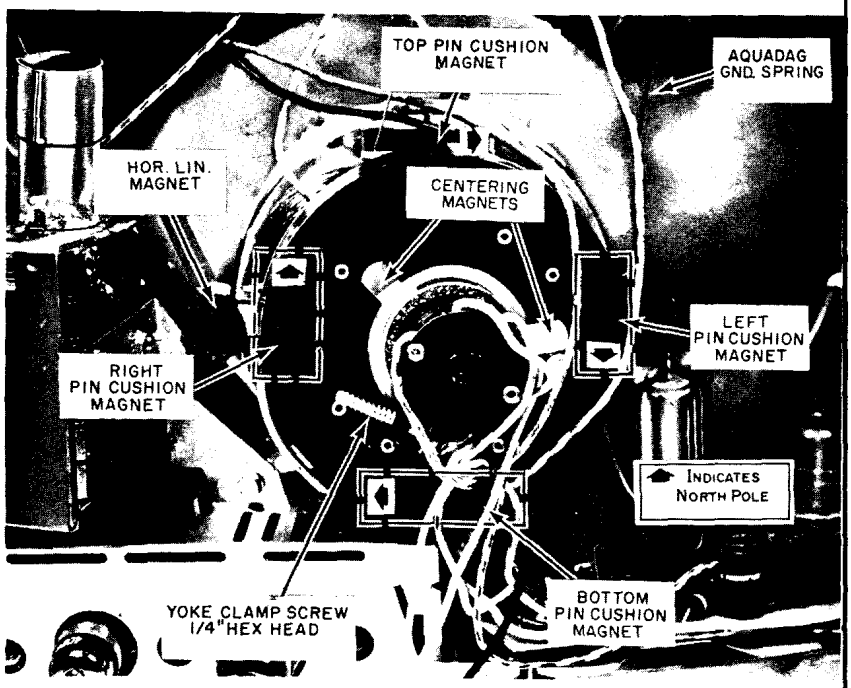
PHILCO TELEVISION

10H25 and 10H25U CHASSIS

Model No.	Chassis	Tuner	CRT
H-3046AQ	10H25	(T-72A) 76-10528-2	17DRP4
UH-3046AQ	10H25U	(T-73A) 76-10529-1	17DRP4
H-3046T	10H25	(T-72A) 76-10528-2	17DRP4
UH-3046T	10H25U	(T-73A) 76-10529-1	17DRP4
H-3046GL	10H25	(T-72A) 76-10528-2	17DRP4
UH-3046GL	10H25U	(T-73A) 76-10529-1	17DRP4
H-3047TC	10H25	(T-72A) 76-10528-1	17DRP4
UH-3047TC	10H25U	(T-73) 76-10529	17DRP4
H-3047WC	10H25	(T-72A) 76-10528-1	17DRP4
UH-3047WC	10H25U	(T-73) 76-10529	17DRP4
H-3047GL	10H25	(T-72A) 76-10528-1	17DRP4
UH-3047GL	10H25U	(T-73) 76-10529	17DRP4
UH-3052WL	10H25U	(T-73A) 76-10529-1	17DRP4
UH-3052L	10H25U	(T-73A) 76-10529-1	17DRP4
H-3055BL	10H25	(T-72A) 76-10528-1	17DRP4
H-3055WL	10H25	(T-72A) 76-10528-1	17DRP4
H-3055L	10H25	(T-72A) 76-10528-1	17DRP4

SPECIFICATIONS

Intermediate Frequencies
Video Carrier.....45.75 MC
Sound Carrier.....4.5 MC
Transmission Line.....300 ohm, twin wire lead
Operating Voltage.....105 to 120 volts, 60 cycle, AC
Power Consumption.....160 watts at 117 volt line
Tuner....10H25: T-72A, 12 position incremental, no UHF
10H25U: T-73, 13 position incremental, 12 channels plus UHF
T-28F, Continuous tuning UHF
10H25R.. Identical to chassis 10H25 with the addition of the "New-Matic" remote tuning.



CRT Adjustments

Additional Models

Model	Chassis	Tuner	CRT
H3039A	10H25	76-10528-2	17DRP4
H3048GL	10H25	76-10528-2	17DRP4
H3049BL	10H25	76-10528-2	17DRP4
UH3049BL	10H25U	76-10529-1	17DRP4

CHASSIS AND CRT REMOVAL

1. Remove back—7 screws, four at top and three at bottom.
2. Remove front (safety window and bezel)—5 screws, one on each side and three at bottom. Free front from bottom and then disengage from top.
3. Remove knobs.
4. Remove the five 5/16 in. drive screws from cabinet bottom.
5. Remove one 1/4 in. drive screw from right rear side and two 1/4 in. drive screws from left rear side.
6. Remove two 1/4 in. drive screws from rear top bracket. Tilt bracket and remove.
7. Remove five 1/4 in. drive screws from front top.
8. Separate wrap-around cabinet from chassis and CRT assy. Caution: speaker leads are still connected.
9. Disconnect anode lead and CRT socket.
10. Remove four 1/4 in. drive screws from front that mounts CRT bracket to chassis frame.
11. Remove CRT assembly from front. Caution: yoke leads are still connected.

NOTE: CRT may be removed from front without removing back.

When replacing chassis after Servicing, care must be taken to ensure that it is correctly remounted. See details under "Chassis and CRT Removal". When chassis is remounted the resistance between chassis and metal cabinet parts should measure not less than 100,000 ohms.

Use an isolation transformer for on the bench servicing as chassis is connected to one side of the line.

HORIZONTAL OSCILLATOR ADJUSTMENT

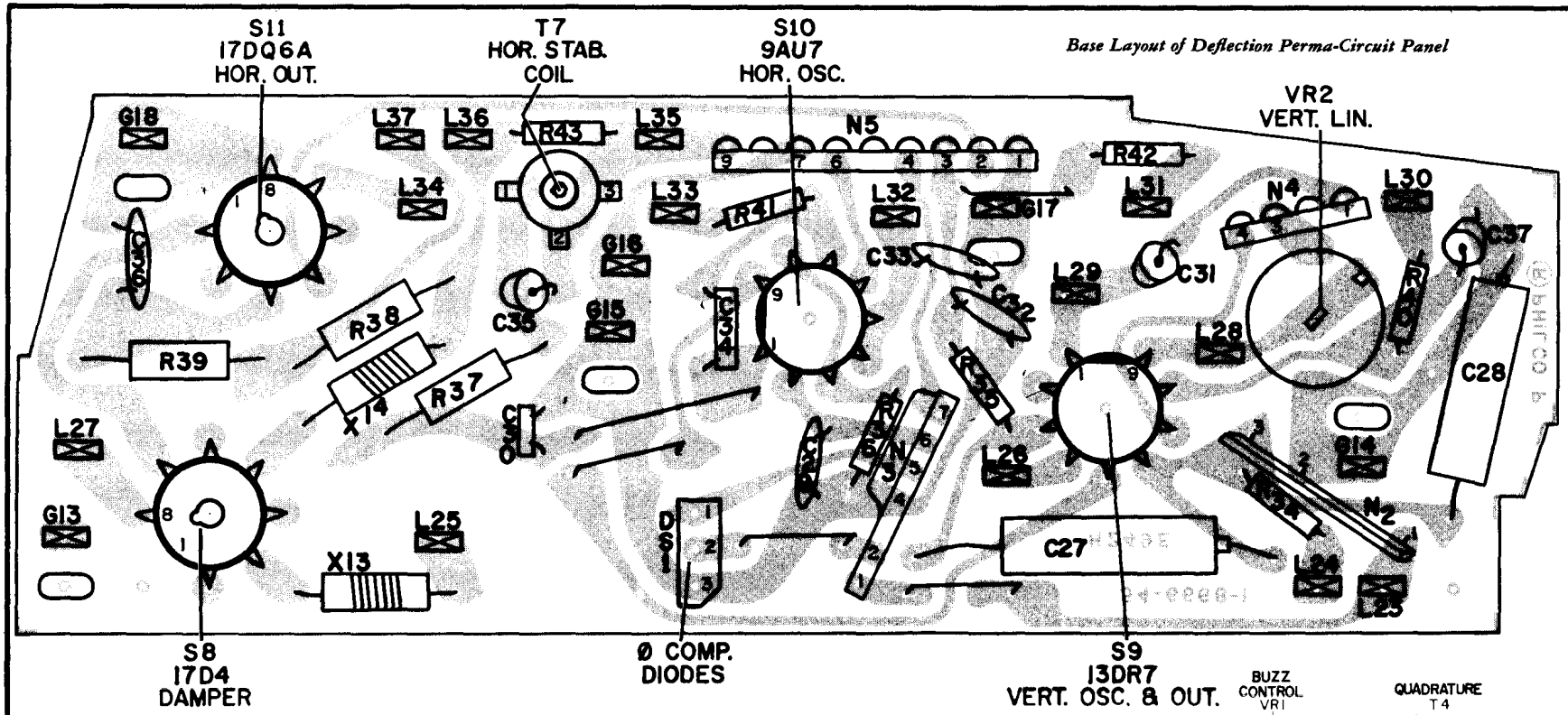
Allow set to warm up. Tune in a picture.
1. Short out the horizontal ringing coil, T7, by placing a jumper across terminals 1 and 3.
2. Set the horizontal hold control, VR4 shaft, to the center of its range.
3. Adjust the horizontal hold centering control, VR4 screwdriver adjustment, to set the oscillator to the correct horizontal line frequency (to stop the picture; it will not be stable). Bring picture into sync from high frequency side (black bars sloping up to the left).
4. Remove the shorting jumper from across T7 and adjust the ringing coil core for stable picture sync. Bring picture into sync from high frequency side.

RECEIVER SET-UP CONTROL LOCATIONS

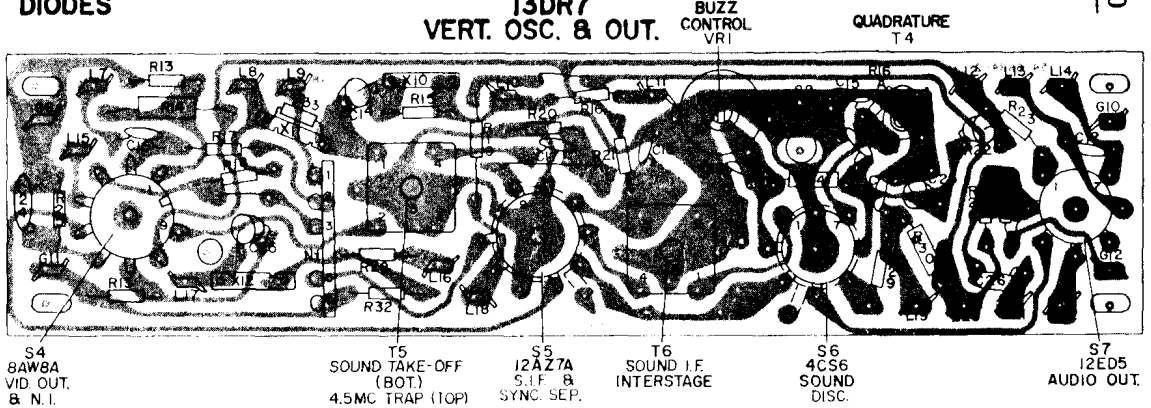
(Refer to Base View, figure 19 on page 14.)

1. Height—Adjust with a thin screwdriver through the hollow vertical hold shaft.
2. Horizontal Hold Centering—Adjust with a thin screwdriver through the hollow horizontal hold shaft.
3. Vertical Linearity—Remove cabinet back (7 screws; 4 at top and 3 at bottom). Control is located on deflection panel.
4. Width Link—Remove cabinet back. A jumper across deflection panel lugs L36 to L37 is used when necessary. These lugs are the two along the rear edge of the deflection panel to the left of the 17DQ6A horizontal output tube. Width is increased with jumper.
5. Fusible B+ Resistor—Remove cabinet back. Resistor is a plug-in unit at top right corner.
6. Tubes—All tubes (except CRT) are accessible after removing back. 1G3GT, high voltage rectifier, is in cage.

(Continued on pages 102 through 106)



Base Layout of Deflection Perma-Circuit Panel



Base Layout of Video-Sound Perma-Circuit Panel

TERMINAL LUG IDENTIFICATION—DEFLECTION PANEL

- L23 Sync input from Video-Sound panel (L18).
- L24 Lead to top of height control, VR5-6.
- L25 Lead from damper cathode to H.O.T. terminal 3 and yoke socket pin 2.
- L26 Filament lead to 13DR7 pin 4 from L15 of Video-Sound panel.
- L27 Filament lead from 17D4 pin 8 to V.I.F. panel lug, L2.
- L28 Vertical output cathode, lead to E1-3 by-pass electrolytic.
- L29 Vertical output plate, blue lead of V.O.T.
- L30 Lead to top of vertical hold control, VR5-3.
- L31 Vertical output bias, lead to Video-Sound panel (L11).
- L32 Filament lead from pins 4 and 5 of 9AU7 to C.R.T. pin 1.
- L33 Shielded lead to horizontal hold centering control, VR4-6.
- L34 Filament lead from surge resistor to 17DQ6A pin 7.
- L35 De-coupled B+, 265V.
- L36 275 V B+.
- L37 Junction of R38 and R39, width shunt when used.

TERMINAL LUG IDENTIFICATION—VIDEO-SOUND PANEL

- L7 Lead from noise inverter grid coupling (C16) to junction of R52 and WR2 (B5-9).
- L8 Lead to video plate supply, R52, at B5-8.
- L9 Lead to lug # 1 of VR6, the contrast control.
- L10 Video output to CRT cathode, pin 7.
- L11 Lead to arm of brightness control, VR3.
- L12 140V B+ lead.
- L13 Red lead of A.O.T. and B+ to audio output screen.
- L14 Blue lead of A.O.T. to audio output plate.
- L15 Filament lead to L26 of Sweep panel.
- L16 Lead to contrast control, VR6-3.
- L17 Video input from 2nd detector, L1 of V.I.F. panel.
- L18 Sync output to L23 of Sweep panel.
- L19 Shielded lead to top of volume control.
- L20 265V B+.
- L21 Shielded lead from arm of volume control.
- L22 Filament lead from L3 of V.I.F. panel.

PHILCO Chassis 10H25, U, Continued

VIDEO I-F ALIGNMENT

AM ALIGNMENT

CHANNEL SELECTOR: Set tuner to channel 4 position.

SIGNAL INJECTION: To tuner feed-thru, L2T, in mixer grid circuit.

BIAS: −8.0 volts to arm of contrast control, VR6-2.

SCOPE: Connect to L17 on Video-Sound panel, video second detector output.

OUTPUT LEVEL: No to exceed 2.0 volts peak-to-peak during pole and sweep alignment. Not less than .2 volts peak-to-peak as null, during trap alignment, is approached.

(1) Adjust tuner pole, T2T, for maximum at 47.25 MC. This is a temporary setting for trap alignment.

(2) Adjust trap VC3 for minimum at 41.25 MC.*

(3) Adjust traps VC2 and VC4 for minimum at 47.25 MC.*

(4) Repeat steps 2 and 3. Bias may be reduced as trap minimum is approached.

(5) Adjust tuner pole, T2T, for maximum at 45.0 MC.

(6) Adjust VC1 and T2 for maximum at 42.7 MC.

(7) Adjust T3 for maximum at 45.75 MC.

(8) Adjust T1 for maximum at 44.4 MC.

* These traps are sharp. During adjustment, the generator output frequency may change with generator attenuator setting. This must be compensated for at the generator.

SWEEP ALIGNMENT

SIGNAL INJECTION: To antenna terminals through an antenna matching network (generator to 300 ohms.)

CHANNEL SELECTOR, BIAS, SCOPE and OUTPUT LEVEL: Same as above under AM alignment.

(1) Inject 65.75 MC, AM, 30% modulated signal, into antenna. Adjust fine tuning control for minimum output. *Do not disturb* fine tuning during balance of I-F adjustment.

(2) Inject channel 4 sweep signal (69 MC with 6 MC sweep width) into antenna. If necessary, adjust the following poles to bring the curve within limits. (See curve, figure 2).

a. Tuner I-F pole, T2T, to set carrier level.
b. T1Z, 3rd V-I-F pole, to adjust curve tilt.
c. T2Z, 2nd V-I-F pole, and VC1Z, 1st grid pole, to adjust 42.5 MC (sound side) slope.
d. T3Z, 1st V-I-F pole, to adjust carrier level.

4.5 MC TRAP ALIGNMENT

(1) Inject 4.5 MC AM signal into L17 or use station signal.

(2) Connect 4.5 MC detector (see circuit, figure 1) to L10 (Pin 7 of CRT).

NOTE: Preliminary padding of 4.5 MC test detector—Connect detector to an accurate source of 4.5 MC signal and pad core of transformer for maximum DC output voltage.

NOTE: When using generator, calibrate by zero beating with sound I-F developed from station signal.

(3) Connect 20,000 ohms/volt meter, set to 2.5 volt range, to detector output.

(4) Turn contrast control fully clockwise (to maximum).

(5) Adjust 4.5 MC trap. (T5 top) for minimum indication.

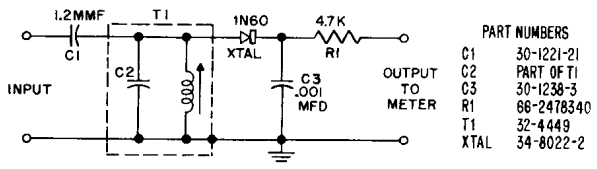


Figure 1. 4.5 mc. Detector Tube

SOUND I-F ALIGNMENT

NOTE: The sound I-F alignment is based upon a properly aligned video I-F strip.

1. With a weak station signal (antenna disconnected) tune receiver for the best possible picture. Do not readjust fine tuning control during balance of procedure.
2. Set buzz control, VR1, to the center of its range.
3. With a strong signal (antenna connected) adjust the quadrature coil, T4, for maximum sound. See Note 1 Below.
4. With a weak signal (antenna disconnected) adjust the sound take-off coil, T5 (bottom), and the sound interstage transformer, T6 (both pri. and sec. cores), for maximum sound.
5. With a weak signal, back off on the contrast control. Adjust the buzz control, VR1, for minimum buzz and noise. See Note 2 Below.
6. Reset the contrast control. With a weak signal, touch-up T5 (bottom) (sound take-off) and T6 (sound interstage) for maximum. See Note 3 Below.
7. With a strong signal (antenna connected) adjust the quadrature coil, T4, for maximum sound. See Note 1 Below.

NOTE 1: The quadrature coil, T4, will peak at two points. The correct peak is the first peak reached as the core is backed out from the full in position. If this coil is misadjusted, weak and distorted output will result and the other coils will not tune properly.

NOTE 2: The buzz control, VR1, sets the operating point of the 4CS6 midway between saturation and cut-off. This enables the tube to provide proper limiting action. If this control is misadjusted excessive buzz or noise will result.

NOTE 3: Misadjustment of the sound take-off, T5 (bottom), and the sound interstage, T6, will cause either weak sound or an excessively high noise level, or both.

TUNER OSCILLATOR ALIGNMENT

AM GENERATOR: Connect to receiver antenna-input terminals (no matching network is required). Use 30% modulated signal.

PRE-SET: Fine tuning control to middle of its range.

OSCILLOSCOPE: Connect to L17, video detector output, on Video-Sound panel.

NOTE: This procedure uses the traps of the video I-F channel. Proper oscillator adjustment is therefore dependent upon an accurately aligned I-F strip.

NOTE: Counter-clockwise rotation of fine tuning causes a lowering of oscillator frequency.

STEP	AM. GEN. FREQ.	TUNER POSITION	ADJUST FOR MIN.	
1	209.75 mc	Channel 13	T4T	
2	203.75 mc	Channel 12	T4T	See Note Below
3	197.75 mc	Channel 11	T4T	
4	191.75 mc	Channel 10	T4T	
5	185.75 mc	Channel 9	T4T	
6	179.75 mc	Channel 8	T4T	
7	173.75 mc	Channel 7	T4T	
8	81.75 mc	Channel 6	T7T	
9	75.75 mc	Channel 5	T7T	
10	65.75 mc	Channel 4	T6T	
11	59.75 mc	Channel 3	T6T	
12	53.75 mc	Channel 2	T5T	

NOTE: T4T is the adjustable oscillator coil for channel 13. This adjustment is also used to set the oscillator position for channels 12 through 7 inclusive. Normally, this is the only adjustment required. However, if one or more of the high channels cannot be properly set, the coils for channels 12 through 7 may be spiked; i.e., moved. Moving the coil closer to the switch wafer will decrease the oscillator frequency, moving the coil away from the wafer will increase the oscillator frequency.
The brass cores of T4T, T5T, T6T and T7T, when turned clockwise (moved into coil), will cause an increase in oscillator frequency.

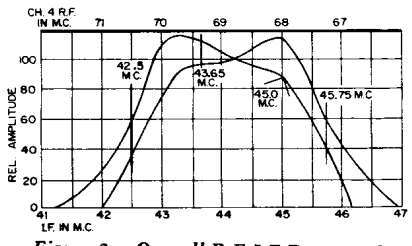
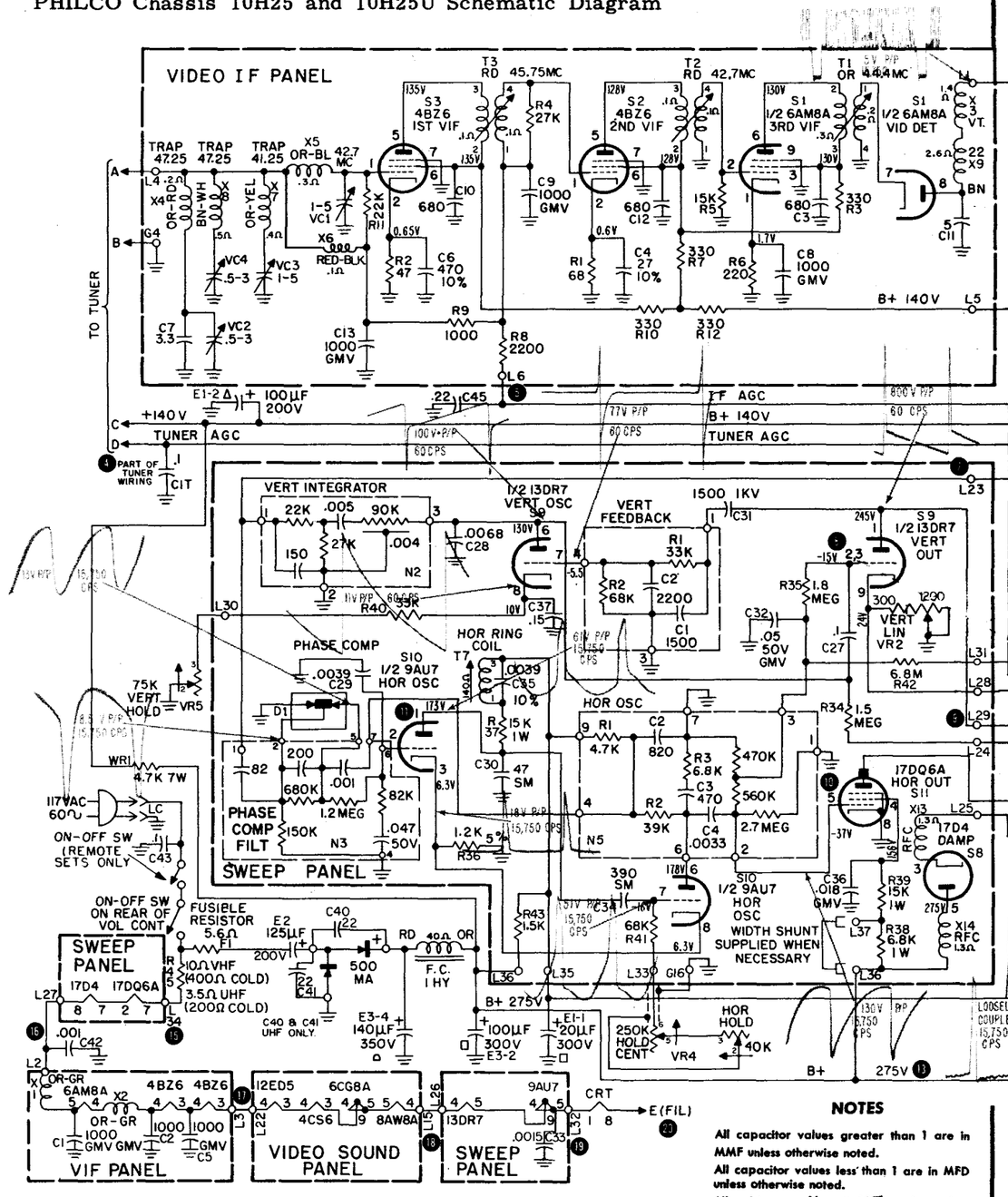


Figure 2. Overall R-F I-F Response Curve

PHILCO Chassis 10H25 and 10H25U Schematic Diagram



Schematic Diagram for Chassis 10H25, 10H25R and 10H25U

NOTES

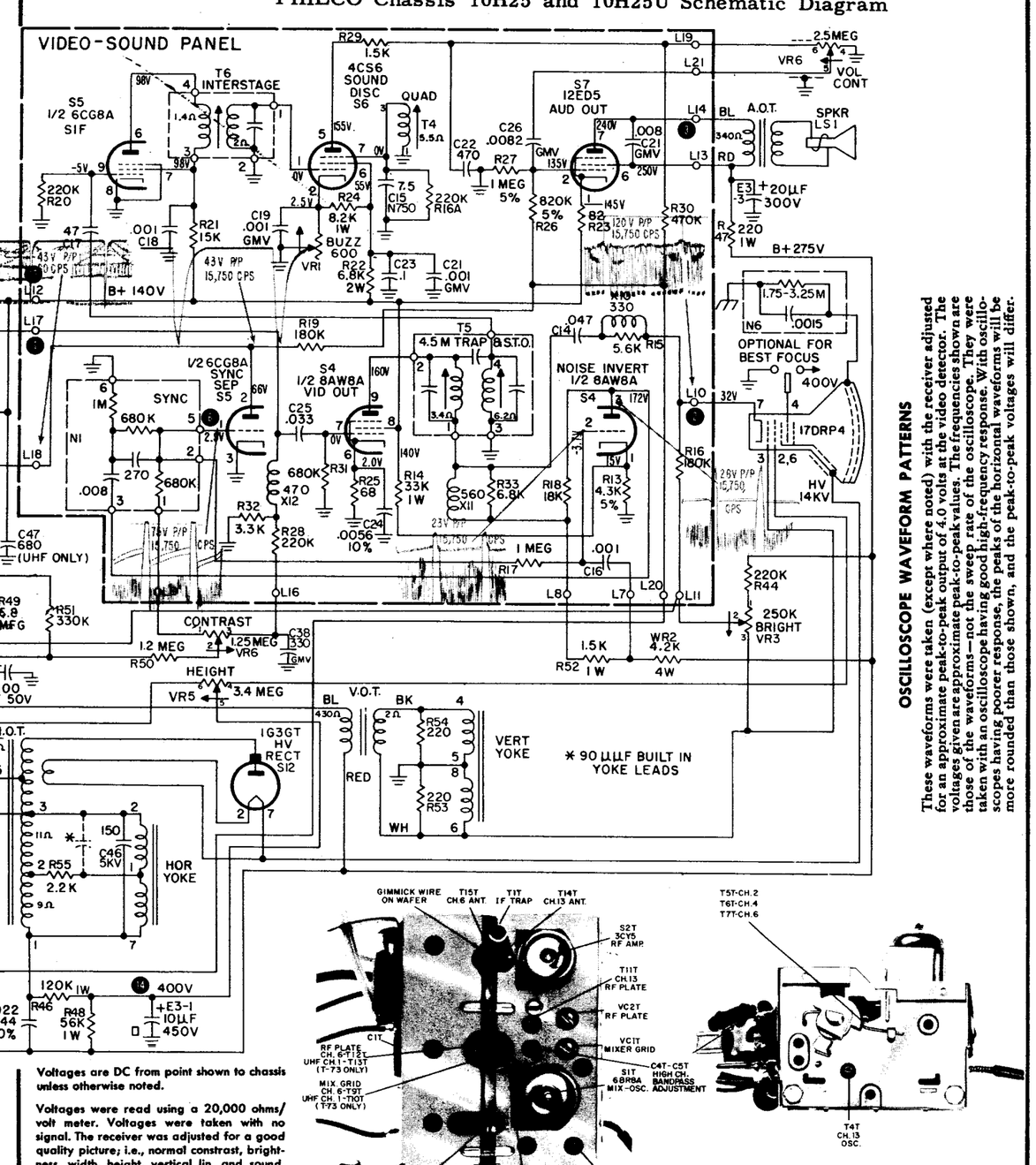
All capacitor values greater than 1 are in MMF unless otherwise noted.

All capacitor values less than 1 are in MFD unless otherwise noted.

All resistors are ½ watt, 10%, carbon unless otherwise noted.

Arrow through control indicates clockwise rotation.

PHILCO Chassis 10H25 and 10H25U Schematic Diagram



OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken (except where noted) with the receiver adjusted for an approximate peak-to-peak output of 4.0 volts at the video detector. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms—not the sweep rate of the oscilloscope. They were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poorer response, the peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ.

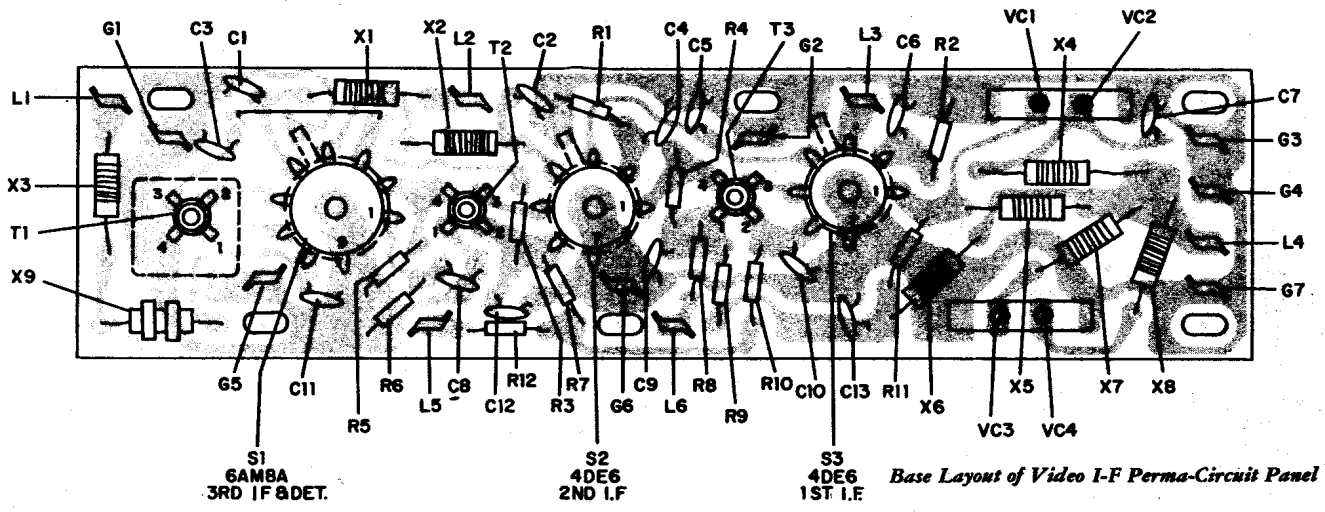
Voltages are DC from point shown to chassis unless otherwise noted.

Voltages were read using a 20,000 ohms/volt meter. Voltages were taken with no signal. The receiver was adjusted for a good quality picture; i.e., normal constrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.

⊕ Focus voltage optional for best focus.

VHF Tuner Adjustment Locations, T-72A and T-73

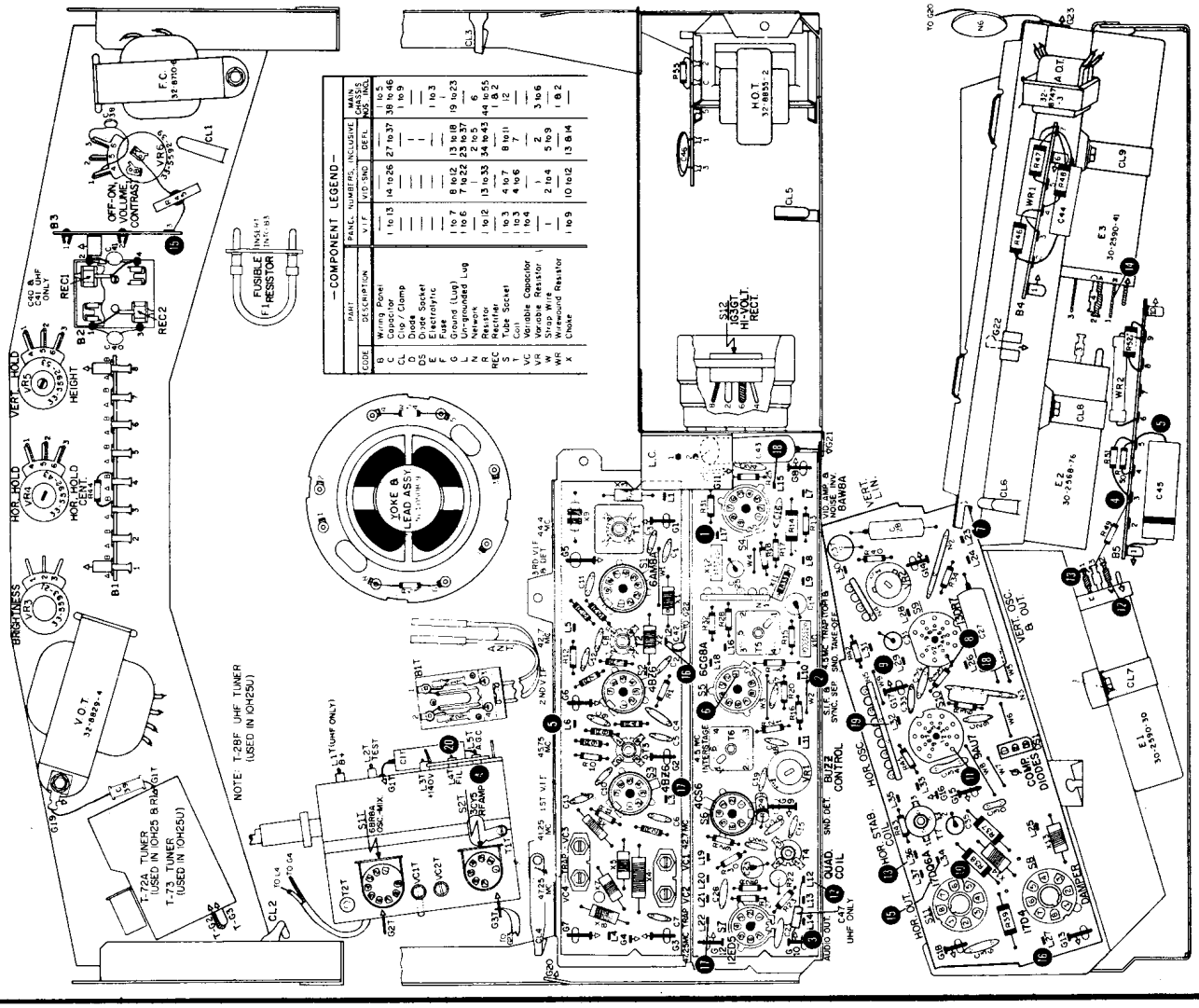
PHILCO Chassis 10H25 and 10H25U, Service Material, Continued



Base Layout of Video I-F Perma-Circuit Panel

TERMINAL LUG IDENTIFICATION—I-F PANEL

L1	Video output from video 2nd detector.	L5	140V B+.
L2	Filament input from L27 of Deflection panel.	L6	A.G.C.
L3	Filament output to L22 of Video-Sound panel.	G4	Shield braid of I-F link.
L4	I-F input link from tuner.		



Chassis Component Layout

PHILCO TELEVISION

10L31 and 10L31U CHASSIS

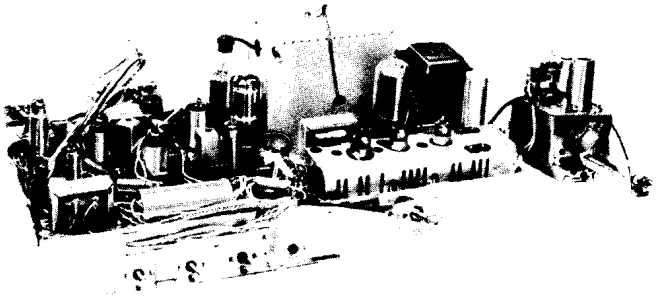
Model No.	Chassis	Tuner	CRT
H-4248E	10L31	(T-100E) 76-10524-4	21DQP4
UH-4248E	10L31	(T-100E) 76-10524-4	21DQP4
H-4250	10L31	(T-100E) 76-10524-4	21DQP4
UH-4250	10L31U	(T-101E) 76-10525-4	21DQP4
H-4250L	10L31	(T-100E) 76-10524-4	21DQP4
UH-4250L	10L31U	(T-101E) 76-10525-4	21DQP4
H-4668	10L31	(T-100E) 76-10524-4	21DQP4
UH-4668	10L31U	(T-101E) 76-10525-4	21DQP4
H-4668L	10L31	(T-100E) 76-10524-4	21DQP4
UH-4668L	10L31U	(T-101E) 76-10525-4	21DQP4
H-4670	10L31	(T-100E) 76-10524-4	21DQP4
UH-4670	10L31U	(T-101E) 76-10525-4	21DQP4
H-4670L	10L31	(T-100E) 76-10524-4	21DQP4
UH-4670L	10L31U	(T-101E) 76-10525-4	21DQP4
H-4670W	10L31	(T-100E) 76-10524-4	21DQP4
UH-4670W	10L31U	(T-101E) 76-10525-4	21DQP4
H-4672	10L31	(T-100E) 76-10524-4	21DQP4
UH-4672	10L31U	(T-101E) 7610525-4	21DQP4
H-4672L	10L31	(T-100E) 76-10524-4	21DQP4
UH-4672L	10L31U	(T-101E) 76-10525-4	21DQP4
H-4672W	10L31	(T-100E) 76-10524-4	21DQP4
UH-4672W	10L31U	(T-101E) 76-10525-4	21DQP4

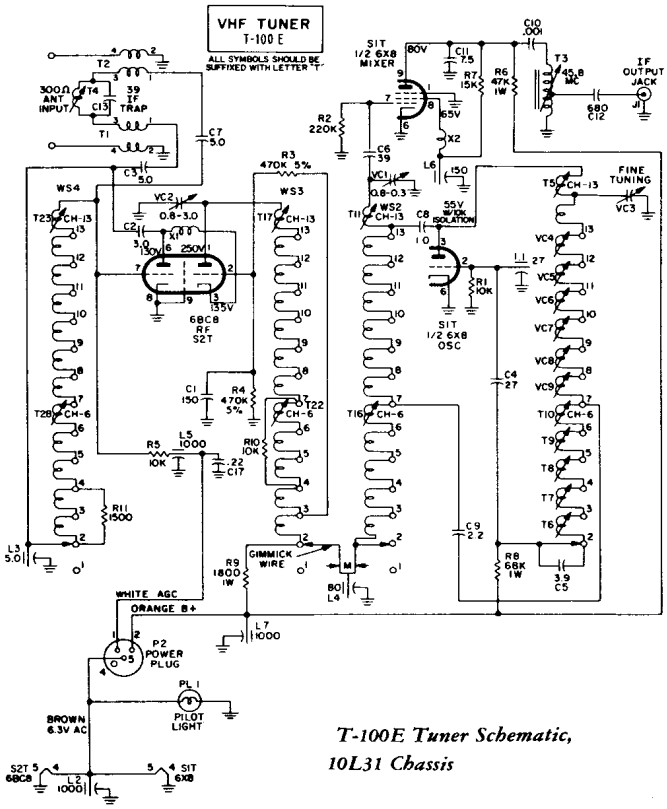
Circuit diagram is on pages 108-109. These chassis are very similar to 10L41 group of chassis covered in the section beginning with page 117. Refer to this material for additional information. For example, see page 118 for alignment, and page 119 for Perma-Circuit Panels data. Specific material that is applicable to 10L31 and 10L31U is printed below and on pages 108 through 110. List of models with cross-reference to chassis, tuner, and CRT, at left.

RECEIVER SET-UP CONTROL LOCATIONS

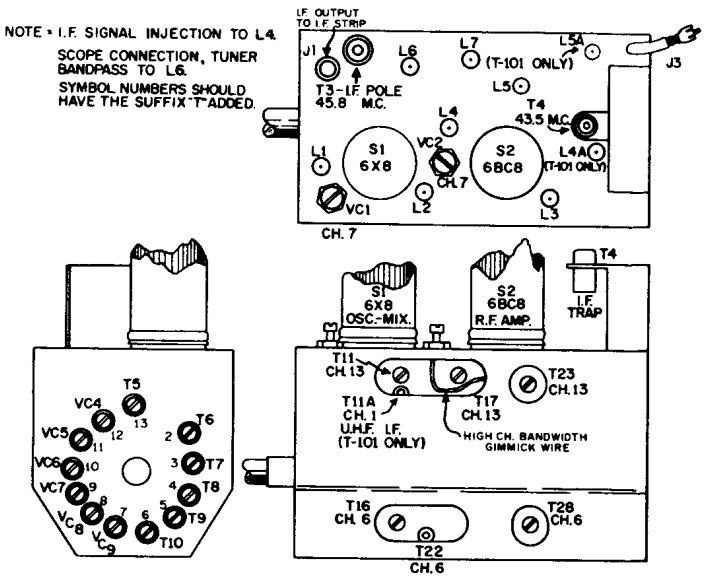
(Refer to Base View, figure 16, on page 110)

1. Vertical Linearity—Control located on rear of chassis. Accessible through hole in back.
2. Height—Control located at rear of chassis below vert. lin. Accessible through hole in back.
3. Width Switch—Control located at rear of chassis. Accessible through hole in back.
4. Horizontal Hold Centering—Control located at rear of chassis below width switch. Accessible through hole in back.
5. Range Switch—Located at right end of chassis (looking at rear). Slide to right for "Normal", to left for "Strong".
6. Fuse—Located on rear of chassis at the left between the power transformer and the high voltage cage. Back must be removed. Use a .7 amp., slow-blow, part number 27-6318-1.
7. Focus Adjustment—Red lead with insulated connector. Connect to either L25 (B plus) or G11 (ground) terminal lugs on V.O.S. panel for best focus.
8. Centering Magnets—Remove back. Magnets are just to the rear of yoke shield. Rotate by the tabs.





T-100E Tuner Schematic, 10L31 Chassis

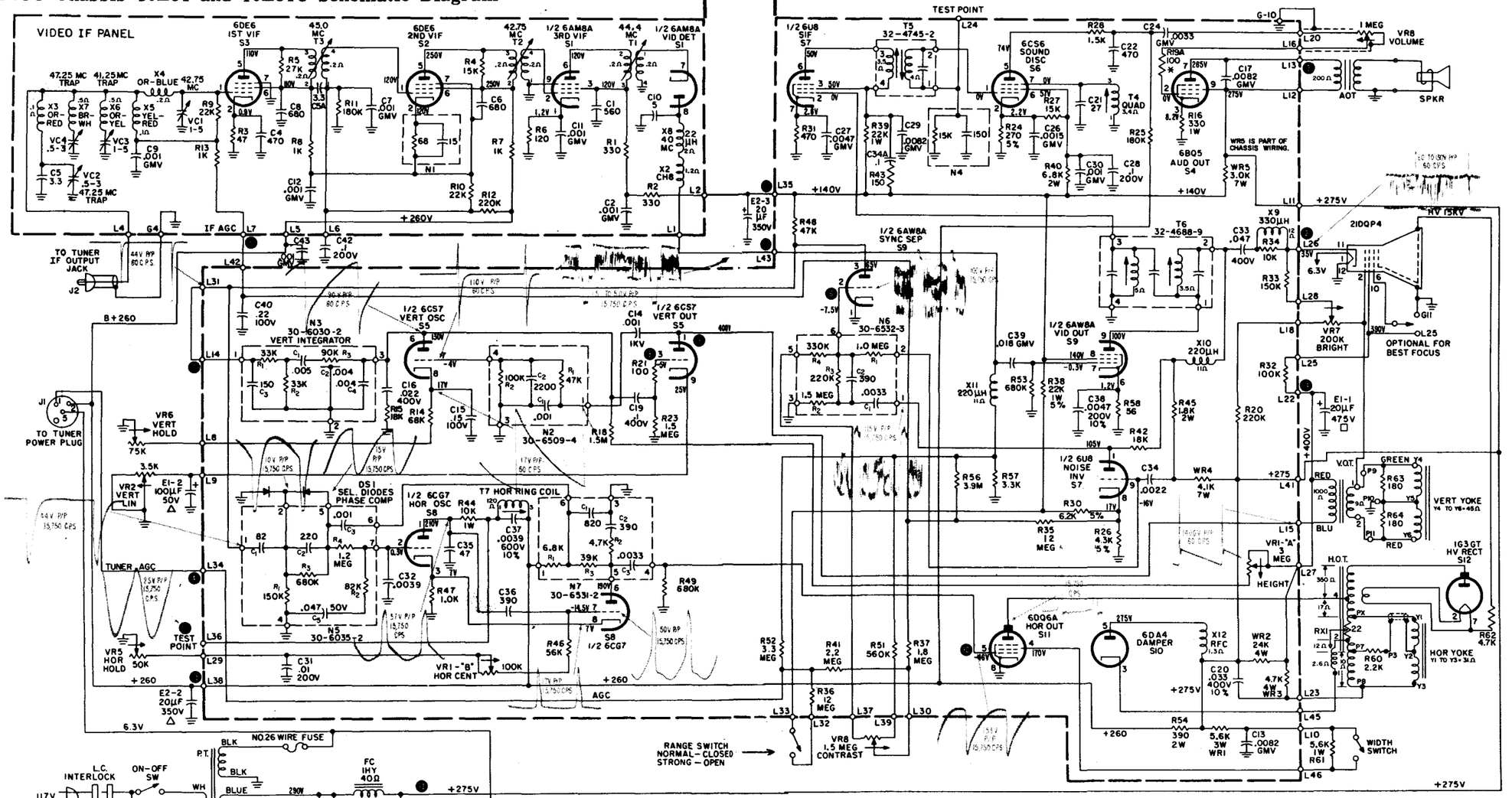


VHF Tuner Adjustment Locations, T-100E and T-101E

PHILCO Chassis 10L31 and 10L31U Schematic Diagram

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

PHILCO



Schematic Diagram for Chassis 10L31

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 4.0 volts at the video detector. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms—not the sweep rate of the oscilloscope. They were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poorer response, the peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ. Measurements given below were taken with range switch in "Normal" position. The 2nd det. output there is approximately a 3:1 decrease when switch is in "Strong" position.

NOTES: All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD unless otherwise noted.
All resistors are ½ watt, 10%, carbon unless otherwise noted.
Arrow through control indicates clockwise rotation.
Voltages are DC from point shown to chassis unless otherwise noted.
Voltages were read using a 20,000 ohms/volt meter. Voltages were taken with no signal. The receiver was adjusted for a good quality picture; i.e., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.

*Focus voltage optional for best focus.
Coil resistances read with coil in circuit except for vert. & hor. yoke and output sec. winding.

PHILCO Chassis 10L31 and 10L31U, Service Material, Continued

V.O.S. PANEL TERMINAL LUG IDENTIFICATION

L8 Lead to vertical hold control, white with yellow tracer.
L9 Vertical output cathode to vertical lin. control and E1-3, two white leads.
L10 Green/white lead to width switch.
L11 275V B+
L12 Red lead to audio output transformer.
L13 Blue lead to audio output transformer.
L14 White/yellow jumper lead to L31.
L15 Blue lead from vert. out. plate to V.O.T.
L16 Green lead to arm of volume control.
L18 Red/white lead to brightness control.
L19 Filament leads.
L20 Blue lead to high side of volume control.
L22 Orange/white jumper lead to L27, 400V.
L23 Brown/white lead to yoke socket lug 8. Boost voltage line to H.O.T. lug 1 and hor. yoke.
L24 Audio test lug.
L25 Orange lead to CRT pin 10, screen grid.
L26 Yellow lead to CRT pin 11, cathode.
L27 Orange/white jumper lead to L22, orange/white lead to E1-1 and red lead to V.O.T.
L28 Orange/white lead to arm of brightness control.
L29 Blue/white lead to horizontal hold control.
L30 Green/white lead to arm of contrast control.
L31 Yellow/white jumper lead to L14.
L32 Red/white lead to range switch.
L33 White lead to range switch.
L34 White tuner AGC lead.
L35 Orange/white lead to E2-3, 140V.
L36 Hor. oscillator test point.
L37 Yellow/white lead to low side of contrast control.
L38 Blue/white lead to E2-2, 260V B+.
L39 Blue/white lead to high side of contrast control.
L41 Red/white lead, 275V B+.
L42 I-F AGC, white lead to i-f L7.
L43 Green/white video input lead, from L1.
L44 Brown/white filament lead.
L45 Damper cathode lead to X13.
L46 Yellow/white lead to width switch.

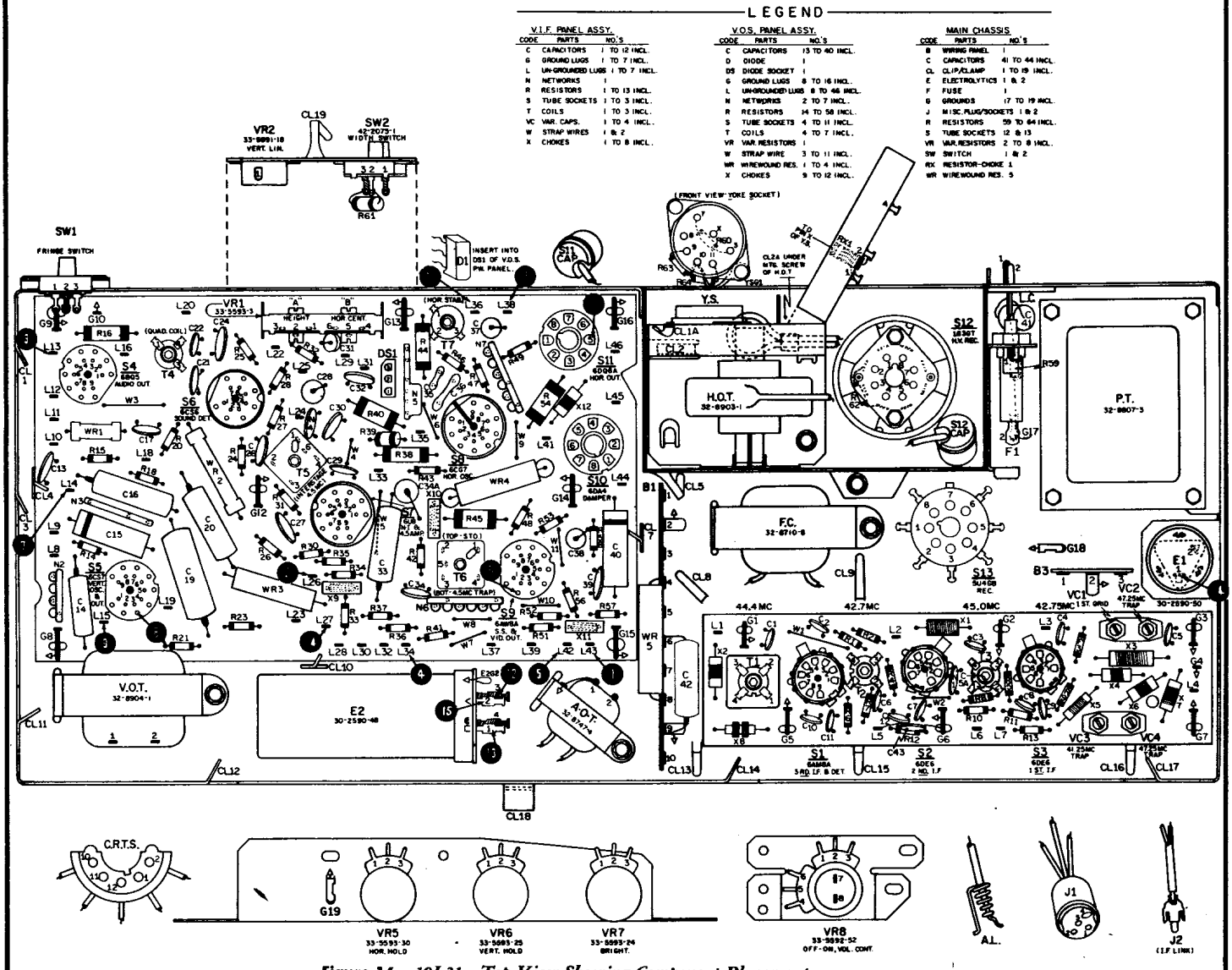


Figure 16. *10L31—Top View Showing Component Placement*

PHILCO TELEVISION

10AT10 CHASSIS

MODELS H-2010S and H-2010SBL

SPECIFICATIONS

Intermediate Frequencies
Video Carrier.....45.75 mc
Sound Intercarrier.....4.5 mc

Operating Voltage
Line.....105 to 120 volts, 60 cycles, a.c.
Battery.....7.5 volts, d.c.

Power Consumption—117V a.c. line.9 watts
7.5V battery...4.5 watts

CABINET DISASSEMBLY AND CRT REMOVAL

The cabinet is a two piece unit, the bottom section composed of leather, to which the carrying handle is secured, and the top plastic housing containing the optical system. To remove the cabinet assembly from the chassis proceed as follows:

1. Remove all external knobs except the Elapsed-Time knob on the lower right side.
2. Remove the 4 screws on the bottom which secure the cabinet stand and the cabinet to the chassis. The leather bottom cabinet section can then be removed by sliding it off the chassis.
3. Remove the two mounting screws in the rear and one mounting screw in the front of the top plastic housing. Disconnect the antenna plug from the tuner. Lift the housing off the chassis.
4. Remove the battery mounting bracket.
5. Remove the sleeve and magnet assembly from the neck of the CRT.
6. Slide the CRT forward out of the yoke assembly through the opening in the chassis.

HORIZONTAL OSCILLATOR ALIGNMENT

1. Allow set to warm up. Tune in picture.
2. Pre-set the horizontal hold control VR5 to its mechanical center. This control must not be moved during the following procedure to assure proper alignment.
3. Place a short across the horizontal stabilizing coil, L17 to L20 and short the sync test lug, L8 to ground.
4. With a video signal being received, adjust the aux. horz. hold control, VR7C to set the oscillator to the correct horizontal line frequency (to stop the picture; it will not be stable).
5. Remove the short from the horizontal stabilizing coil and adjust the coil to bring the horizontal oscillator back on frequency. Again, as in step 4, the picture will not be stable.
6. Remove the ground from the sync test point, L8. Rotate the aux. horz. hold control VR7C counter clockwise until the picture is out-of-sync. Now slowly rotate VR7C clockwise until the picture just pulls into sync. The horizontal oscillator now is completely aligned.

VIDEO I-F ALIGNMENT

AM ALIGNMENT

CHANNEL SELECTOR: Set to channel 4.
RANGE SWITCH: Normal.
DRIVE LEVEL CONTROL: Approximately ½ way on.
SIGNAL INJECTION: Unplug i-f cable from tuner and feed signal into cable.
BIAS: Apply to agc, test point 3, L6. Bias will range from —1.5 volts dc to +3 volts dc. During alignment procedure, bias is +.2 volts dc unless otherwise stated.
SCOPE: Connect to 2nd detector, test point 4, L5.
NOTE: To gain access to i-f coils, remove battery and battery holder.

1. 39.75 mc, adjust T-10 for minimum. Raise bias in positive direction if necessary to obtain adequate scope deflection being careful not to overload.
2. 41.25 mc, adjust T-11 and T-12 for minimum. Adjust bias as required. (Access to T-12 through bottom of panel.)
3. 47.25 mc, adjust T-4 for minimum. Adjust bias as required. This trap has a very sharp null and must be minimized carefully. (Access through bottom of panel.)
4. 45.3 mc, adjust T-9 for maximum. This pole has a rather broad peak and must be maximized carefully. (Access through bottom of panel.)
5. 45.0 mc, adjust T-6 for maximum.
6. 44.0 mc, adjust T-5 for maximum.
7. T-7 and T-8 are to be pre-padded and will not require maximizing at a particular frequency. Adjust so that the top of the inner core is flush with the top of the outer core.

SWEEP ALIGNMENT

CHANNEL SELECTOR: Set to channel 4.
RANGE SWITCH: Normal.
DRIVE LEVEL CONTROL: Approximately ½ way on.
SIGNAL INJECTION: Antenna input jack on tuner, J2T. Reconnect i-f cable. Adjust signal input level to give reasonable scope deflection.
BIAS: +.2 volts dc.
SCOPE: Connect to 2nd detector, test point 4, L5.

1. Inject 65.75 mc, AM, 30% modulated. Adjust fine tuning control for minimum output. Do not disturb fine tuning during balance of adjustments.
2. Inject 44.7 mc, AM, 30% modulated. Adjust T-4, tuner mixer collector coil, for maximum. It is possible to get two peaks with this coil; adjust the core to the peak occurring toward the top of the coil.
3. Inject channel 4 sweep signal (69 mc with 6 mc sweep width). Adjust the following cores to bring the curve within limits (see figure 3).
   T-6 or T-4—Carrier level (T-6 preferred)
   T-5—Curve tipping
   T-9—42.5 slope
   Use marker generator set to 45.75 mc and 42.5 mc to set proper level of these two points.

SOUND I-F ALIGNMENT

SIGNAL INJECTION: 4.5 mc, AM, 30% modulated signal injected at 2nd detector, test point, 4, L5, VISS panel. Keep signal input below limiting level of sound system.
METER: Connect 20,000 ohm/volt meter set to 2.5 volt range to lug # 5 on the discriminator transformer, T1.
BIAS: —3 volts to the i-f agc test point 3, L6 on the VISS panel.

1. Adjust T3 for maximum.
2. Adjust T2 for maximum.
3. Pre-set disc transformer, T1, cores to maximum outer position (Top core toward top of can; bottom core toward bottom).
4. Tune disc transformer secondary, T1 top core, for maximum on first peak coming in.
5. Tune disc transformer primary, T1 bottom core, for maximum on first peak going in.
6. Retouch secondary of disc transformer, T1 top core, on weak air signal for minimum noise and/or distortion.

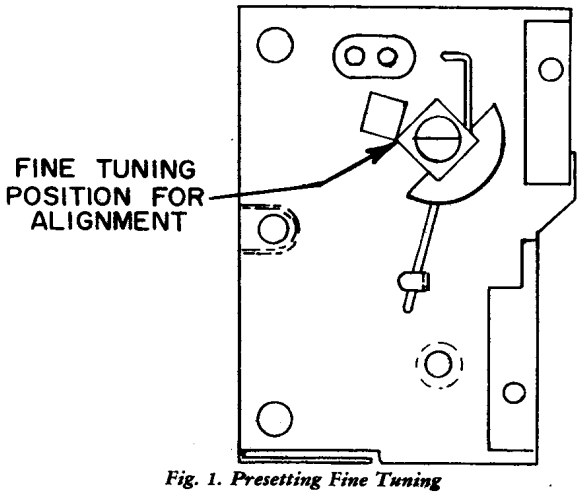


Fig. 1. Presetting Fine Tuning

(Alignment continued on page 111, other material on pages 111-116.)

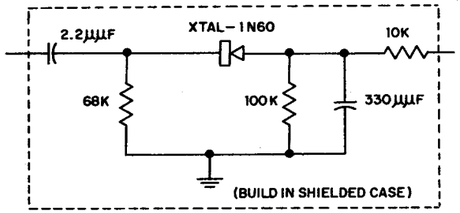


Fig. 2. Special Detector Jig

TUNER OSCILLATOR ALIGNMENT

AM GENERATOR: Connect to receiver antenna-input terminals (no matching network is required). Use 30% modulated signal.

PRE-SET: Fine tuning control as indicated in figure 1.

OSCILLOSCOPE: Connect to L5, video detector output, on VISS panel.

NOTE: This procedure uses the traps of the video I-F channel. Proper oscillator adjustment is therefore dependent upon an accurately aligned I-F strip.

NOTE: Counter-clockwise rotation of fine tuning causes a lowering of oscillator frequency.

STEP	AM. GEN. FREQ.	TUNER POSITION	ADJUST FOR MIN.
1	209.75 mc	Channel 13	T1
2	203.75 mc	Channel 12	T1
3	197.75 mc	Channel 11	T1
4	191.75 mc	Channel 10	T1
5	185.75 mc	Channel 9	T1
6	179.75 mc	Channel 8	T1
7	173.75 mc	Channel 7	T1
8	81.75 mc	Channel 6	T5
9	75.75 mc	Channel 5	T5
10	65.75 mc	Channel 4	T7
11	59.75 mc	Channel 3	T7
12	53.75 mc	Channel 2	T9

(See Note Below)

NOTE: T1 is the adjustable oscillator coil for channel 13. This adjustment is also used to set the oscillator position for channels 12 through 7 inclusive. Normally, this is the only adjustment required. However, if one or more of the high channels cannot be properly set, the coils for channels 12 through 7 may be spiked; i.e., moved. Moving the coil closer to the switch wafer will decrease the oscillator frequency, moving the coil away from the wafer will increase the oscillator frequency.

The brass cores of T1, T5, T7 and T9, when turned clockwise (moved into coil), will cause an increase in oscillator frequency.

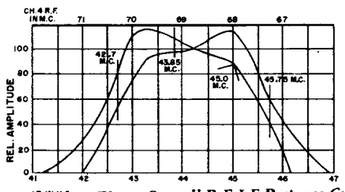


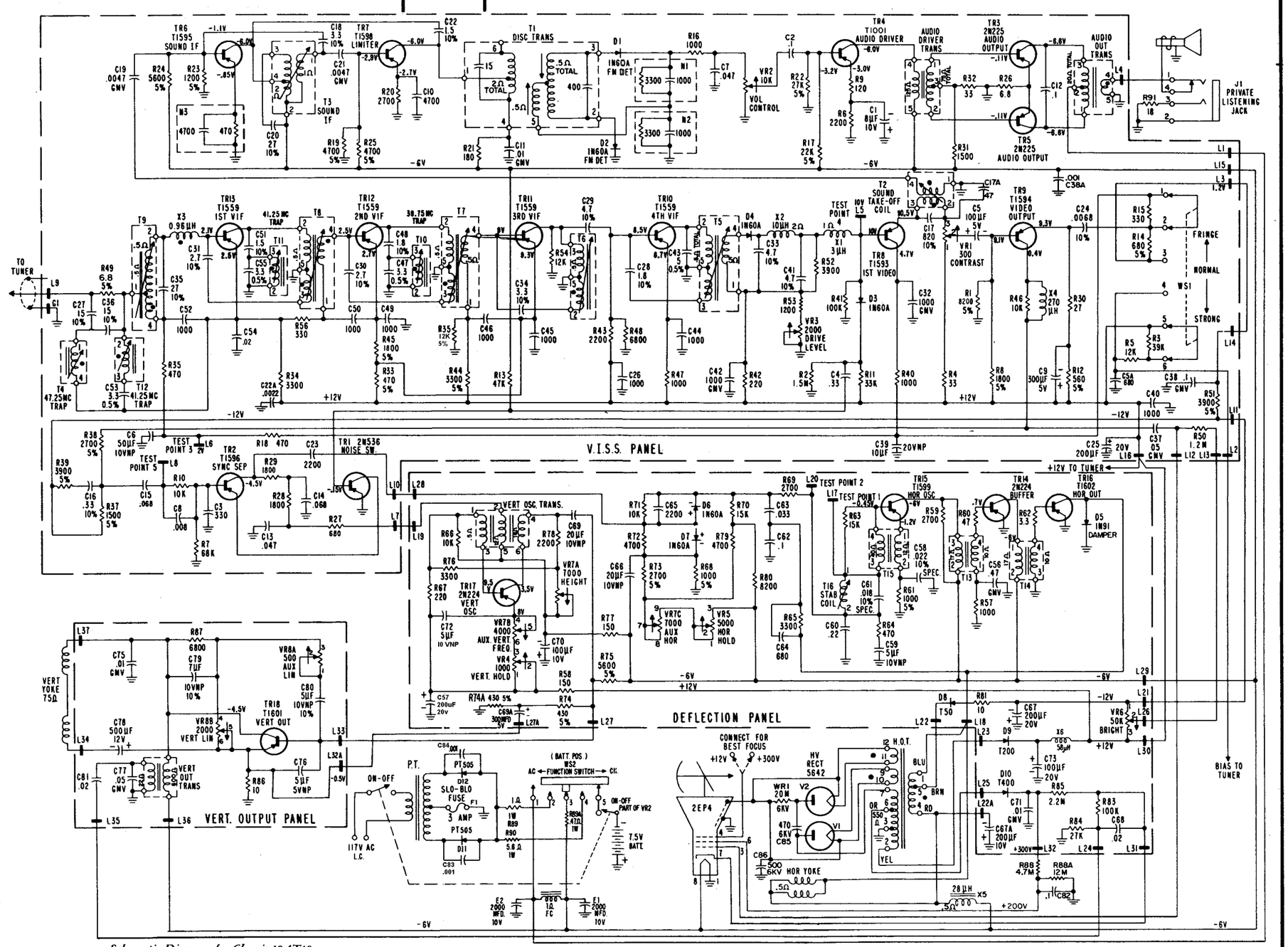
Fig. 3. Overall R-F I-F Response Curve

NOTES

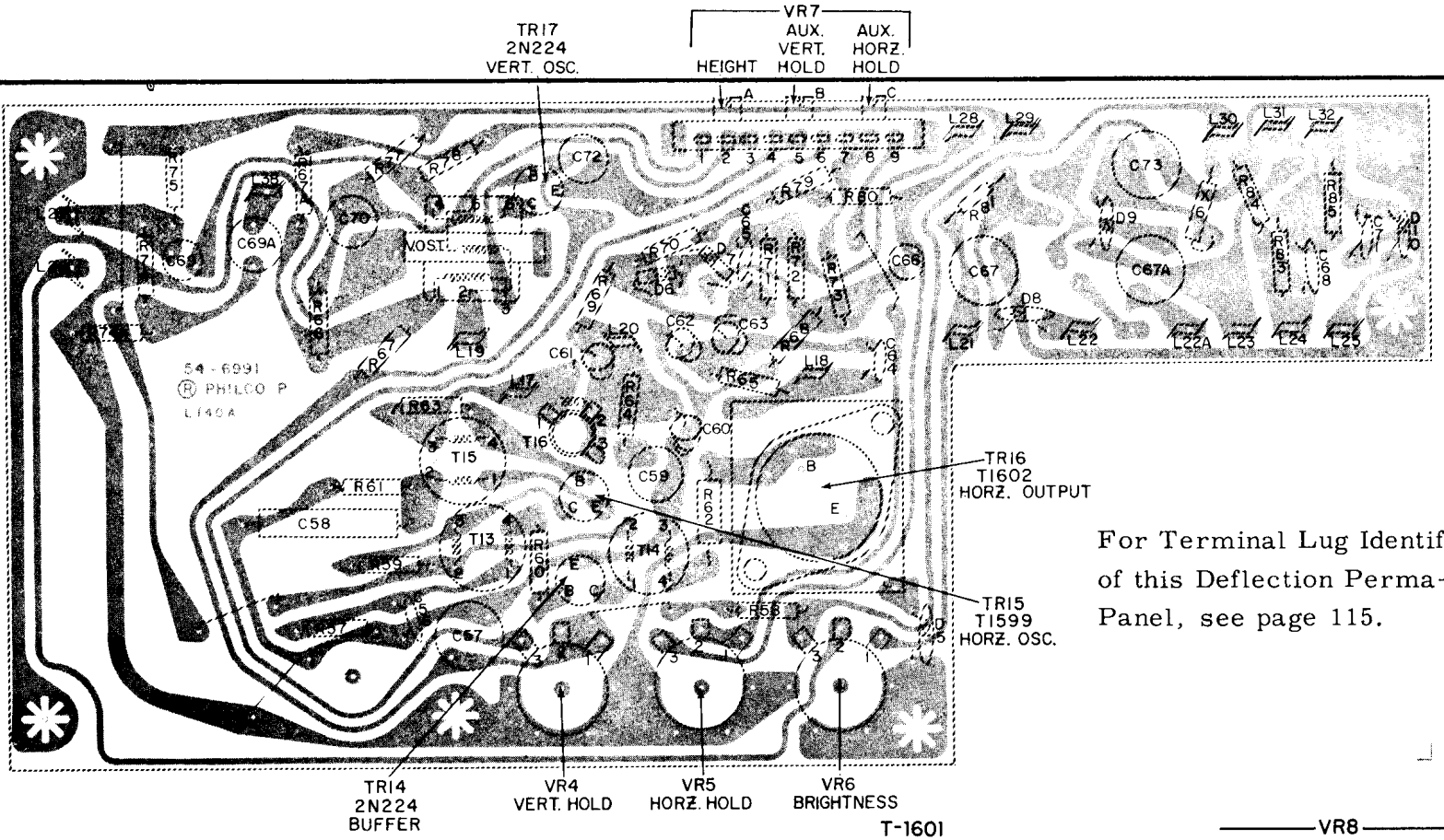
1. All capacitor values greater than 1 are in MMF unless otherwise noted. All capacitor values less than 1 are in MFD unless otherwise noted.
2. All resistors are ½ watt, 10%, carbon unless otherwise noted.
3. Voltages are dc from point shown to chassis. Voltages are read using a VTVM. Voltages were taken with no signal. The receiver was adjusted for a good quality picture, i.e., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then signal is removed.
4. ● Indicates a coil resistance of less than .5 ohms. Resistance measured with coil in circuit.

PHILCO Chassis 10AT10, Continued

PHILCO Chassis 10AT10 Schematic Diagram

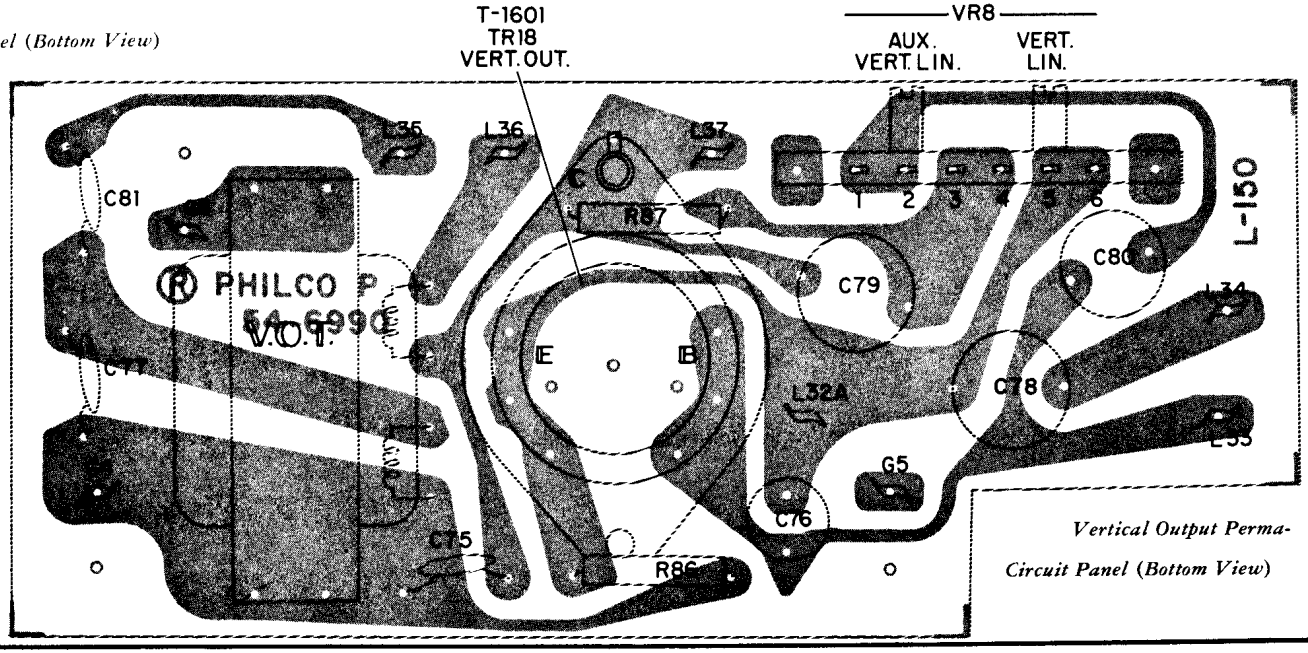


Schematic Diagram for Chassis 10AT10



Deflection Perma-Circuit Panel (Bottom View)

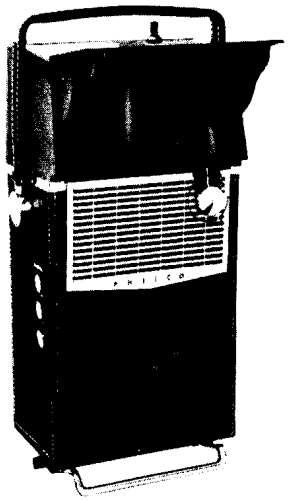
For Terminal Lug Identification of this Deflection Perma-Circuit Panel, see page 115.



Vertical Output Perma-Circuit Panel (Bottom View)

TERMINAL LUG IDENTIFICATION—
VERTICAL OUTPUT
PERMA-CIRCUIT PANEL

LUG NO.	CONNECTED TO:
L32A	Lug L27A of deflection panel
L33	Lug L27 of deflection panel
L34	Vertical yoke
L35	Lug L24 of deflection panel
L36	Lug L29 of deflection panel
L37	Vertical yoke

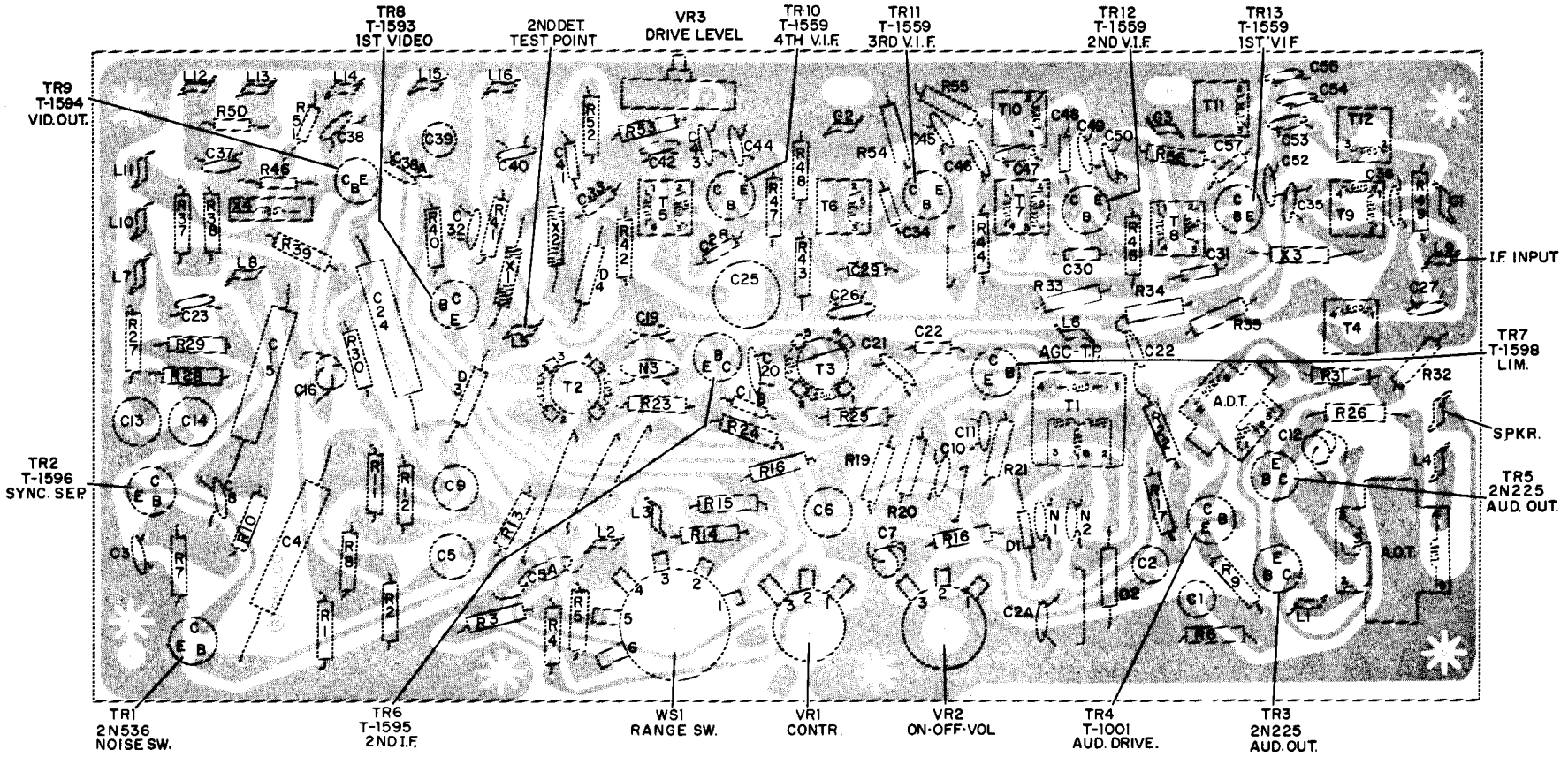


TERMINAL LUG IDENTIFICATION—DEFLECTION PERMA-CIRCUIT PANEL

LUG NO.	CONNECTED TO:
L17	Test point # 1
L18	Terminal 1 of horz. output transformer and horz. yoke
L19	Lug L7 of VISS panel
L20	Test point # 2
L21	Lug L11 of VISS panel
L22	Terminal 5 of horz. output transformer
L23	Terminal 2 of horz. output transformer
L24	Lug L35 of vertical output panel
L25	Terminal 6 of horz. output transformer
L26	Lug L13 of VISS panel
L27	Lug L33 of vertical output panel
L28	Lug L10 of VISS panel
L29	Lug L36 of vertical output panel and lug L15 of VISS panel
L30	Lug L16 of VISS panel
L31	Pin 7 of crt socket (cathode)
L32	Terminal 3 of terminal board B1

TERMINAL LUG IDENTIFICATION—VISS PERMA-CIRCUIT PANEL

LUG NO.	CONNECTED TO:
L1	Terminal 6 of terminal board B3
L2	Tuner (blue wire)
L3	Lug L14 of VISS panel
L4	Terminal 1 of private listening jack
L5	Test point # 4
L6	Test point # 3
L7	Lug L19 of deflection panel
L8	Test point # 5
L9	I.F. link, plug J2
L10	Lug L28 of deflection panel
L11	Lug L21 of deflection panel
L12	Pin 3 of crt socket (control grid)
L13	Lug L26 of deflection panel
L14	Lug L3 of VISS panel
L15	Lug L29 of deflection panel and terminal 4 of terminal board B4
L16	Tuner (red lead) and lug L30 of deflection panel

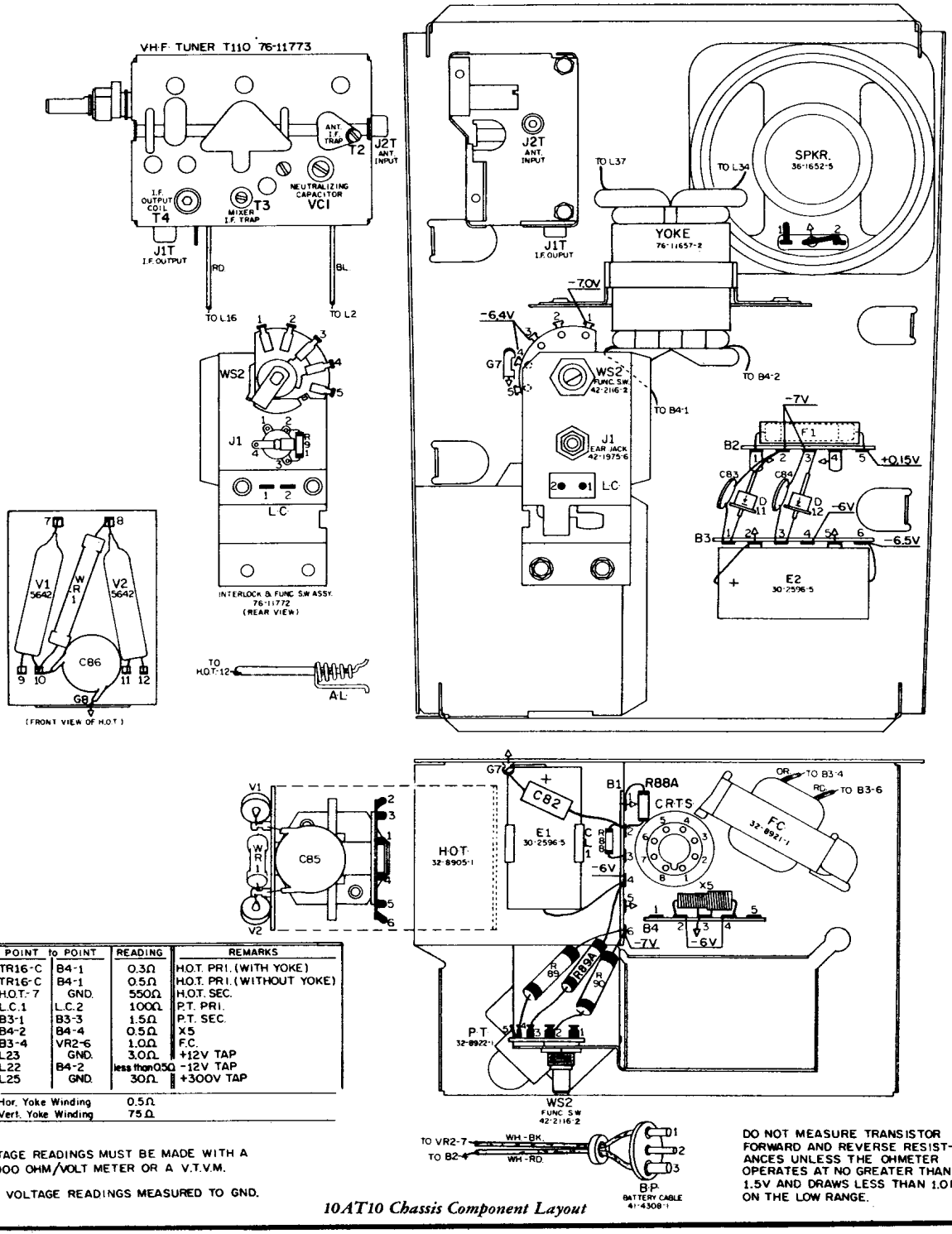


Video, I-F, Sync, Sound Perma-Circuit Panel (Bottom View)

PHILCO Chassis 10AT10, Service Material, Continued

RECEIVER SET-UP CONTROL LOCATIONS

1. *Vertical Linearity*—Accessible from chassis rear. Left-hand control of dual controls in single housing, mounted on vertical output panel.
2. *Aux. Vertical Linearity*—Accessible from chassis rear. Right-hand control of dual controls in single housing, mounted on vertical output panel.
3. *Horizontal Hold Centering*—Accessible from chassis rear. Bottom control of triple controls in single housing, mounted on deflection panel.
4. *Vertical Hold Centering*—Accessible from chassis rear. Center control of triple controls in single housing, mounted on deflection panel.
5. *Height*—Accessible from chassis rear. Top control of triple controls in single housing, mounted on deflection panel.
6. *Drive Level Control*—Accessible from right rear of chassis. Potentiometer is located on VISS panel.



POINT	to POINT	READING	REMARKS
TR16-C	B4-1	0.3Ω	H.O.T. PRI. (WITH YOKE)
TR16-C	B4-1	0.5Ω	H.O.T. PRI. (WITHOUT YOKE)
H.O.T.-7	GND.	550Ω	H.O.T. SEC.
L.C.1	L.C.2	100Ω	P.T. PRI.
B3-1	B3-3	1.5Ω	P.T. SEC.
B4-2	B4-4	0.5Ω	X5
B3-4	VR2-6	1.0Ω	F.C.
L23	GND.	3.0Ω	+12V TAP
L22	B4-2	less than 0.5Ω	-12V TAP
L25	GND.	30Ω	+300V TAP
Hor. Yoke Winding		0.5Ω	
Vert. Yoke Winding		75Ω	

VOLTAGE READINGS MUST BE MADE WITH A 20,000 OHM/VOLT METER OR A V.T.V.M.

ALL VOLTAGE READINGS MEASURED TO GND.

DO NOT MEASURE TRANSISTOR FORWARD AND REVERSE RESISTANCES UNLESS THE OHMETER OPERATES AT NO GREATER THAN 1.5V AND DRAWS LESS THAN 1.0MA ON THE LOW RANGE.

10AT10 Chassis Component Layout

PHILCO TELEVISION

10L41, 10L42 & 10L43

Model No.	Chassis	Tuner	CRT
H-3408C	10L43	(T-100D) 76-10524-3	17DAP4 or 17DRP4
UH-3408C	10L43U	(T-101D) 76-10525-3	17DAP4 or 17DRP4
H-3410	10L43	(T-100D) 76-10524-3	17DAP4 or 17DRP4
UH-3410	10L43U	(T-101D) 76-10525-3	17DAP4 or 17DRP4
H-3410L	10L43	(T-100D) 76-10524-3	17DAP4 or 17DRP4
UH-3410L	10L43U	(T-101D) 76-10525-3	17DAP4 or 17DRP4
H-3410V	10L43	(T-100D) 76-10524-3	17DAP4 or 17DRP4
UH-3410V	10L43U	(T-101D) 76-10525-3	17DAP4 or 17DRP4
H-3412L	10L43	(T-100D) 76-10524-3	17DAP4 or 17DRP4
UH-3412L	10L43U	(T-101D) 76-10525-3	17DAP4 or 17DRP4
H-3412GL	10L43	(T-100D) 76-1024-3	17DAP4
H-4254S	10L41	(T-100E) 76-10524-4	21EVP4
UH-4254S	10L41U	(T-101E) 76-10525-4	21EVP4
H-4254SL	10L41	(T-100E) 76-10524-4	21EVP4
UH-4254SL	10L41U	(T-101E) 76-10525-4	21EVP4
H-4674	10L41	(T-100E) 76-10524-4	21EVP4
UH-4674	10L41U	(T-101E) 76-10525-4	21EVP4
H-4674L	10L41	(T-100E) 76-10524-4	21EVP4
UH-4674L	10L41	(T-101E) 76-10525-4	21EVP4
H-4674W	10L41	(T-100E) 76-10524-4	21EVP4
UH-4674W	10L41U	(T-101E) 76-10525-4	21EVP4
H-4676S	10L41	(T-100E) 76-10524-4	21EVP4
UH-4676S	10L41U	(T-101E) 76-10525-4	21EVP4
H-4676SL	10L41	(T-100E) 76-10524-4	21EVP4
UH-4676SL	10L41U	(T-101E) 76-10525-4	21EVP4
H-4676SR	10L42	(T-100A) 76-10524-5	21EVP4
H-4676SLR	10L42	(T-100A) 76-10524-5	21EVP4
H-4678	10L41	(T-100E) 76-10524-4	21EVP4
UH-4678	10L41U	(T-101E) 76-10525-4	21EVP4
H-4678W	10L41	(T-100E) 76-10524-4	21EVP4
UH-4678W	10L41U	(T-101E) 76-10525-4	21EVP4
H-4680	10L41	(T-100E) 76-10524-4	21EVP4
UH-4680	10L41U	(T-101E) 76-10525-4	21EVP4
H-4680W	10L41	(T-100E) 76-10524-4	21EVP4
UH-4680W	10L41	(T-101E) 76-10525-4	21EVP4
H-4680L	10L41	(T-100E) 76-10524-4	21EVP4
UH-4680L	10L41U	(T-101E) 76-10525-4	21EVP4
H-4680R	10L42	(T-100A) 76-10524-5	21EVP4
H-4680WR	10L42	(T-100A) 76-10524-5	21EVP4
UH-4680WR	10L42U	(T-101A) 76-10525-5	21EVP4
H-4682S	10L41	(T-100E) 76-10524-4	21EVP4
UH-4682S	10L41U	(T-101E) 76-10525-4	21EVP4
H-4682SL	10L41	(T-100E) 76-10524-4	21EVP4
UH-4682SL	10L41U	(T-101E) 76-10525-4	21EVP4
H-4682SW	10L41	(T-100E) 76-10524-4	21EVP4
UH-4682SW	10L41U	(T-101E) 76-10525-4	21EVP4
H-4690	10L41	(T-100E) 76-10524-4	21EVP4
UH-4690	10L41U	(T-101E) 76-10525-4	21EVP4
H-4690P	10L41	(T-100E) 76-10524-4	21EVP4
UH-4690P	10L41U	(T-101E) 76-10525-4	21EVP4
H-4690R	10L42	(T-100A) 76-10524-5	21EVP4
UH-4690R	10L42U	(T-101A) 76-10525-5	21EVP4
H-4690PR	10L42	(T-100A) 76-10524-5	21EVP4
UH-4690PR	10L42U	(T-101A) 76-10525-5	21EVP4
H-4692W	10L41	(T-100E) 76-10524-4	21EVP4
UH-4692W	10L41U	(T-101E) 76-10525-4	21EVP4
H-4696SM	10L41	(T-100E) 76-10524-4	21EVP4
UH-4696SM	10L41U	(T-101E) 76-10525-4	21EVP4
H-4696SW	10L41	(T-100E) 76-10524-4	21EVP4
UH-4696SW	10L41U	(T-101E) 76-10525-4	21EVP4
H-4698R	10L42	(T-100A) 76-10524-5	21EVP4
UH-4698R	10L42U	(T-101A) 76-10525-5	21EVP4
H-4698PR	10L42	(T-100A) 76-10524-5	21EVP4
UH-4698PR	10L42U	(T-101A) 76-10525-5	21EVP4
H-4730	10L43	(T-100D) 76-10524-3	21EVP4
H-4730W	10L43	(T-100D) 76-10524-3	21EVP4
UH-4730W	10L43U	(T-101D) 76-10525-3	21EVP4

Chassis Variations

10L41—Basic chassis in conventional cabinetry

10L42—Similar to 10L41 chassis except two silicon rectifiers and with stepper operated touch tuning, pre-set fine tuning and remote control.

10L43—Similar to 10L41 chassis except two silicon rectifiers. Modern cabinetry with "Separate" picture tube mounted in plastic shell. Available with either 17" or 21" picture tube. No tone control.

10L43A—Identical to 10L43 except it has the tone control circuit.

Service Information on the New 10N41 Television Chassis

Some of the new January line of television sets use the 10N41 chassis. This chassis is basically similar to the 10L41, run 8. The main difference is the yoke and the picture tube. The picture tube is the new rectangular tube, type 23CP4. This tube has a regular 6.3 volt filament and therefore, derives its power from the 6.3 volt filament winding on the power transformer. The tap on this winding is not used.

Additional models using these various chassis are listed in Index, page 192.

RECEIVER SET-UP CONTROL LOCATIONS

1. Vertical Linearity—Control located on rear of chassis. Accessible through hole in back.
2. Height—Control located at rear of chassis below vert. lin. Accessible through hole in back.
3. Width—Control located on rear of chassis. Accessible through hole in back.
4. Horizontal Hold Centering—Control located at rear of chassis below width. Accessible through hole in back.
5. Range Switch—Located at right end of chassis (looking at rear). Slide to right for "Normal," to left for "Strong."
6. Fuse—10L41 located on rear of chassis at the left between the power transformer and the high voltage cage. Back must be removed. Use a .7 amp., slow-blow, part number 27-6318-1. 10L42 & 10L43—Fusistor located in front of the power transformer, plug in type. Use part number 33-1366-3.
7. Focus Adjustment—Red lead with insulated connector. Connect to either L25 (B+) or G11 (ground) terminal lugs on V.O.S. panel for best focus.
8. Centering Magnets—10L41 & 10L42. Remove back. Magnets are just to the rear of yoke shield. Rotate by the tabs.
   10L43 using 17DAP4. Remove rear cover of CRT housing. Magnets are mounted on the rear of yoke shield. Top magnet is for vertical centering, left hand magnet is for horizontal centering. Rotate magnets for best centering.
   10L43 using 17DRP4. Remove rear cover of CRT housing. Magnets are just to the rear of yoke shield. Rotate by the tabs.
9. Horizontal Linearity—Remove back (on 10L43 remove rear cover of CRT housing). Magnet is mounted in a bracket to the left of the yoke. Rotate magnet within the bracket for the desired action.

CHECKING THE HORIZONTAL PHASE COMPARER SELENIUM DIODE (DS ON V.O.S. PANEL)

When servicing television receivers where the dual selenium diode phase comparer is suspected, a fast and efficient method of checking them is this:—

A 20,000 ohm/volt meter is employed. On the 10K scale the forward resistance (meter connected in the same polarity as the diode) should be a maximum of 6000 ohms. The ratio of the forward resistances of the two diodes should be less than 2 to 1. On the 100K scale the back resistance (meter connecter in reverse polarity to the diode) should be a minimum of 2 megohms.

The center conductor of the phase comparer unit is the common negative.

(Continued on pages 118 through 122)

PHILCO Chassis 10L41, 10L42, 10L43, Service Material; Continued

VIDEO I-F ALIGNMENT

AM ALIGNMENT

CHANNEL SELECTOR—Set tuner to channel 4 position.

SIGNAL INJECTION—To mixer grid through L4T.

BIAS—6.0 volts to L42. Connect 2:1 voltage divider from L42 to ground. Feed from divider 3 volts to L34.

SCOPE—Connect to video detector output, L43 on V.O.S. panel.

OUTPUT LEVEL—Not greater than 2 volts peak to peak during pole and sweep alignment; not less than 0.2 volts peak to peak during trap alignment.

WARM UP—Allow equipment and chassis 15 minutes warm-up.

1. 45.8 mc Adjust T3T (tuner) for maximum.
2. 41.25 mc Adjust trap VC3 for minimum. Bias may be reduced as minimum is approached.
3. 47.25 mc Adjust traps VC2 and VC4 for minimum. Bias may be reduced as minimum is appoached. Repeat for accuracy.
4. 42.75 mc Adjust VC1 and T2 for maximum.
5. 45.0 mc Adjust T3 for maximum.
6. 44.4 mc Adjust T1 for maximum.

SWEEP ALIGNMENT

CHANNEL SELECTOR—Set tuner to channel 4 position.

SIGNAL INJECTION—To the antenna terminals through an antenna matching network (generator to 300 ohm antenna). Bias, Scope and Output Level same as above for AM alignment.

1. 65.75 mc, AM, 30% modulated to antenna. Tune fine tuning control for minimum output. Do not disturb fine tuning during balance of video I-F sweep alignment. Remove signal.
2. Inject channel 4 sweep signal (69 mc, with 6 mc sweep width) into antenna. If necessary, adjust the following cores to bring the curve within limits (see Overall R-F - I-F Response Curve Fig. 2). Do not change settings of VC2, VC3 or VC4.
3. Adjust 67.25 mc to fall at the 50% point with cores T3T (tuner) and T3.
4. Level curve with core T1.
5. Position 70.50 mc slope with T2 and VC1.

4.5 MC TRAP ALIGNMENT

(1) Inject 4.5 MC AM signal into L43 or use station signal.

(2) Connect 4.5 MC detector (see circuit, figure 1) to L26 (pin 7 of CRT).

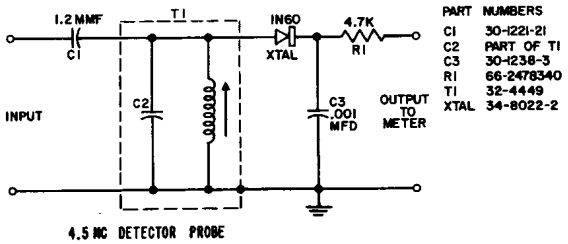
NOTE: Preliminary padding of 4.5 MC test detector—Connect detector to an accurate source of 4.5 MC signal and pad core of transformer for maximum DC output voltage.

NOTE: When using generator, calibrate by zero beating with sound I-F developed from station signal.

(3) Connect 20,000 ohms/volt meter, set to 2.5 volt range, to detector output.

(4) Turn contrast control fully clockwise (to maximum).

(5) Adjust 4.5 MC trap (bottom core of T6) for minimum indication.



PART	NUMBERS
C1	30-1221-21
C2	PART OF T1
C3	30-1238-3
R1	66-2478340
T1	32-4449
XTAL	34-8022-2

Figure 1. 4.5 mc Detector Tube

SOUND I-F ALIGNMENT

NOTE: The sound I-F alignment is based upon a properly aligned video I-F strip.

(1) With a weak station signal (antenna disconnected) tune receiver for best possible picture. Do not readjust fine tuning control during balance of procedure.

(2) With a strong signal (antenna connected) adjust the quadrature coil T4, for maximum sound.

(3) Connect a VTVM to the audio test point, L24. Be sure volt-meter probe contains an isolation resistor. (If it is required to add a probe isolating resistor, use a value of 10,000 ohms or more.) Using a weak station signal (antenna disconnected), adjust the sound take-off coil (top core of T6) and the sound interstage transformer, T5 (both pri. and sec. cores), for maximum. The station signal employed should not be too weak for this adjustment.

(4) If any signs of intercarrier buzz or noise interference occur, a very slight adjustment of T5 and/or the top core of T6 may be made to minimize the noise. Neither core should be adjusted more than ¼ turn; if more adjustment appears necessary, re-check the sound alignment.

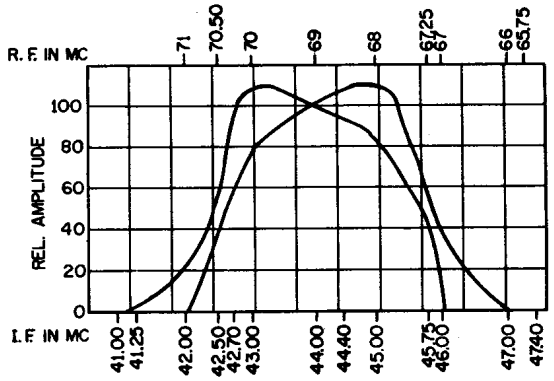


Figure 2. Overall R-F I-F Response Curve, Channel 4

TUNER OSCILLATOR ALIGNMENT T-100 & T-101

AM GENERATOR: Connect to receiver antenna-input terminals (no matching network is required). Use 30% modulated signal.

PRE-SET: Fine tuning control to middle of its range.

OSCILLOSCOPE: Connect to L43, video detector output, on V.O.S. panel.

STEP	AM. GEN. FREQ.	TUNER POSITION	ADJUST FOR MIN.
1	209.75 mc	Channel 13	T5T
2	203.75 mc	Channel 12	VC4T
3	197.75 mc	Channel 11	VC5T
4	191.75 mc	Channel 10	VC6T
5	185.75 mc	Channel 9	VC7T
6	179.75 mc	Channel 8	VC8T
7	173.75 mc	Channel 7	VC9T
8	81.75 mc	Channel 6	T10T
9	75.75 mc	Channel 5	T9T
10	65.75 mc	Channel 4	T8T
11	59.75 mc	Channel 3	T7T
12	53.75 mc	Channel 2	T6T

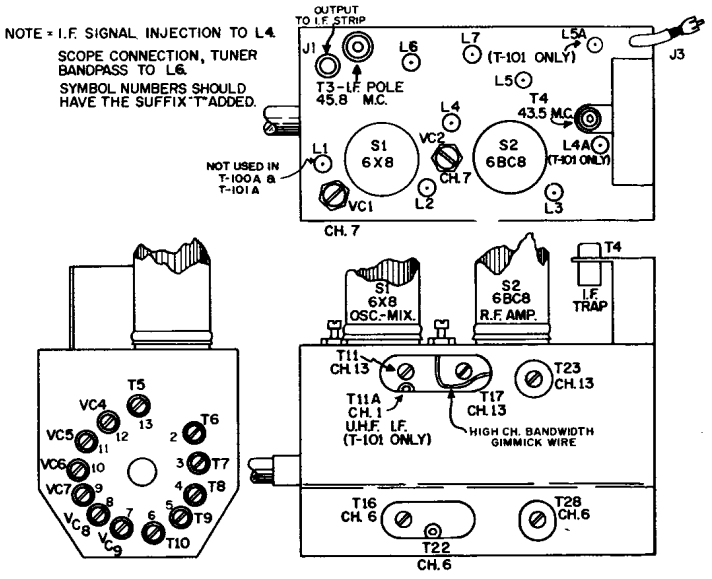
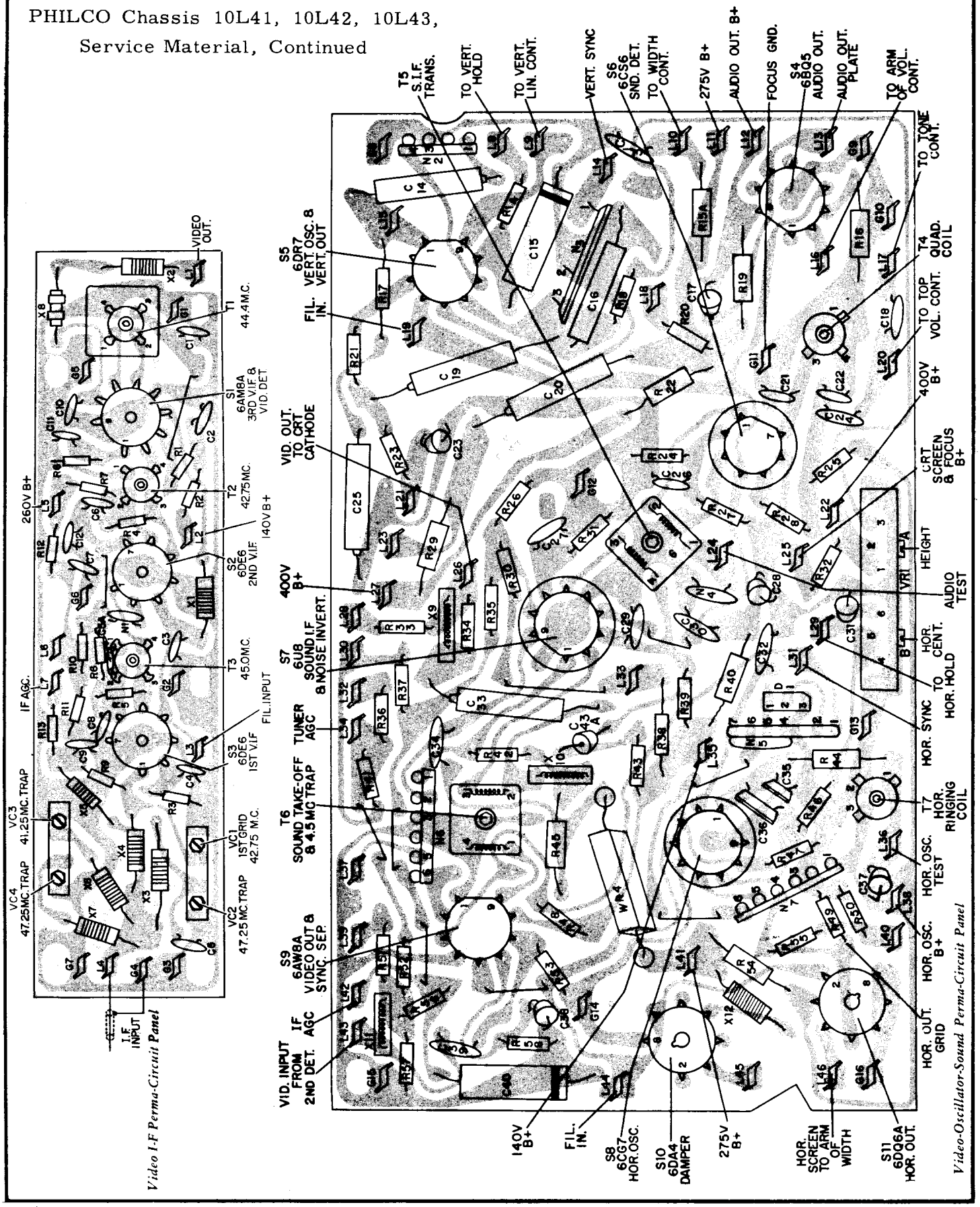


Figure 6. VHF Tuner Adjustment Locations, T-100 and T-101

PHILCO Chassis 10L41, 10L42, 10L43,
Service Material, Continued

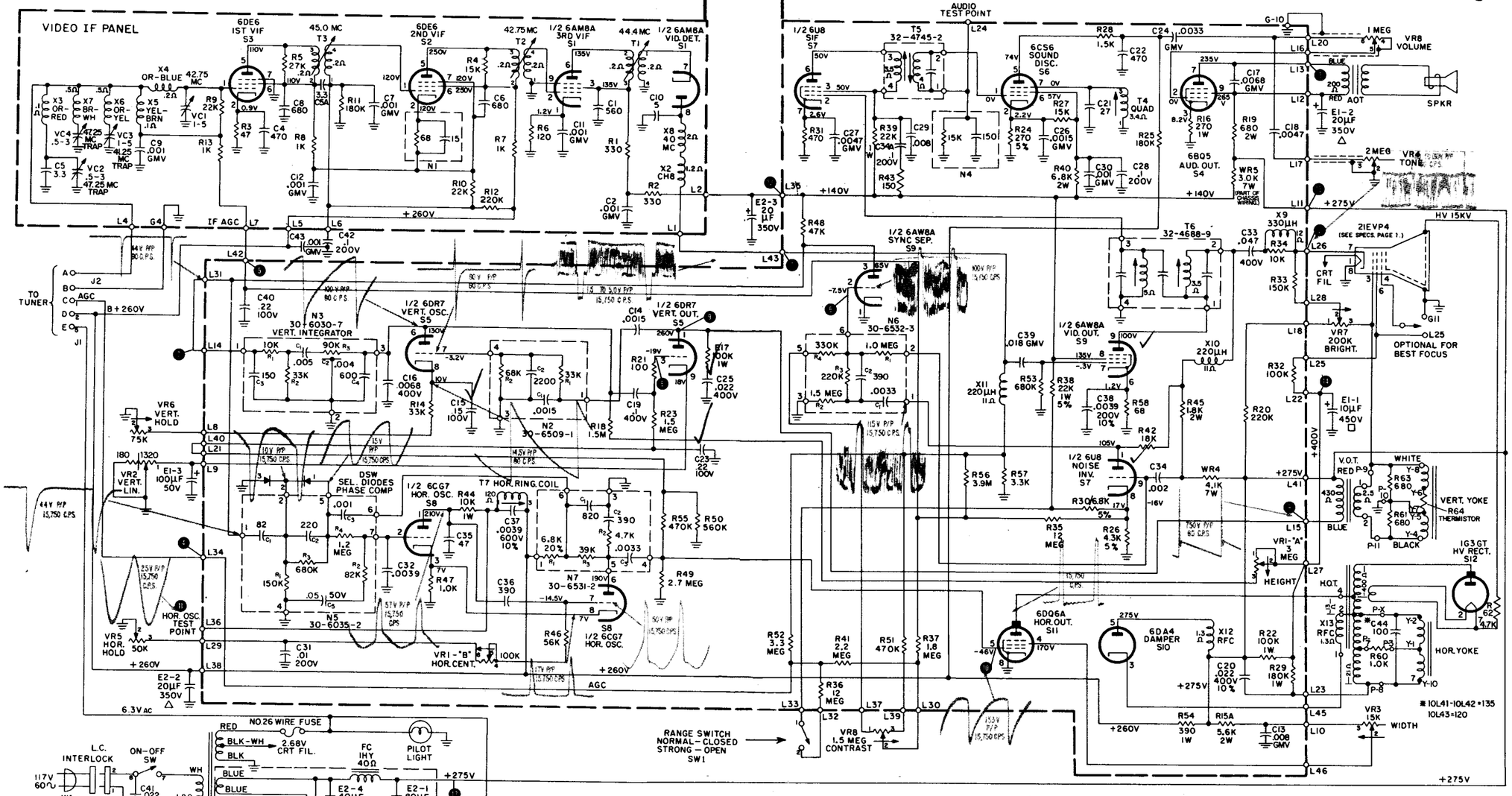


For Terminal Lug Identification of V. O. S. Panel see page 122

PHILCO Chassis 10L41, 10L42, 10L43, Schematic Diagram

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 4.0 volts at the video detector. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms—not the sweep rate of the oscilloscope. They were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poorer response, the peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ. Measurements given below were taken with range switch in normal position. At the 2nd det. output there is approximately a 3:1 decrease when switch is in strong position.



SPECIFICATIONS

Transmission Line	300 ohm input, twin wire lead
Operating Voltage	105 to 120 volts, 60 cycle, AC
Power Consumption at 117 volt line 10L41	190 watts
10L42	255 watts
10L43	190 watts

Intermediate Frequencies

Video Carrier	45.75 MC
Sound Carrier, V.I.F.	41.25 MC
S.I.F.	4.5 MC

Schematic Diagram for Chassis 10L41, 10L42 and 10L43

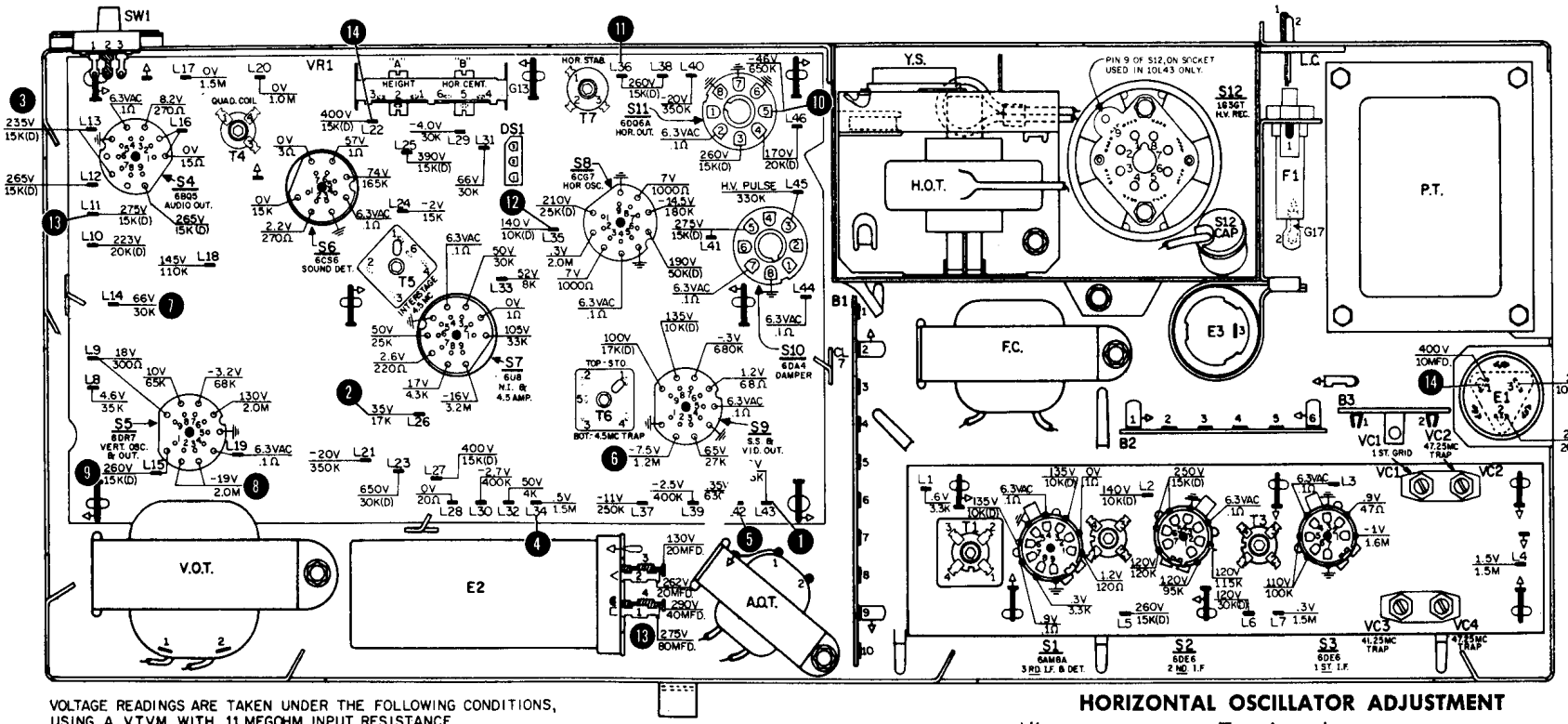
NOTES: All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD unless otherwise noted.
All resistors are ½ watt, 10%, carbon unless otherwise noted.
Arrow through control indicates clockwise rotation.
Voltages are DC from point shown to chassis unless otherwise noted.
Voltages were read using a 20,000 ohms/volt meter. Voltages were taken with no signal. The receiver was adjusted for a good quality picture; i.e., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.
Focus voltage optional for best focus.
Coil resistances read with coil in circuit.

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

PHILCO Chassis 10L41, 10L42, 10L43, Schematic Diagram

Terminal Lug Identification of V.O.S. Panel

L8 Lead to vertical hold control, white with yellow tracer.
L9 Vertical output cathode to vertical lin. control and E1-3, two white leads.
L10 Red/white lead to width control.
L11 270V B+.
L12 Red lead to audio output transformer and white/green lead to E1-2.
L13 Blue lead to audio output transformer.
L14 White/yellow jumper lead to L31.
L15 Blue/white lead from vert. out. plate to V.O.T.
L16 Green lead to arm of volume control.
L17 Yellow lead to tone control (not used in 10L43).
L18 Red/white lead to brightness control.
L19 Two brown/white filament leads.
L20 Blue lead to high side of volume control.
L21 Output bias, white jumper lead to L40.
L22 Orange/white jumper lead to L27, 400V.
L23 Brown/white lead to yoke socket lug 7. Boost voltage line to H.O.T. lug 1 and hor. yoke.
L24 Audio test lug.
L25 Orange/white lead to CRT pin 6, screen grid.
L26 Yellow/white lead to CRT pin 7, cathode.
L27 Orange/white jumper lead to L22 and orange/white lead to E1-1.
L28 Orange/white lead to arm of brightness control.
L29 Blue/white lead to horizontal hold control.
L30 Green/white lead to arm of contrast control.
L31 Yellow/white jumper lead to L14.
L32 Red/white lead to range switch.
L33 White lead to range switch.
L34 White tuner AGC lead.
L35 Orange/white lead to E2-3, 140V B+.
L36 Hor. oscillator test point.
L37 Yellow/white to low side of contrast control.
L38 Blue/white lead to E2-2.
L39 Blue/white lead to high side of contrast control.
L40 White jumper lead to L21.
L41 Red/white lead, 270V B+.
L42 White lead to IF L7.
L43 Green/white video input lead.
L44 Brown/white filament lead.
L45 Brown damper cathode lead to X13.
L46 Orange/white lead to arm of width control.



Top View Showing Voltage and Resistance Readings

VOLTAGE READINGS ARE TAKEN UNDER THE FOLLOWING CONDITIONS, USING A VTVM WITH 11 MEGOHM INPUT RESISTANCE.

VOLUME	FULL TURN CCW.	WIDTH	HALF TURN CW.
TONE	FULL TURN CCW.	HOR. CENT	HALF TURN CW.
CONTRAST	FULL TURN CW.	HEIGHT	HALF TURN CW.
BRIGHTNESS	FULL TURN CW.	VERT. HOLD	HALF TURN CW.
VERT. LIN.	HALF TURN CW.	HOR. HOLD	HALF TURN CW.
		FRINGE SWITCH	LOCAL POSITION.

NOTE
ALL VOLTAGE & RESISTANCE MEASUREMENTS SHOWN ON THIS DRAWING, ARE MADE WITH NO SIGNAL ON ANTENNA AND THE YOKE PLUGGED INTO (Y.S.) YOKE SOCKET.

HORIZONTAL OSCILLATOR ADJUSTMENT

Allow set to warm up. Tune in a picture.

1. Short out the horizontal ringing coil, T7, by placing a jumper across C37 by jumping L36 and L38.
2. Set the horizontal hold control, VR5, to the center of its range.
3. Adjust the horizontal hold centering control, VR1B, to set the oscillator to the correct horizontal line frequency (to stop the picture; it will not be stable).
4. Remove the shorting jumper from across C37 and adjust the ringing coil, T7, core for stable picture sync.

RCA VICTOR

MODELS

230-K-536, 230-K-536U
230-K-537, 230-K-537U
230-K-556, 230-K-556U
230-K-559, 230-K-559U
240-K-495M, 240-K-495MU
240-K-497M

CHASSIS NOS.

KCS127L, M, R, T, U & W

The sets of this group are identical to some sets covered in this section, but may differ in type of tuners and the use of 23" picture tubes instead of 21" size.

MODELS

N2026, N2026SU
210-K-405-406 & 407
210-KA-465 & 466
210-T-171-172 & 172U
210-T-195-196 & 199
240-K-495X & 495XU
240-K-496X & 497X

CHASSIS NOS.

KCS127A, B, F, K, AC, LX, MX & ZK

The material below and on the next nine pages is exact for above listed group of sets. Several different tuners are used and the circuitry of some is shown.

MODELS 230-K-505 & U

230-K-505SU, 230-K-506 & U
230-K-509 & U, 230-K-50C4 & U
230-K-50C4SU, 230-K-50N6 & U
230-K-50N6SU, 230-K-545 & U
230-K-546 & U, 230-K-549 & U
230-KR-525SU, 230-KR-526SU

CHASSIS NO.

KCS127AF, AH, ZAA, ZAB, ZAE, ZAF & ZAH

These 23" picture size receivers are identical to those covered in this section except for tuners used.

COMBINATION RECEIVERS

MODELS

240-KV-775SU, 240-KV-776SU

CHASSIS NOS.

Television Chassis — KCS127AE

These stereo phonograph, AM-FM tuners, and TV combination sets use a TV section that is very similar to units described here.

(Continued on the next nine pages)

RCA Victor Chassis KCS-127+ Group, Service Information, Continued

CENTERING ADJUSTMENT

Centering is accomplished by means of two levers on the back of the yoke. By alternately rotating one magnet with respect to the other, then rotating both simultaneously around the neck of the tube, proper centering of the picture can be obtained.

DEFLECTION YOKE ADJUSTMENT

If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the yoke clamp screw.

CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the horizontal hold control to the extreme clockwise position. The picture should be out of sync, with a minimum of eight bars slanting downward to the left. Turn the control counter-clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 1½ to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional counter-clockwise rotation of the control. The picture should remain in sync for approximately one quarter of a full turn of additional counter-clockwise rotation of the control. Continue counter-clockwise rotation until the picture falls out of sync. Rotation beyond fall out position should produce a minimum of 2 bars before end of rotation or a minimum of 7 bars before interrupted oscillation "motorboat" occurs.

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Adjustment of Horizontal Oscillator" and proceed with "Centering Adjustment."

ADJUSTMENT OF HORIZONTAL OSCILLATOR

If in the above check the receiver failed to hold sync for one-quarter of a turn of counter-clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

The width and drive adjustments should be properly set, as explained in the paragraph below, before adjusting the sine wave coil.

Connect a short jumper across the terminals of the sine wave coil L501-A on PW500 deflection board. Also short the grid of the sync output tube, pin 2 of V502, to ground with a small screwdriver or jumper.

Adjust the horizontal hold to obtain a picture with the sides vertical (picture may drift slowly sideways). Remove the jumper on the sine wave coil L501-A and adjust L501-A to again obtain a picture with the sides straight. When the sine wave coil is properly adjusted, alternate shorting and no short should not cause a change in frequency, only a slight sideways shift should occur.

Remove the short on the grid of the sync output. The horizontal hold should now perform as outlined above under "CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT."

WIDTH AND DRIVE ADJUSTMENTS

Set the horizontal control at the "pull-in" point. Set the width coil maximum counter-clockwise and adjust horizontal drive trimmer counter-clockwise until a bright vertical line appears in the middle of the picture then clockwise until the bright line just disappears. If no line appears set the drive trimmer at maximum counter-clockwise position.

At normal brightness adjust the width coil L101 to obtain ¾" overscan at each side with normal line voltage.

Readjust the drive trimmer C101 as was done previously.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the height control R528 until the picture overscans approximately ⅝" at botth top and bottom. Adjust vertical linearity R531 until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust centering to align the picture with the mask.

CHASSIS REMOVAL

To remove the chassis from the cabinet for repair, remove the on/off volume and contrast control knobs at the side or front of the cabinet, whichever applies to the particular model involved. On front tuning models also remove the brightness, vertical hold and horizontal hold control knobs. Remove the cabinet back and unplug the antenna cable, the speaker cable, the kinescope socket and the yoke plug. Disconnect the H. V. anode lead.

(NOTE:—On Models N2026 and N2026SU the speaker cable clamp must be removed and the speaker unplugged under the left side of the cabinet. Also, the antenna cable clamp at the center of the chassis shelf must be unmounted to provide clearance for removing the chassis.)

Unplug the tuner power plug. Remove the screws holding the on/off volume control bracket to the tuner mounting bracket. Also remove the screws of the brightness/vertical/-horizontal bracket at the front or the top rear rail.

The chassis is mounted by bolts through the cabinet bottom and by brackets at the top left and right sides of the chassis. Remove the screws holding the brackets and the bolts holding the bottom of the chassis. Carefully slide the chassis out of the cabinet, disengaging the contrast control shaft extension.

(NOTE:—The contrast control on Models 240-K-495X & XU, -496X and -497X is mounted on a separate bracket at the side of the cabinet.)

If it is necessary to remove the tuner and its bracket, the remaining knobs at the side or front of the cabinet must be removed and the tuner bracket unmounted from the cabinet. (On Models 210-KA-465 and 210-KA-466, incorporating the clock timed programmer, the three programmer plugs should be disconnected from the tuner assembly before removing the tuner bracket.)

Models N2026 & N2026SU

The kinescope and chassis compartment must be swung up to the viewing position before the chassis may be removed. **WARNING:—AFTER REMOVING THE CHASSIS, REACH UNDER THE SPEAKER COMPARTMENT AND DISCONNECT THE LARGE COUNTER-BALANCE SPRING AT THE INNER END. DO NOT LEAVE THE SPRING CONNECTED WITH THE CHASSIS REMOVED FROM THE CABINET. THIS IS IMPORTANT AS PERSONAL INJURY, OR DAMAGE TO THE CABINET, MAY RESULT IF THE KINESCOPE AND CHASSIS COMPARTMENT IS UNLATCHED, FROM ITS CLOSED POSITION, WITH THE CHASSIS OUT OF THE CABINET. WHEN REPLACING THE CHASSIS, RECONNECT THE BALANCE SPRING, THEN FASTEN THE CHASSIS IN POSITION.**

The chassis is attached to a platform at the bottom and to the cabinet by a bracket at the upper right side. Remove the wood screws holding the platform to the cabinet shelf and the screw holding the bracket. Unmount the small contrast control bracket at the left side of the cabinet and the on/off-volume control bracket from the tuner mounting bracket. Carefully remove the chassis, on the platform, from the compartment and lower the compartment to the closed position.

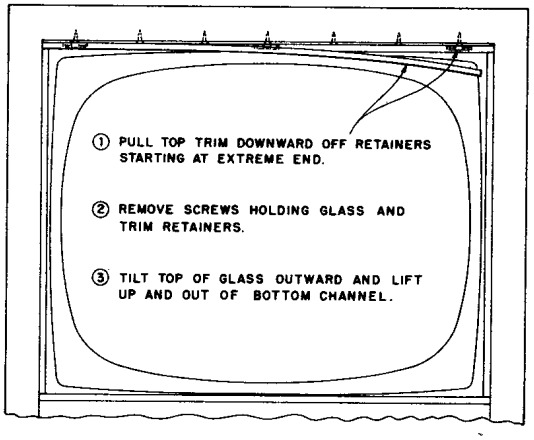


Figure 8—Safety Glass Removal (Models N2026 & SU, 210-KA-465 & 6, 240-K-495X, 5XU, 6X & 7X)

RCA Victor Chassis KCS-127+ Group, Alignment Information (Continued)

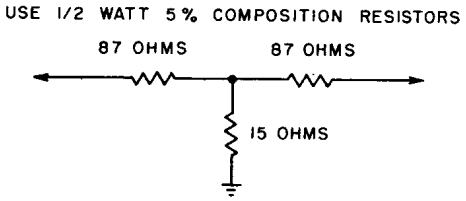


Figure 9—Sound Attenuation Pad

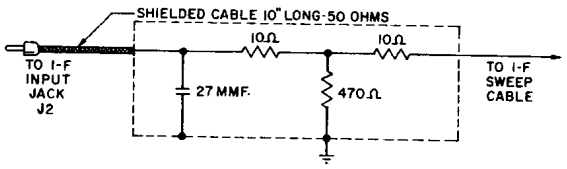


Figure 10—Tuner I-F Input Head

PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

BIAS ..... Ground the I-F AGC bus at terminal "N" of PW200.

SIGNAL GENERATOR ..... Connect to mixer grid, at strap on S1B for KRK72, KRK73, KRK85 and KRK86 series tuners or to test point TP2 for KRK87 series tuners, in series with 1500 mmf. capacitor (see below).

VACUUM TUBE VOLTMETER .... Connect to 2nd Detector output at test point TP204 of PW200 using direct probe. Ground lead connected to chassis.

	STEP	SIGNAL GENERATOR	ADJUST	REMARKS
1	Peak 3rd pix. I-F transformer	44.5 mc.	T208	Peak T208, T207 & T206 on frequency for maximum output on meter. Adjust generator output for 3 volts on meter when finally peaked.
2	Peak 2nd pix. I-F transformer	45.5 mc.	T207	
3	Peak 1st pix. I-F transformer	43.0 mc.	T206	
4	Adjust 47.25 mc. traps	47.25 mc.	T205	Minimum output indication on meter.

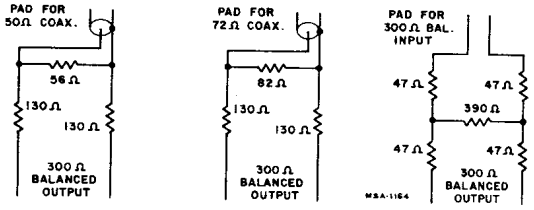


Figure 11—Sweep Attenuator Pads

Figure 12—Picture I-F Transformer and Trap Adjustments

RCA Victor Chassis KCS-127+ Group, Alignment Information, Continued

SWEEP ALIGNMENT OF PICTURE I-F

TEST EQUIPMENT CONNECTIONS:

BIAS SUPPLY ..... Set for 0.0 volts on I-F AGC bus at "N" of PW200, and —3.0 volts to tuner AGC terminal.
OSCILLOSCOPE ..... Connect a .001 mf. capacitor in series with a 180 ohm resistor from TP202 to ground, with the capacitor connected to TP202. Connect oscilloscope to the junction of the resistor and capacitor, using diode probe. (See below.)
SWEEP GENERATOR ..... Connect in series with 1500 mmf. to S1B (or test point TP2 on KRK87 series tuners) at mixer grid. Use shortest leads possible. (See below.)
SIGNAL GENERATOR ..... Couple loosely to sweep output cable to provide markers.
VACUUM TUBE VOLTMETER .... Connect to 2nd Detector output at test point TP204. Use DC probe.

STEP		SWEEP GENERATOR	SIGNAL GENERATOR	ADJUST	REMARKS
Set channel selector to channel 4.					
1	Adjust mixer plate coil	40 - 50 mc. (I-F)	42.5 mc. 45.75 mc.	L11—KRK87 L18—KRK72 L56—KRK85 86 T2—KRK73	Sweep output set for 0.5 v. P-P on scope. Adjust for max. gain and response "A" below. Max. allow. tilt 20%.
2	Adjust I-F input	40 - 50 mc. (I-F)	42.5 mc. 45.75 mc.	T204 & C120	
Remove 180 ohm, .001 capacitor and scope from TP202. Connect scope to test point TP204, using direct probe. Set bias supply for —3 volts at terminal "N" of PW200.					
3	Retouch I-F transformers	40 - 50 mc. (I-F)	42.5 mc. 45.0 mc. 45.75 mc.	T208 T207 T206	Adjust for response "B". Use 5 v. P-P on scope.
Remove sweep from mixer grid. Couple signal generator to mixer, in series with pad shown in Figure 9. Set generator to 45.75 mc. and adjust output for exactly one and one-half (1½) volts on the "VoltOhmyst". Remove the pad and connect generator direct to mixer grid. Do not change generator output in step 4.					
4	Set 41.25 mc. attenuation	—	41.25 mc.	T206 & T208	Adjust for 1.2 to 1.5 volts on VTVM with response "B".
5	Connect sweep generator to antenna terminals using pad shown in Figure 11.				
	Check overall	Chans. 13 to 2	42.5 mc., 45.0 mc. 45.75 mc.	T207 & T208	Retouch slightly to correct overall tilt. Maintain response "B".

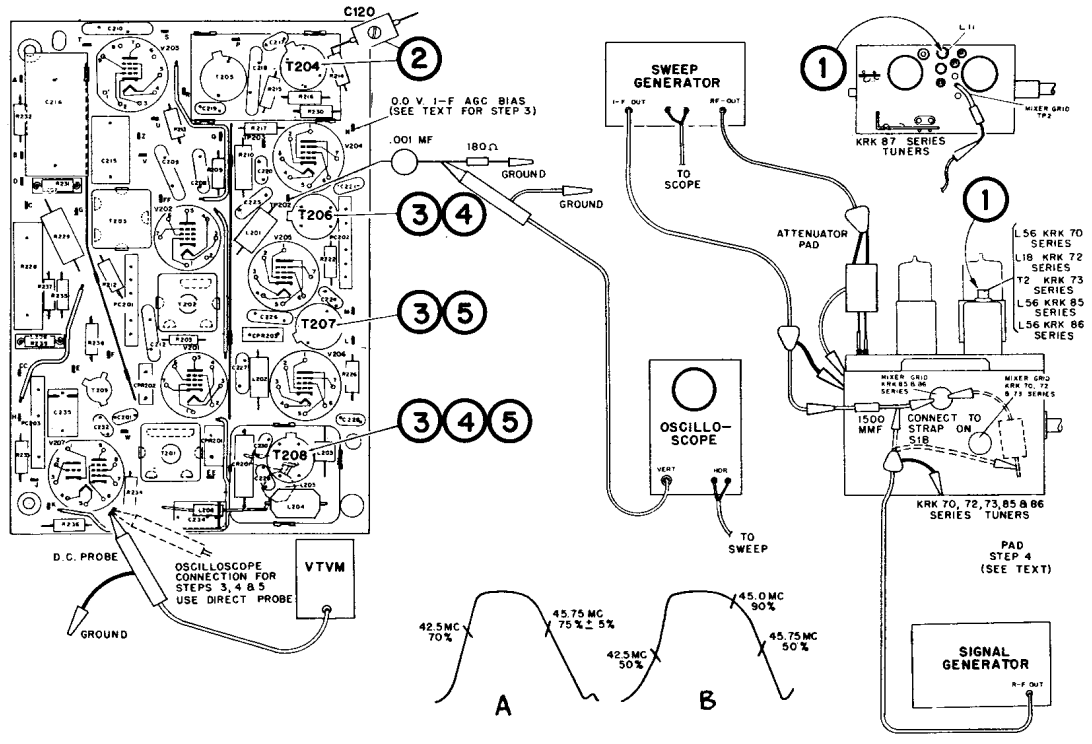


Figure 13—Sweep Alignment from Mixer Grid

RCA Victor Chassis KCS-127+ Group, Alignment Information, Continued

SOUND I-F, SOUND DETECTOR AND 4.5 MC TRAP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

BIAS SUPPLY ..... Apply —10 volts to the I-F AGC bus at terminal "N" on PW200.
OSCILLOSCOPE ..... Connect across speaker voice coil.
SIGNAL GENERATOR ..... Connect to test point TP204 on PW200.
VACUUM TUBE VOLTMETER .... Connect to output of diode detector shown below. Set meter for negative voltage readings.
MISCELLANEOUS ..... Connect test diode detector, as shown below, to pin 7 of V202.

	STEP	SIGNAL GENERATOR	ADJUST	REMARKS
	Set contrast control maximum clockwise.			
1	Adjust Driver Transformer Primary and Secondary	4.5 mc.	T202 (top & bottom)	Adjust T202 top & bottom for maximum on meter. Set generator for 1.0 to 1.5 volts when peaked. Peak cores at open end of coils.
2	Adjust Sound Take-Off Trans.	4.5 mc.	T201	Adjust T201 for maximum negative DC on meter. Set generator for 1.0 to 1.5 volts on meter.
3	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area adjusting volume control for normal volume (approx. ¼ turn from c.c.w.). Turn core of T203 flush with top of coil form.			
4	Adjust Sound Detector Trans.	Observing oscilloscope and listening to audio output adjust T203 clockwise to a peak. Continue clockwise to second louder peak and adjust for maximum on this peak.		
	Move the oscilloscope to terminal "A" on PW200. Use the diode probe. Set the contrast control to maximum clockwise position.			
5	Adjust 4.5 mc. trap	4.5 mc., A-M Mod., 400 Cycles	T209	Adjust for minimum 400 cycle indication on oscilloscope.
	Alternate Method Using Generators With F-M Modulation Provided.			
1	Same as step 1 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
2	Same as step 2 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
3	Adjust Sound Detector Trans.	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T203	Adjust T203 for max. 400~ output on scope using max. amplitude peak. Set volume control for .70 v. p-p on scope when peaked. See response below.
4	Retouch Driver and Sound Take-Off. Trans. for breakout	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T201 & T202	Decrease input to minimum usable signal. Retouch T201 & T202 for symmetrical breakout. Response below.
	Move the oscilloscope to terminal "A" on PW200. Use the diode probe. Set the contrast control to maximum clockwise position.			
5	Adjust 4.5 mc. trap	Same as step 5 above. Adjust for minimum 400 cycle indication on oscilloscope.		

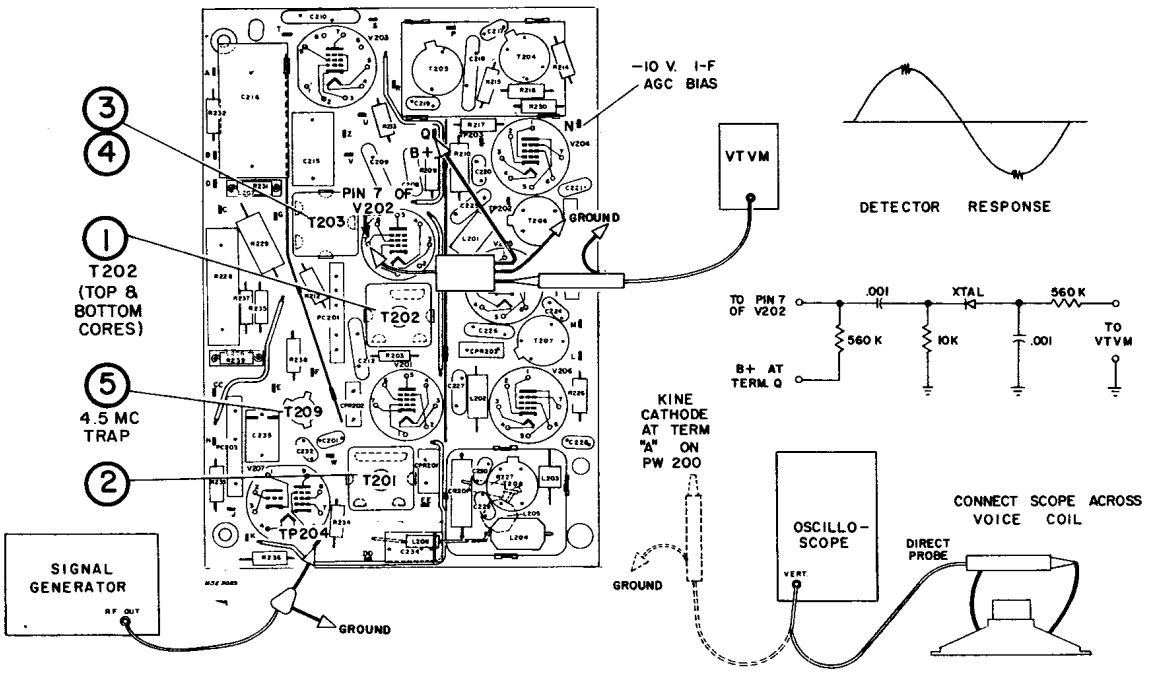


Figure 20—Sound I-F, Sound Detector and 4.5 mc. Trap Alignment

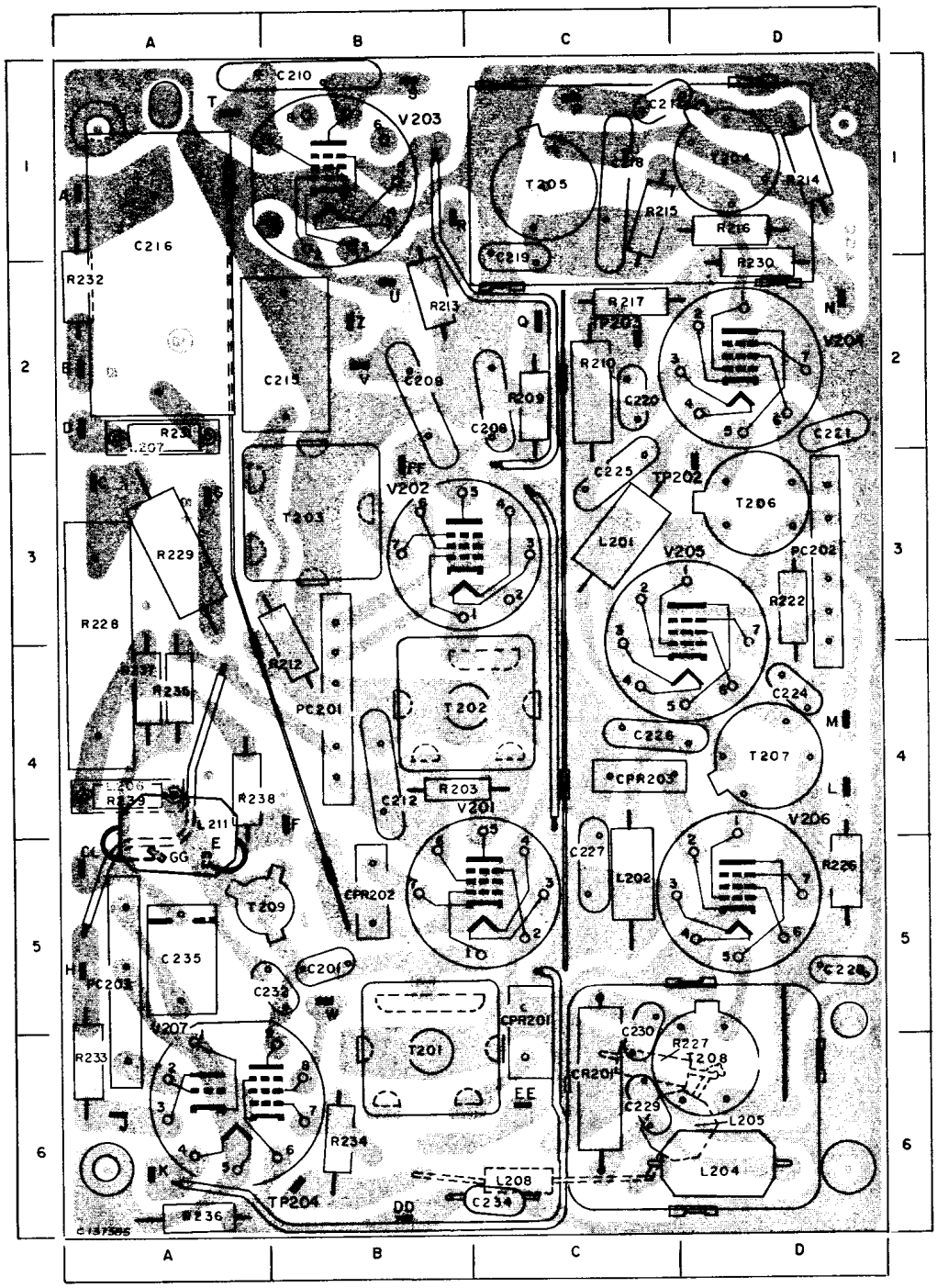
RCA Victor Chassis KCS-127+ Group, Circuit Assembly Data (Continued)

The assemblies are viewed from component side of circuits and are oriented as they will usually be viewed when servicing the chassis.

The printed wiring, on the reverse side of the circuits is duplicated in the white printing on the component side, along with identification of the components.

Figures 27 and 29 are diagrammatic views of the circuits showing the printed wiring in a "phantom" view superimposed on the component layout.

The coordinate letters and numbers, shown at the sides of the assembly views, are provided for rapid location of components. Reference to the location guide will show the location of any given component. The component will be found in the area designated by the particular letter/number combination indicated.

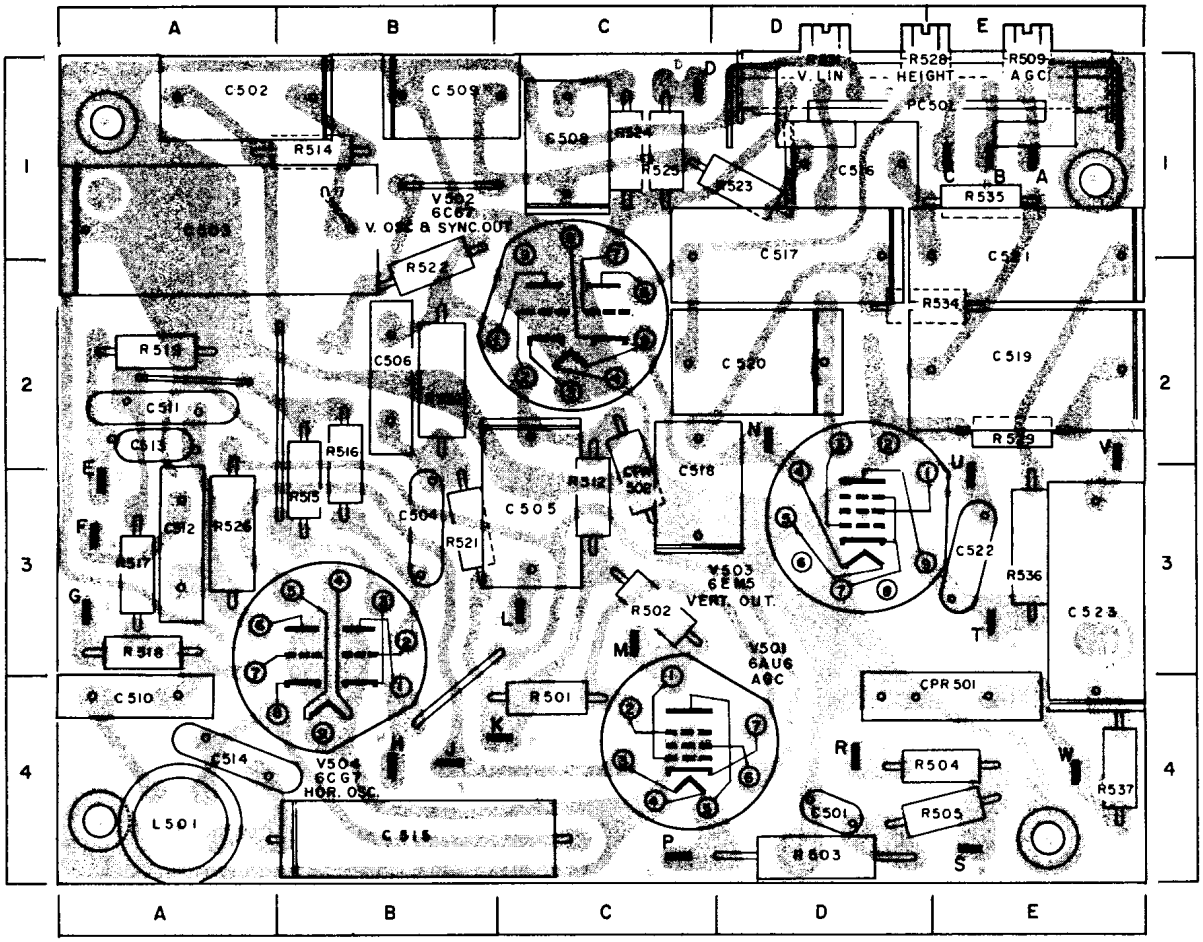


PW200 COMPONENT LOCATION GUIDE

C201	B5
C208	C2
C209	B2
C210	B1
C212	B4
C215	B2
C216	A1
C217	C1
C218	C1
C219	C1
C220	C2
C221	D2
C224	D4
C225	C3
C226	C4
C227	C5
C228	D5
C229	C6
C230	C5
C232	B5
C234	C6
C235	A5
C238	D3
C239	A6
CPR201	C5
CPR202	B5
CPR203	C4
CR201	C6
L201	C3
L202	C5
L204	D6
L205	D6
L206	A4
L207	A2
L208	C6
L211	A5
PC201	B4
PC202	D3
PC203	A5
R203	B4
R209	C2
R210	C2
R212	B3
R213	B2
R214	D1
R215	C1
R216	D1
R217	C2
R222	D3
R226	D5
R227	C6
R228	A4
R229	A3
R230	D1
R231	A2
R232	A2
R234	B6
R235	A4
R236	A6
R237, R238, R239	A4
T201	B6
T202	C4
T203	B3
T204	D1
T205	C1
T206	D3
T207	D4
T208	D6
T209	A5

Figure 27—PW200 Sealed Circuit I-F and Video Assembly Composite Diagram

RCA Victor Chassis KCS-127+ Group, Circuit Assembly Data (Continued)



PW500 COMPONENT LOCATION GUIDE

C501	D4	C508	C1	C515	B4	C522	E3	PC501	D1	R512	C3	R520	B2	R529	E2
C502	A1	C509	B1	C516	D1	C523	E3			R514	B1	R521	B3	R534	D2
C503	A1	C510	A4	C517	D1			R501	C4	R515	B3	R522	B2	R535	E1
C504	B3	C511	A2	C518	C3	CPR501	E4	R502	C3	R516	B3	R523	D1	R536	E3
C505	C3	C512	A3	C519	E2	CPR502	C3	R503	D4	R517	A3	R524	C1	R537	E4
C506	B2	C513	A2	C520	D2			R504	E4	R518	A3	R525	C1	R547	B1
C507	B1	C514	A4	C521	E1	L501	A4	R505	E4	R519	A2	R526	A3		

Figure 29—PW500 Sealed Circuit Assembly Composite Diagram

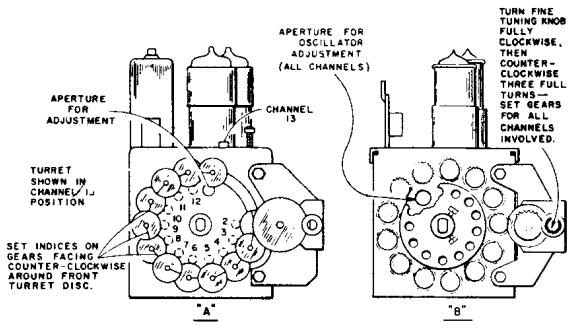
AGC CONTROL ADJUSTMENT

To check the adjustment of the AGC Control, tune in a strong signal and sync the picture. Momentarily remove the signal by switching off channel and then back. If the picture reappears immediately, the receiver is not overloading due to improper setting of R509. If the picture requires an appreciable portion of a second to reappear, or bends excessively, R509 should be readjusted.

Turn R509 fully clockwise. The raster may be bent slightly. This should be disregarded. Turn R509 counter-clockwise until there is a very slight bend or change of bend in the picture. Then turn R509 clockwise just sufficiently to remove the bend or change of bend.

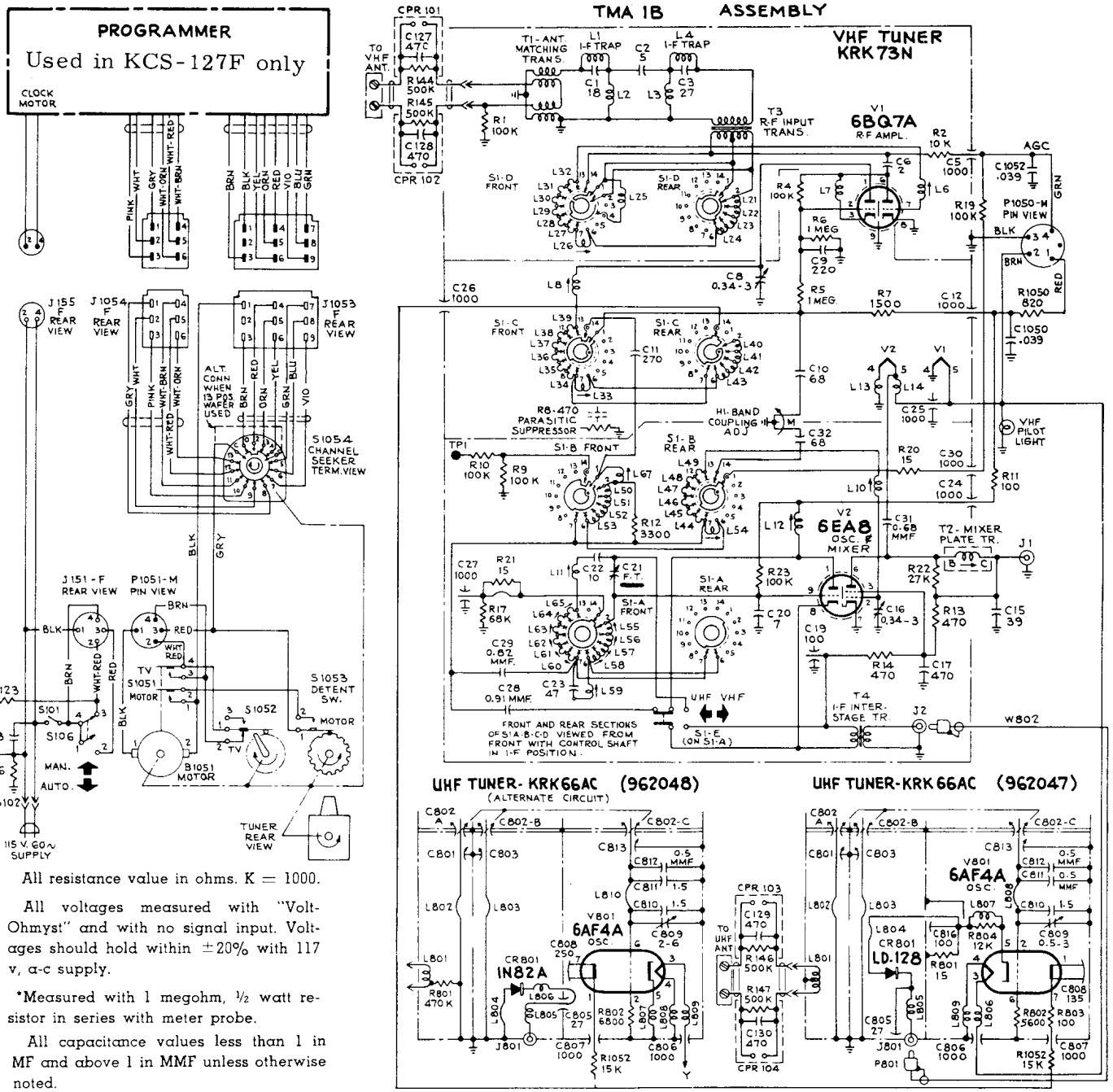
If the signal is weak, the above method may not work as it may be impossible to get the picture to bend. In this case, turn R509 counter-clockwise until the snow in the picture becomes more pronounced, then clockwise until the best signal to noise ratio is obtained.

The AGC control adjustment should be made on as strong a signal as possible.



VHF Oscillator Adjustments ("One-Set" Tuners)

RCA Victor Chassis KCS-127+ Group, Service Information, Continued



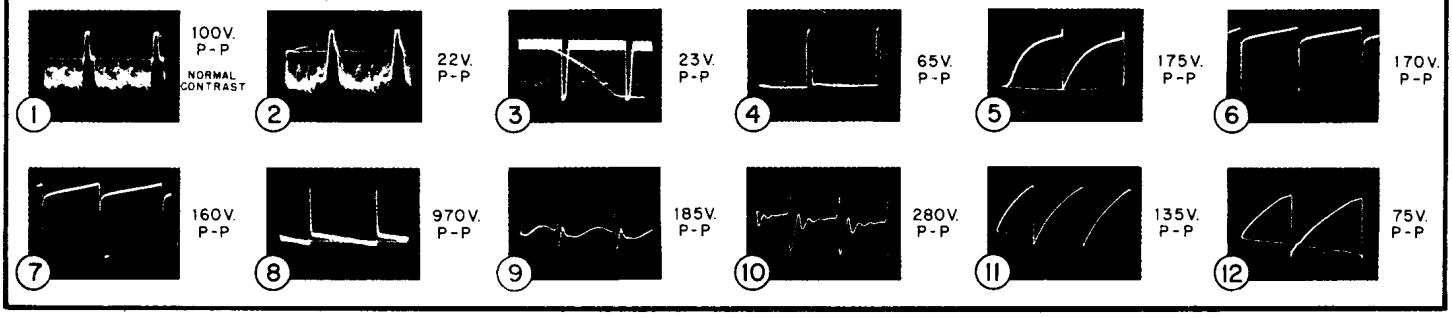
All resistance value in ohms. K = 1000.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v, a-c supply.

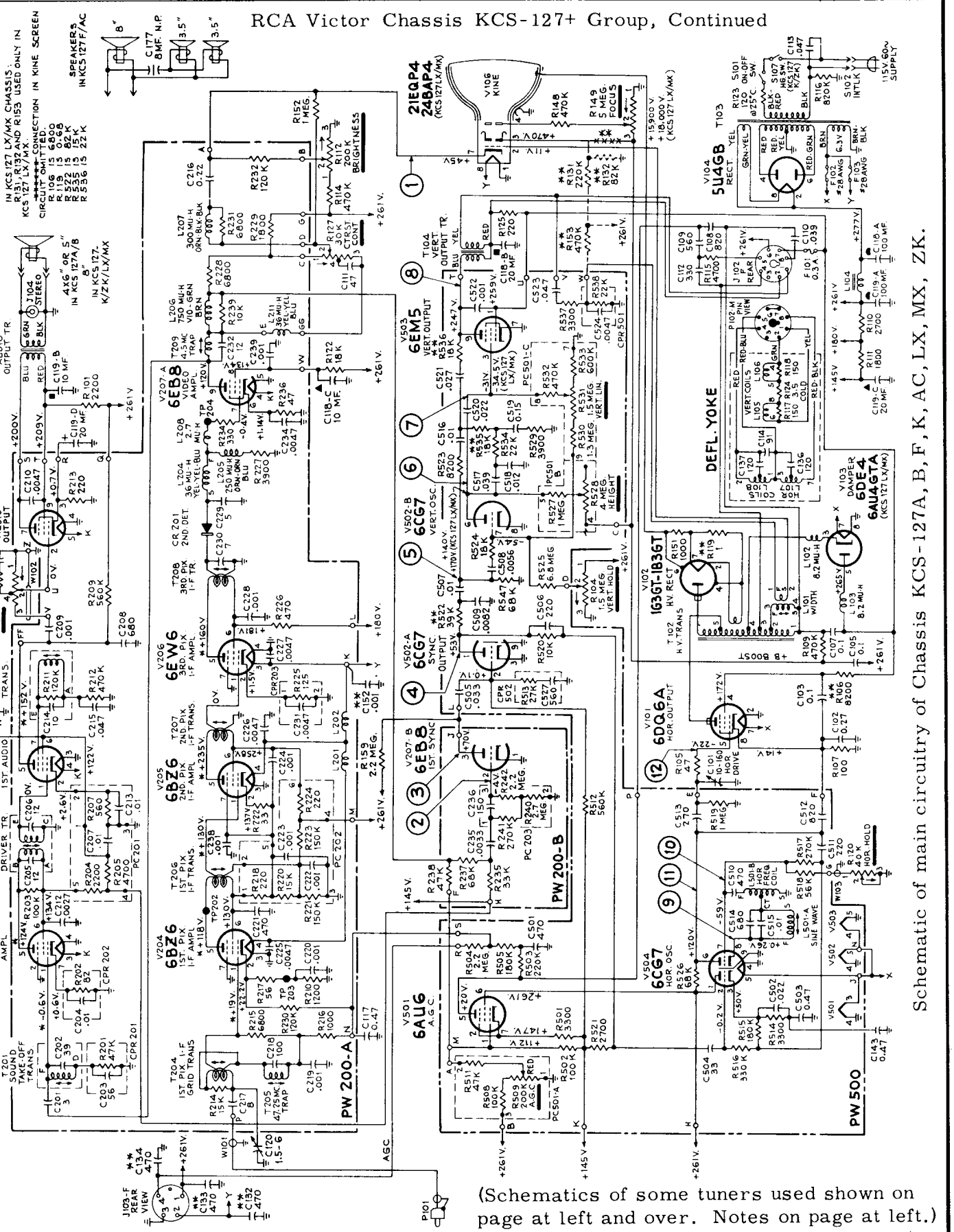
*Measured with 1 megohm, ½ watt resistor in series with meter probe.

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

Balloons ① ② etc., shown on schematics indicate points of observation of the waveforms shown below.



RCA Victor Chassis KCS-127+ Group, Continued



Schematic of main circuitry of Chassis KCS-127A, B, F, K, AC, LX, MX, ZK.

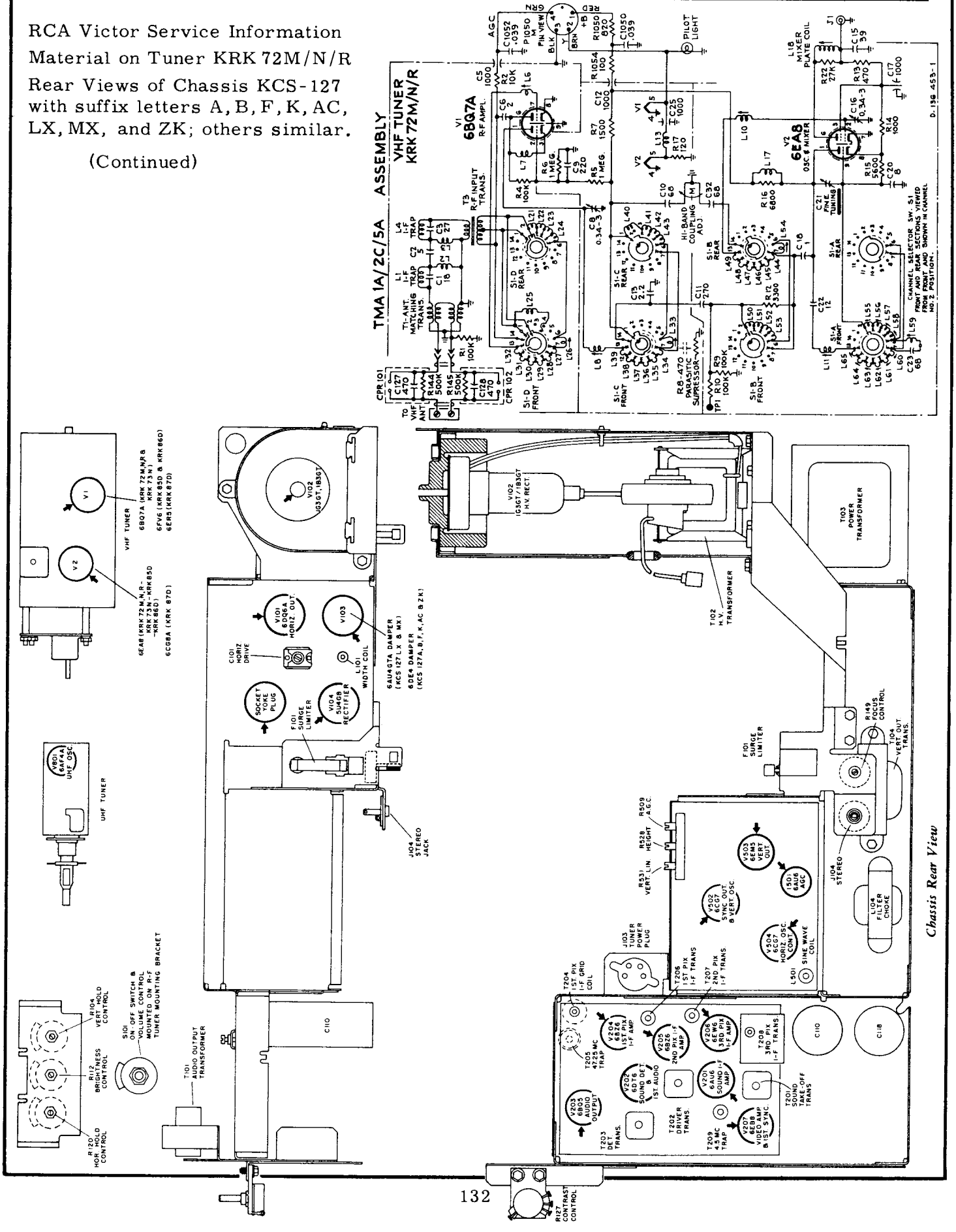
R214 changes from 15,000 ohms to 10,000 ohms ± 5%, ½ watt resistor.
C217 changes from 8mmfd to 9.5mmfd ± 0.5mmfd 500 volts.
C120 trimmer capacitor has been eliminated.

(Schematics of some tuners used shown on page at left and over. Notes on page at left.)

RCA Victor Service Information Material on Tuner KRK 72M/N/R

Rear Views of Chassis KCS-127 with suffix letters A, B, F, K, AC, LX, MX, and ZK; others similar.

(Continued)



TELEVISION RECEIVERS—MODELS

210-K-295M-6M-7M-9M-5MU & 7MU
210-K-315M-6M-7M-9M-5MU & 7MU
210-K-335M-6M-7M & 5MU
210-K-356M & 7M, 210-K-390M & 4M
210-K-415M-6M-7M & 5MU
210-KR-435M, 210-KR-436M
210-KR-445M, 210-KR-446M
210-T-140M, 210-T-152M-5M & MU
210-T-156M-7M & MU, 210-TR-212M
210-TR-222M-5M & 7M
240-K-485M, 240-K-486M

CHASSIS NOS.

KCS128H, J, AC, AE, AF, YA, YB, YE, YM, YU, YAA & YAB

The sets in this group are identical to some sets covered in this section, but differ in type of tuners employed.

RCA VICTOR

TELEVISION RECEIVERS—MODELS

210-K-295-6-7-9-5U-7U-5SU & 7SU
210-K-315-6-7-9-5U & 7U
210-K-335-6-7 & 5U, 210-K-356 & 7
210-K-365-6 & 5SU, 210-K-390 & 4
210-K-415X-6X-7X & 5XU
210-KR-435-6-5SU & 6SU
210-KR-445-6-5SU & 6SU
210-KR-455-6-7-5SU-6SU & 7SU
210-T-140, 210-T-152-2U & 2SU
210-T-155-6-5U-6U-5SU & 6SU
210-T-157-U & SU, 210-TR-212 & SU
210-TR-222-5-7 & 5SU, 240-K-485 & 6

CHASSIS NOS.

KCS128A, B, C, E, F, M, U, AA, AB, HX, JX, YC, YP, ZA, ZM, ZP, ZU & ZAA

The material below and on the next nine pages is exact for above listed group of sets. Circuits of two of the three tuners used are shown. The remote control models used two different receivers-transmitters and the circuit of one of these is on page 142.

MODELS 210-K-244 & U
210-K-244SU, 210-K-255 & U
210-K-256 & U, 210-K-256SU
210-K-295 & U, 210-T-162 & U
210-T-185 & U, 210-T-185SU
210-T-186 & U, 210-T-187 & U
210-TR-215M, 210-TR-215SU

CHASSIS NOS.

KCS128YE, YF, YU, YAD, YAE, YAF, ZU & ZAE

These 21" picture size receivers are identical electrically to sets covered in this section except that some may use different tuners.

WIDTH AND DRIVE ADJUSTMENTS

Set the horizontal control at the "pull-in" point. Set the width coil maximum counter-clockwise and adjust horizontal drive trimmer counter-clockwise until a bright vertical line appears in the middle of the picture then clockwise until the bright line just disappears. If no line appears set the drive trimmer at maximum counter-clockwise position.

At normal brightness adjust the width coil L101 to obtain 3/4" overscan at each side with normal line voltage.

Readjust the drive trimmer C101 as was done previously.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the height control R528 until the picture overscans approximately 5/8" at both top and bottom. Adjust vertical linearity R531 until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust centering to align the picture with the mask.

(Continued on pages 134 through 142)

RCA Victor Chassis KCS-128+ Group, Service Information, Continued

CHASSIS DESIGNATIONS

CHASSIS	TUNER MOUNTING ASSEMBLY	TUNER ASSEMBLY	MODELS
KCS128A	TMA1C	KRK85D	210-T-152 & 5 210-T-156 & 7
KCS128B	TMA1D	KRK86D KRK66AC	210-T-152U & 5U 210-T-156U & 7U
KCS128C	TMA2A	KRK85D	210-K-356 & 7 210-K-390 & 4
KCS128E	TMA1K	KRK85F	210-K-335-6 & 7
KCS128F	TMA1L	KRK86F KRK66AC	210-K-335U
KCS128M	TMA3C	KRK85E	*210-KR-445 & 6 *210-KR-455-6 & 7 *210-TR-222-5 & 7
KCS128U	TMA4A	KRK85J	210-KR-435 & 6 210-TR-212
KCS128AA	TMA2K	KRK85D	210-K-295 & 6 210-K-297 & 9 210-K-315 & 6 210-K-317 & 9 240-K-485 & 6
KCS128AB	TMA2L	KRK86D KRK66P	210-K-295U & 7U 210-K-315U & 7U
KCS128HX	TMA1K	KRK85F	210-K-415X & 6X 210-K-417X
KCS128JX	TMA1L	KRK86F KRK66AC	210-K-415XU
KCS128YC	TMA1C	KRK85D	210-T-140
KCS128YP	TMA1K	KRK85F	210-K-365 & 6
KCS128ZA	TMA6A	KRK87A	210-T-152SU & 5SU 210-T-156SU & 7SU
KCS128ZM	TMA3E	KRK87C	*210-KR-445SU & 6SU *210-KR-455SU-6SU & 7SU *210-TR-225SU
KCS128ZP	TMA6C	KRK87J	210-K-365SU
KCS128ZU	TMA8A	KRK87B	210-KR-435SU & 6SU 210-TR-212SU
KCS128ZAA	TMA7A	KRK87A	210-K-295SU & 7SU

*These models also incorporate a CTP9A Remote Control Receiver chassis and a CRK3B Remote Control Transmitter assembly.

CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the horizontal hold control to the extreme clockwise position. The picture should be out of sync, with a minimum of eight bars slanting downward to the left. Turn the control counter-clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 1½ to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional counter-clockwise rotation of the control. The picture should remain in sync for approximately one quarter of a full turn of additional counter-clockwise rotation of the control. Continue counter-clockwise rotation until the picture falls out of sync. Rotation beyond fall out position should produce a minimum of 2 bars before end of rotation or a minimum of 7 bars before interrupted oscillation "motorboat" occurs.

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Adjustment of Horizontal Oscillator".

ADJUSTMENT OF HORIZONTAL OSCILLATOR

If in the above check the receiver failed to hold sync for one-quarter of a turn of counter-clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

Connect a short jumper across the terminals of the sine wave coil L501-A on PW500 deflection board. Also short the grid of the sync output tube, pin 9 of V501, to ground with a small screwdriver or jumper.

Adjust the horizontal hold to obtain a picture with the sides vertical (picture may drift slowly sideways). Remove the jumper on the sine wave coil L501-A and adjust L501-A to again obtain a picture with the sides straight. When the sine wave coil is properly adjusted, alternate shorting and no short should not cause a change in frequency, only a slight sideways shift should occur.

Remove the short on the grid of the sync output. The horizontal hold should now perform as outlined above under "CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT."

VHF R-F OSCILLATOR ADJUSTMENTS

Models 210-K-295-6-7-9-5U & 7U, 210-K-315-6-7 & 9, 210-K-335-6-7 & 5U, 210-K-356 & 7, 210-K-390 & 4, 210-K-365 & 6, 210-K-415X-6X-7X & 5XU, 210-T-140, 210-T-152-5-6-7 & U and 240-K-485 & 6

On these models adjustments for channels 2 through 12 are available through the holes on the front of the tuner. Adjustment for channel 13 is on top of the tuner chassis. Remove the channel selector knob to make adjustments. Pull knob outward off shaft. See Figure 6A. Set Fine Tuning to mechanical center of its range.

Models 210-K-295SU & 7SU, 210-K-365SU and 210-T-152SU-5SU-6SU & 7SU

On these models adjustments for all channels are available through the single hole on the front of the tuner. Remove the channel selector knob to make adjustments. Pull knob outward off shaft. See "B" of Figure 6. Set Fine Tuning to mechanical center of its range.

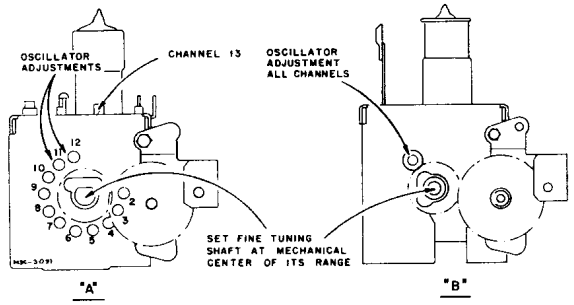


Figure 6—Oscillator Adjustments ("Off-Set" Fine Tuning)

All other models incorporate the "One-Set" fine tuning feature which requires one of the following procedures for oscillator adjustment.

Models 210-KR-435 & 6, 210-KR-445 & 6, 210-KR-455-6 & 7, 210-TR-212 and 210-TR-222-5 & 7

Remove the channel selector knob by pulling the knob outward off its shaft. There are twelve gear and cam assemblies around the disc on the tuner face, one for each channel from 2 through 13.

Depress the fine tuning knob and set each gear with the index mark on the gear facing counter-clockwise around the outer edge of the disc as shown in Figure 7A. With the gears in this position, the fine tuning capacitor will automatically position to its mechanical center for each channel. On some models, the channel selector must be rotated to bring each gear into view through the opening in the tuner mounting plate.

Switch to channel 13 and, if necessary, adjust the channel 13 slug on top of the tuner. Progress counter-clockwise from channel 13 downward to channel 2, adjusting the oscillator slug, if required, on each channel. Do not change the setting of the fine tuning cams during adjustment of the oscillator slugs. The proper slug for each channel will become accessible through the opening in the front disc as the channel selector is switched to the desired channel.

After the oscillator slugs are properly set for all channels, the fine tuning cam settings may be readjusted at any time to maintain identical tuning for all channels as the channel selector is rotated.

RCA Victor Chassis KCS-128+ Group, Service Information, Continued

Models 210-K-435SU & 6SU, 210-KR-445SU & 6SU, 210-KR-455SU-6SU & 7SU, 210-TR-212SU and 210-TR-225SU

Remove the channel selector knob by pulling the knob outward off its shaft. There are thirteen gear and cam assemblies around the disc on the tuner face.

Push in on the fine tuning knob and turn clockwise to the stop then counter-clockwise three full turns. Repeat this procedure for each gear. This places the fine tuning capacitor at the center of its mechanical range for each channel. Refer to Figure 7B.

Switch the channel selector to the individual channels, in any order, and adjust the oscillator slug for all channels to be used. The aperture for adjustment is in the same location for all channels as shown in Figure 7B. Do not change the settings of the fine tuning cams during adjustment of the oscillator slugs.

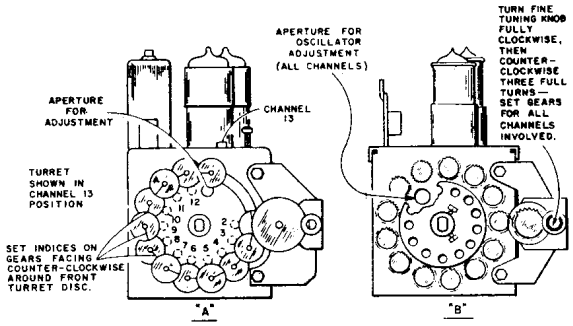


Figure 7—Oscillator Adjustments ("One Set" Fine Tuning)

KINESCOPE AND SAFETY GLASS CLEANING

The front safety glass may be removed to allow for cleaning of the kinescope faceplate and the safety glass if required.

Models 210-K-295-6-7-9-5U-7U-5SU & 7SU, 210-K-315-6-7-9-5U & 7U, 210-KR-455-6-7 & SU, 210-T-140, 210-T-152-5-6-7-U & SU, 210-TR-212 & SU, 210-TR-222-5-7 & 5SU and 240-K-485 & 6 have a channel under the front top edge of the cabinet, in front of the top of the safety glass. Take out the screws holding the channel and remove the channel. Lift up on the safety glass to remove.

Models 210-K-335-6-7 & 5U have a metal frame around the glass. Remove the screws at the bottom edge of the frame, pull out the frame slightly from the bottom and lift upward. CAUTION:—The glass should be held in place while removing the frame.

All other models have a "U" shaped channel in front of the top edge of the safety glass and also at the bottom edge. Pry off the top channel starting at the extreme end. Remove the screws holding the glass and channel retainers. Tilt the glass forward at the top and lift up out of the bottom channel. Refer to Figure 8.

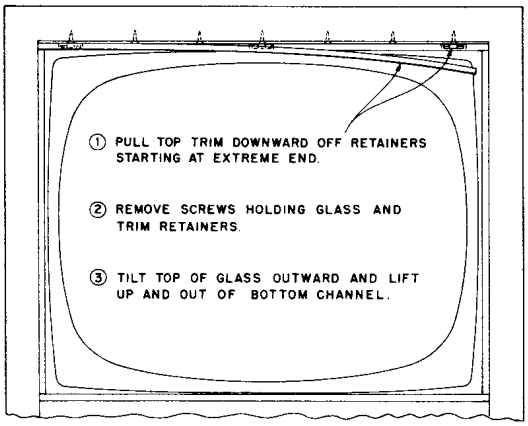


Figure 8—Safety Glass Removal

CHASSIS REMOVAL

To remove the chassis from the cabinet for repair, remove the on/off-volume, fine tuning and contrast control knobs at the side or front of the cabinet, whichever applies to the particular model involved. On front tuned models, where applicable, also remove the brightness, vertical hold and horizontal hold control knobs. Remove the cabinet back and unplug the antenna cable, the speaker cable, the kinescope socket and the yoke plug. Disconnect the H. V. anode lead, the tuner power plug(s) and the remote control receiver plugs on remote control models.

Remove the screws holding the on/off-volume and contrast control bracket (where applicable) to the tuner mounting bracket. Also, the screws holding the brightness/vertical hold/-horizontal hold bracket to the cabinet front or the top rear rail, must be removed.

The chassis is mounted by bolts through the cabinet bottom and by a bracket at the top right side of the chassis. Remove the screws holding the bracket, and the bolts holding the bottom of the chassis. Carefully slide the chassis out of the cabinet, disengaging the contrast control shaft extension. When replacing the chassis in the cabinet, the flats on the contrast control shaft extension must be properly engaged with the shafts as the chassis is reinstalled.

If it is necessary to remove the tuner and its bracket, the remaining knobs at the side or front of the cabinet must also be removed and the tuner bracket assembly must be unmounted from the cabinet.

REMOTE CONTROL PROGRAMMING PROCEDURE

Models 210-KR-435 & 6, 210-KR-445 & 6, 210-KR-455-6 & 7, 210-TR-212 and 210-TR-222-5 & 7

The motor-driven tuner in these remote control models is equipped with an automatic channel selector. The channel selector moves clockwise, stopping in turn at each preselected channel, progressing from low to high channels until channel 13 is reached, where it again drops to the lowest channel, channel 2, and repeats the cycle.

The programmer, by which the desired channels are preset, consists of a cylinder fastened concentrically outside the channel shaft at the front of the tuner, as shown in Figure 9.

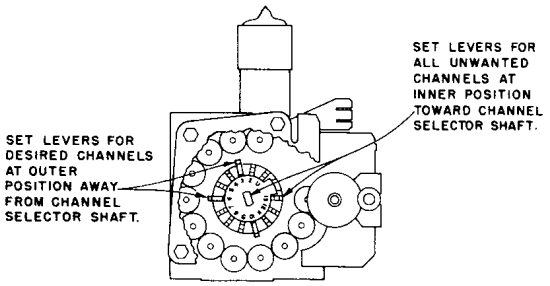


Figure 9—Remote Control Programmer Settings

Channel selection is made in the following manner.—Remove the channel knob and the programmer will be visible through the knob opening. There are a series of levers around the front of the cylinder. The levers may be moved inward toward the channel selector shaft or outward away from the shaft. A numbered disc identifies the lever for each channel. The levers for the desired channels should be set at the outer position, and all others for unwanted channels should be set at the inner position. The tuner will then stop automatically at the channels selected; in turn, progressively from low to high channels, as the remote transmitter is actuated.

Models 210-KR-435SU & 6SU, 210-KR-445SU & 6SU, 210-KR-455SU-6SU & 7SU, 210-TR-212SU and 210-TR-225SU

Channel programming for these models is accomplished in the following manner.—Switch to each unwanted channel, push in on the fine tuning knob and turn counter-clockwise six or more turns. The tuner will now by-pass these unwanted channels, stopping only at the desired channels on which the fine tuning adjustment was not changed.

RCA Victor Chassis KCS-128+ Group, Alignment Information, Continued

SIGNAL OVERLOAD

Use of excessive signal from the sweep generator can cause overloading of the receiver circuits. To determine that this condition is not present and that the response is a true representation, turn the sweep generator output to zero. Gradually increase the output until a response is obtained. Further increase of the sweep output should not change the configuration of the response except in amplitude. If the response changes in configuration, such as flattening at the top or dropping below the base line at the bottom, decrease the sweep output to restore the proper configuration. The oscilloscope gain should be run as high as possible to maintain a usable pattern with the peak-to-peak values specified, thus requiring a lower output from the sweep generator and less chance of overload.

PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

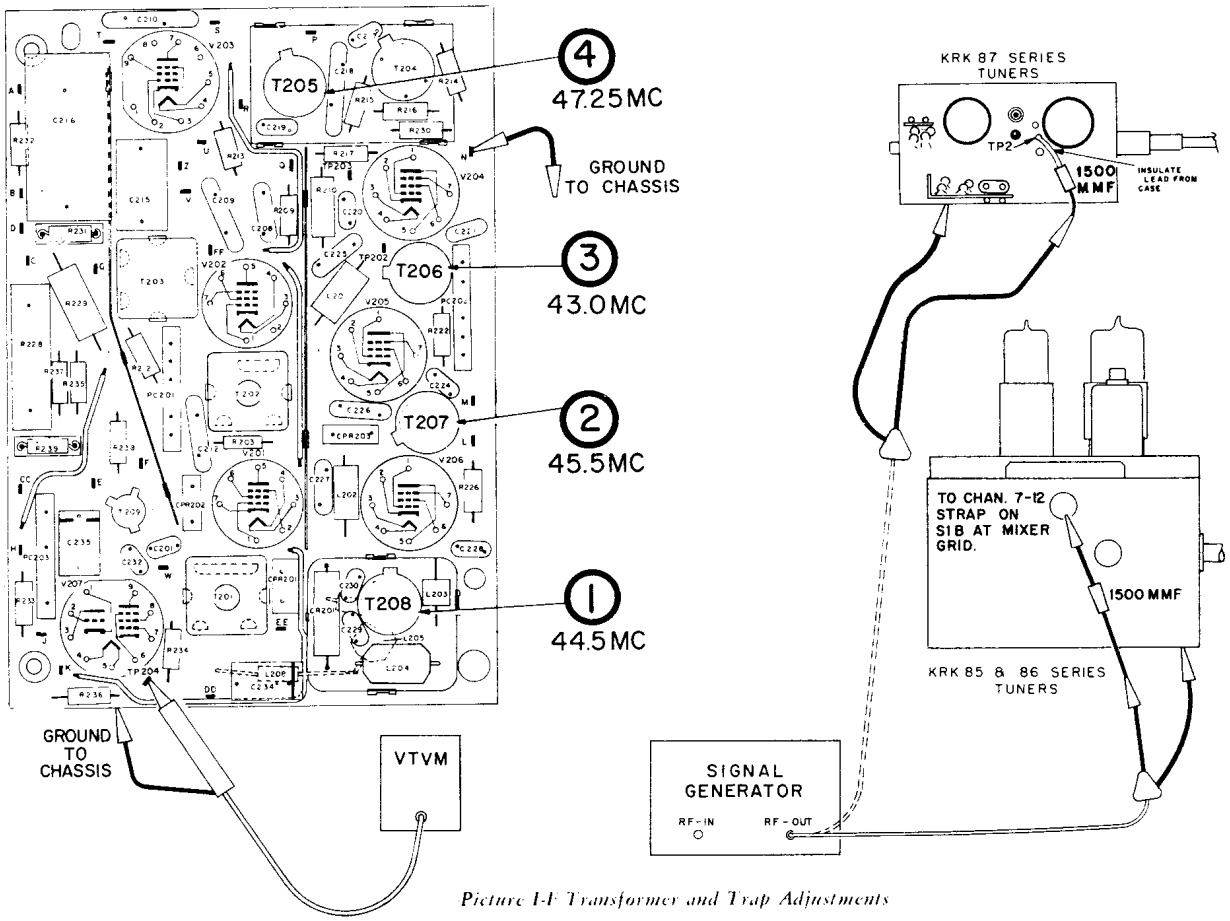
TEST EQUIPMENT CONNECTIONS:

BIAS ..... Ground the I-F AGC bus at terminal "N" of PW200.

SIGNAL GENERATOR ..... Connect to mixer grid, at strap on S1B for KRK85 and KRK86 series tuners or to test point TP2 for KRK87 series tuners, in series with 1500 mmf. capacitor (see below).

VACUUM TUBE VOLTMETER.... Connect to 2nd Detector output at test point TP204 of PW200 using direct probe. Ground lead connected to chassis.

STEP		SIGNAL GENERATOR	ADJUST	REMARKS
1	Peak 3rd pix. I-F transformer	44.5 mc.	T208	Peak T208, T207 & T206 on frequency for maximum output on meter. Adjust generator output for 3 volts on meter when finally peaked.
2	Peak 2nd pix. I-F transformer	45.5 mc.	T207	
3	Peak 1st pix. I-F transformer	43.0 mc.	T206	
4	Adjust 47.25 mc. traps	47.25 mc.	T205	Minimum output indication on meter.



Picture I-F Transformer and Trap Adjustments

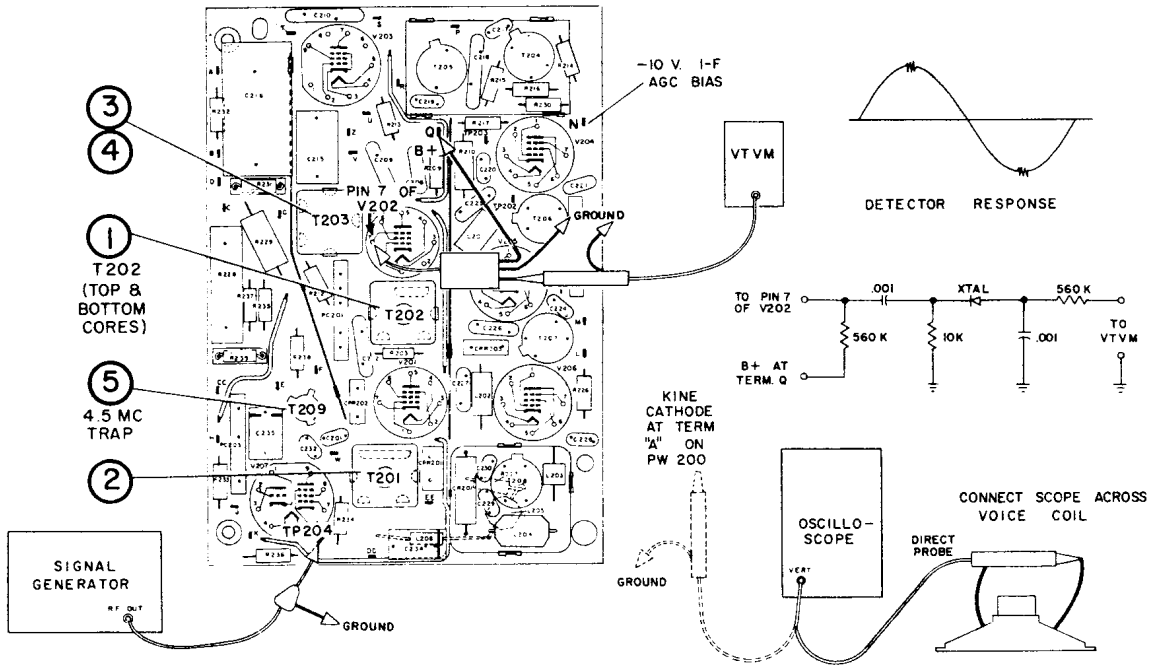
RCA Victor Chassis KCS-128+ Group, Alignment Information, Continued

SOUND I-F, SOUND DETECTOR AND 4.5 MC TRAP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

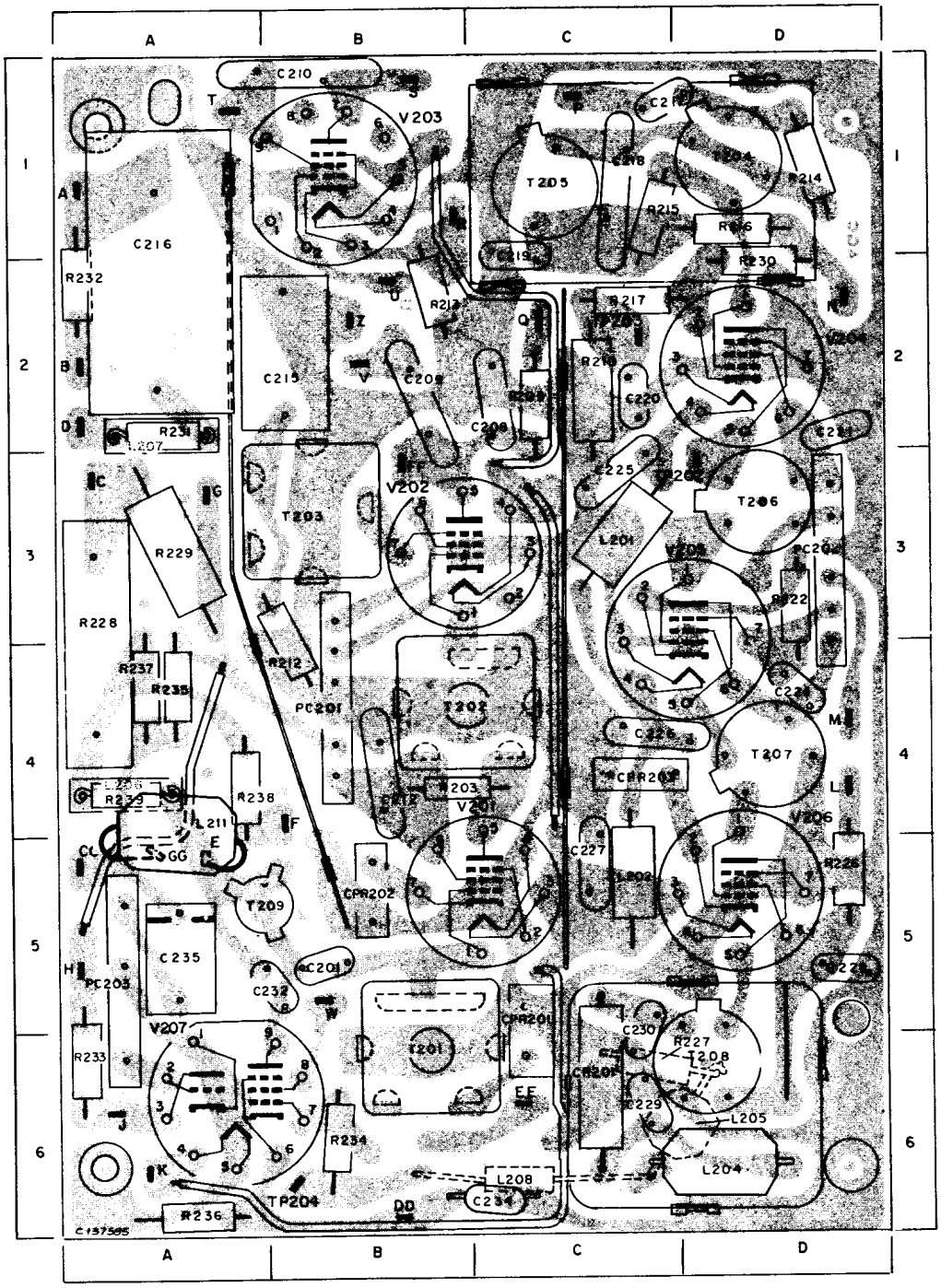
BIAS SUPPLY ..... Apply —10 volts to the I-F AGC bus at terminal "N" on PW200.
OSCILLOSCOPE ..... Connect across speaker voice coil.
SIGNAL GENERATOR ..... Connect to test point TP204 on PW200.
VACUUM TUBE VOLTMETER.... Connect to output of diode detector shown below. Set meter for negative voltage readings.
MISCELLANEOUS ..... Connect test diode detector, as shown below, to pin 7 of V202.

	STEP	SIGNAL GENERATOR	ADJUST	REMARKS
	Set contrast control maximum clockwise.			
1	Adjust Driver Transformer Primary and Secondary	4.5 mc.	T202 (top & bottom)	Adjust T202 top & bottom for maximum on meter. Set generator for 1.0 to 1.5 volts when peaked. Peak cores at open end of coils.
2	Adjust Sound Take-Off Trans.	4.5 mc.	T201	Adjust T201 for maximum negative DC on meter. Set generator for 1.0 to 1.5 volts on meter.
3	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area adjusting volume control for normal volume (approx. ¼ turn from c.c.w.). Turn core of T203 flush with top of coil form.			
4	Adjust Sound Detector Trans.	Observing oscilloscope and listening to audio output adjust T203 clockwise to a peak. Continue clockwise to second louder peak and adjust for maximum on this peak.		
	Move the oscilloscope to terminal "A" on PW200. Use the diode probe. Set the contrast control to maximum clockwise position.			
5	Adjust 4.5 mc. trap	4.5 mc., A-M Mod., 400 Cycles	T209	Adjust for minimum 400 cycle indication on oscilloscope.
	Alternate Method Using Generators With F-M Modulation Provided.			
1	Same as step 1 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
2	Same as step 2 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
3	Adjust Sound Detector Trans.	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T203	Adjust T203 for max. 400~ output on scope using max. amplitude peak. Set volume control for .70 v. p-p on scope when peaked. See response below.
4	Retouch Driver and Sound Take-Off. Trans. for breakout	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T201 & T202	Decrease input to minimum usable signal. Retouch T201 & T202 for symmetrical breakout. Response below.
	Move the oscilloscope to terminal "A" on PW200. Use the diode probe. Set the contrast control to maximum clockwise position.			
5	Adjust 4.5 mc. trap	Same as step 5 above. Adjust for minimum 400 cycle indication on oscilloscope.		



Sound I-F, Sound Detector and 4.5 mc. Trap Alignment

RCA Victor Chassis KCS-128+ Group, Circuit Assembly, Continued



PW200 COMPONENT LOCATION GUIDE

C201	B5
C208	C2
C209	B2
C210	B1
C212	B4
C215	B2
C216	A1
C217	C1
C218	C1
C219	C1
C220	C2
C221	D2
C224	D4
C225	C3
C226	C4
C227	C5
C228	D5
C229	C6
C230	C5
C232	B5
C234	C6
C235	A5
C238	D3
C239	A6
CPR201	C5
CPR202	B5
CPR203	C4
CR201	C6
L201	C3
L202	C5
L203	D6
L204	D6
L205	D6
L206	A4
L207	A2
L208	C6
PC201	B4
PC202	D3
PC203	A5
R203	B4
R209	C2
R210	C2
R212	B3
R213	B2
R214	D1
R215	C1
R216	D1
R217	C2
R222	D3
R226	D5
R227	C6
R228	A4
R229	A3
R230	D1
R231	A2
R232	A2
R234	B6
R235	A4
R236	A6
R237, R238, R239	A4
R243	B2
T201	B6
T202	C4
T203	B3
T204	D1
T205	C1
T206	D3
T207	D4
T208	D6
T209	A5

Figure 24—PW200 Sealed Circuit Assembly Composite Diagram

The assembly represented above and on page are viewed from the component side of the circuits and are oriented as they will usually be viewed when servicing the chassis.

The printed wiring, on the reverse side of the circuits is duplicated in the white printing on the component side, along with identification of the components.

Figures 24 and 26 are diagrammatic views of the circuits showing the printed wiring in a "phantom" view superimposed on the component layout. These presentations, in conjunction with the photographs, provide for rapid circuit tracing while referring to only the component side of the assemblies.

The coordinate letters and numbers, shown at the sides of the assembly views, are provided for rapid location of components. Reference to the location guide will show the location of any given component. The desired component location will be found in the area designated by the particular letter/number combination indicated.

RCA Victor Chassis KCS-128+ Group, Circuit Assembly, Continued

PW500 COMPONENT LOCATION GUIDE

C501	C4	C508	C2	C515	B4	CPR502	E3	PC503	D2	R501	D4	R505	C4	R512	B1	R518	A3	R534	B1
C502	A1	C510	A4	C517	B2							R512	D3	R514	E4	R519	A2	R537	E4
C503	A1	C511	A2	C518	C1	L501	A4			R501	D4	R514	B1	R515	D1	R520	C3	R539	D1
C504	C3	C512	A3	C519	B1					R502	D3	R515	B3	R516	B2	R521	D3	R541	C1
C505	E3	C513	A2	C520	C1	PC501	D1			R503	D4	R516	B2	R517	A3	R525	C2	R542	B2
C506	D3	C514	A4	C521	E2	PC502	C3			R504	C4	R517	A3			R526	A3		

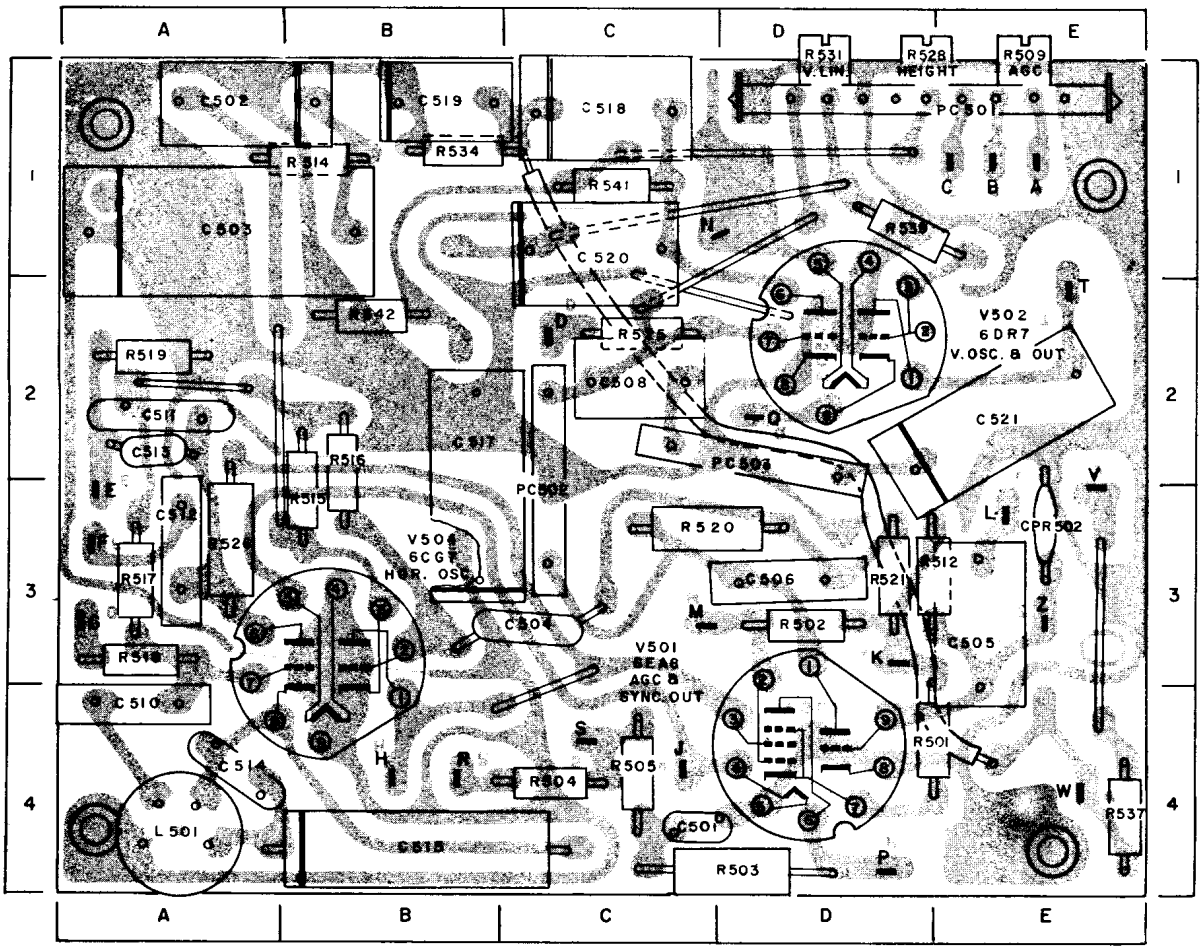
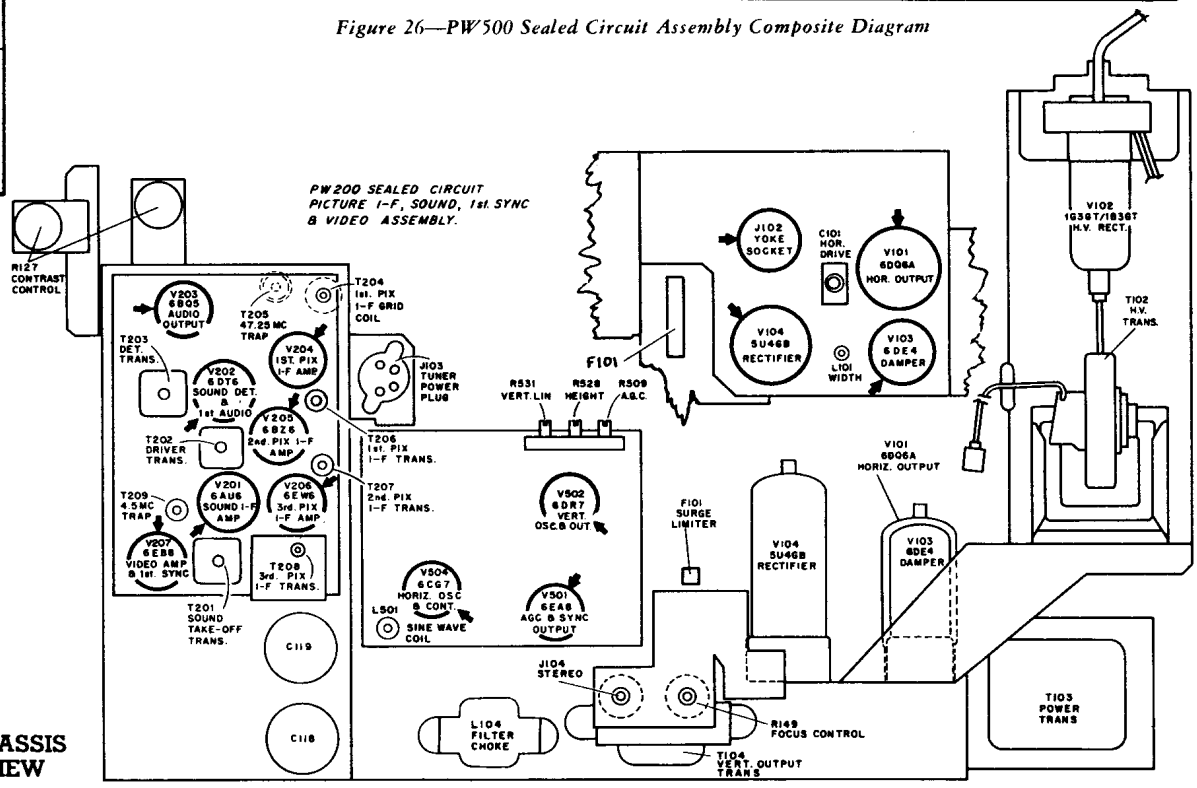
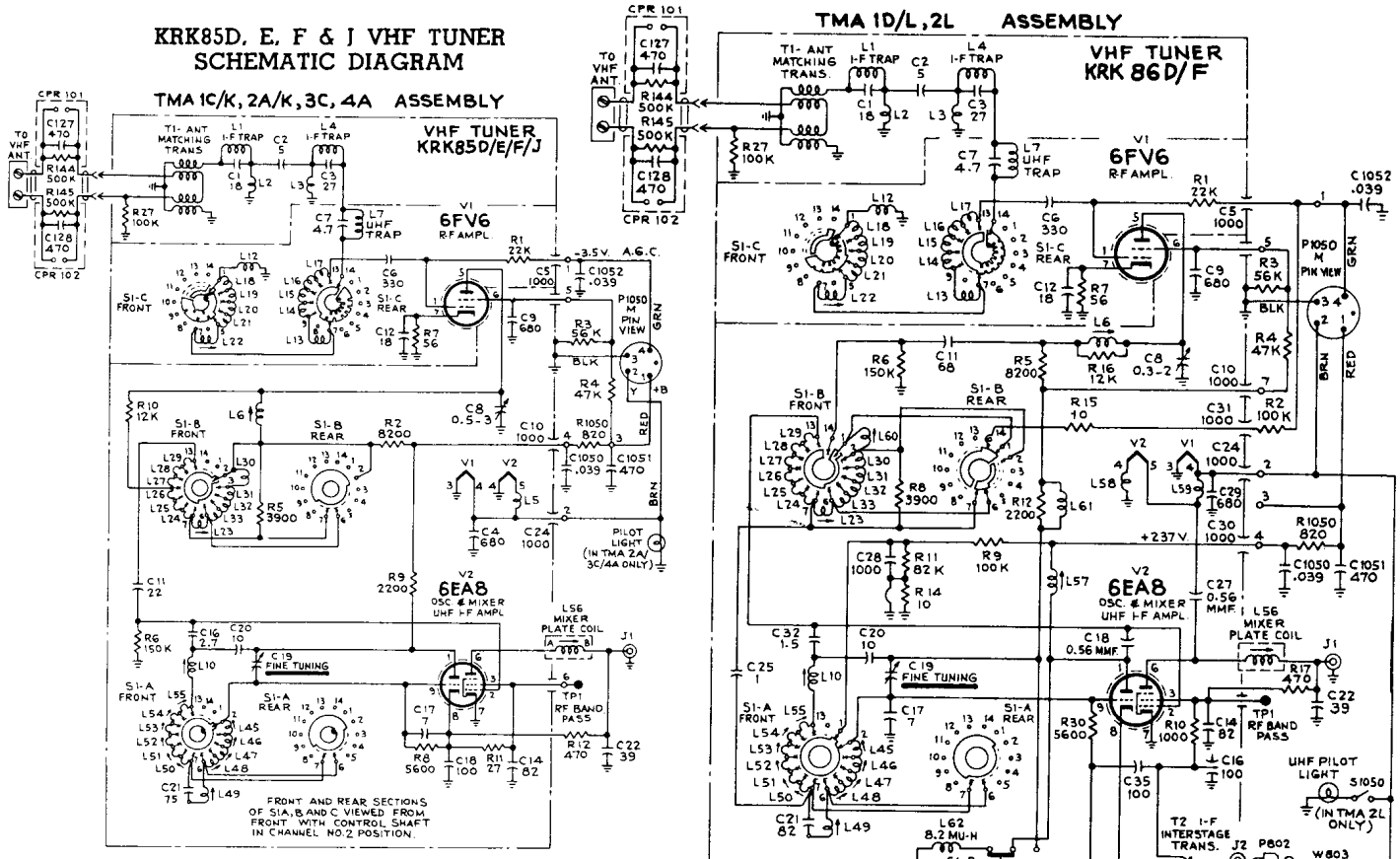


Figure 26—PW500 Sealed Circuit Assembly Composite Diagram



MAIN CHASSIS REAR VIEW

RCA Victor Chassis KCS-128+ Group, Tuner Diagrams and Schematic Notes



All schematics are shown in the latest condition at the time of printing.

All resistance value in ohms. K = 1000.

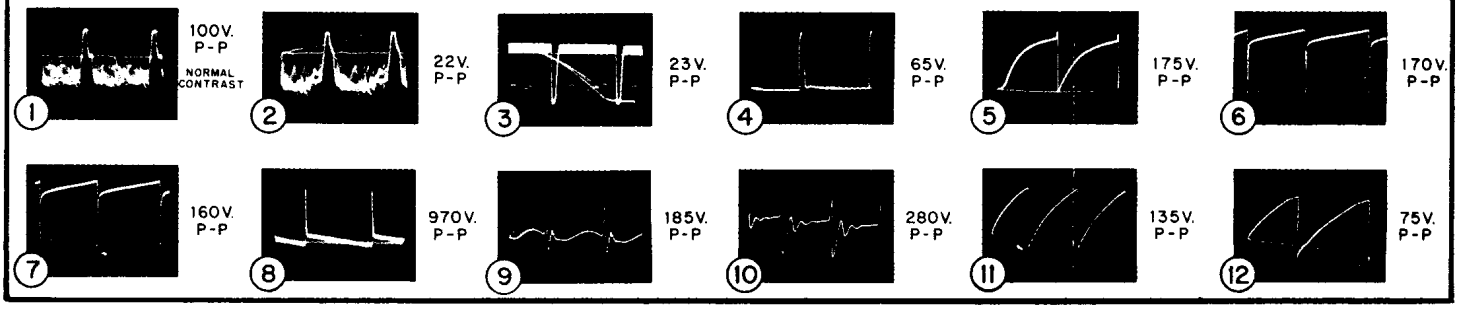
All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v, a-c supply.

*Measured with 1 megohm, ½ watt resistor in series with meter probe.

Balloons ① ② etc., shown on schematics indicate points of observation of the waveforms shown below the individual schematic.



RCA Victor Chassis KCS-128+ Group, Main Schematic Diagram, Continued

R214 changes from 15,000 ohms to 10,000 ohms ± 5%, ½ watt resistor.
C217 changes from 8mmfd to 9.5mmfd ± 0.5mmfd 500 volts.
C120 trimmer capacitor has been eliminated.

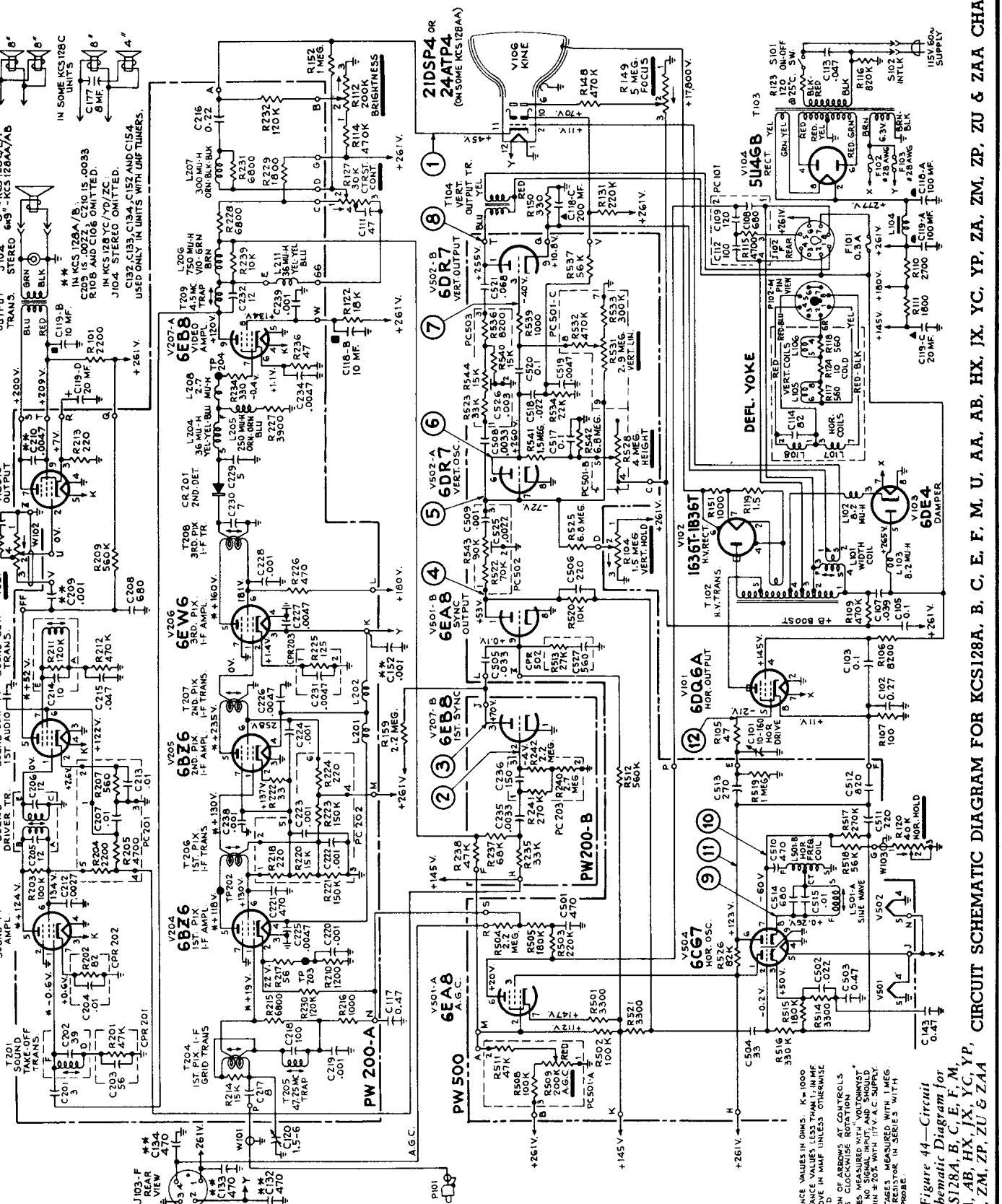


Figure 44—Circuit Schematic Diagram for KCS128A, B, C, E, F, M, U, AA, AB, HX, JX, YC, YP, ZA, ZM, ZP, ZU & ZAA CHASSIS

(For diagrams of some tuners used see page 140, adjacent at left.)

RCA Victor Chassis KCS-128+ Group, Data on Remote Control CTP9A, CRK3B

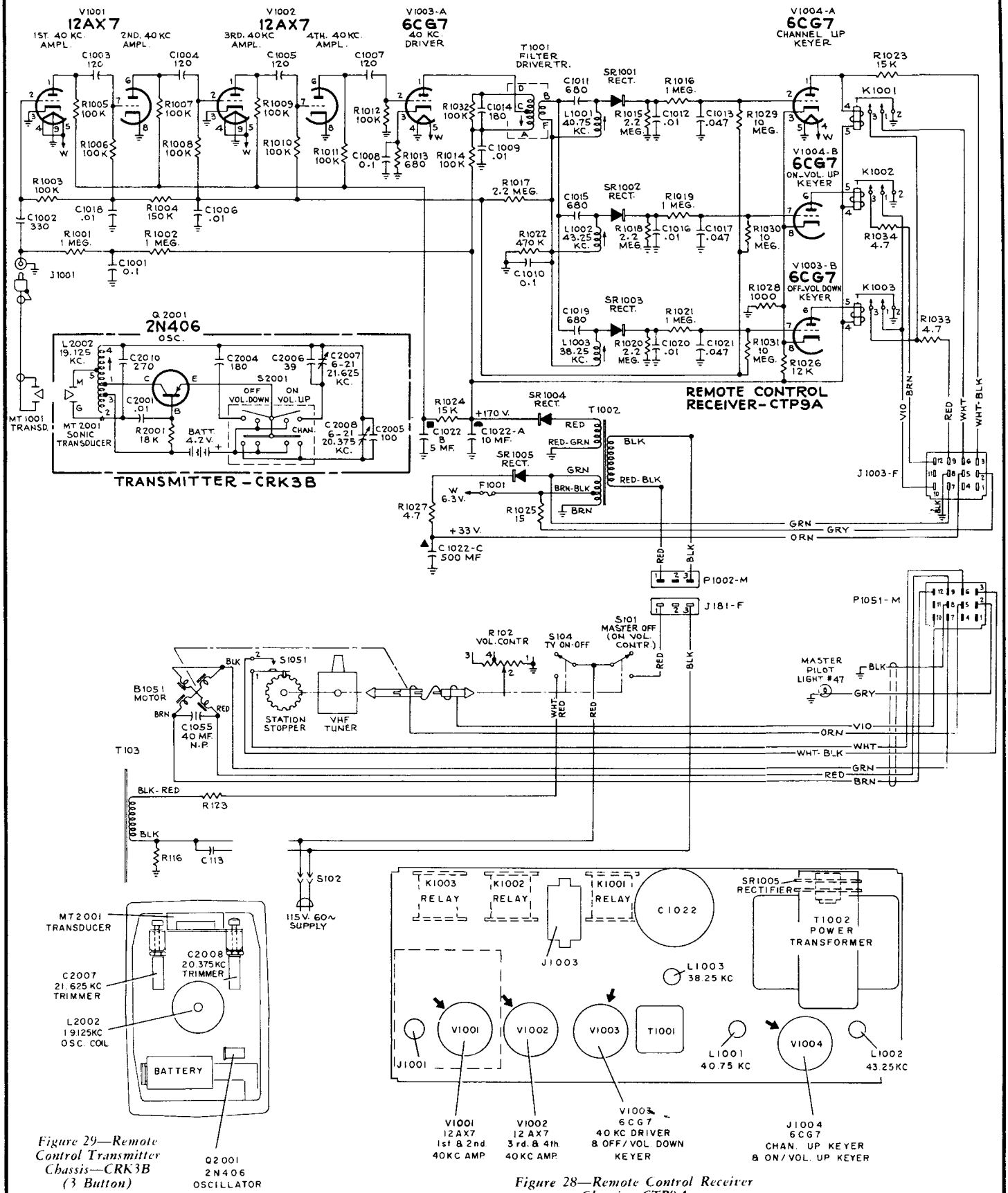


Figure 29—Remote Control Transmitter Chassis—CRK3B (3 Button)

Figure 28—Remote Control Receiver Chassis—CTP9A

RCA VICTOR

TELEVISION RECEIVERS—MODELS

210-DK-595 & U, 210-DK-596 & 7
210-DK-635 & U, 210-DK-635SU
210-DK-636, 210-DK-655-6 & 7
210-DK-670 & 4, 210-DKR-655SU
210-DKR-656SU, 210-DKR-657SU
210-DKR-670SU, 210-DKR-674SU
210-DKR-715, 210-DKR-715SU
210-DKR-716, 210-DKR-716SU
210-DT-572 & U, 210-DT-575,R,& 7

CHASSIS NOS.

KCS129A, B, C, D, E, F, H, M, N, YA, ZE, ZH, & ZAA

These chassis are used in models listed at left. To a large degree this KCS-129 group is similar to KCS-128 group of the previous section. Much of the service material there is directly applicable to these sets. In particular, PW200 circuit assembly (page 138), alignment (on pages 136 and 137), remote control circuits (page 142). Important material that is different and circuits of the two types of main chassis are presented below and on pages 144 through 146.

DEFLECTION YOKE ADJUSTMENT

If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the yoke clamp screw.

CENTERING ADJUSTMENT

Centering is accomplished by means of two levers on the back of the yoke. By alternately rotating one magnet with respect to the other, then rotating both simultaneously around the neck of the tube, proper centering of the picture can be obtained.

FOCUS

A focus control is provided to permit proper focusing of the kinescope. This control is R149 located on the chassis rear and should be adjusted to give best overall focus with brightness set at normal operating level.

CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the horizontal hold control to the extreme clockwise position. The picture should be out of sync, with a minimum of eight bars slanting downward to the left. Turn the control counter-clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 1½ to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional counter-clockwise rotation of the control. The picture should remain in sync for approximately one quarter of a full turn of additional counter-clockwise rotation of the control. Continue counter-clockwise rotation until the picture falls out of sync. Rotation beyond fall out position should produce a minimum of 2 bars before end of rotation or a minimum of 7 bars before interrupted oscillation "motorboat" occurs.

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Adjustment of Horizontal Oscillator."

ADJUSTMENT OF HORIZONTAL OSCILLATOR

If in the above check the receiver failed to hold sync for one-quarter of a turn of counter-clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

The width and drive adjustments should be properly set, as explained in the paragraph below, before adjusting the sine wave coil.

Connect a short jumper across the terminals of the sine wave coil L501-A on PW500 deflection board. Also short the grid of the sync output tube, pin 9 of V501, to ground with a small screwdriver or jumper.

Adjust the horizontal hold to obtain a picture with the sides vertical (picture may drift slowly sideways). Remove the jumper on the sine wave coil L501-A and adjust L501-A to again obtain a picture with the sides straight. When the sine wave coil is properly adjusted, alternate shorting and no short should not cause a change in frequency, only a slight sideways shift should occur.

Remove the short on the grid of the sync output. The horizontal hold should now perform as outlined above under "CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT."

WIDTH AND DRIVE ADJUSTMENTS

Set the horizontal control at the "pull-in" point. Set the width coil maximum counter-clockwise and adjust horizontal drive trimmer counter-clockwise until a bright vertical line appears in the middle of the picture then clockwise until the bright line just disappears. If no line appears set the drive trimmer at maximum counter-clockwise position.

At normal brightness adjust the width coil L101 to obtain ¾" overscan at each side with normal line voltage.

Readjust the drive trimmer C101 as was done previously.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the height control R528 until the picture overscans approximately ⅝" at both top and bottom. Adjust vertical linearity R531 until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust centering if necessary to align the picture with the mask.

RCA Victor Chassis KCS-129+ Group, Service Information, Continued

AGC & SYNC STABILIZER CONTROL ADJUSTMENTS

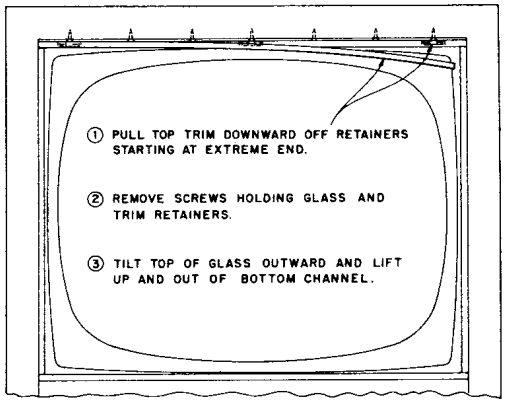
Select the channel with the strongest signal and set the fine tuning to obtain a slight 4.5 mc beat on the kinescope. Set the AGC control R509 and the Sync Stabilizer control R139 fully clockwise. Turn the AGC control counter-clockwise to obtain a slight bend at the top of the picture. Turn the Sync Stabilizer control counter-clockwise to produce a further bend in the picture then clockwise just to the degree of bend originally produced by the AGC control. Now adjust the AGC control clockwise to obtain a normal picture without bend at the top.

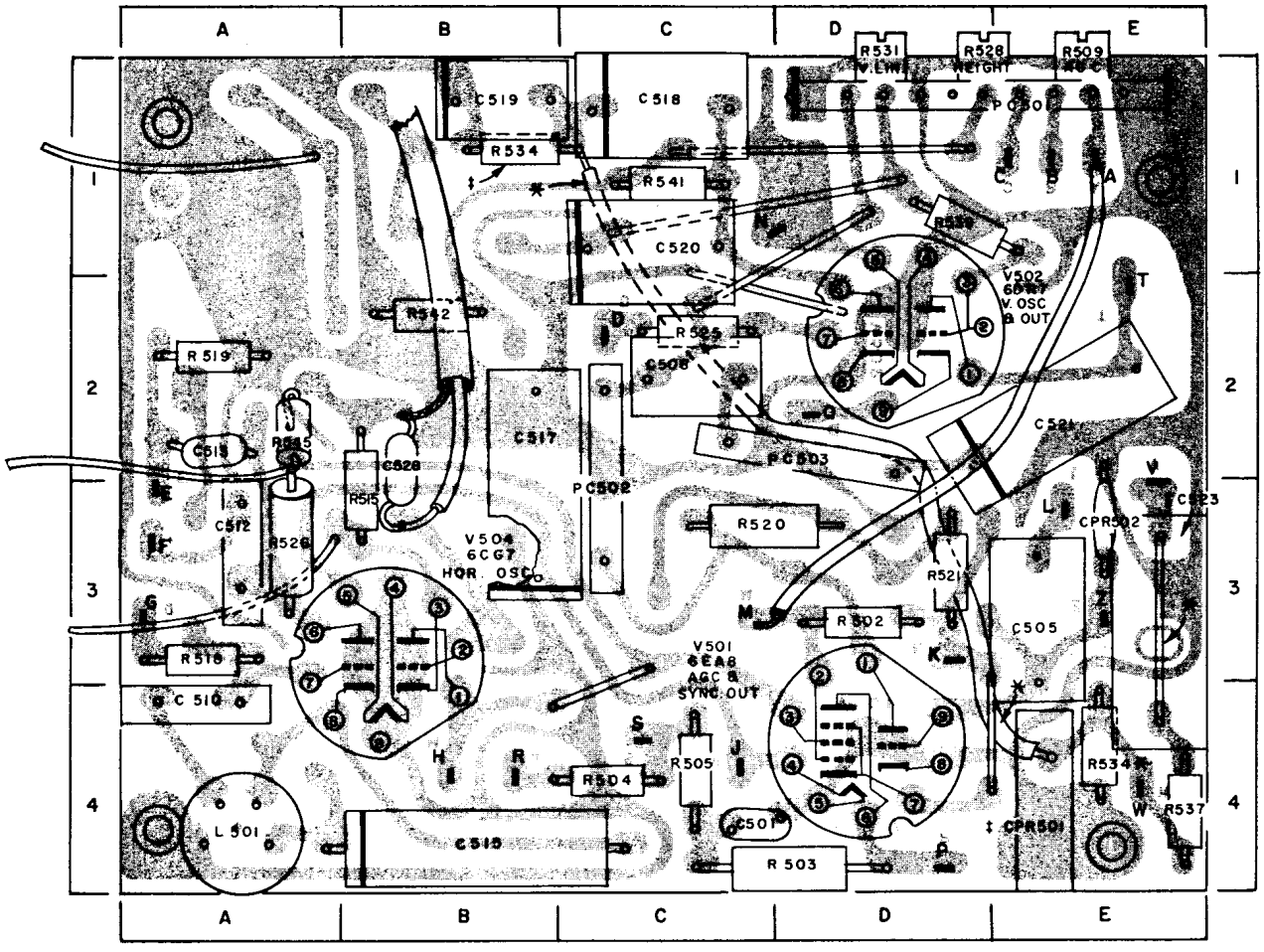
If no bend is produced by the Sync Stabilizer control set the control at the center of its range and adjust the AGC control as described above. In high noise or weak signal areas adjust the Sync Stabilizer control for minimum noise in the picture.

KINESCOPE AND SAFETY GLASS CLEANING

Models 210-DK-635-6-5U and 5SU and Models 210-DT-572-5-7 & 2U have a channel under the front top edge of the cabinet, in front of the top of the safety glass. Take out the screws holding the channel and remove the channel. Lift up on the safety glass to remove.

All other models have a "U" shaped channel in front of the top edge of the safety glass and also at the bottom edge. Pry off the top channel starting at the extreme end. Remove the screws holding the glass and channel retainers. Tilt the glass forward at the top and lift up out of the bottom channel.





PW500 COMPONENT LOCATION GUIDE

C501 .....C4	C515 .....B4	‡C523 .....E3	L501 .....A4	R503 .....D4	R520 .....C3	R537 .....E4
C505 .....E3	C517 .....B2	C528 .....B2	PC501 ...D1	R504 .....C4	R521 .....D3	R539 .....D1
C508 .....C2	C518 .....C1		PC502 ...C2	R505 .....C4	R525 .....C2	R541 .....C1
C510 .....A4	C519 .....B1	‡CPR501,	PC503 ...D2	R515 .....B3	R526 .....A3	R542 .....B2
C512 .....A3	C520 .....C1	CPR502 ..E3	R502 .....D3	R518 .....A3	‡R534 .....B1	R545 .....A2
C513 .....A2	C521 .....E2			R519 .....A2	*R534 .....E4	‡*—See Note

PW500 Sealed Circuit Assembly Composite Diagram

NOTE:
*KCS129A, B, C, D, E, F, H, ZE & ZH only
‡KCS129M & ZAA only

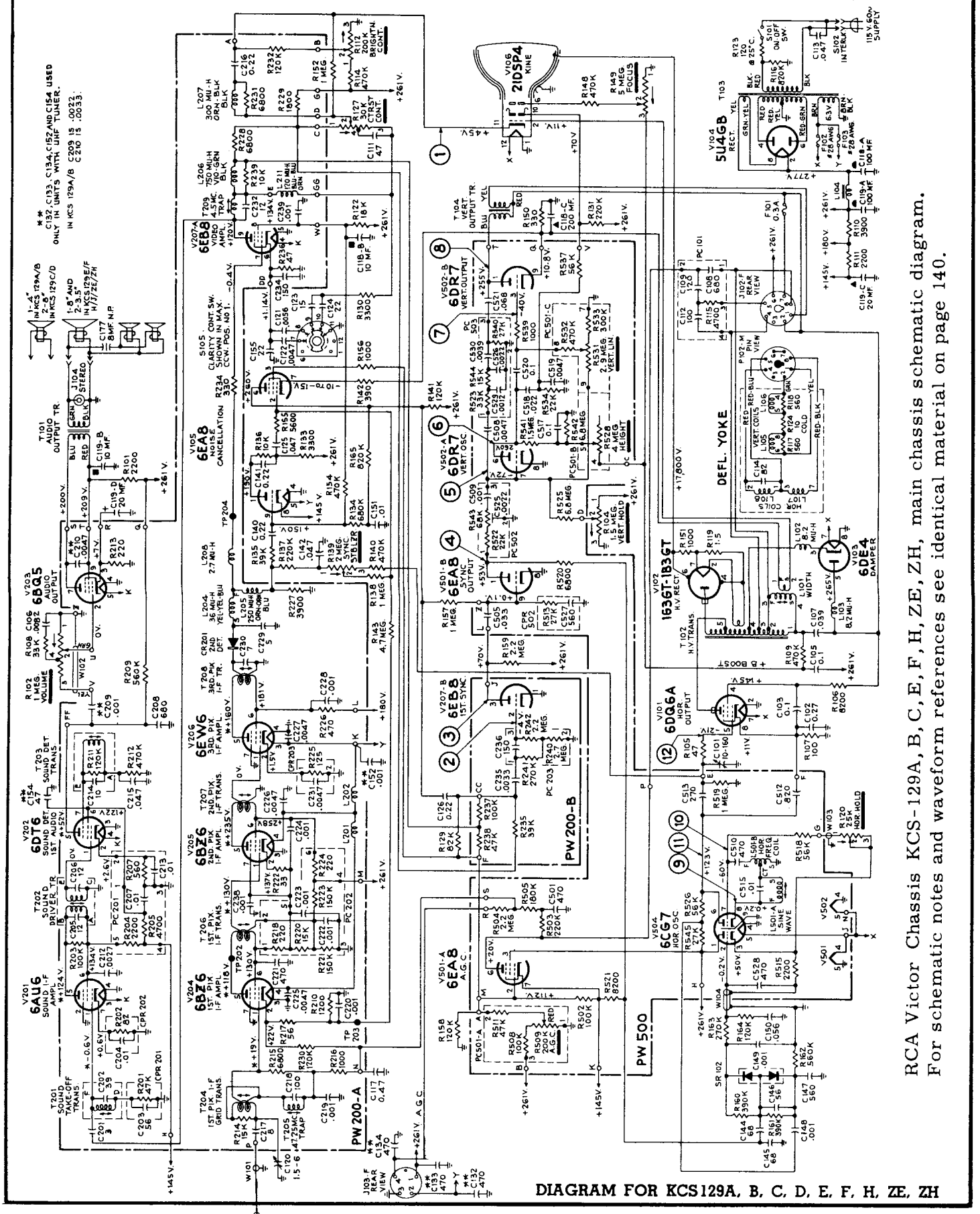
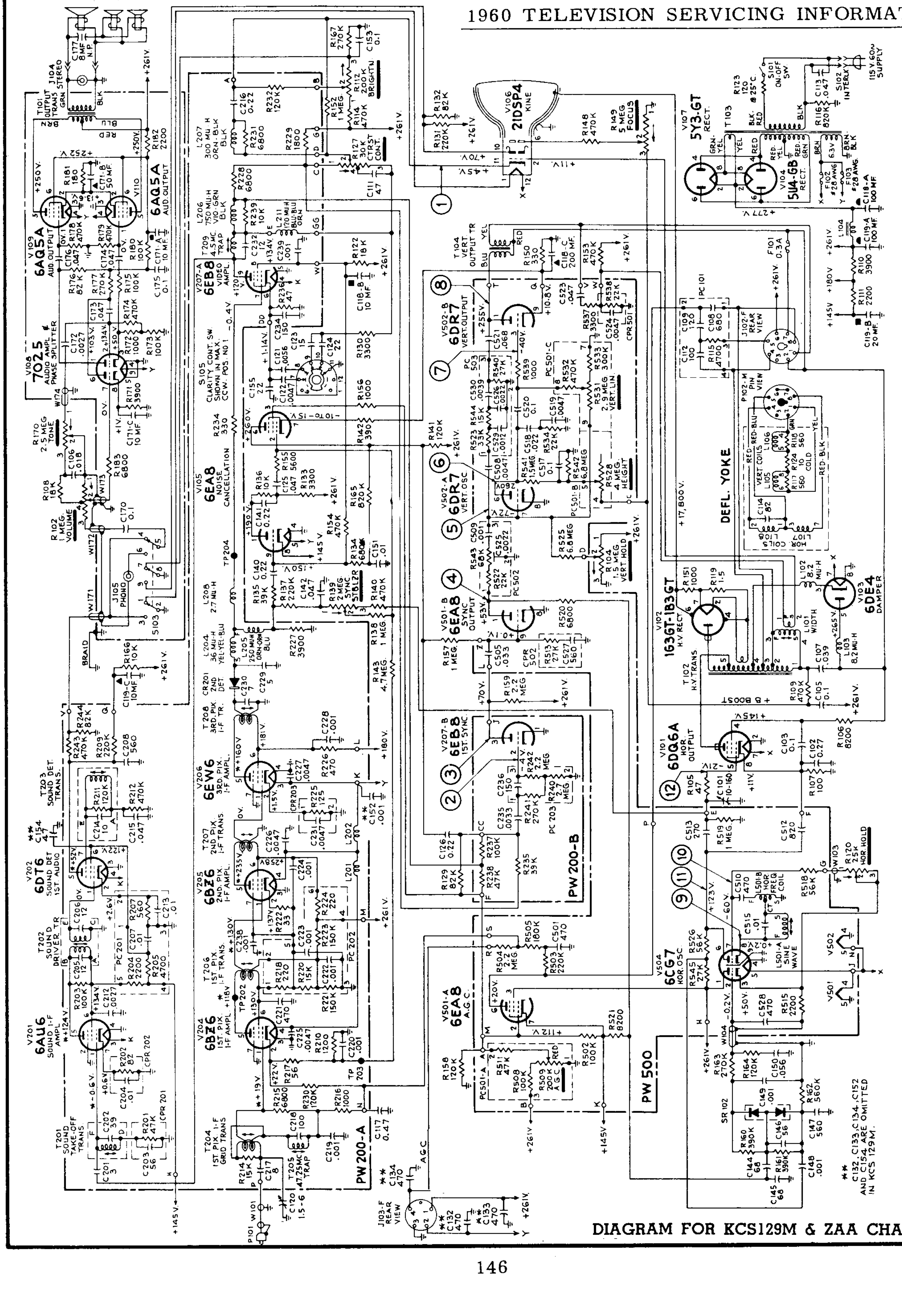


DIAGRAM FOR KCS129A, B, C, D, E, F, H, ZE, ZH

RCA Victor Chassis KCS-129A, B, C, E, F, H, ZE, ZH, main chassis schematic diagram.
For schematic notes and waveform references see identical material on page 140.



RCA Victor Chassis KCS-129M and -ZAA main chassis schematic diagram.
For schematic notes and waveform references see identical material on page 140.

DIAGRAM FOR KCS129M & ZAA CHASSIS

SYLVANIA

CHASSIS: 1-541-7, -8, -9, -0, used in Models 23S23, 23S24 Series

CHASSIS: 1-545-1 used in Remote Control Model 23S22

(Service material on pages 147 through 152. Circuit diagram on pages 150-151. Diagrams of some tuners used on page 152. For alignment and information on printed board assembly refer to material for Chassis 1-544-1, pages 156 - 158.)

CHASSIS REMOVAL

NOTE: Upper and lower chassis assemblies may be removed individually. For removal, follow the appropriate procedure below.

UPPER CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connection. Remove interlock cover
2. Remove channel selector lever, picture prompter knob and secondary control knobs by pulling straight up.
3. Disconnect the following:
   A. Picture tube socket.
   B. Speaker leads at lower left speaker.
   C. Braided ground strap connecting upper chassis to lower chassis. See "Caution" in step four (4) under "Lower Chassis Removal"
   D. Three prong Halo plug.
   E. Unwrap "twist-tie" supporting yellow picture tube lead.
   F. Remove vertical hold knob extension.
4. While supporting upper chassis remove two (2) screws fastening right hand chassis bracket to cabinet and one (1) screw fastening left hand chassis bracket to cabinet.
5. Slide chassis slightly to rear and to the right to disengage support rivet from left chassis bracket. Remove upper chassis.

CAUTION: WHEN SERVICING CHASSIS OUT OF CABINET, DO NOT OPERATE RECEIVER WITH SPEAKER LEAD'S DISCONNECTED.

LOWER CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connection. Remove interlock cover.
2. Remove one screw fastening rear chassis foot to cabinet.
3. Disconnect yoke plug and eleven pin plug from sockets in lower chassis.
4. Disconnect high voltage anode lead from picture tube and remove screw securing braided ground strap to lower chassis. CAUTION: Braided ground strap is only common ground connection between upper and lower chassis assemblies. It must be secure at both ends whenever power is applied to receiver.
5. Disconnect plastic connector from vertical hold control and remove lower chassis from cabinet.

MASK AND TRIM REMOVAL

1. Remove small trim strip at bottom center of mask.
2. Slide left hand bottom trim to right, remove trim guide in lower left corner of mask and remove left side trim strip by sliding down.
3. Remove trim guide from upper left corner of mask and remove top trim by sliding to left.
4. Remove trim guide from upper right corner of mask and remove right side trim by sliding straight up while supporting mask.
5. Remove trim guide in lower right corner of mask, remove (2) bottom trim strips and remove mask.

SYLVANIA Chassis 1-541-7, etc., Service Information, Continued

PICTURE TUBE REMOVAL

1. Remove upper and lower chassis assemblies as outlined under "Chassis Removal".
2. Remove yoke clamp and yoke.
3. Remove two (2) speed nuts securing each speaker and remove speakers.
4. Lay cabinet face down on a soft material so as not to mar or scratch the face of picture tube.
5. Remove the four (4) screws securing mask, shield, and picture tube to cabinet. Untie twist tie securing halo lead.
6. Lift cabinet up and off mask, shield and picture tube, being careful not to strike neck of picture tube when removing cabinet
7. Remove the four (4) brackets and screws securing picture tube to mask and shield. NOTE: When replacing brackets securing picture tube, the beveled edges of brackets must face outward.
8. USING GOGGLES AND GLOVES, reach under face of tube and lift from mask and shield. DO NOT GRASP NECK OF PICTURE TUBE AT ANYTIME.
9. To install picture tube, reverse the preceding steps. Exercise care not to scratch face of picture tube.

CENTERING ADJUSTMENT

1. Position deflection yoke as far forward as possible on the neck (against the flare) of the picture tube.
2. Rotate centering adjustment rings (located on yoke cover) individually or together until picture is centered. Turn brightness control to a low level and check that no corner cutting exists in the picture.

FOCUS

With contrast and brightness at normal settings, adjust focus control (R231) for maximum sharpness and clarity of fine detail in picture.

AGC ADJUSTMENT

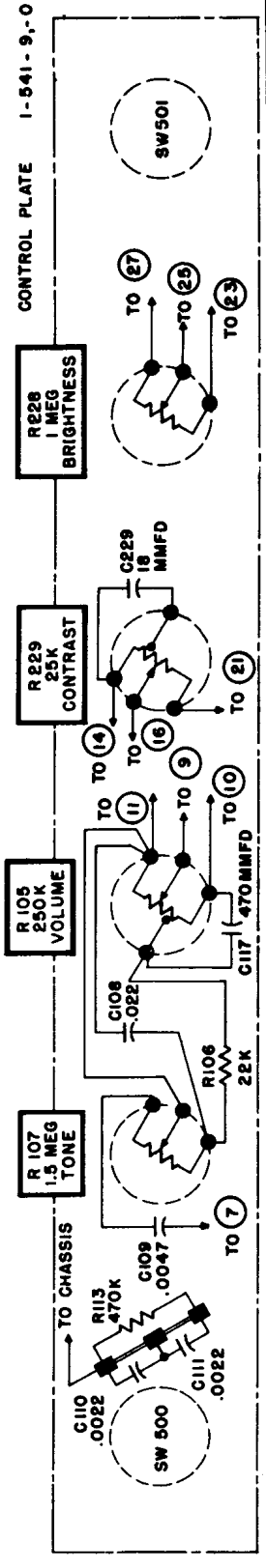
1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.
2. Set contrast and brightness controls to maximum.
3. Rotate AGC control (R301) clockwise until picture "bends" or "jumps" sideways.
4. Reverse rotation of the AGC control (counterclockwise) until picture is horizontally and vertically stable.
5. Reduce contrast and brightness to normal setting, rotate fine tuning control to correct tuning point. Normal picture should be observed. If this condition cannot be met, rotate the AGC control a small amount further in the counterclockwise direction.

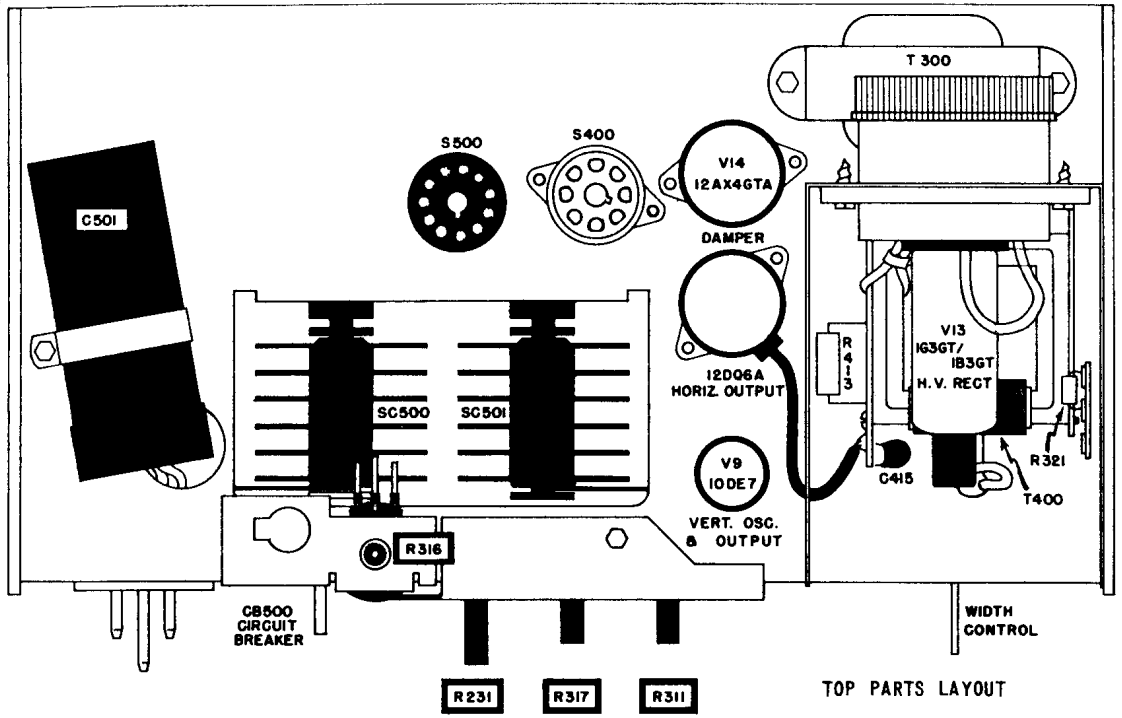
NOTE: For optimum performance, this adjustment should be made under actual operating conditions (in the owner's home).

HORIZONTAL AFC ADJUSTMENT

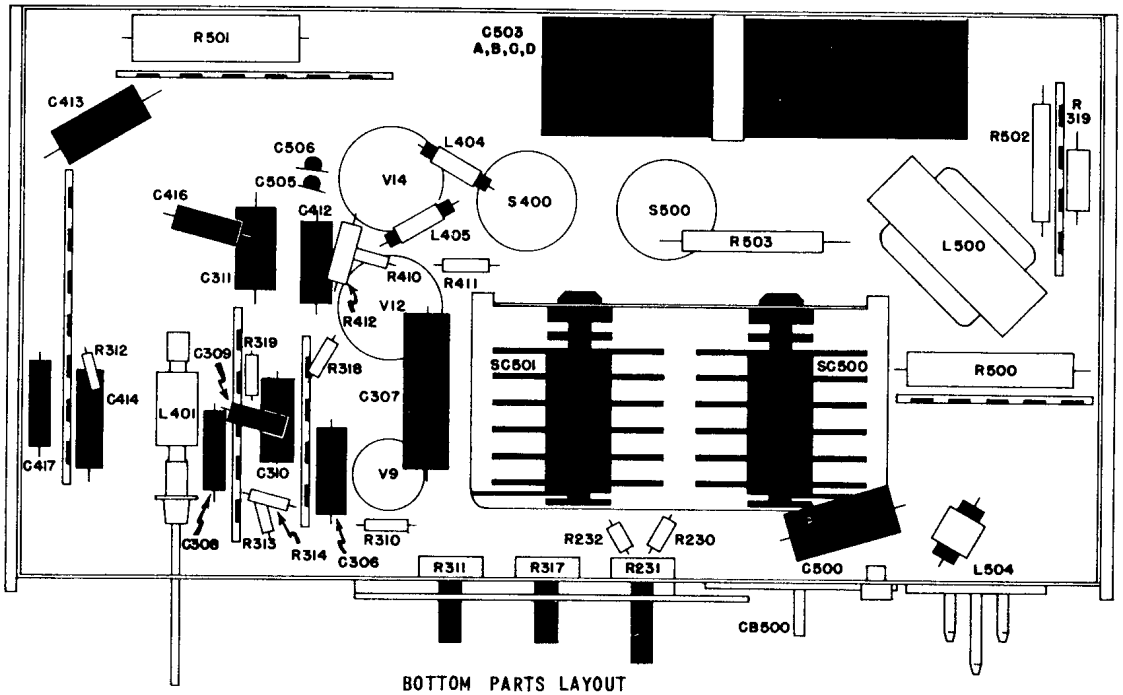
Before performing the following procedure, check AGC adjustment as described in "AGC adjustment".

1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.
2. Adjust vertical height, vertical linearity, and width control for normal picture.
3. Rotate horizontal frequency control (L400) in either direction until picture falls out of horizontal sync. (If picture is not out of sync at the end of the control range, momentarily switch tuner to "free" channel and then return to original).
4. Reverse rotation of frequency control slowly until picture falls into sync.
5. Rotate channel selector to a position on which no signal is received; then return to the original station. The picture should immediately fall into sync. If not, slightly readjust horizontal frequency control (L400) and repeat this step.



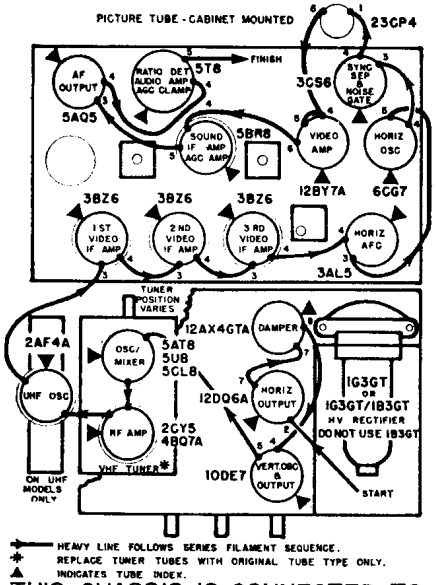


TOP PARTS LAYOUT



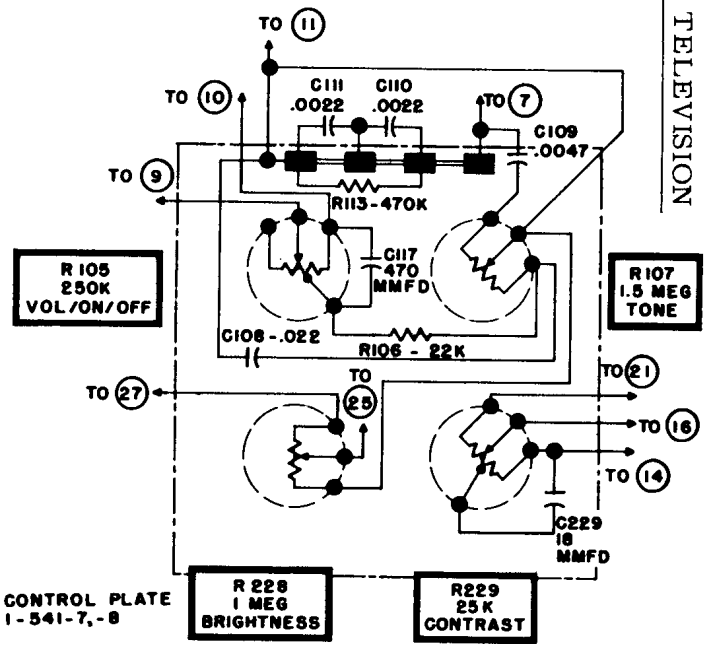
BOTTOM PARTS LAYOUT

TUBE LAYOUT AND FILAMENT SEQUENCE



HEAVY LINE FOLLOWS SERIES FILAMENT SEQUENCE.
* REPLACE TUNER TUBES WITH ORIGINAL TUBE TYPE ONLY.
▲ INDICATES TUBE INDEX.

THIS CHASSIS IS CONNECTED TO ONE SIDE OF THE AC LINE.



SYLVANIA 1-541-7,-8,-9,-0 CHASSIS

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED.

1. Voltages measured to chassis using VTVM.
2. AC power source 117V, 60 cycle line.
3. Voltage readings in brackets taken with no signal input; channel selector set to a free channel. Antenna disconnected. Antenna terminals shorted together and grounded to chassis.
4. Voltage readings not in brackets taker with a strong signal input; tuner set to strong local station developing approximately 6 volts on IF AGC buss test point (1) . (junction of R205 and R206).
5. Contrast control set to maximum. Brightness control set to minimum.
6. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

SPECIAL VOLTAGE MEASUREMENT CONDITIONS

(S) Picture tube anode voltage measured with VTVM high voltage probe at line voltage of 117 volts under conditions of normal signal. No brightness and correct scan size.

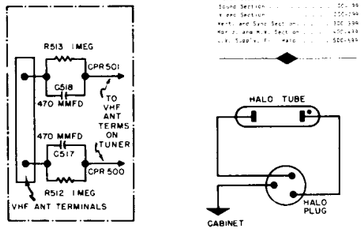
▲ High peak voltage of short duration may damage meter used for this measurement.

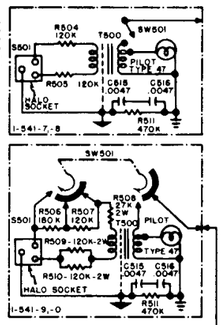
WAVEFORM MEASUREMENT CONDITIONS

1. Channel selector set to strong channel.
2. Contrast control set for signal of 40 volt peak to peak at yellow lead of picture tube.
3. Waveforms measured with respect to chassis using Sylvania type 40% oscilloscope. (other type oscilloscopes may alter waveform shapes or amplitudes).
4. The terms "30 Ω" or "7875 Ω" refer to scope sweep frequency used.

GENERAL SCHEMATIC NOTES

1. Voltage sources are indicated by encircled symbols; corresponding symbols without circles indicate voltage tie points.
2. Average resistances of coils and transformers are shown and are measured with component connected in circuit.
3. Encircled numbers on edge of printed circuit indicate tie points corresponding with those shown on parts layout of top board.
4. All capacitors are rated in microfarads unless otherwise specified.
5. Coil and transformer terminal views are shown as seen from bottom.
6. Arrows on controls indicate direction of clockwise rotation.





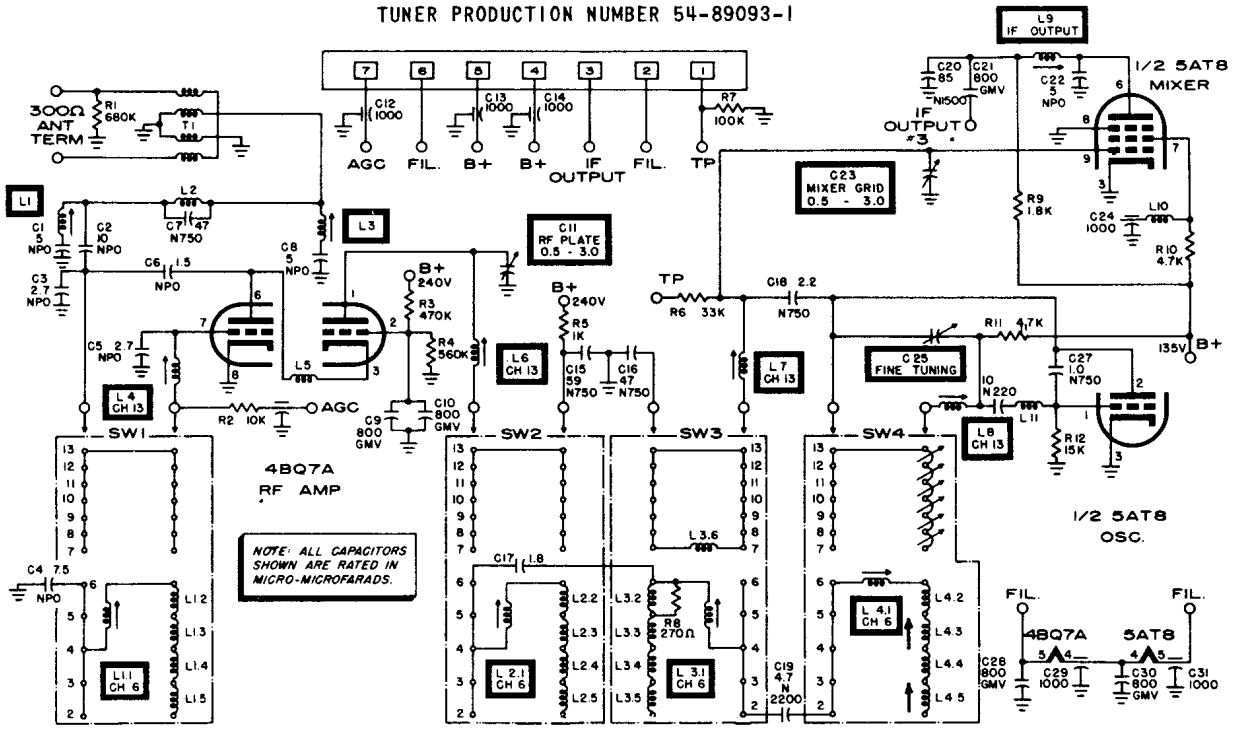
AFTER UNIT IS REASSEMBLED, CHECK FOR POSSIBLE ISOLATION NETWORK OR OTHER DEFECTS IN THE FOLLOWING MANNER.

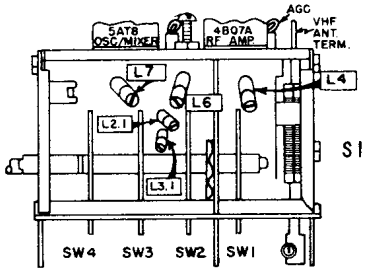
1. UNPLUG RECEIVER FROM AC OUTLET.
2. CONNECT BOTH SIDES OF THE RECEIVER AC LINE CORD TOGETHER.
3. MAKE SURE RECEIVER AC SWITCH IS IN "ON" POSITION.
4. MEASURE RESISTANCE BETWEEN LINECORD AND ALL METAL TRIM, KNOBS, BRACKETS, ANTENNA TERMINALS, ETC. IF A READING OF LESS THAN 470,000 OHMS OR MORE THAN 3 MEGOHMS IS NOTED, CHECK FOR A DEFECTIVE ISOLATION NETWORK OR OTHER FAULTS.

SYLVANIA Chassis 1-541-7, -8, -9, -0 Schematic Diagram (Continued)

SYLVANIA Chassis 1-541-7, etc., Service Information, Continued

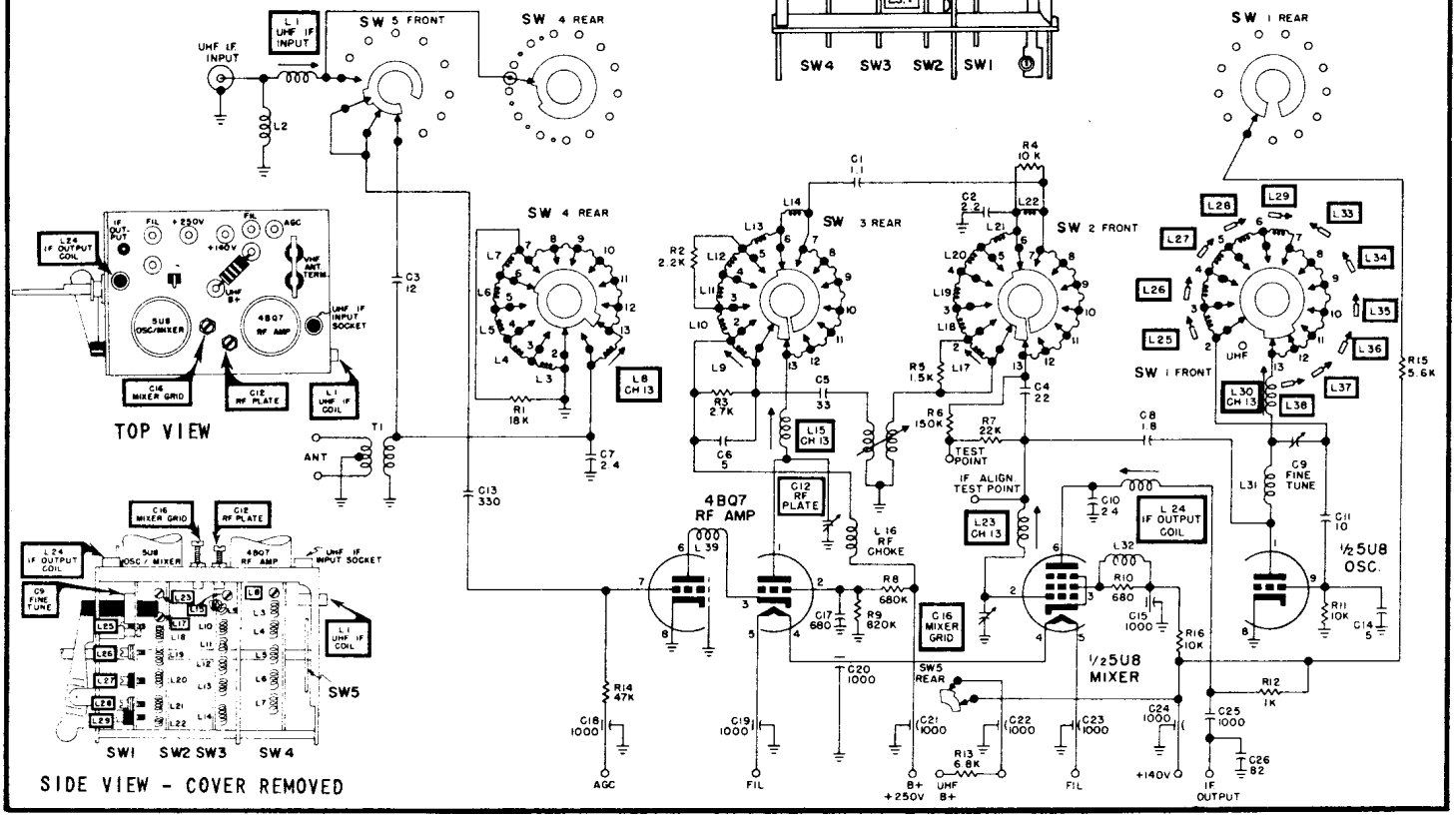
TUNER PRODUCTION NUMBER 54-89093-1





SIDE VIEW - COVER REMOVED

TUNER PRODUCTION NUMBER 54-88847-2



SYLVANIA

CHASSIS: 1-544-1, -2, -3

MODELS: 23C17, 23C18, 23C19, 23C20, 23C21, 23T12, 23T13, 23T14 SERIES

(Service material on pages 153 through 158)

CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Unplug HaloLight leads at upper right side of chassis. (On some models).
3. Disconnect speaker leads at speaker, high voltage lead, picture tube socket, and extension shaft from vertical hold control.
4. Remove two screws locking chassis feet and disengage feet from slots by sliding chassis to rear and up.
5. Remove deflection yoke retaining spring. Remove yoke and hang on hook provided, near horizontal output tube.
6. While supporting tuner assembly, remove top two (2) screws securing assembly to cabinet.
7. Grasp chassis near vertical hold control and remove chassis and tuner assembly from cabinet.

   NOTE: For convenience in handling and servicing, the tuner and control plate may be secured to the left side of the chassis by inserting the ears on left side of chassis plate into slot of tuner assembly. Lower tuner assembly to chassis and join with snap provided.
8. To reinstall chassis reverse the above procedure being careful when inserting picture tube socket that pins are not bent, missaligned or damaged.

HALOLIGHT MASK REMOVAL

1. Remove three (3) screws securing top trim to cabinet.
2. Lift mask and side trim from lower trim.
3. To replace mask and trim reverse

3. To replace mask and trim reverse the above procedure making certain the edges of side trims are behind top and bottom trim.

PICTURE TUBE REMOVAL

1. Remove chassis and tuner assembly as outlined under "Chassis Removal" procedure.
2. Lay cabinet face down on a soft material so as not to scratch or mar the face of the picture tube or finish on cabinet.
3. Remove the four (4) brackets and screws securing picture tube to cabinet.
4. USING GOGGLES AND GLOVES, reach under face of tube and lift from cabinet. DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.
5. To install picture tube, reverse the preceding steps. Exercise caution not to scratch face of picture tube.

   NOTE: When replacing bracket securing picture tube, the beveled edge of brackets must face outward.

SYLVANIA

CAUTION: WHEN SERVICING CHASSIS OUT OF CABINET, DO NOT OPERATE RECEIVER WITH SPEAKER LEADS DISCONNECTED.

AGC ADJUSTMENT

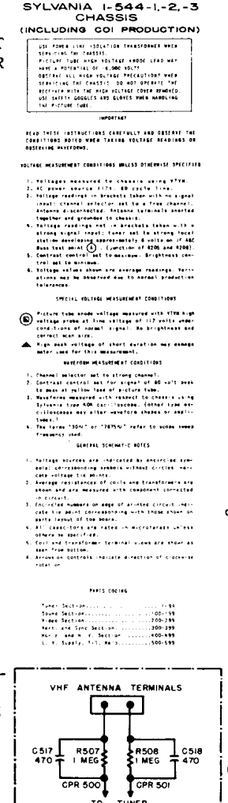
1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.
2. Set contrast and brightness controls to maximum.
3. Rotate AGC control (R301) clockwise until picture "bends" or "jumps" sideways.
4. Reverse rotation of the AGC control (counterclockwise) until picture is horizontally and vertically stable.
5. Reduce contrast and brightness to normal setting, rotate fine tuning control to correct tuning point. Normal picture should be observed. If this condition cannot be met, rotate the AGC control a small amount further in the counterclockwise direction.

HORIZONTAL AFC ADJUSTMENT

Before performing the following procedure, check AGC adjustment as described in "AGC adjustment".

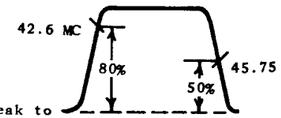
1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.
2. Adjust vertical height, vertical linearity, and width control for normal picture.
3. Rotate horizontal frequency control (L400) in either direction until picture falls out of horizontal sync. (If picture is not out of sync at the end of the control range, momentarily switch tuner to "free" channel and then return to original).
4. Reverse rotation of frequency control slowly until picture falls into sync.
5. Rotate channel selector to a position on which no signal is received; then return to the original station. The picture should immediately fall into sync. If not, slightly readjust horizontal frequency control (L400) and repeat this step.

SYLVANIA Chassis 1-544-1, -2, -3, Schematic Diagram

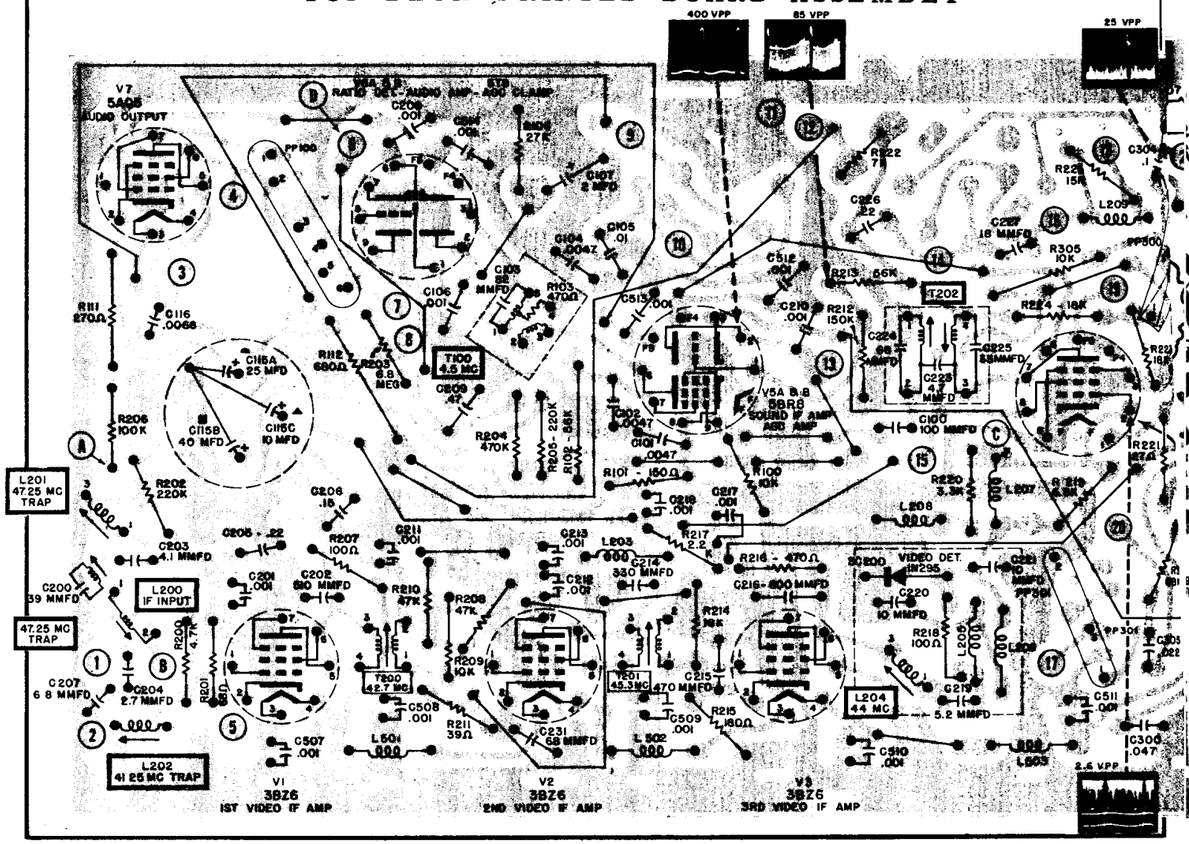


SYLVANIA Chassis 1-544-1, -2, -3, Alignment Information, Continued

VIDEO IF ALIGNMENT

STEP	ALIGNMENT SET-UP NOTES	TEST EQUIPMENT HOOK-UP	ADJUST
1.	Set VHF tuner to a free channel that does not disturb the response curve. Detune tuner converter coil by turning core fully counter-clockwise. Connect -3.5V DC source (–) term to point (A), (+) term. to chassis. Connect -25V DC source (–) term. to point (D), (+) term. to chassis. Adjust sweep generator output for a 3V peak to peak response curve on the scope.	SWEEP GENERATOR - through a .0047 Mfd capacitor to point (B). Set generator to 43.5 MC with 10 MC sweep. SIGNAL GENERATOR - loosely coupled as a marker to sweep generator lead. OSCILLOSCOPE - connected to test point (C).  FIGURE 1	a. Adjust L204 for maximum response at 44.0 MC. b. Adjust T201 for maximum response at 45.3 MC. c. Adjust T200 for maximum response at 42.7 MC. Repeat steps A, B, C to obtain response curve shown in figure 1. Adjust L204 to remove tilt. Adjust T201 to position 45.75 MC marker. Adjust T200 to position 42.6 MC marker. (See Fig. 1)

TOP DECK-PRINTED BOARD ASSEMBLY



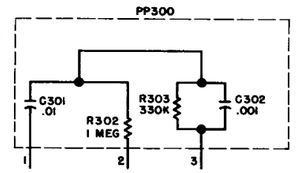
SYLVANIA Chassis 1-544-1, -2, -3, Video I F Alignment (Continued from page 156)

2.	Same as step 1.	SWEEP GENERATOR - through a .0047 Mfd capacitor to a jig shield on mixer tube of tuner. Do not allow shield to short to tuner frame. SIGNAL GENERATOR - loosely coupled to jig shield. OSCILLOSCOPE - Same as Step 1.	a. Set signal generator at 47.25 MC. Detune L201 then adjust trap L200 (top core) for maximum dip. Adjust L201 for maximum dip at 47.25 MC. b. Set signal generator at 41.25 MC and adjust L202 for maximum dip. Note: to observe results it may be necessary to disconnect the -3.5V DC source to point (A).
3.	Same as Step 1.  FIGURE 2	SWEEP GENERATOR - Same as Step 2. SIGNAL GENERATOR - Same as Step 2. OSCILLOSCOPE - Same as Step 2.	a. Adjust converter coil in tuner and L200 (bottom core) to position 42.6 and 45.75 markers as shown in Fig. 2. Note: If 42.6 marker will not position properly, adjust T200 and L204 slightly. DO THIS ONLY IF NECESSARY.

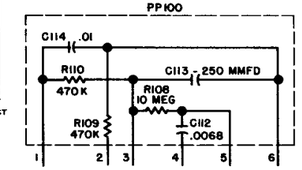
(Continued on page 158)

ALT. PP300

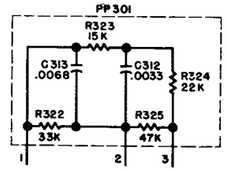
ALTERNATE PP-300 IS ELECTRICALLY SIMILAR TO PP300 EXCEPT FOR THE MOUNTING POSITION AS SHOWN.

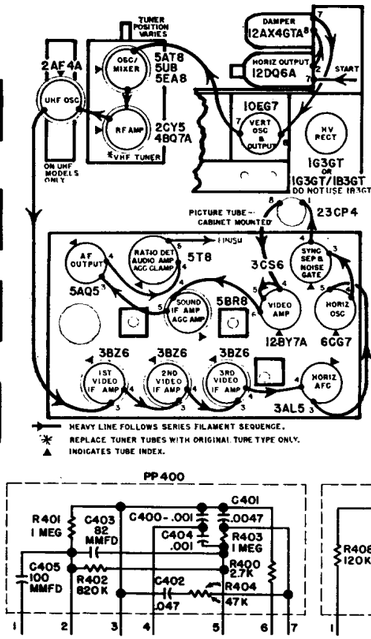


PP100



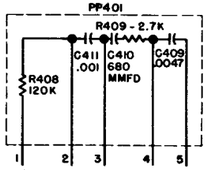
PP301





PP400

PP401



ALT. PP401

ALTERNATE PP401 IS ELECTRICALLY SIMILAR TO PP-401 EXCEPT FOR THE MOUNTING POSITION AS SHOWN.

SYLVANIA Chassis 1-544-1, -2, -3, Alignment Information, Continued

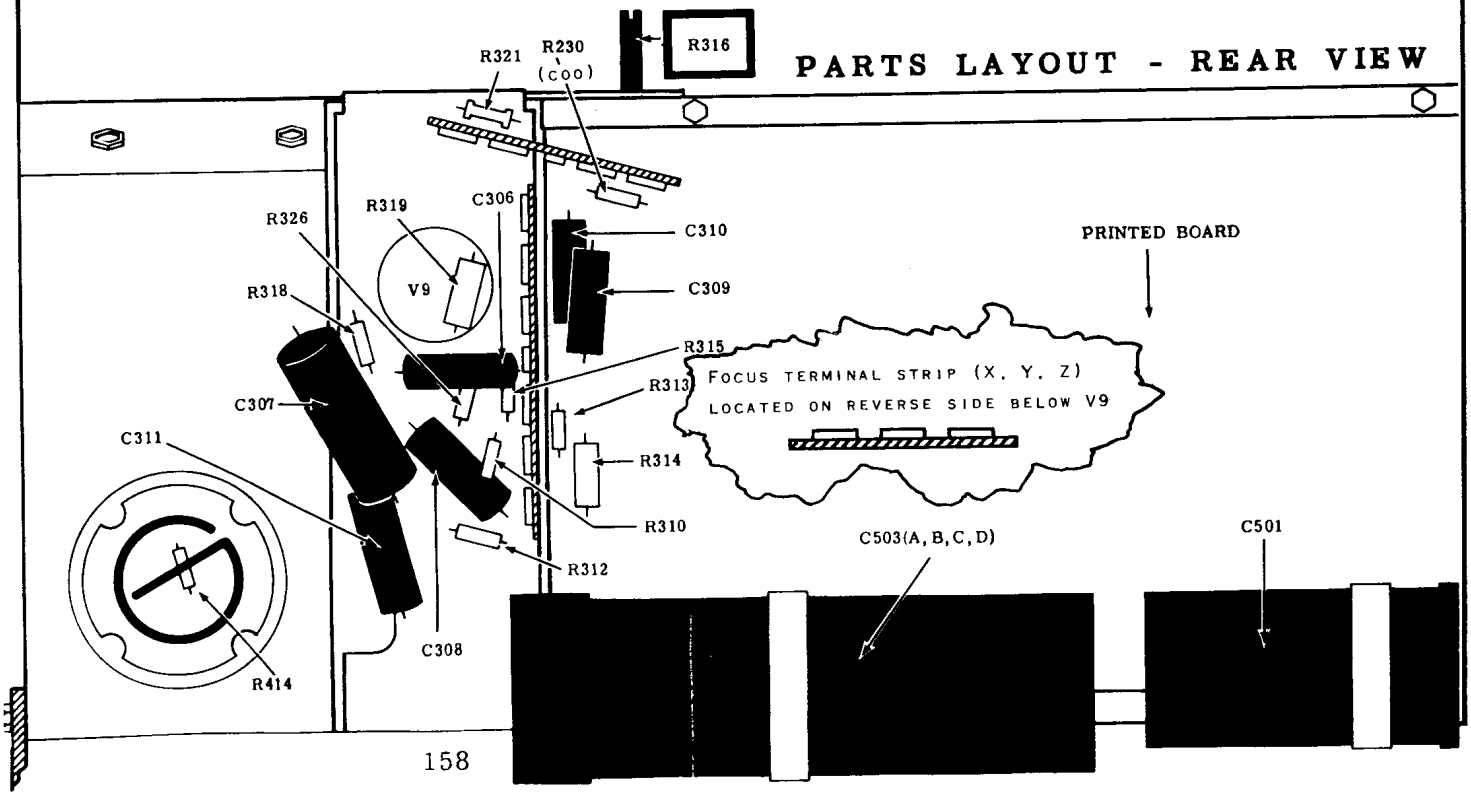
4.5 MC TRAP, SOUND IF AND RATIO DETECTOR ALIGNMENT

STEP	ALIGNMENT SET-UP NOTES	TEST EQUIPMENT HOOK-UP	ADJUST
1.	Set contrast control to maximum and brightness control to minimum. Connect -30 volts DC source (−) term. to test point (A) and (+) term. to chassis. Connect a 4.5 MC series tuned circuit between yellow cathode lead of picture tube and ground.	VTVM - Ground or "common" lead to junction of two matched 100K resistors connected in series across R104 (27K). DC probe through 100K resistor to terminal 4 of T100. Isolate VTVM from ground. SIGNAL GENERATOR - to test point (C). Set signal generator to 4.5 MC.	For MAXIMUM neg. reading: T100 (Top core) T100 (Bottom core) T202 (Bottom core) T202 (Top core) Note: Use peak resulting in greatest separation of cores.
2.	Same as Step 1.	VTVM - RF probe connected across coil of series tuned 4.5 MC circuit. SIGNAL GENERATOR - Same as step 1.	For MINIMUM reading: T202 (Bottom core) Using lowest signal generator output level, repeat step 1 except T202 (bottom core).
3.	Same as Step 1.	Same as step 1.	For zero reading: T100 (Top core) Set VTVM to zero reading using lowest meter scale. At correct setting for T100 (top core), a slight turn of core will give a reading either up or down the scale.

ALTERNATE 4.5 MC TRAP ALIGNMENT

Connect a good antenna to the receiver and properly tune in a strong station. Adjust (T202 bottom core) for minimum 4.5 MC interference in the picture. This interference takes the form of a "grainy" appearance or a fine line pattern through the picture.

PARTS LAYOUT - REAR VIEW

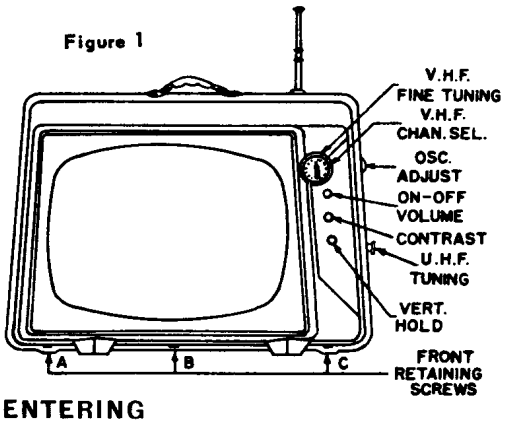


TRAVLER

TRAV-LER RADIO CORPORATION

CHASSIS 1150-19, MODEL X1770,
CHASSIS 1156-39, MODELS 1788, 1790
(Service material on pages 159 through 162)

Figure 1



CENTERING

If the picture is not centered, in the picture opening, it may be centered by removing the cabinet back and adjusting the centering device, on the neck of the tube, at the rear of the deflection yoke. Turn the whole device to the right or left. To increase the amount of picture shift move the two tabs, which project from the device, farther apart. If the picture is tilted at an angle, it may be straightened by loosening the deflection yoke locking clamp and adjusting the deflection yoke.

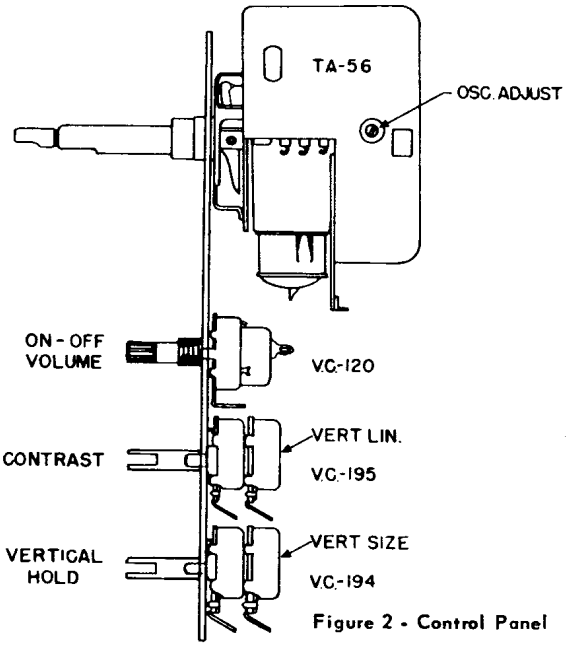
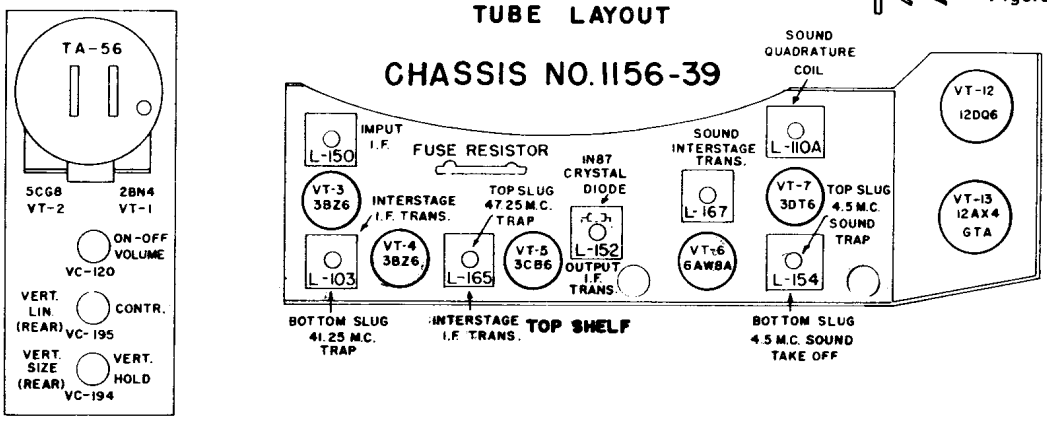


Figure 2 - Control Panel

TUBE LAYOUT



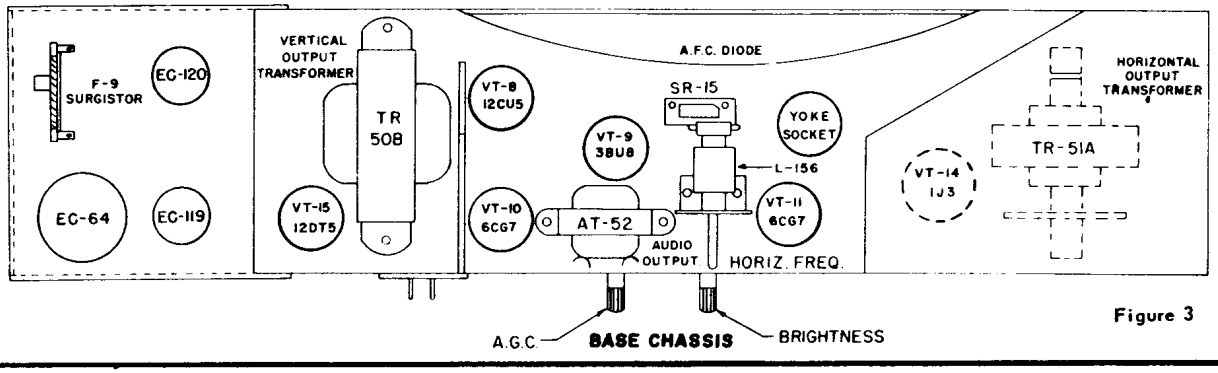
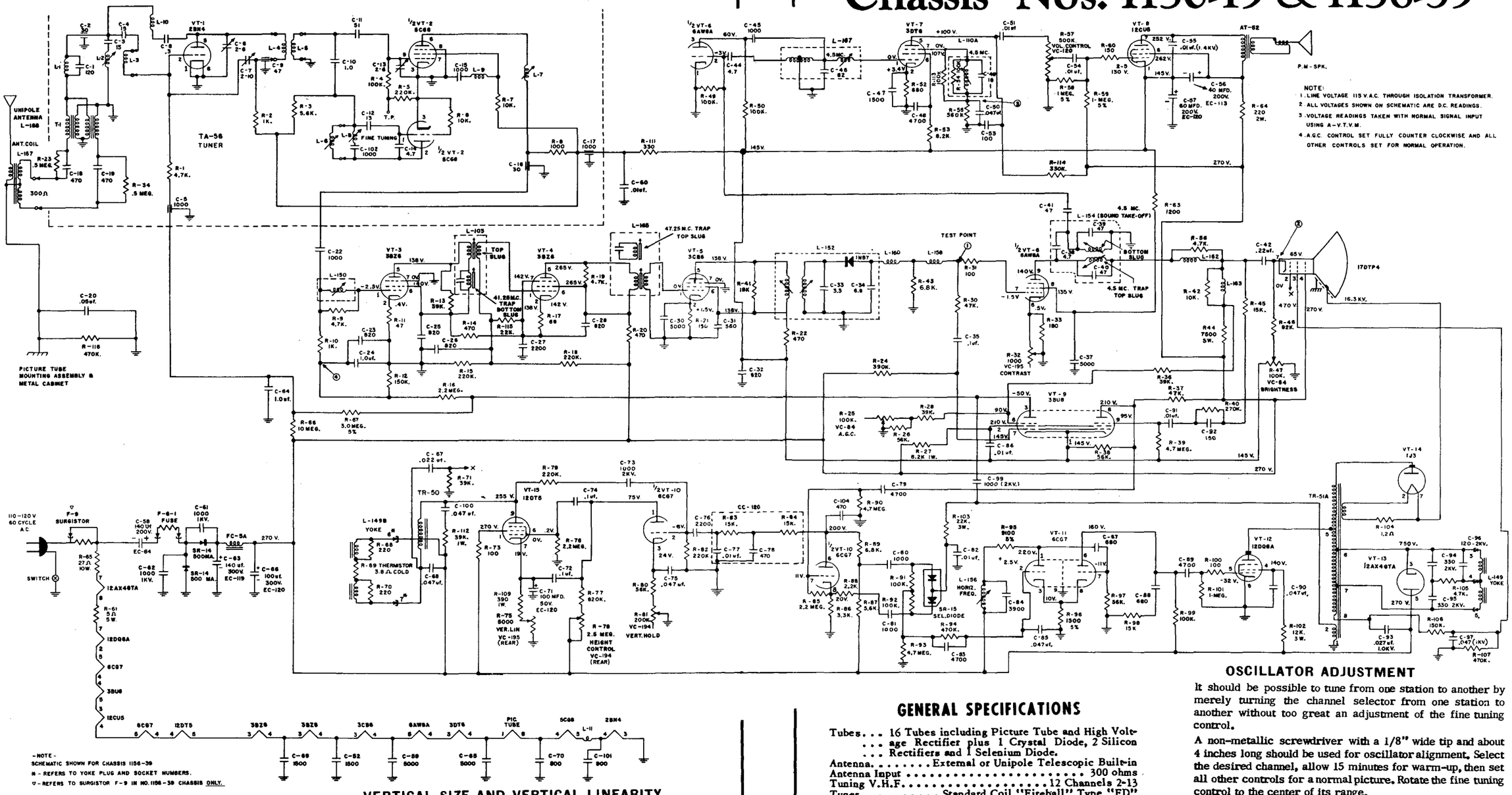


Figure 3

TRAV-LER Chassis 1150-19 & 1156-39 Schematic Diagram (Continued)



- NOTE -
SCHEMATIC SHOWN FOR CHASSIS 1156-39
* - REFERS TO YOKE PLUG AND SOCKET NUMBERS.
▽ - REFERS TO SURGISTOR F-9 IN NO. 1156-39 CHASSIS ONLY.

ELECTROLYTIC KIT

CHASSIS NO. 1156-39	CHASSIS NO. 1150-19
EC-64, C-58	EC-64A, C-58
EC-113, C-56	EC-113, - C-56
EC-119, C-63	EC-119, - C-63
EC-120, C-57, 66, 71	EC-56A, -C-57, 66, 71

TUNER PART NO.

TA-56	TA-50

VERTICAL SIZE AND VERTICAL LINEARITY

The vertical size and vertical linearity controls are the rear portions of the vertical hold and the contrast control. SEE FIG. 2. Access to these controls can be obtained by removing the knobs from the vertical hold and contrast control. Use a thin blade screwdriver to fit into the hollow shaft of each control until the slotted shaft of the rear control is engaged.

Chassis Nos. 1150-19 & 1156-39

GENERAL SPECIFICATIONS

Tubes . . . 16 Tubes including Picture Tube and High Voltage Rectifier plus 1 Crystal Diode, 2 Silicon Rectifiers and 1 Selenium Diode.
Antenna . . . . . External or Unipole Telescopic Built-in
Antenna Input . . . . . 300 ohms
Tuning V.H.F. . . . . 12 Channels 2-13
Tuner . . . . . Standard Coil "Fireball" Type "FD"
Picture Tube 17DTP4
Deflection . . . . . 110°
I.F. Picture Carrier . . . . . 45.75 M.C.
I.F. Sound Carrier . . . . . 41.25 M.C.
Sound I.F. . . . . 4.5 M.C.
Power Supply . . . . . 110-120 Volts-60 Cycle A.C.
Power Consumption . . . . . 175 Watts
Speaker . . . . . 4" P.M.

OSCILLATOR ADJUSTMENT

It should be possible to tune from one station to another by merely turning the channel selector from one station to another without too great an adjustment of the fine tuning control.

A non-metallic screwdriver with a 1/8" wide tip and about 4 inches long should be used for oscillator alignment. Select the desired channel, allow 15 minutes for warm-up, then set all other controls for a normal picture. Rotate the fine tuning control to the center of its range.

Remove the plug button located on the upper right side of the cabinet. This will provide access to the oscillator slug for the channel indicated by the selector knob.

Insert the non-metallic screwdriver and adjust for best picture and sound. The slug requires a slight rotation only.

TRAV-LER Chassis 1150-19 & 1156-39 Alignment Information (Continued)

1. SOUND ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE:

   a. Connect FM signal generator set at 4.5 Mc center frequency. 7.5 Kc deviation to point (1) shown on schematic.

   b. Connect oscilloscope across voice coil of speaker.

   c. Connect VTVM to point (3). Set meter to read at least-5 V.D.C.

   d. Adjust generator for a high level output approximately 200 millivolts or greater and set volume control of receiver for an audible level.

   e. Adjust L-110A quadrature coil for maximum audio output on the oscilloscope. Note - during this adjustment, two peaks may occur. It is important to select the peak which gives the maximum voltage. This will normally measure approximately-2.5 V.D.C.

   f. Reduce the 4.5 Mc signal from 200 millivolts to a point where the output signal on the oscilloscope starts to break up.

   g. Adjust L-154 (bottom) sound take-off coil and L-167 interstage coil for cleanest maximum audio output on the oscilloscope.

   h. Further reduce the 4.5 Mc signal until the audio output signal breaks up again and reset L-154 and L-167 coils for cleanest maximum output. Final adjustment of these two coils should be made at that mainimum signal level at which undistorted audio output signal is just obtainable.

2. ALTERNATE SOUND ALIGNMENT USING TELEVISION STATION SIGNAL AND OUTPUT METER

   a. Tune in strong air signal.

   b. Connect output meter across voice coil of speaker and VTVM to point (3).

   c. Adjust L-110A quadrature coil for maximum audio output. Note - during this adjustment, two peaks may occur. It is important to select the peak which gives the maximum voltage. This will normally measure approximately -2.5 V.D.C.

   d. Reduce the air signal by disconnecting antenna and/or detuning fine tuning control until audio distortion occurs.

   e. Adjust L-154 (bottom slug) sound take-off coil and L-167 interstage coil for maximum undistorted audio output.

   f. Further reduce the air signal level and reset L-154 and L-167 for maximum undistorted audio output. Final adjustment of these two coils should be made at that minimum air signal level at which undistorted audio output is just obtainable.

   g. It may be advisable in some cases to repeat above steps to make certain that the alignment is accurate.

4.5 M.C. SOUND TRAP ADJUSTMENT

1. Connect a signal generator (4.5 M.C. unmodulated) to point (1) shown on schematic. Ground side to chassis.

2. Connect VTVM A.C. probe to point (2).

3. Adjust L-154 Coil (top slug) for minimum reading.

NOTE: A crystal detector shown in Fig. 5 may be used with the VTVM in place of a commercial A.C. probe if desired.

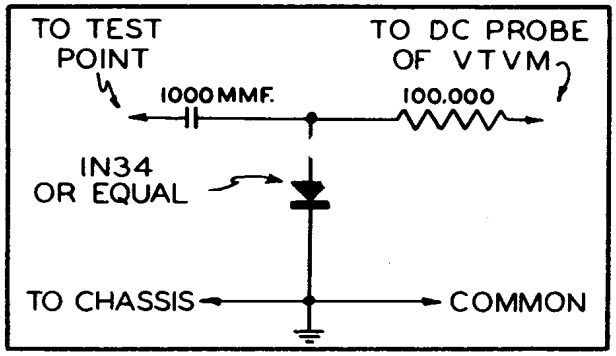


Figure 5 - Diode Detector Detail

VIDEO I.F. ALIGNMENT

1. Tune receiver to channel 12 or 13, whichever is not assigned.

2. Set the contrast control to maximum and a.g.c. control to minimum clockwise position.

3. Connect the negative side of 3.0 volt battery to point (4); connect positive side to chassis.

4. Connect synchronized sweep voltage from sweep signal generator to horizontal input of oscilloscope for horizontal deflection.

5. Connect vertical input of oscilloscope to point (1); connect ground lead to chassis.

6. Loosely couple the weep generator (40 to 48 m.c. for sound carrier and 45.75 m.c. for video carrier).

7. Refer to Fig. 6 for correct position of each coil slug to obtain the resultant I. F. Position as shown.

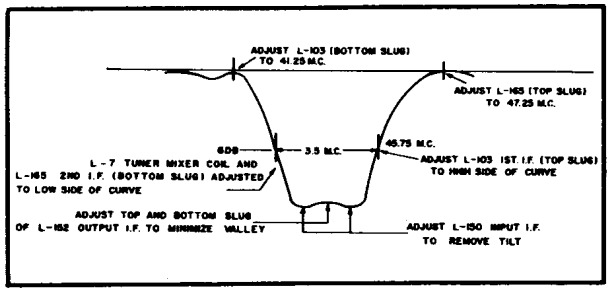


Figure 6 - Video I.F. Phased Pattern

WESTERN AUTO SUPPLY CO.

STOCK NOS. 2DC1040A, 2DC1042A, 2DC1044A & 2DC2040A
UHF STOCK NOS. 2DC1041A, 2DC1043A, 2DC1045A & 2DC2041A

INSTRUCTIONS CHASSIS ASSEMBLY REMOVAL

1. Remove the knobs, dial scale escutcheon, channel indicator and secondary control knobs in the order listed.
2. Remove cabinet back.
3. Disconnect the speaker leads and (if equipped with monopole antenna) the monopole antenna lead.

HIGH VOLTAGE WARNING

This television receiver contains high voltages which are dangerous to life. Never operate or service the receiver outside of the cabinet or with the covers removed until all the safety precautions necessary for working with high voltage equipment have been observed.

PICTURE TUBE HANDLING PRECAUTIONS

Shatterproof goggles and heavy gloves must be worn by individuals while handling the picture tube or installing the picture tube into the receiver.

The picture tube encloses a high vacuum and due to the large surface area, is subjected to very high air pressure. Therefore, care should be taken not to bump or scratch the picture tube accidentally as it may cause the tube to implode resulting in damage to property or injury to an individual.

PICTURE TUBE REMOVAL

1. Disconnect the yoke plug, picture tube socket, anode lead and remove the beam aligner magnet and deflection yoke.
2. Loosen 4 screws marked "A" and 2 screws marked "B" on illustration.
3. Remove old picture tube and install new tube reversing the steps outlined above, keeping the following in mind:
   a. There is a mold match line on the picture tube. Assemble the harness to the picture tube, centering the harness over the mold match line on picture tube. Holes are provided in harness to check the centering. Then tighten the screws marked "B" until the picture tube is firmly in place on harness.
   b. The pilot light socket assembly must be replaced in the bracket.

NOTE - If the above is not observed, difficulty may be encountered in replacing the entire assembly into the cabinet.

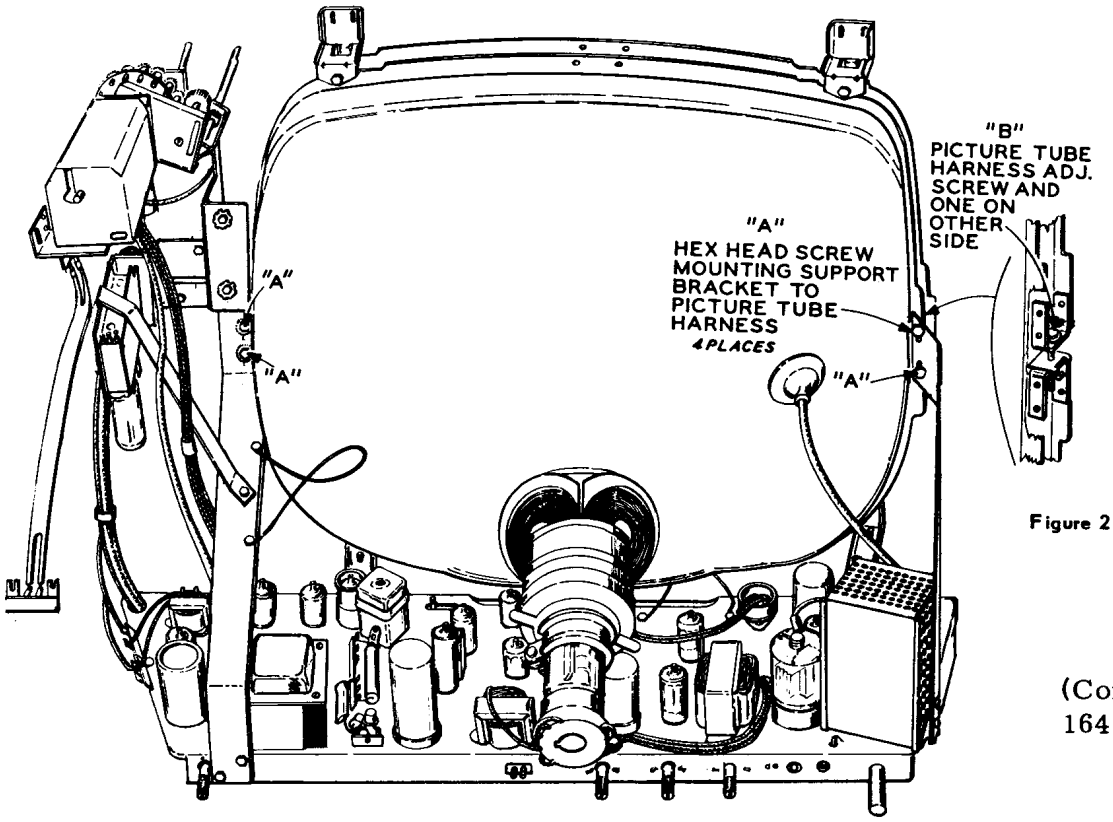


Figure 2 - Pix Tube Removal

(Continued on pages 164 through 168)

WESTERN AUTO Truetone Models 2DC1040A, 2DC1041A, etc. Alignment Information

TEST EQUIPMENT -

R-F SWEEP GENERATOR
CATHODE-RAY OSCILLOSCOPE
BIAS BATTERY - 1.5V & -4.5V
VTVM
DIODE DETECTOR

40 MC I-F Alignment - Connect sweeper with very short leads through a 1 K mmf disc ceramic capacitor to mixer grid test point. With short leads connect crystal diode detector (Fig. 4) to plate of 1st I-F tube. Connect -1.5V to A.G.C. line (Junction of C-304 & R-336). Connect oscilloscope to detector output. Adjust sweep output to give adequate deflection.

FREQUENCY	ADJUST
1. 47.25 Mc	1st Pix I-F Coil (T-200 Bottom of Coil) to center notch over 47.25 Mc marker.
2.	Converter Plate Coil L-7 (Top of Tuner) Input Grid Coil (L-200) and Input Coupling Coil (L-201) to give response shown in figure 5.

The converter plate and input grid coils control the shape of the top. The input coupling coil controls the position of the 41.25 marker. This adjustment must be made accurately or the sound rejection will not be correct (41.25 Mc 31 to 36 db down from top of overall P.I.F. response). 45.75 Mc marker must be set exactly on peak or the position of the 44.5 Mc marker in the overall response curve will not be correct.

When the input circuit is aligned place - 4.5V bias on the AGC line. (Junction of C-304 & R-336). Remove

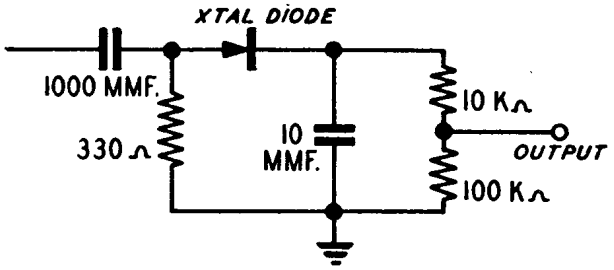


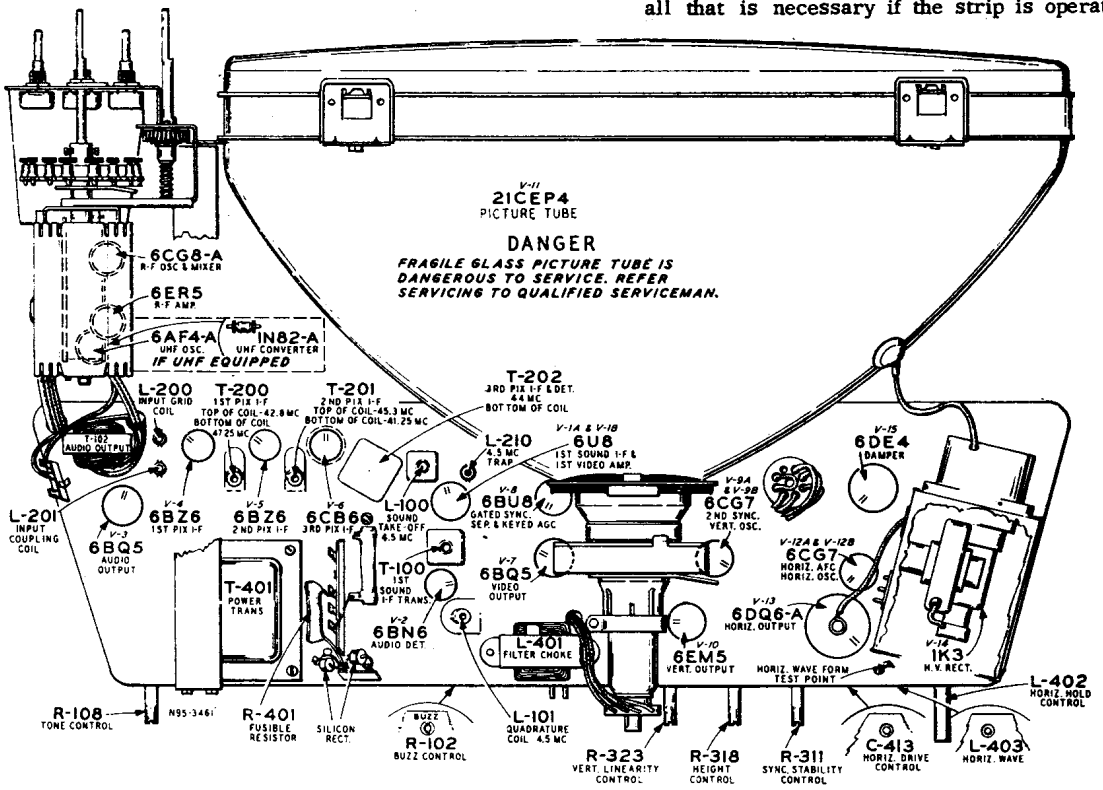
Figure 4-Crystal Diode Detector

the crystal detector and connect oscilloscope and VTVM to the 2nd pix detector load resistor R-213. Adjust sweep output to give 2.0 VDC at detector.

FREQUENCY	ADJUST
1. 42.8 Mc	1st Pix I-F Coil (T-200, Top of Coil) for maximum height of 42.8 Mc marker.
2. 41.25 Mc	2nd Pix I-F Coil (T-201, Bottom of Coil) for minimum height of 41.25 Mc marker.
3. 45.3 Mc	2nd Pix I-F Coil T-201, Top of Coil) for maximum height of 45.3 Mc marker.
4. 44.0 Mc	3rd Pix I-F Coil (T-202, Bottom of Coil) for maximum height of the 44.0 Mc marker.

These adjustments may be made with a single frequency generator if it is more convenient to do so.

After these adjustments have been made recheck the peak to peak output on the oscilloscope. If the shape of the curve is not as shown in figure 6, it will be necessary to retouch the adjustments. A small fraction of a turn is all that is necessary if the strip is operating correctly.



WESTERN AUTO Models 2DC1040A, 2DC1041A, etc., Alignment Information, Continued

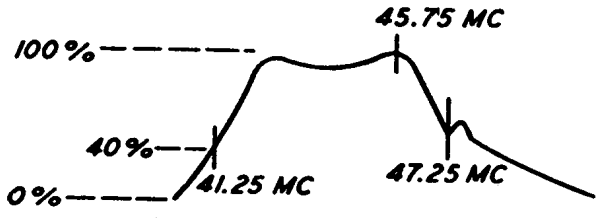


Figure 5-Input Circuit Response

The position of the 44.5 Mc marker is critical (98%). The 44.0 Mc transformer (3rd I-F) controls the symmetry of the top. The 45.3 Mc transformer (2nd I-F) controls the height of the 45.75 Mc marker. The 42.8 Mc transformer (1st I-F) controls the height of the 42.4 Mc marker. This adjustment will very seldom need retouching.

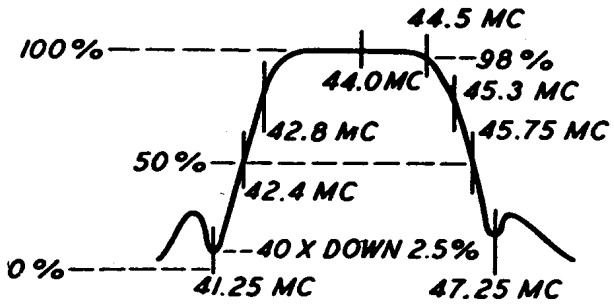


Figure 6-Overall Response Curve

DO NOT RETOUCH the converter plate coil or the input grid coil. These coils MUST be adjusted correctly with the diode detector. Recheck position of 41.25 Mc and 47.25 Mc markers. Reset if necessary.

VIDEO

With 4.5 Mc unmodulated signal into grid of the video amplifier tube and VTVM on picture tube cathode, tune 4.5 Mc trap for minimum response. VTVM on 0-10 V AC scale. This adjustment can also be made while observing a picture from a station. Tune trap for least 4.5 Mc beat (grainy appearance) in picture.

AUDIO

1. Tune in a TV station and reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.

2. Adjust sound take-off coil (L-100) sound I-F transformer, (T-100) quadrature coil (L-101) and buzz control (R-102) for maximum undistorted sound and minimum buzz.

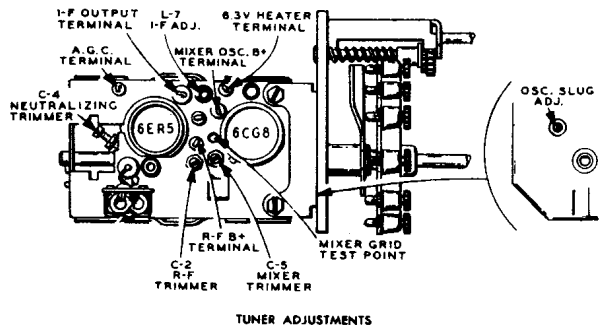


Figure 7-Top Tuner Adjustment

3. If "hiss" disappears during step 2, further reduce signal strength.

TUNER ALIGNMENT

A. Sweep generator with balanced 300 ohm output to antenna terminals. Marker generator output to antenna terminals. Oscilloscope to "test point" on tuner. Connect - 2.5V bias thru 10 K ohm resistor to R-F AGC terminal on tuner.

B. RF AND CONVERTER ADJUSTMENT

1. With channel selector on Channel 10, adjust C-2 and C-5 for maximum symmetrical response with respect to pix and audio markers.

2. With short leads connect crystal diode detector to plate of 1st I-F tube. Connect -1.5V to aAGC line (junction of C-304 and R-336). Connect oscilloscope to detector output. Adjust sweep output to give adequate deflection. Adjust neutralizing trimmer (C-12) for minimum response on I-F display.

3. Recheck R-F Plate trimmer (C-2). (R-F plate and neutralizing adjustment interact.)

4. Check R-F passband on other channels as per step No. 1.

C. OSCILLATOR ADJUSTMENT

1. Apply - 4.5 volts on I-F AGC line at junction of R-336 and C-304.

2. Connect oscilloscope to output of video detector. Place pre-set mechanism (fine tuning) in center of range. Check response on all channels. Sound marker should be in notch and picture marker at 50%. (See Overall Response Curve.)

3. If markers are off, individual oscillator coil slugs will require adjustment. Adjust each channel slug with a non-metallic screwdriver to bring sound marker to correct position.

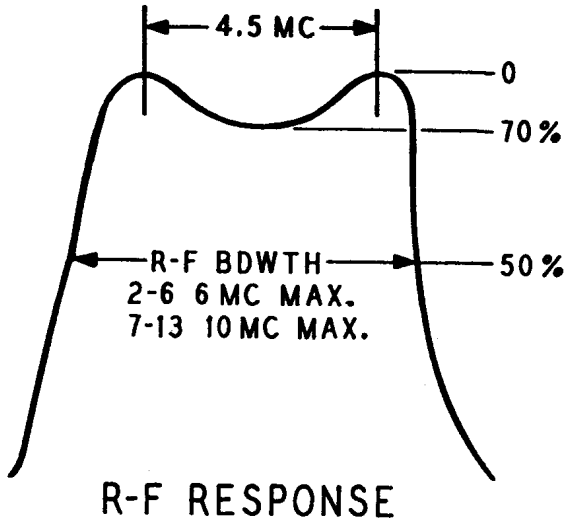


Figure 8-Pix & Audio Markers

WESTERN AUTO SUPPLY CO. (Truetone)

Models 2DC1040A, 2DC1041A, 2DC1042A, 2DC1043A, 2DC1044A, 2DC1045A, 2DC2040A, and 2DC2041A

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT

Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel and then back. Normally the picture may be out of sync. Turn the control slowly clockwise. The number of diagonal bars will be gradually reduced and when only 2 to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control.

At the extreme clockwise position the picture should be just starting to pull out of a sync.

If the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned.

HORIZONTAL DRIVE ADJUSTMENT - While receiving a signal from a station (with picture locked in sync) turn contrast control fully counter-clockwise, turn the brightness control up so that the picture appears washed out. Turn the horizontal drive control clockwise until white bars appear in the left center portion of the raster, then turn counter-clockwise until the white bars just disappear. This adjustment will allow the horizontal system to operate at maximum efficiency.

HORIZONTAL WAVE FORM ADJUSTMENT - This is a factory adjustment and it should not be necessary to readjust unless the setting has been disturbed. However, if it is found that readjustment is required, follow this procedure: With the picture in sync connect an oscilloscope to the horizontal wave form test point. Adjust the horizontal wave form until the two peaks of the wave form shown in figure 3 are equal.

NOTE-Picture must be in sync during this adjustment.

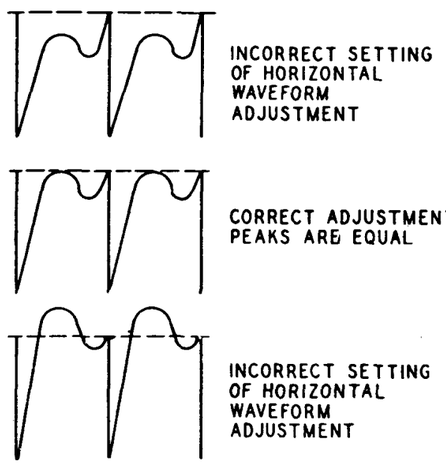
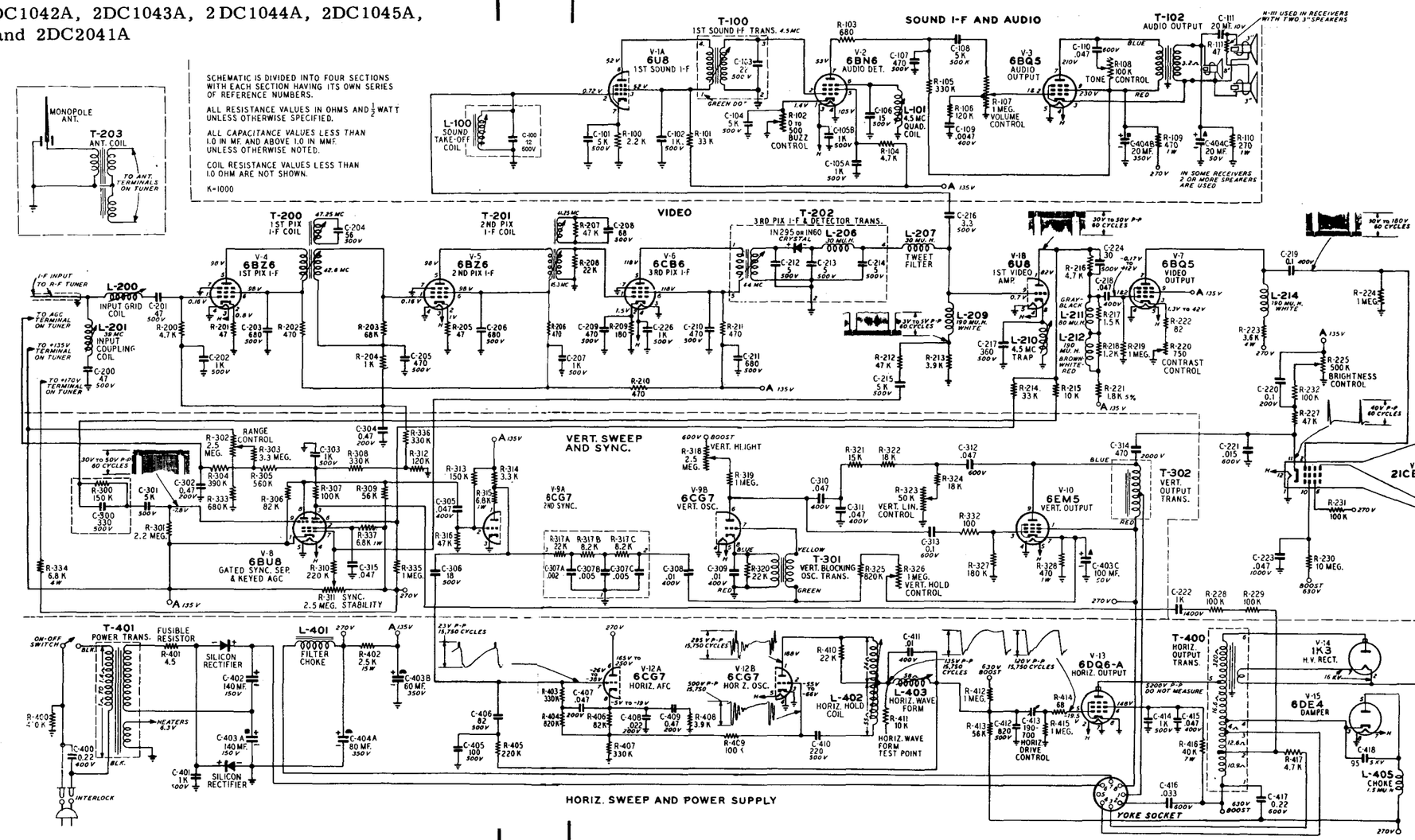


Figure 3-Settings of Waveform Adjustment

ADJUSTMENT OF RANGE CONTROL - Tune the receiver to the strongest station in the area in which the receiver will be used. While observing the picture and listening to the sound, turn the control clockwise until signs of overloading (buzz in sound, washed-out picture, sync instability) appear. Then turn the control a few degrees counter-clockwise from the point at which overloading occurs. (The stronger the signal input, the more counter-clockwise this setting will be.) In areas where the strongest signal does not exceed 1000 MV the setting will usually be maximum clockwise. With the control set correctly, the AGC will automatically adjust the bias on the R-F and I-F amplifiers so that the best possible signal to noise ratio (minimum snow) will be obtained for any signal input to the receiver.

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

WESTERN AUTO SUPPLY CO. (Truetone)



WESTERN AUTO Models 2DC1040A, 2DC1041A, etc., Service Hints, Continued

HORIZONTAL DEFLECTION ONLY - If only horizontal deflection is obtained as evidenced by a straight line across the face of the picture tube, it can be caused by the following:

1. Vertical oscillator V-9 or vertical output tube V-10 inoperative. Check socket voltages.
2. Vertical oscillator transformer (T-301) defective.
3. Vertical output transformer (T-302) open or shorted.
4. Yoke vertical coils open or shorted.
5. Vertical hold, height or linearity controls may be defective.

POOR VERTICAL LINEARITY - If adjustment of the height and linearity controls does not correct this condition, any of the following may be the cause.

1. Check variable resistors R-318 and R-323.
2. Vertical output transformer (T-302) defective.
3. Capacitor C-403C defective.
4. V-9 or V-10 defective, check voltages.
5. Excess leakage or incorrect value of capacitors C-310 C-311 and C-312 or open or incorrect value of resistors R-321, R-322, R-324 and R-327.
6. Vertical deflection coils (L-300) defective.

POOR HORIZONTAL LINEARITY - If adjustment of the horizontal drive control does not correct this condition, check the following:

1. Check horizontal drive setting.
2. Check or replace horizontal output tube V-13.
3. Check or replace damper tube V-15.
4. Check capacitors C-411, C-412, and C-416 and resistors R-412 & R-413 for defects.
5. Horizontal deflection coils (L-404) defective.

WRINKLES ON LEFT SIDE OR RASTER - This condition can be caused by:

1. Defective yoke.
2. V-15 defective.
3. R-417 defective.

SMALL RASTER - This condition can be caused by:

1. Low + B or line voltage. Check silicon rectifier.
2. Insufficient output from horizontal output tube V-13. Replace tube.
3. Insufficient output from vertical oscillator or vertical output tube V-9 & V-10. Replace tubes.
4. Incorrect setting of horizontal drive control C-413.
5. V-15 defective.

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

1. No signal on picture tube grid. Check V-1 and V-7 tubes and associated circuits.
2. Bad contact to picture tube grid (lead to socket broken).
3. AGC tube (V-8) may be defective. Check tube and its associated circuit.
4. Range control mis-adjusted.
5. Fine tuning control mis-adjusted.

MAN MADE NOISE IN SOUND (Ignition, etc.)

1. Check sound I-F tubes V-1, V-2 and V-3 and associated circuits.
2. Check sound I-F alignment.

SIGNAL ON PICTURE TUBE GRID AND HORIZONTAL SYNC ONLY - If this condition is encountered, check:

1. Vertical integrating network.
2. Vertical hold control (R-326) defective.
3. Check voltages of V-9.

SIGNAL ON PICTURE TUBE GRID AND VERTICAL SYNC ONLY

1. V-12 defective.
2. Improper setting of horizontal hold coil (L-402) or horizontal wave for (L-403).
3. Check V-12 socket voltages.
4. Capacitor C-306 defective.

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

1. Defective pix I-F tubes V-4, V-5 and V-6.
2. Defective picture detector crystal or video amplifier tube (V-1) or video output tube (V-7).
3. Defective picture tube.
4. Open video peaking coil. Check all peaking coils L-209, L-211, L-212 and L-214 for continuity. Note that L-211 and L-212 have shunting resistors.
5. Leakage in V-7 grid capacitor C-218. If the capacitor is not found to be defective, check the following:
   1. Check all potentials in video circuits.
   2. Check picture tube grid circuit for poor or dirty contact.
   3. Check and realign, if necessary, the picture I-F and R-F circuits.

BENDING OR S-ING

1. Check sync stability control adjustment.
2. Abnormal hum in power supply. Check wave forms.
3. V-12 or V-13 defective.
4. Check sync separator tube V-8 , sync amplifier tube V-9 and video amplifier tube V-1.
5. Check Range control.

RASTER ON TUBE BUT NO PICTURE OR SOUND - This condition can be caused by:

1. Defective pix I-F tubes V-4, V-5 or V-6.
2. Defective pix detector crystal. Check crystal and its associated circuit.
3. Defective R-F amplifier or oscillator mixer tubes in the tuner.
4. Defective AGC tube V-8.

POOR FOCUS

1. Improper setting of beam aligner. (If used)
2. Defective picture tube or picture tube socket.

PICTURE JITTER

1. If regular sections at left of the picture are displaced, replace the horizontal oscillator tube (V-12).
2. Vertical instability may be due to loose connections or noise received with the signal.
3. Horizontal instability may be due to unstable transmitted sync.
4. Check receiver AGC system for proper operation.
5. Check sync amplifier and sync separator tubes.
6. Improper setting of sync stability and Range controls.

Westinghouse

V-2384-1 VHF ONLY
V-2384-2 VHF/UHF

MODEL AND CHASSIS CHART

Models	*Chassis*	*Tuner Used*	*Tuner Tubes*
HP3200 HP3300 HP3301	V-2384-1	VHF: 470V065H01	RF Amp: 3EA5 Osc-Mix: 6CL8A
HP3200U HP3300U HP3301U	V-2384-2	VHF: 470V066H01	RF Amp: 3EA5 Osc-Mix: 6CL8A
		UHF: 472V035H01	Osc: 3AF4A Crystal: 1N82A

CHASSIS REMOVAL

1. Remove control knobs. (On early production models the fine tuning knob is not removable.)
2. Remove back cover and disconnect antenna lead-in. Push out nylon pin holding lead-in to back cover.
3. Remove screw holding metal brace behind tuner and swing brace out of the way.
4. Disconnect speaker leads at output transformer. (On deluxe models speaker assembly and handle assembly must also be removed. Remove the four ¼" screws with a ratchet type socket wrench.)
5. Remove three ¼" screws securing control panel and chassis front to cabinet front.
6. Remove six screws holding chassis to cabinet bottom.
7. Carefully remove chassis, tuner end first.
   CAUTION: Be extra careful not to break off feed-thru capacitor on tuner.

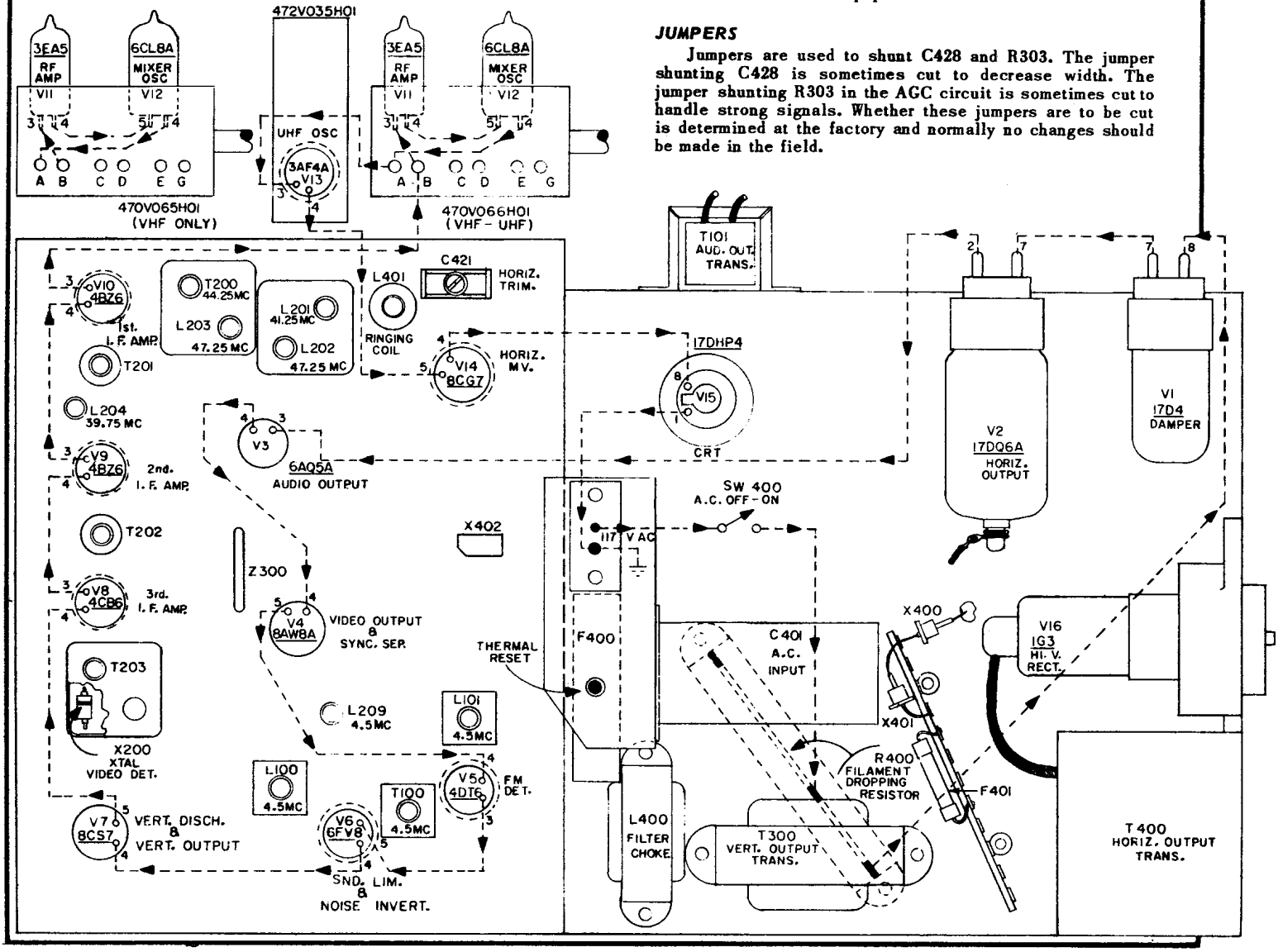
PICTURE TUBE REMOVAL

1. Remove chassis as described under CHASSIS REMOVAL.
2. Remove High Voltage lead, CRT socket and yoke. Discharge High Voltage button.
3. Loosen rear picture tube wire strap. Loosen and remove front picture tube wire strap.
4. Remove picture tube from front of chassis. Force metal corners outward slightly to pass tube. It should not be necessary to remove corners.

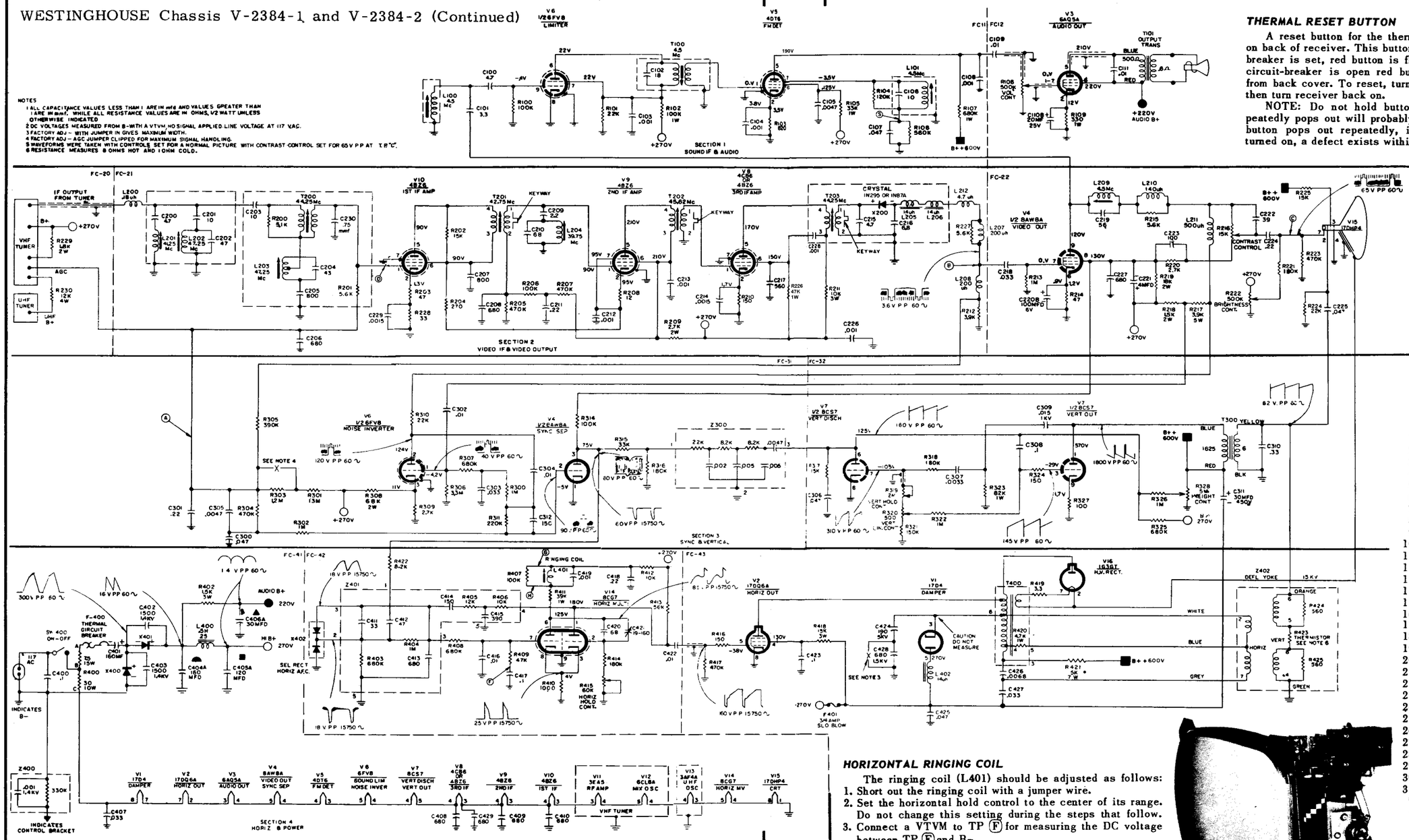
The Horizontal B+ fuse F401 is a 3/4 amp. pigtail slo-blo, 250V, located near the vertical output transformer and covered with insulation paper.

JUMPERS

Jumpers are used to shunt C428 and R303. The jumper shunting C428 is sometimes cut to decrease width. The jumper shunting R303 in the AGC circuit is sometimes cut to handle strong signals. Whether these jumpers are to be cut is determined at the factory and normally no changes should be made in the field.



WESTINGHOUSE Chassis V-2384-1 and V-2384-2 (Continued)



CENTERING

The centering rings, located at the rear of the deflection yoke, should be rotated to center the raster.

DEFLECTION YOKE

The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

HEIGHT AND VERTICAL LINEARITY

The HEIGHT AND VERT. LIN. controls are accessible through two holes in the front escutcheon, just below the Channel Selector knob, with HEIGHT on the left and VERT. LIN. on the right. With a narrow screwdriver, adjust them alternately until a picture of proper height and linearity is obtained.

VOLUME TV-17, MOST-OFTEN-NEEDED 1960 TELEVISION SERVICING INFORMATION

THERMAL RESET BUTTON

A reset button for the thermal circuit-breaker is located on back of receiver. This button is red in color. When circuit breaker is set, red button is flush with cabinet back. When circuit-breaker is open red button will project about 1/8" from back cover. To reset, turn off receiver, push in button, then turn receiver back on.

NOTE: Do not hold button in. To do so when it repeatedly pops out will probably cause component failure. If button pops out repeatedly, immediately after receiver is turned on, a defect exists within receiver.

HORIZONTAL RINGING COIL

The ringing coil (L401) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire.
2. Set the horizontal hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to TP (F) for measuring the DC voltage between TP (F) and B-.
4. With the receiver tuned to a station of normal signal strength, adjust C421 for 0 volts DC on the meter.
5. Remove the jumper from the ringing coil.
6. Adjust the ringing coil for 0 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal sync on all channels.

Key to Figure 6, printed on page 172

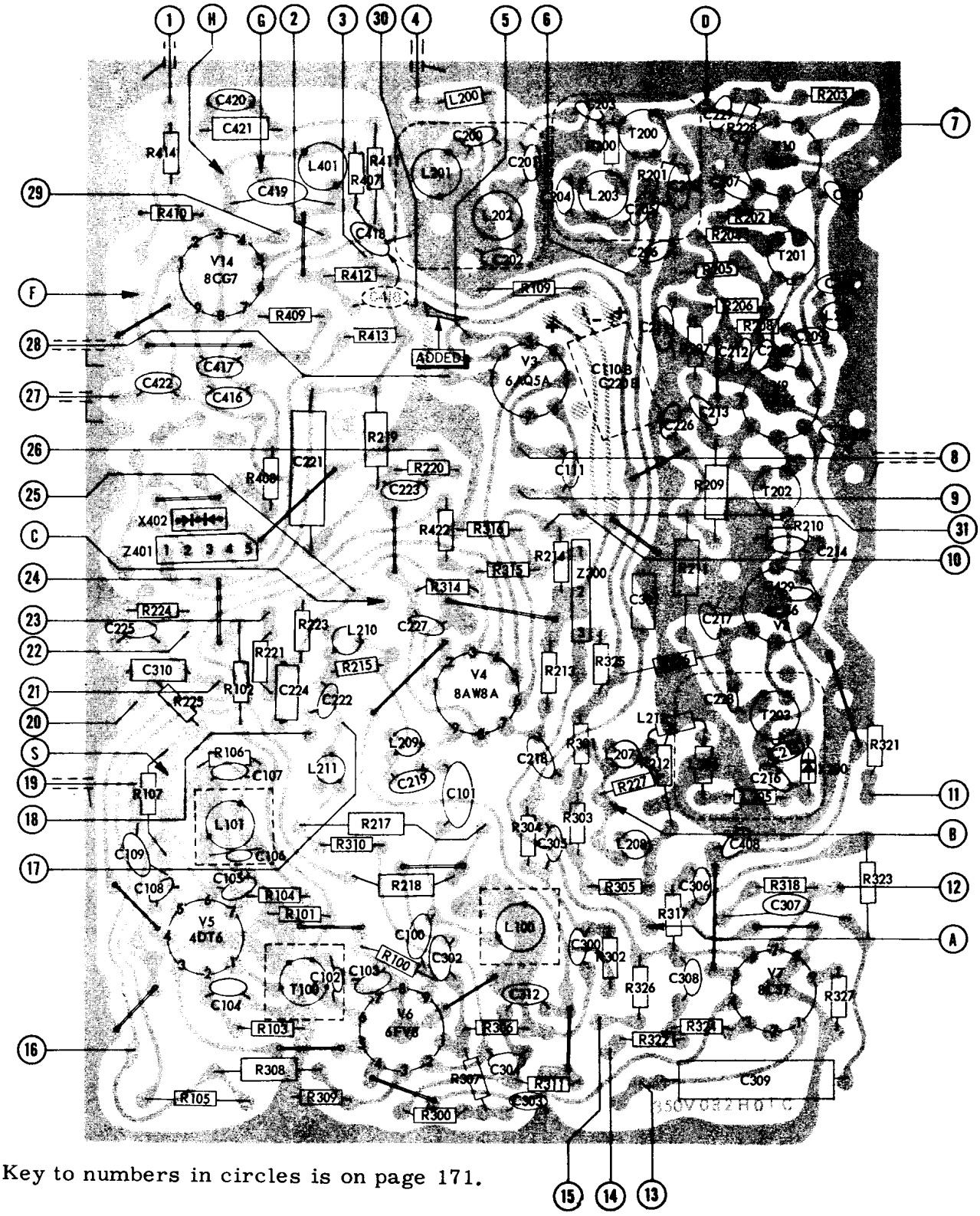
1. Horiz Hold R415
2. Tuner filament
3. Tuner B+
4. Tuner to IF input
5. Pin 2 of 17DQ6A
6. Tuner AGC
7. Tuner filament
8. T101 primary
9. Audio B+
10. T101 primary
11. R320, Vert Lin, bottom
12. R319 Vert Hold
13. T300 Vert output
14. R320 Vert Lin Control, Arm
15. R328 Height control, arm
16. L400 Hi B+
17. R216 Contrast control, top
18. R216 Contrast control, arm
19. R108 Volume control, top
20. CRT pin #3
21. T300 Vert output
22. CRT pin #3
23. R222 Brightness control, arm
24. R222 Brightness control, top
25. CRT pin #7
26. R216 Contrast control, bottom
27. R416 grid of Horiz output
28. R108 Volume control, arm
29. CRT pin #8
30. *To C110B
31. *To C220B

* Not on early boards

TEST POINTS

A. AGC for 1st IF: also AGC for tuner
B. Video detector
C. CRT cathode
D. 1st IF input
F. Horiz MV
G. Ringing coil
H. Ringing coil
S. FM sound

WESTINGHOUSE Chassis V-2384-1, V-2384-2, View of PC Board, Continued



Key to numbers in circles is on page 171.

Figure 6 – Bottom view of PC board showing location of top components in solid outlines. Tube pin numbering is for bottom of socket.

Westinghouse

CHASSIS ASSEMBLIES

VHF only

V-2378-1&3 MANUAL

VHF-UHF

V-2378-2&4 MANUAL

V-2378-5&6 POWER

Models HK4300, -U, HK4800, use Chassis V-2379-1, -2, -3, and are identical to V-2378+ except that they use a 23" picture tube and C416 is 130 mmfd.

MODEL AND CHASSIS CHART

Models		Chassis	Tuners Used	Tuner Tubes
HT3700	HT3701	V-2378-1	VHF: 470V062H01	RF Amp: 6EA5
HT3702	HK4000			Mix-Osc: 6CL8A
HK4001	HK4002			
HK4100	HK4101	V-2378-3	Alt: 470V064H01	RF Amp: 6ER5
HK4102	HK4200			Mix-Osc: 6CG8A
HK4201	HK4202			
HT3700U	HT3701U	V-2378-2	VHF: 470V063H01	RF Amp: 6EA5
HT3702U	HK4000U			Mix-Osc: 6CL8A
HK4001U	HK4002U			
HK4100U	HK4101U	V-2378-4	UHF: 472V034H02	UHF Osc: 6AF4A
HK4102U	HK4200U			
HK4201U	HK4202U			
HK4400	HK4401	V-2378-5	VHF/UHF: 470V064H01 Power Tuned	RF Amp: 6ER5 Mix-Osc: 6CG8A
HK4402	HK4403			
HK4500	HK4501			
HK4502	HK4503			
HK4600	HK4601	V-2378-6		
HK4602				

Models HK4103, -U, use Chassis V-2378-3, -4

CHASSIS REMOVAL

1. Remove control knobs.
2. Remove back cover and antenna terminal bracket.
3. Remove the five screws which secure control panel and tuner brackets to cabinet front.
4. Remove the four screws which secure chassis to cabinet.
5. Remove speaker leads from terminal lugs on chassis.
6. On receivers having Remote Director, remove remote receiver plug.
7. Carefully slide chassis out from cabinet.

CRT REMOVAL

1. Remove chassis from cabinet.
2. Remove CRT socket, yoke clamp, width control and second anode lead.
3. Loosen bolt at top of CRT to release strap.
4. Remove CRT.

CENTERING

The centering rings, located at the rear of the deflection yoke should be rotated to center the raster.

DEFLECTION YOKE

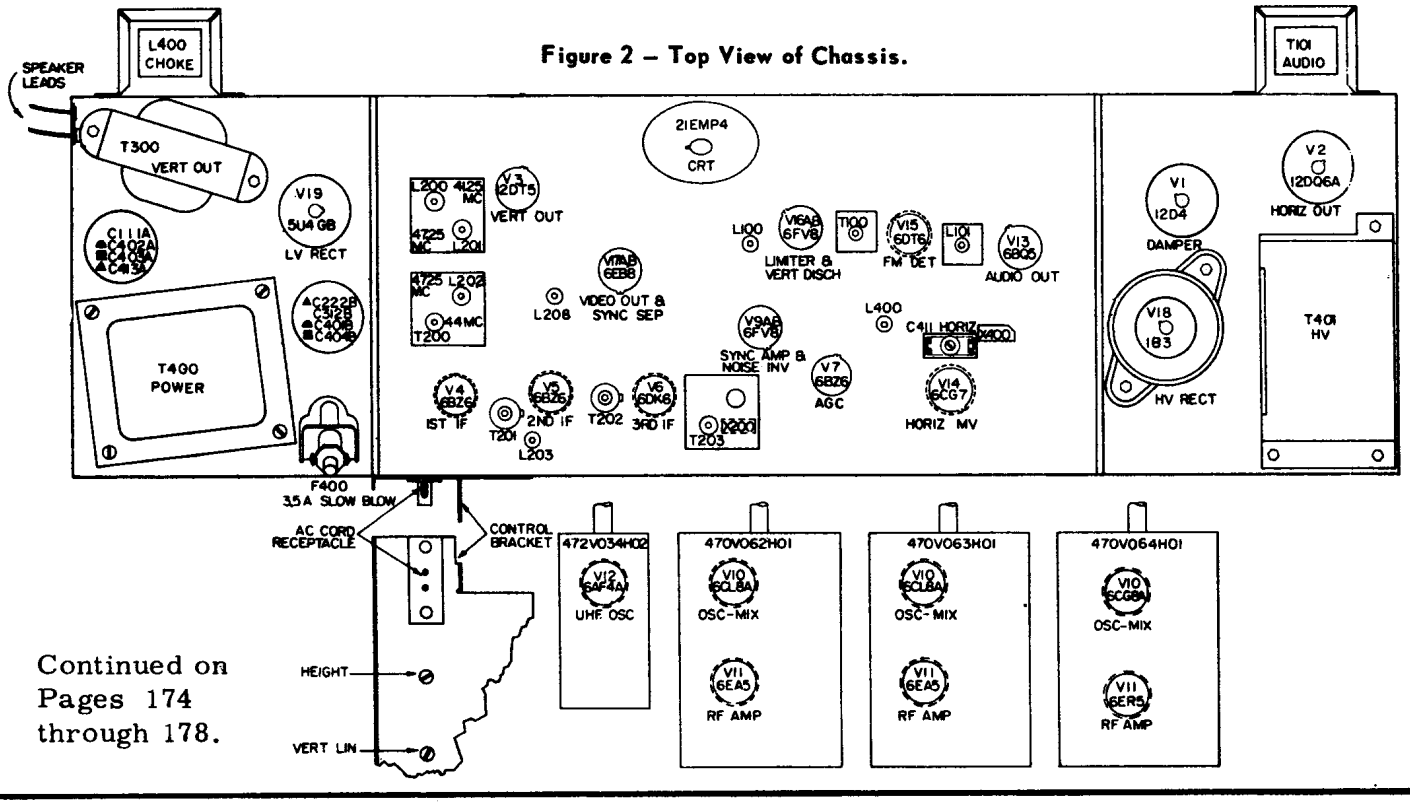
The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

WIDTH ADJUSTMENT

This adjustment is a plastic tab with a copper rectangle bonded on to one side. It protrudes out from between the yoke and the top of the neck of the picture tube. The shiny side of the copper rectangle goes down against the picture tube. It must be centered at the top of the CRT neck.

To adjust the width, loosen the yoke clamp. Pushing the tab into the yoke decreases width. Pulling the tab out of the yoke increases width. Set this tab for approximately 1/2" overscan, then tighten the yoke clamp.

Figure 2 – Top View of Chassis.



Continued on Pages 174 through 178.

WESTINGHOUSE Chassis V-2378-1 through V-2378-6, Continued

ALIGNMENT

SOUND ALIGNMENT

EQUIPMENT: VTVM

PROCEDURE:

1. Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
2. Adjust the quad coil (L101) for maximum sound from the speaker.
3. Use a jumper wire to short the control grid of the 3rd IF amplifier to chassis ground.
4. Connect the VTVM to TP (S).
5. Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
6. Remove the jumper wire used to short the control grid of the 3rd IF amplifier.
7. Disconnect the antenna input and place it close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss) should accompany the sound.
8. Adjust the limiter input coil (L100) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

4.5 MC TRAP ALIGNMENT

Inject a 4.5 MC CW signal through a .001mf capacitor to T.P. (B). Couple a .001mf capacitor to a demodulation probe tip. Connect the other end of the probe to a VTVM and the capacitor to T.P. (C). Set the VTVM to 1.5 - 2V scale. Turn the set on and allow five minutes for warmup. Then adjust L208 for minimum on the VTVM.

IF ALIGNMENT

EQUIPMENT

1. *Sweep Generator* with a 10 MC wide sweep at center frequencies from 10 MC to 90 MC and 170 MC to 216 MC.
2. *CW (Marker) Generator* which accurately produces the IF and RF frequencies from 4.5 MC to 216 MC.
3. *Oscilloscope* with good low frequency response characteristics.
4. *VTVM.*
5. *Bias Supplies* of -4 volts and -2.5 volts.
6. Standard Alignment Tool with a 3/32" hexagonal tip.

TERMINATION AND ADJUSTMENT OF EQUIPMENT

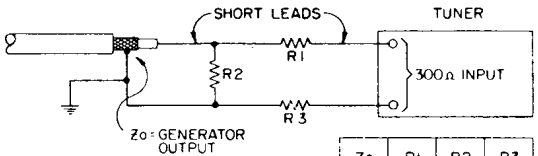
These instructions on termination and adjustment of equipment will apply throughout the IF Alignment procedure.

All test equipment cables and leads should be as short and direct as possible.

Oscilloscope and VTVM – Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 7. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring -1.5 volts.

Generators – Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 6. Connect the signal cable ground near the ground of the stage where the signal is injected.

Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the -1 volt point. (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.



Zo	R1	R2	R3
52Ω	120Ω	56Ω	150Ω
72Ω	110Ω	85Ω	150Ω

Figure 5 – Impedance matching network.

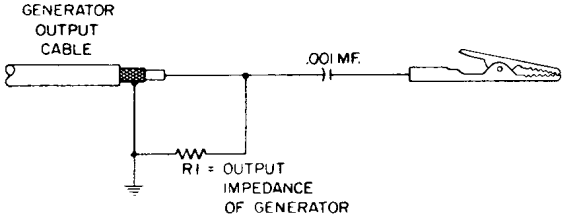


Figure 6 – Generator cable termination.

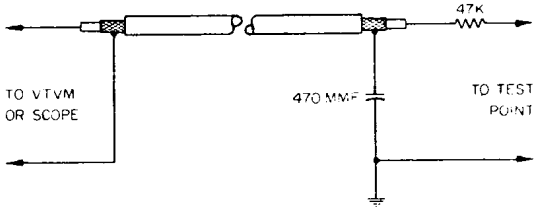


Figure 7 – VHF Decoupling Network.

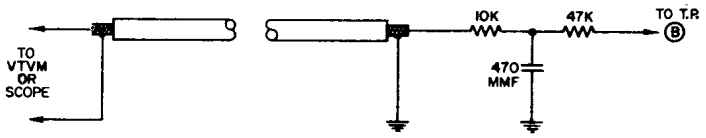


Figure 8 – UHF Decoupling Network.

SPECIFICATIONS

Operating Voltage	105 to 120 volts, 60 cps AC
Power consumption	210 watts
Power consumption with motor drive and remote receiver	300 watts
Audio power output, maximum	3.5 watts

WESTINGHOUSE Chassis V-2378-1 through V-2378-6, Continued

IF ALIGNMENT

Step	*Test Equipment and Connection*	*Adjustment*
1.	-4V bias to T.P. (A) and -2.5V bias to T.P. (B)	Channel selector to #10
2.	VTVM to T.P. (B) and CW generator to T.P. (D) Set generator at: a. 44.25 MC b. 45.62 MC c. 39.75 MC d. 42.75 MC	 T203: Maximum on VTVM T202: Maximum on VTVM L203: Minimum on VTVM T201: Maximum on VTVM
3.	Oscilloscope to T.P. (B) and sweep generator at 43 MC to T.P. (D) Couple CW marker generator to sweep generator.	T201, T202, T203, slight retouching may be necessary. See Figure 9 for typical response curve.
4.	VTVM to T.P. (B) and CW generator to T.P. (M) See Figures 18, 19, (on 470V064H01 tuner use gimmick, see Figure 12). Set CW generator to: a. 44.25 MC b. 44.25 MC c. 41.25 MC d. 41.25 MC } It may be necessary to increase signal level and remove IF bias during this step in order to obtain dip on VTVM e. 41.25 MC }	 Mixer output coil: Maximum on VTVM - See Figures 18,19,20 T200: Maximum on VTVM L200: Minimum on VTVM L201: Minimum on VTVM L202: Minimum on VTVM
5.	Oscilloscope to T.P. (B) and sweep generator at 44 MC center to T.P. (M) adjust for approximately 2V-PP. Couple CW marker generator to sweep gen.	Mixer output coil: Maximum amplitude T200: Rocking symmetrical response at approximately the center of the passband so that the mixer carrier (45.75 MC) is placed 7DB down from the peak response. See Figure 10.
6.	CW generator at 47.25 MC to T.P. (M) oscilloscope to T.P. (B)	L202: Minimum amplitude on oscilloscope. This step is necessary because there is a one way interaction inherent in trap design, therefore tuning the IF input transformer will change the frequency response of the trap.
7.	Oscilloscope, 2V-PP to T.P. (B) Sweep generator thru impedance matching network (see Figure 5) to the antenna terminals. Set picture marker at: a. 211.25 MC, channel 13 (for 470V062H01, 470V063H01 tuners b. 193.25 MC, channel 10 (for 470V064H01 tuner) Inject 45.75 MC marker into IF section by connecting CW output cable to outer shield of IF link cable at a point close to chassis. Keep marker amplitude at minimum to avoid distorting response.	Fine tuner screw to center of range. Channel selector to #13 Channel selector to #10 Oscillator slug setting: picture should fall at 45.75 MC (±400 KC) marker on oscilloscope. See Figure 11.
8.	Repeat step 7 for all channels	NOTE: On 470V062H01 and 470V063H01 tuners, maximum fine tuner screw engagement gives maximum oscillator frequency. For 470V064H01 tuners, maximum screw engagement gives minimum oscillator frequency.

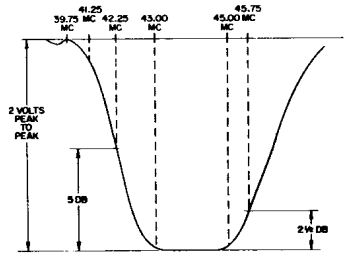


Figure 9 – IF Response, 1st IF Amp. Grid to 2nd Det.

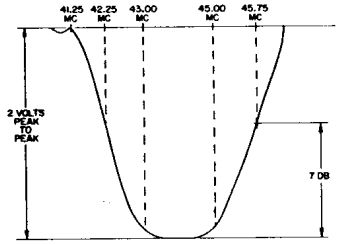


Figure 10 – IF Response, Mixer Grid to 2nd Det.

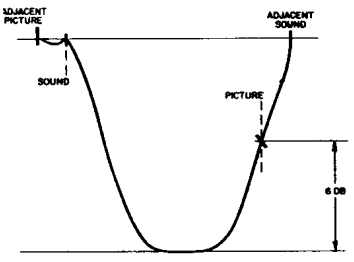


Figure 11 – Typical RF-IF Response.

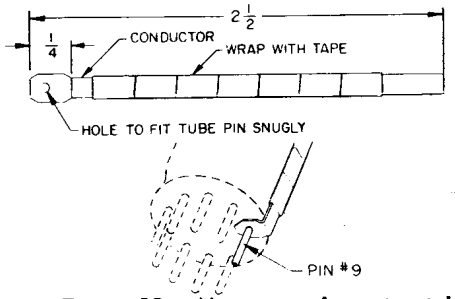


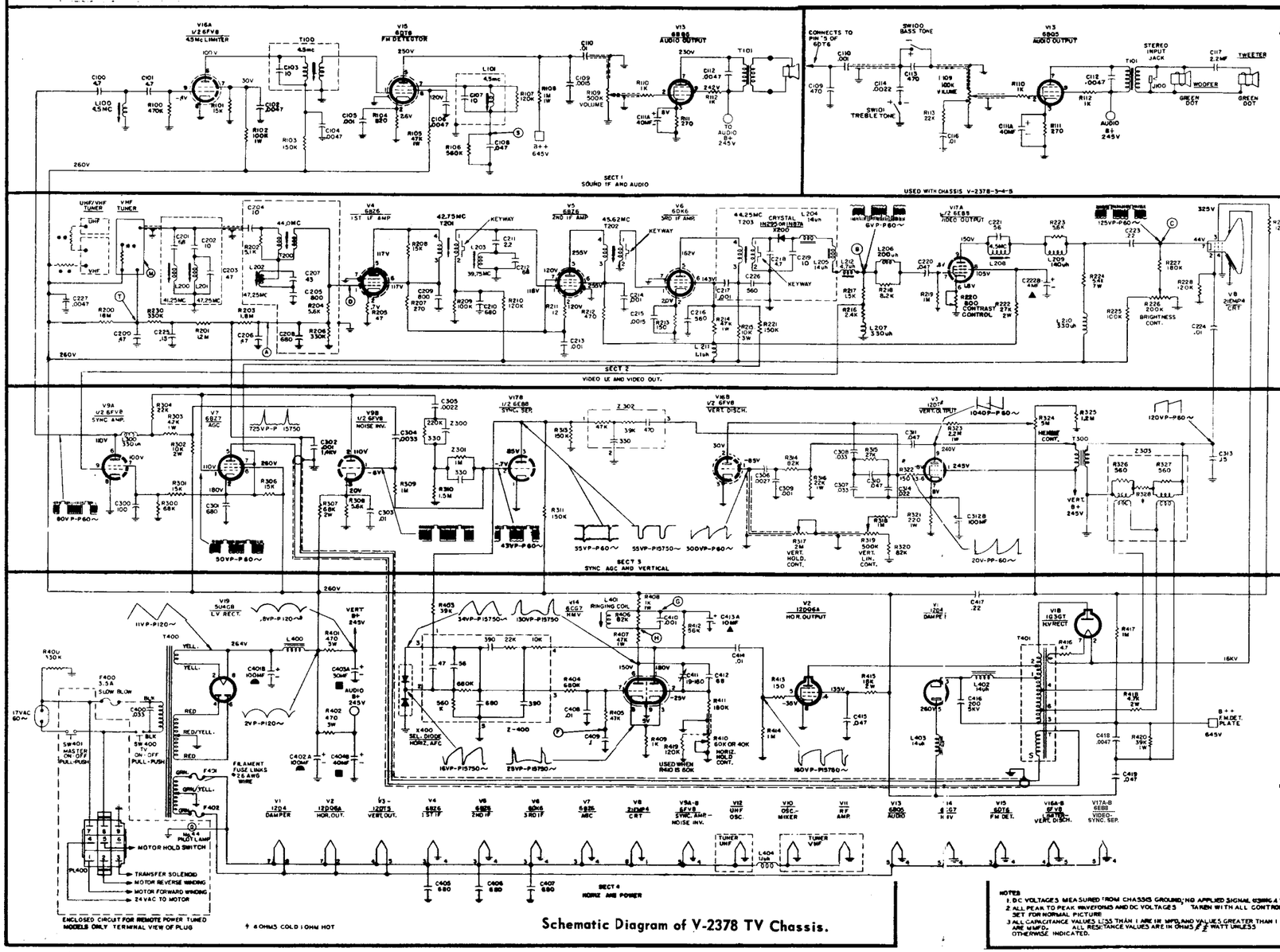
Figure 12 – Mixer coupling gimmick.

WESTINGHOUSE Chassis V-2378-1 through V-2378-6, Continued

HORIZONTAL FREQUENCY ADJUSTMENT

The ringing coil (L401) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire.
2. Set the horizontal hold control to the center of its mechanical range. Do not change this setting during the steps that follow.
3. Calibrate a VTVM to 0V Center scale on the 1.5V range and connect to test point (F) for measuring the DC voltage between (F) and ground.
4. With the receiver tuned to a station of normal signal strength, adjust trimmer C411 so that moving it one way causes the meter to swing to the left and moving it the other way causes it to swing to the right. Then carefully adjust trimmer C411 for center scale on this meter.
5. Remove the jumper from the ringing coil.
6. Adjust the ringing coil for center scale on the VTVM. Check this adjustment by switching to another channel and back again. The receiver should snap into horizontal sync on all channels.



Schematic Diagram of V-2378 TV Chassis.

NOTES
1. D.C. VOLTAGES MEASURED FROM CHASSIS GROUND; NO APPLIED SIGNAL USING A VTVM.
2. ALL PEAK TO PEAK WAVEFORMS AND DC VOLTAGES TAKEN WITH ALL CONTROLS SET FOR NORMAL PICTURE.
3. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MFD. AND VALUES GREATER THAN 1 ARE MMFD. ALL RESISTANCE VALUES ARE IN OHMS K = 1000 WATT UNLESS OTHERWISE INDICATED.

WESTINGHOUSE Chassis V-2378-1 through V-2378-6, Continued

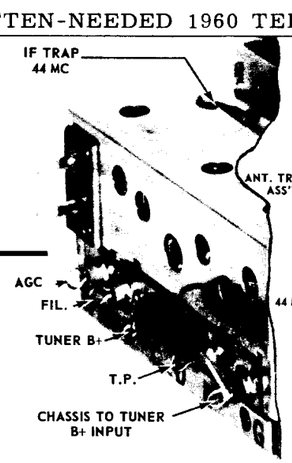


Figure 18 – 470V062H01 Tuner.

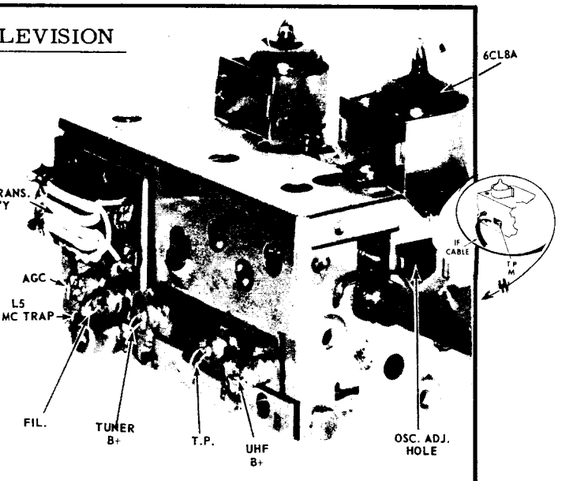


Figure 19 – 470V063H01 Tuner.

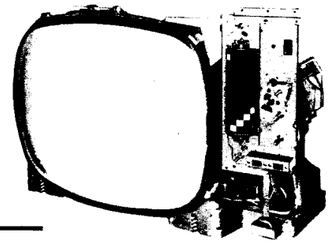
TEST POINTS

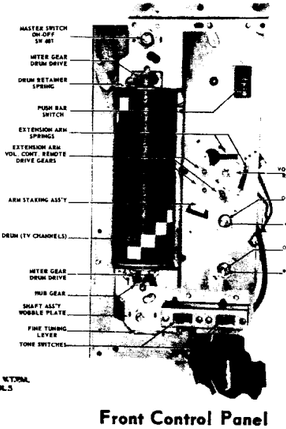
- (A) AGC for IF
- (B) Video detector
- (C) CRT cathode
- (D) 1st IF input
- (F) Horiz. MV
- (G) } Ringing coil
- (H) }
- (S) Quad coil
- (T) AGC for tuner

Key to Fig. 4, over, on page 178

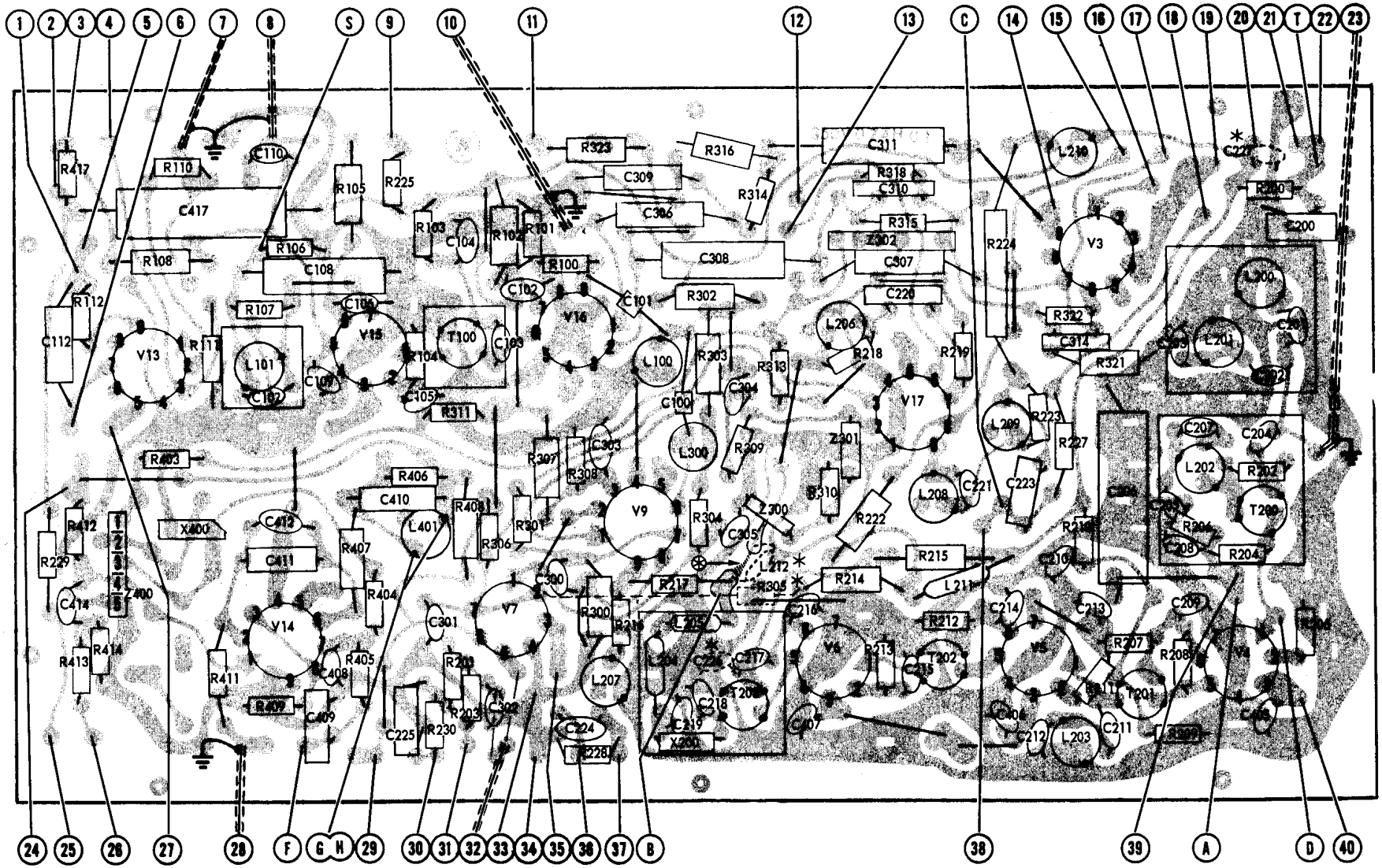
The leads identified by letters and numbers in Figure 4 connect to the following points:

1. T101 primary, connect to red wire
2. High side of HEIGHT CONTROL
3. Junction of C416 & C418
4. C111A
5. Junction of C404B & R402
6. T101 primary, connect to blue wire
7. Wiper arm of VOLUME control
8. High side of VOLUME control
9. High side of BRIGHTNESS control
10. High side of VERTICAL HOLD control
11. Arm of HEIGHT control
12. High side & wiper arm of CONTRAST control
13. Wiper arm of VERTICAL LINEARITY control
14. T300 primary, connect to plate of V3
15. C222B
16. Junction C403A & R401
17. C312B
18. Wiper arm of BRIGHTNESS control
19. Tuner filament point
20. C402A
21. Jumper to (30)
22. Tuner AGC point
23. Tuner IF output point
24. C413A
25. Pin 3 of CRT
26. Pin 5 of V2
27. Pin 8 of V1
28. High side of HORIZONTAL HOLD control
29. Junction R415 and L403
30. Jumper to (21)
31. Jumper to (39)
32. T401, terminals T and S
33. Pin 4 of CRT
34. Pin 1 of CRT
35. Pin 8 of CRT
36. T300 secondary, connect to yellow wire
37. Pin 2 of CRT
38. Pin 7 of CRT
39. Jumper to (31)
40. Junction of green filament wire from T400 and brown wire





Front Control Panel



For key to circled figures see page 177.

Figure 4 – Bottom view of PC board showing location of top components in solid outlines. Tube pin numbering is for bottom of socket.

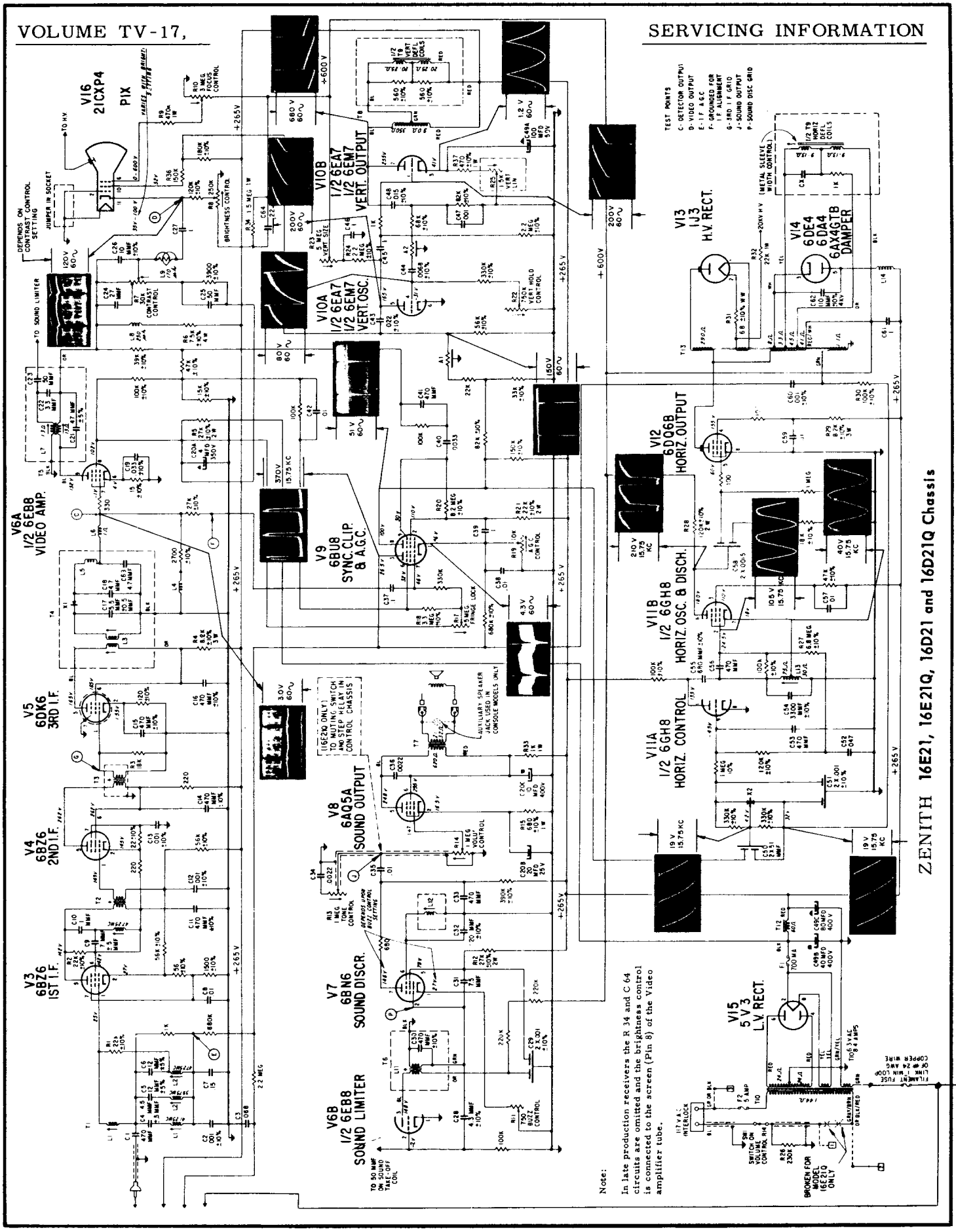
WESTINGHOUSE Chassis V-2378-1 through V-2378-6, Continued

ZENITH

Chassis 16D21, 16D21Q, 16E21, 16E21Q, 16D25, 16D25Q, 16E25, 16E25Q, 16E27, 16E27Q, 17D20, 17D20Q, 18D20, 18D20Q, 18E20, and 18E20Q. See below for model-chassis cross-reference.

MODEL	TYPE	CHASSIS	TUNER	PICTURE TUBE
D1810B	Table	16D25	Bandswitch	17DQP4
D1811C	Table	16D25	Bandswitch	17DQP4
D1812L	Table	16D25	Target Turret	17DQP4
D1814P	Table	16D25	Target Turret	17DQP4
D2010C	Table	16D25Q	Target Turret	17DQP4
D2015L	Table	16D25Q	Target Turret	17DQP4
D2301R & Y	Table	16D21	Bandswitch	21CXP4
D2302R	Table	16D21	Bandswitch	21CXP4
D2315L	Table	16D21	Target Turret	21CXP4
D2315R	Table	16D21	Target Turret	21CXP4
D2315Y	Table	16D21	Bandswitch	21CXP4
D2317E,R,W	Table	16D21	Target Turret	21CXP4
D2345E,R,W	Console	16D21	Target Turret	21CXP4
D2347E,L,M,R,W	Console	16D21	Target Turret	21CXP4
D2348E,R,W	Console	16D21	Target Turret	21CXP4
D2350H,M,R,W	Console	16D21	Target Turret	21CXP4
D2355E,L,R,W	Console	16D21	Target Turret	21CXP4
D2381E,R,W	Console/Phono	16D21/5B28	Target Turret	21CXP4
D2384H & R	Console/Phono	16D21/5B28	Target Turret	21CXP4
D2430E,R,W	Table	17D20	Bull's Eye Turret	21CXP4
D2458E,R,W	Console	17D20	Bull's Eye Turret	21CXP4
D2460M & R	Console	17D20	Bull's Eye Turret	21CXP4
D2462H	Console	17D20	Bull's Eye Turret	21CXP4
D2464L & W	Console	17D20	Bull's Eye Turret	21CXP4
D2673E,R,W	Console	16D21	Target Turret	24AJP4
D3002E,R,W	Table	16D21Q	Target Turret	21CXP4
D3004E,R,W	Console	16D21Q	Target Turret	21CXP4
D3005E,L,M,R,W	Console	16D21Q	Target Turret	21CXP4
D3006E,L,R,W	Console	16D21Q	Target Turret	21CXP4
D3007E,M,R,W,Y	Console	16D21Q	Target Turret	21CXP4
D3008R	Console	16D21Q	Target Turret	21CXP4
D3009E,W,Y	Console	16D21Q	Target Turret	21CXP4
D3010E,H,R	Console	17D20Q	Bull's Eye Turret	21CXP4
D3011E,W,Y	Console	17D20Q	Bull's Eye Turret	21CXP4
D3012H & R	Console	17D20Q	Bull's Eye Turret	21CXP4
D3013H	Console	17D20Q	Bull's Eye Turret	21CXP4
D3014W	Console	17D20Q	Bull's Eye Turret	21CXP4
D3015L	Console	17D20Q	Bull's Eye Turret	21CXP4
E1810B	Table	16E25 or 16D25	Bandswitch	17DQP4
E1811C	Table	16E25 or 16D25	Bandswitch	17DQP4
E1812L	Table	16E25 or 16D25	Target Turret (small)	17DQP4
E1814P	Table	16E25 or 16D25	Target Turret (small)	17DQP4
E2010C	Table	16E25Q or 16D25Q	Target Turret (small)	17DQP4
E2015L	Table	16E25Q or 16D25Q	Target Turret (small)	17DQP4
E2301R,Y	Table	16E21 or 16D21	Bandswitch	21CXP4
E2302R	Table	16E21 or 16D21	Bandswitch	21CXP4
E2315L,Y	Table	16E21	Bandswitch	21CXP4
E2316E,R,W	Table	16E21	Target Turret	21CXP4
E2345E,R,W	Console	16E21 or 16D21	Target Turret	21CXP4
E2346E,R,W	Console	16E21	Target Turret	21CXP4

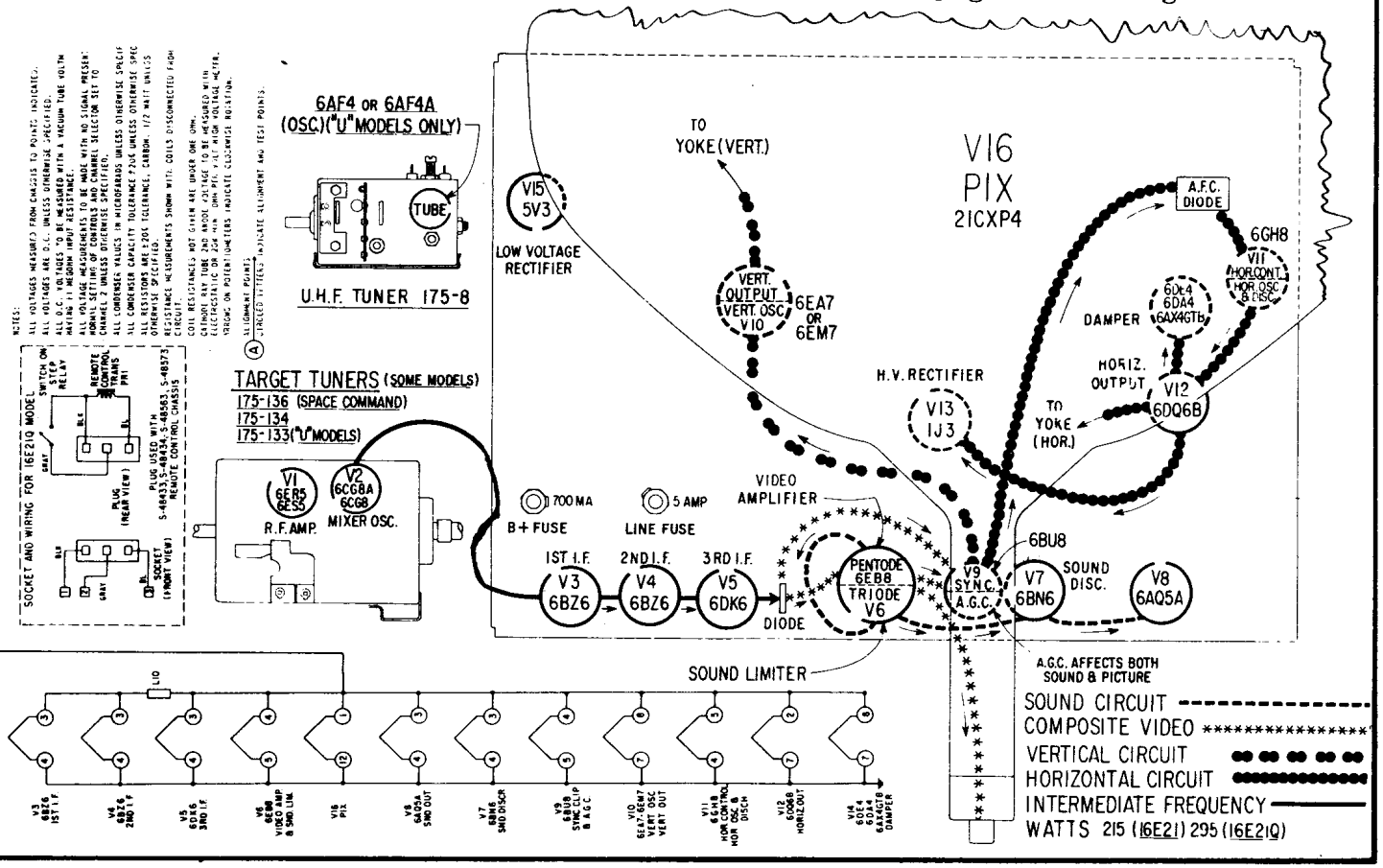
(Model and Chassis Information and Cross Reference continued on page 181)


ZENITH Schematic Diagram 16E21, 16E21Q, 16D21 and 16D21Q Chassis
V1 6BZ6 1ST I.F.
V2 6BZ6 2ND I.F.
V3 6BN6 SOUND DISCR.
V4 6EB8 SOUND LIMITER
V5 6DK6 3RD I.F.
V6A I/2 6EB8 VIDEO AMP.
V6B I/2 6EB8 SOUND LIMITER
V7 6BN6 SOUND DISCR.
V8 6AQ5A SOUND OUTPUT
V9 6BU8 SYNC. CLIP. & A.G.C.
V10A I/2 6EA7 I/2 6EM7 VERT. OSC.
V10B I/2 6EA7 I/2 6EM7 VERT. OUTPUT
V11A I/2 6GH8 HORIZ. CONTROL
V11B I/2 6GH8 HORIZ. OSC. & DISCH.
V12 6DQ6B HORIZ. OUTPUT
V13 1J3 H.V. RECT.
V14 6DE4 6DA4 6AX4GTB DAMPER
V15 5V3 L.V. RECT.
V16 21CXP4 PIX
TEST POINTS
C-DETECTOR OUTPUT
D-VIDEO OUTPUT
E-1 F AGC
F-GROUNDED FOR I.F. ALIGNMENT
G-3RD I.F. GRID
J-SOUND OUTPUT
P-SOUND DISC GRID
Note:
In late production receivers the R 34 and C 64 circuits are omitted and the brightness control is connected to the screen (Pin 8) of the Video amplifier tube.
ZENITH 16E21, 16E21Q, 16D21 and 16D21Q Chassis

ZENITH Chassis 16D21, -Q, 16E21, Q, 16D25, -Q, 16E27, -Q, 17D20, -Q, etc., Continued

E2347E,L,M,R,W	Console	16E21 or 16D21	Target Turret	21CXP4
E2348E,R,W	Console	16E21 or 16D21	Target Turret	21CXP4
E2350H,M,R,W	Console	16E21 or 16D21	Target Turret	21CXP4
E2384H,R	Console/Phono	16E21/5B28	Target Turret	21CXP4
E2458E,R,W	Console	16E27	Bull's Eye Turret	21CXP4
E2460R,M	Console	16E27	Bull's Eye Turret	21CXP4
E2747E,R,M,W	Console	18E20 or 18D20	Target Turret	23JP4
E2755E,R,W	Console	18E20 or 18D20	Target Turret	23JP4
E2764W	Console	18E20 or 18D20	Target Turret	23JP4
E3000R,Y	Table	16E21Q	Target Turret	21CXP4
E3002E,R,W	Table	16E21Q or 16D21Q	Target Turret	21CXP4
E3004E,R,W	Console	16E21Q	Target Turret	21CXP4
E3005E,M,R,W	Console	16E21Q or 16D21Q	Target Turret	21CXP4
E3006E,R,W,Y	Console	16E21Q	Target Turret	21CXP4
E3007E,R,M,W	Console	16E21Q or 16D21Q	Target Turret	21CXP4
E3008R	Console	16E21Q	Target Turret	21CXP4
E3009E,W,Y	Console	16E21Q	Target Turret	21CXP4
E3012H,R	Console	16E27Q	Bull's Eye Turret	21CXP4
E3013H	Console	16E27Q	Bull's Eye Turret	21CXP4
E3014W	Console	16E27Q	Bull's Eye Turret	21CXP4
E3015L	Console	16E27Q	Bull's Eye Turret	21CXP4
E3354E,R,W	Console	18E20Q or 18D20Q	Target Turret	23JP4
E3356E,H,R,W	Console	18E20Q or 18D20Q	Target Turret	23JP4

Suffix "Q" following a chassis number identifies a receiver equipped with a Space Command remote control. For diagrams of various chassis and other service information on these sets refer to material on pages 180 through 190.



ZENITH 1960 TV Sets

AGC ADJUSTMENT

Tune in a strong TV signal and slowly turn the delay control until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be backed down from this position and set at a point comfortably below the level of intercarrier buzz, picture distortion and improper sync. This setting will correspond to approximately 3 V. peak to peak output from the video detector.

CAUTION: Misadjustment of the AGC control can result in a washed-out picture, distorted picture, buzz in the sound or complete loss of picture and sound.

FRINGE LOCK ADJUSTMENT

The fringe lock adjustment is made to obtain best possible synchronization under weak and noisy signal conditions. To adjust, first check the AGC adjustment and proceed as follows:

1. Turn the fringe lock control fully clockwise and then back it off approximately 1/4 turn. Adjust the vertical and horizontal hold controls and check operation of the receiver to see that it syncs normally when the turret is switched from channel to channel.

2. If the picture jitters or shows evidence of delay, tearing, split phase, etc., back down the fringe lock control further, a few degrees at a time, each time readjusting the hold controls and switching from channel to channel until normal sync action is obtained. It will be found that under normal signal conditions, the correct adjustment will be near the counterclockwise position of the control.

3. In fringe and noisy areas, the best adjustment will be found at or near the maximum clockwise position of the control; however, do not automatically turn the fringe lock fully clockwise in fringe areas. Follow the procedure outlined. In areas where both local and fringe signals are received, a compromise setting should be made for best overall performance.

AFC ADJUSTMENT

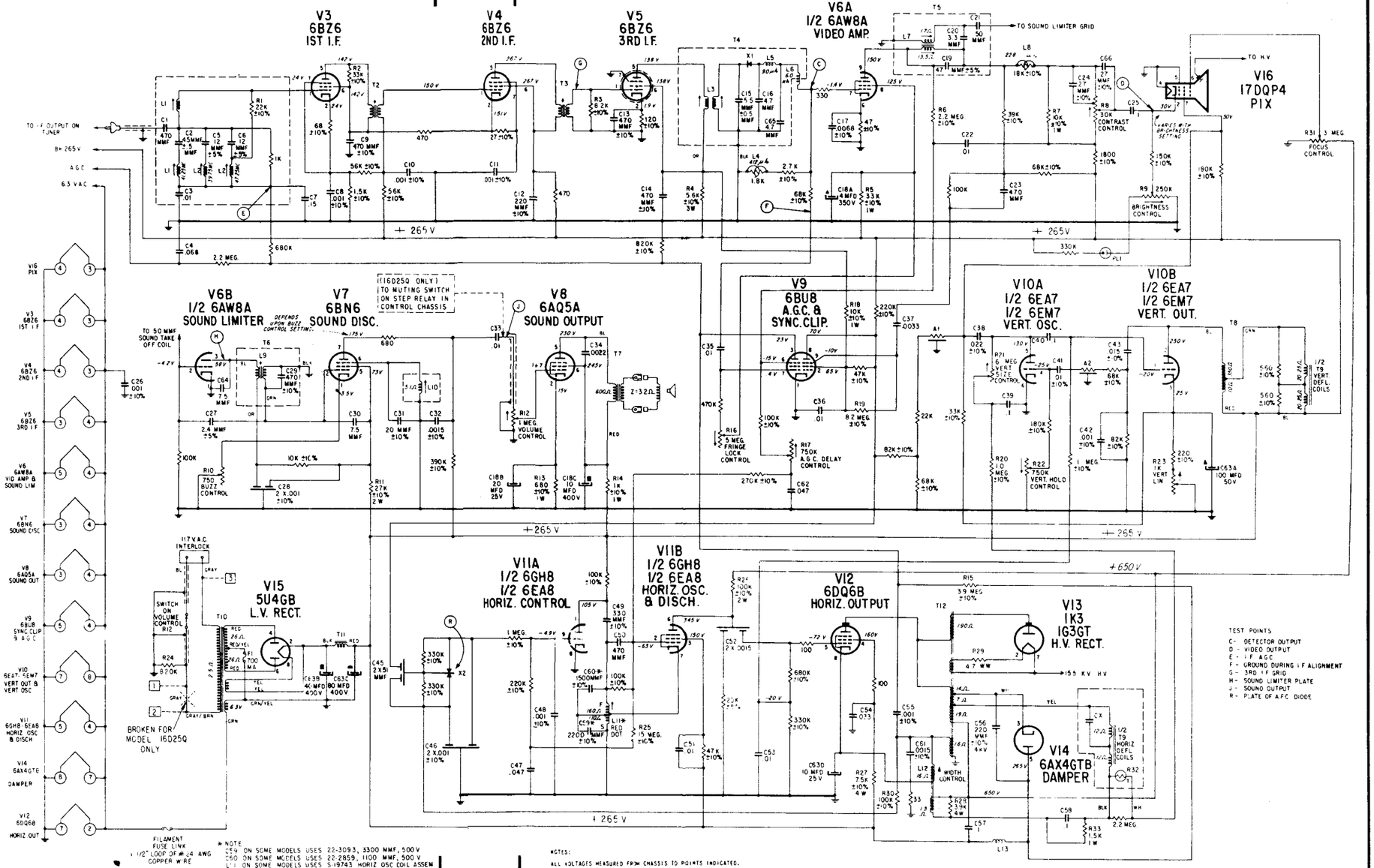
The horizontal hold control is equipped with a stop which limits knob rotation to approximately 270 degrees. To adjust the AFC, remove the knob and turn the shaft to a position where it is virtually impossible to disrupt horizontal synchronization when switching from channel to channel. After adjustment, install the knob with its pointer centered between the stops.

WIDTH ADJUSTMENT

To obtain proper width, slide and turn the metal sleeve along the neck of the picture tube. A setting will be found which results in proper width and linearity. In the 16D25, 18E20 and 18D20 chassis the width control is at the rear of the chassis or on the side of the high voltage compartment shield. Adjustment is made by sliding the iron core slug in or out of the width coil.

Circuit Diagram **16D25 and 16D25Q Chassis**

ZENITH Chassis 16D25 and 16D25Q Schematic Diagram



This diagram is exact for 16D25 and 16D25Q. Chassis 16E25 and 16E25Q are almost identical to these corresponding chassis. There are minor differences in circuitry and V6 is type 6EB8 instead of 6AW8.

ALIGNMENT

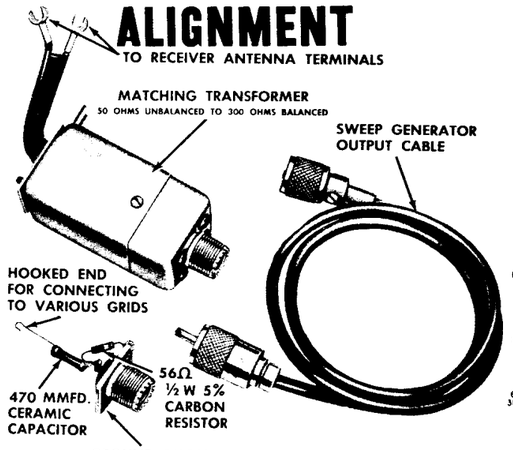


Fig. 4 IF-RF Alignment Fixtures

SOUND ALIGNMENT

Proper alignment of the 4.5 Mc intercarrier sound channel can only be made if the signal to the receiver antenna terminals is reduced to a level below the limiting point of the 6BN6 Gated Beam Detector. This level can be easily identified by the "hiss" which then accompanies the sound. Various methods may be used to reduce the signal level; however, a step attenuator is recommended for most satisfactory results.

1. Connect the step attenuator between the antenna and the receiver antenna terminals.

2. Tune in a tone modulated TV signal. Adjust the step attenuator until the signal is reduced to a level where a "hiss" is heard in the sound.

3. Adjust the sound take-off coil (top and bottom cores), intercarrier transformer, quadrature coil and buzz control for the best quality sound and minimum buzz. It must be remembered that any of these adjustments may cause the "hiss" to disappear and further reduction of the signal will be necessary to prevent the "hiss" from disappearing during alignment.

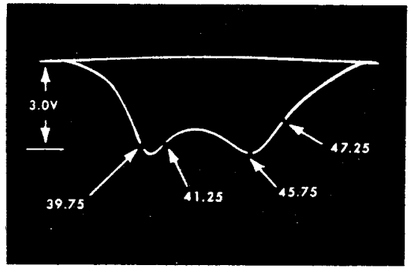
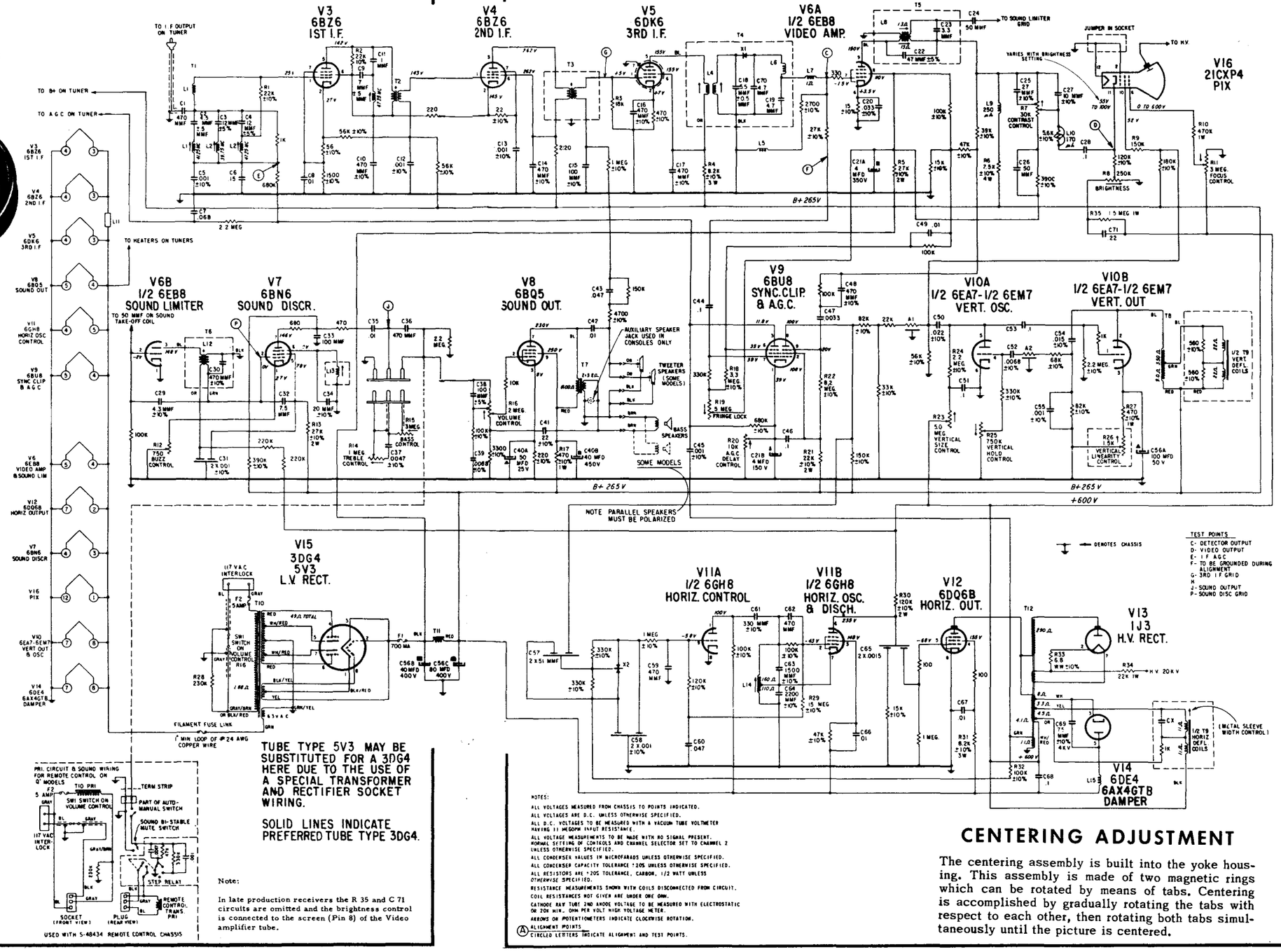


Fig. 5 4th IF Response

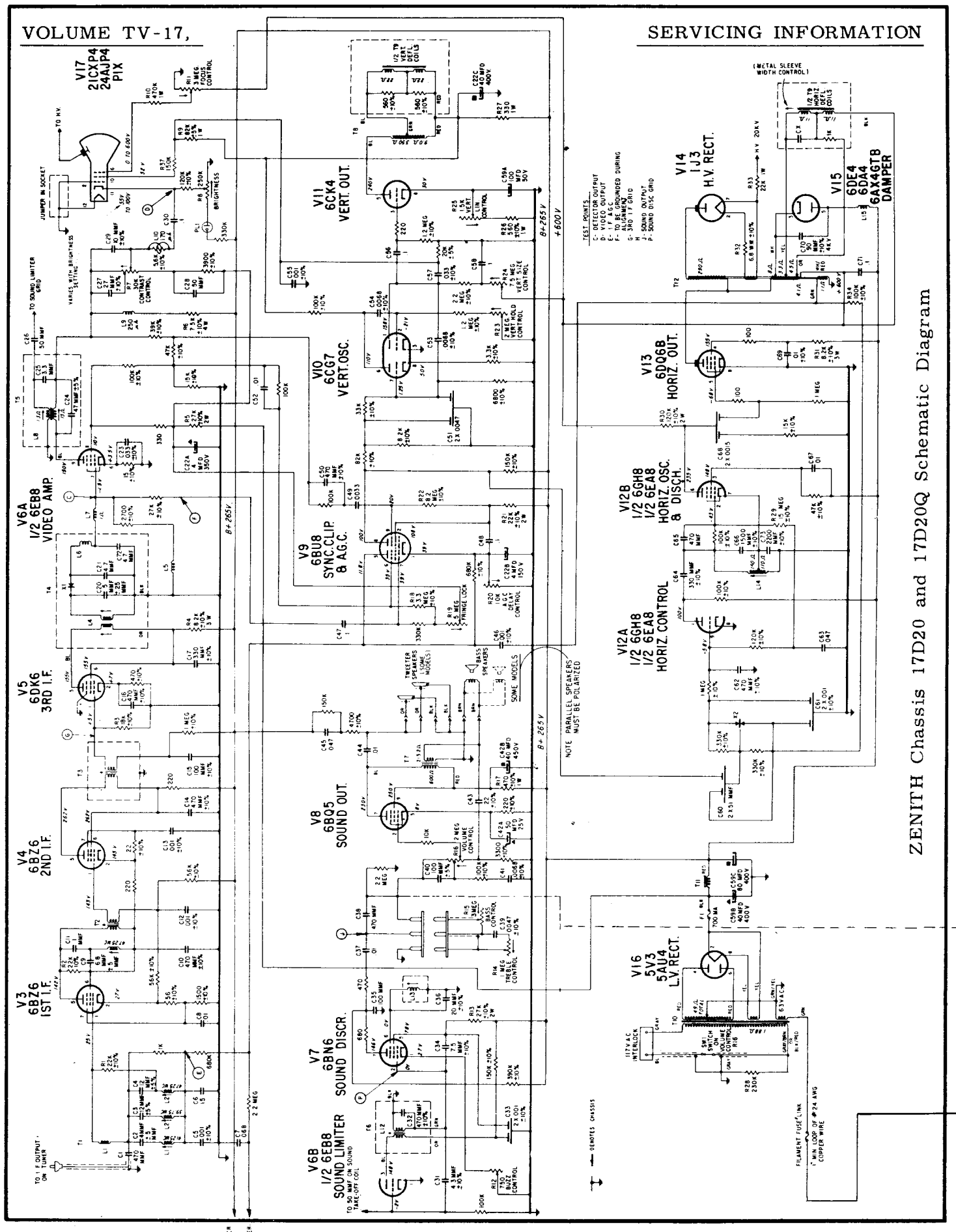
ZENITH **16E27 and 16E27Q Chassis**

ZENITH Chassis 16E27 and 16E27Q Schematic Diagram (Material Continued)



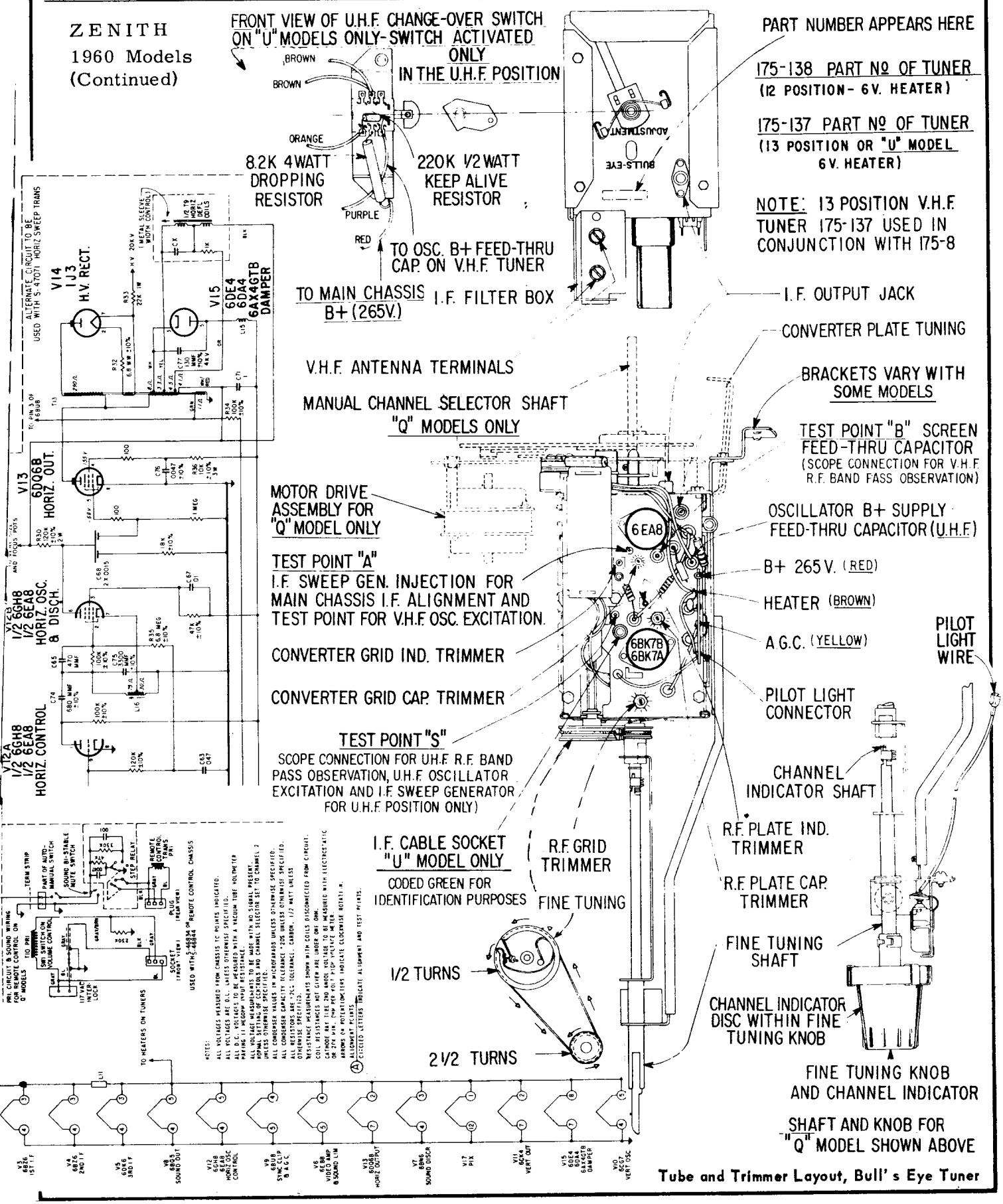
CENTERING ADJUSTMENT

The centering assembly is built into the yoke housing. This assembly is made of two magnetic rings which can be rotated by means of tabs. Centering is accomplished by gradually rotating the tabs with respect to each other, then rotating both tabs simultaneously until the picture is centered.



ZENITH Chassis 17D20 and 17D20Q Schematic Diagram

ZENITH
1960 Models
(Continued)



Tube and Trimmer Layout, Bull's Eye Tuner

Alignment continued from page 184)

VIDEO I F ALIGNMENT

1. Slowly turn the channel selector until the tuner rotor is made to rest between two channels. This will prevent an erroneous response.

2. Connect an oscilloscope through a 10,000 ohm isolation resistor to terminal "C" (detector). Connect the ground lead to chassis.

3. Feed the sweep generator through the special terminating network shown in Fig. 4 to point "G" (Pin 1 of the 3rd IF). Adjust generator to obtain a response similar to Fig. 5 with a detector output of 3 volts peak to peak. Do not exceed this level during any of the adjustments.

4. Set the marker generator to 45.75 Mc and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 Mc marker positioned as shown in Fig. 5. The 39.75 Mc marker can fall within ± 0.5 Mc of the specified frequency. If the correct response cannot be obtained, check the position of the cores to see that they are not butted but are entering their respective windings from the opposite ends of the coils.

5. Connect the sweep generator to terminal "A" (mixer grid, see Fig. 1, 2 or 3 depending on tuner). Connect terminal "F" to chassis and connect a jumper between terminal "E" and the junction of the 56 (68 in 16E20 and 16E25) and 1500 ohm resistors in the cathode of the 1st IF. Adjust sweep to obtain a response similar to Fig. 8. Switch oscilloscope to 10 X gain to "blow up" the traps.

6. Refer to Fig. 6 and 7 and adjust the 39.75 Mc 41.25 Mc. and the two 47.25 Mc traps for minimum marker amplitude. It can be seen that high oscilloscope gain must be used to "run" the response off the screen in order to view a "blow up" of the traps.

7. Disconnect the jumper between "E" and the 56 and 1500 ohm cathode resistors. Connect this jumper between "E" and chassis. Adjust sweep generator for 3 volts peak to peak output. Alternately adjust the 2nd, 3rd, 1st IF and the converter plate coil until overall response similar to Fig. 8 It will be found that the 2nd IF affects the low side (42.75 Mc) and the 3rd IF the high side of the response. If the receiver is equipped with a target tuner, adjust the IF trap L1 (when used) for minimum response at 45.5 Mc. After alignment remove all jumpers and check operation.

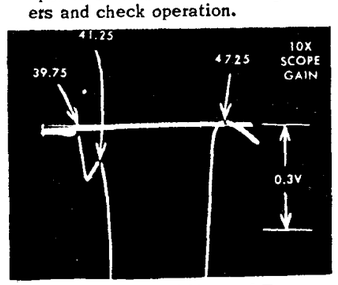


Fig. 6 Expanded View of Traps

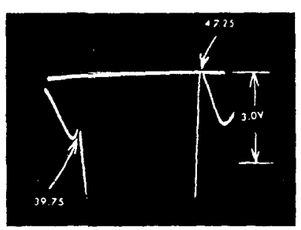


Fig. 7 Further Expansion of Fig. 6 for Detail View of the 39.75 and 47.25 Mc Traps.

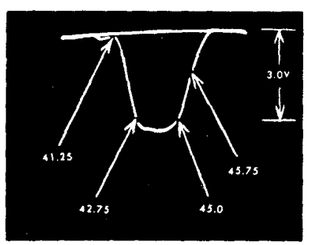


Fig. 8 Overall IF Response

ZENITH Chassis 18E20, 18E20Q, 18D20, and 18D20Q Diagram (Material Continued)

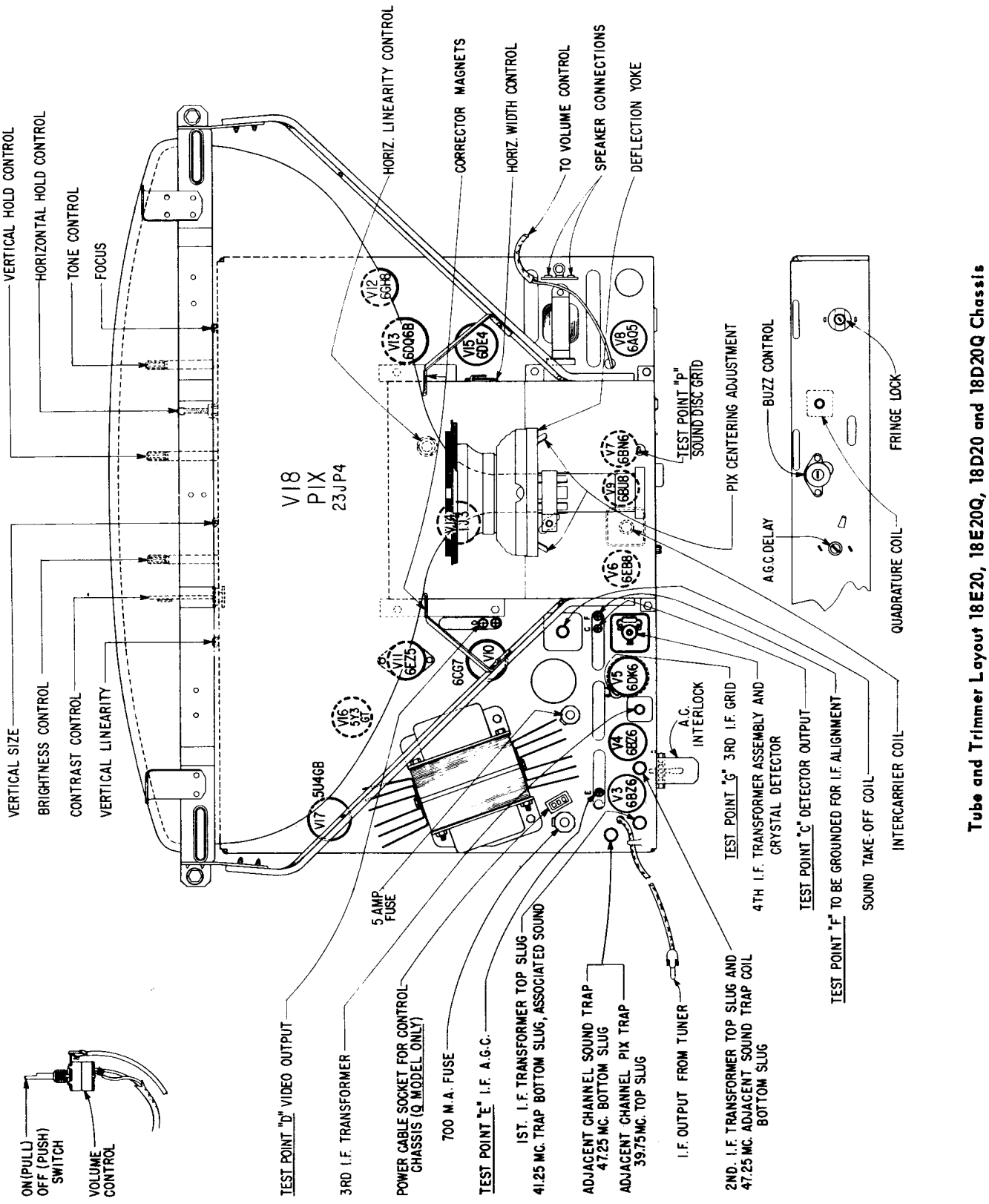
Note:

In late production receivers the PL 1 circuit is omitted and the brightness control is connected to the screen (Pin 8) of the video amplifier tube.

Note:

The voltage dependent resistor R 28 varies in resistance with applied voltage. As the pulse increases the resistance automatically drops. This prevents possible flashover in the tube or transformer during the retrace period.

ZENITH Chassis 18D20, 18D20Q, 18E20, 18E20Q, Service Material Continued



Tube and Trimmer Layout 18E20, 18E20Q, 18D20 and 18D20Q Chassis

Index

Under each manufacturer's name are listed that make chassis and models in numerical order, at left. The corresponding page number at right of each listing refers to the first page of each section dealing with such material.

(Index continued on page 192)

INDEX Continued

Another

Supreme Publications

Service Manual