

Introduction

I found these books to be very helpful for specific problems and troubles as found and documented by the TV manufacturers themselves during the 50's. I decided they would be helpful to others in the hobby of fixing up and obsessing over old TV's like myself. Please let me know if you see any issues with the scans or need clarification on something that is not clear/visible in a scan.

From the general preface:

This is a series of volumes which deal with specific TV receiver troubles and their cures. These trouble cures are the TV manufacturers' answers to some of the problems that may arise in their particular receivers.

After a certain model or chassis has been in the field for a while, certain troubles may occur which are peculiar to that receiver. In an effort to maintain his own good reputation, the manufacturer is interested in keeping his receiver in tip-top working order. Therefore, his service or engineering department evolves a cure for the particular trouble.

The question may be asked, "Why doesn't the manufacturer incorporate the cure into future production runs on his own receiver? The answer is that he frequently does. However, it is certainly not possible, with such a complex device as a TV receiver, to hold off on production until every single "bug" has been removed. The fact remains that many receivers are in the field and do develop certain peculiarities of operation for which the manufacturer has a definite tried-and-tested cure. Many of these cures will be found in these volumes.

In addition, the development of new ideas and circuitry is unending. These new ideas are conceived by TV receiver manufacturers and many of the circuits can be incorporated into receivers already in the field. Such changes will improve the operation of the receiver, especially under unusual or difficult operating conditions. What is more, in areas of high humidity, in fringe areas, in strong-signal areas, etc., certain troubles are apt to occur. Many of the manufacturers' trouble cures given in this volume will alleviate these troubles when properly applied to the receiver in question.

You will note that these volumes contain valuable information relating to trouble cures and circuit changes which will actually improve the operation of the TV receiver. You will not be given generalized instructions to "check this capacitor" or "check that tube" if a certain trouble appears. Instead, you will be given exact directions as to the specific operation to be performed in affecting the cure. In all cases where components are identified, the manufacturers own circuit symbol is used. This makes it easy to utilize the information given in these pages along with Rider Manuals and Tek-File. A complete index in which trouble cures are listed by brand and chassis or model number appears at the end of this volume.

Volumes

There are seven volumes available (that I know about). Volumes 1-5 cover most sets and were published between 1953 and 1954. Volumes 6 and 7 cover newer sets in 1954 and 1955 and include some updates for brands covers in earlier volumes.

Volume 1			
Cat. No. 143-1, 115 Pages, Published January, 1953			
Admiral	Air King	Andrea	Arvin
Belmont-Raytheon	Bendix	Calbest	Caphart-Farnsworth
CBS-Columbia	Certified	Crosley	DuMont

Volume 2			
Cat. No. 143-2, 117 Pages, Published February, 1953			
Emerson	Fada	Firestone	Freed
Gamble-Skogmo	General Electric	Hallicrafters	Hoffman
Industrial TV	International TV	Jackson	
Volume 3			
Cat. No. 143-3, 119 Pages, Published April, 1953			
Kaye-Halbert	Kent	Magnavox	Majestic
Meck	Mercury	Midwest	Montgomery Ward
Motorola	Muntz	National	North American Philips
Olympic	Pacific Mercury	Packard-Bell	Philco

Volume 4			
Cat. No. 143-4, 120 Pages, Published July, 1953			
Philharmonic	Pilot	Radio and Television (Brunswick)	RCA Victor
Remington (Rembrandt)	Scott	Sears Roebuck	Sentinel
Setchell Carlson	Shaw TV		

Volume 5			
Cat. No. 143-5, 119 Pages, Published March, 1954			
Sparton	Stewart-Warner	Stromberg-Carlson	Sylvania
Tele King	Trad TV	Transvision	Trav-ler
Wells-Gardner	Western Auto (Truetone)	Westinghouse	Zenith

Volume 6			
Cat. No. 143-6, 120 Pages, Published November, 1954			
Admiral	Aimcee (AMC)	Arvin	Bendix
Cadillac TV	Capehart	CBS-Columbia	Conrac
Crosley	DuMont	Emerson	Firestone

Volume 7			
Cat. No. 143-7, 112 Pages, Published June, 1955			
General Electric	Hallicrafters	Hoffman	Jackson
Kaye-Halbert	Magnavox	Majestic	Mars TV
Mattison TV	Meck	Montgomery Ward	Motorola
Muntz	Pacific Mercury	Packard-Bell	Philco
Philharmonic	Radio Craftsmen	Raytheon	

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TV

MANUFACTURERS' RECEIVER TROUBLE CURES

VOLUME 3

(CAT. NO. 143-3)

Kaye-Halbert
Kent
Magnavox
Majestic
Meck
Mercury
Midwest
Montgomery Ward
Motorola
Muntz
National
North American Philips
Olympic
Pacific Mercury
Packard-Bell
Philco

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PREFACE

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The editor wishes to acknowledge the cooperation of the following tv receiver manufacturers who furnished the information contained in this volume to John F. Rider Publisher, Inc.

KAYE-HALBERT

MOTOROLA

KENT

MUNTZ

MAGNAVOX

NATIONAL

MAJESTIC

NORTH AMERICAN PHILIPS

MECK

OLYMPIC

MERCURY

PACIFIC MERCURY

MIDWEST

PACKARD-BELL

MONTGOMERY WARD

PHILCO

April, 1953

Milton S. Snitzer

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KAYE-HALBERT Chassis 231, 242
Correcting picture bend.

Bend can be caused by unbalance of the horizontal sync pulses to the 6AL5 horizontal-phase tube or the tube itself. To check balance, tune in a station and connect a VTVM across *R50* (4.7-meg resistor connected from junction of two input resistors to ground).

Remove the sawtooth wave by connecting pins 1 and 2 of the 6AL5 horizontal-phase tube to ground. The VTVM will then read the sync unbalance voltage. It should be no more than plus or minus 5 volts. To balance temporarily, place approximately 33k ohms across *R46* or *R43* (12AU7 phase inverter cathode and plate loads) whichever improves the balance.

After determining whether *R46* or *R43* needs correcting, select a value of resistor which brings the balance voltage within tolerance, then solder in place. Sometimes bend can be compensated for by a little unbalance, but do not exceed the tolerance given.

KAYE-HALBERT Chassis 231, 242
Buzz and hum.

Buzz can be traced to many sources. Some of the most common will be mentioned. The first source of both buzz and hum may be the station. Station technique may not always be perfect. The station may also cause buzz in intercarrier sets by too much modulation of the video carrier. This results in the tips of the sync pulses cutting off or nearly cutting off the video carrier. The 4.5-

mc intercarrier is formed by the beat between the sound carrier and the picture carrier. If one becomes zero, the intercarrier also becomes zero. Sync occurs at a 60 cycle rate (frame) so the carrier may drop out 60 times a second, causing buzz. This buzz is characterized by a sharp wave front containing high-frequency components, as compared to hum. This type of buzz may change as cameras are changed at the studio, due to the video level of one camera being set at a slightly different value than the others.

Buzz occurring in the receiver has been experienced by not having the i-f curve and the cathode trap aligned to produce very low response at the 20.5-mc sound carrier; not having the ratio detector correctly tuned, especially by being on the wrong secondary null; and by having an unbalanced ratio detector coil. The latter can usually be corrected by connecting a 330- μmf capacitor from the junction of *C4* (330 μmf), *R5* (22 k), and *R4* (470 ohms) to ground. Re-peak the 4.5-mc i-f coil also.

Be sure the fine-tuning control is tuned correctly. A slight buzz can be obtained on a strong station by turning the contrast full on, causing the video amplifier to overload and clipping sync with the same effect as previously described. This effect is normal and at normal contrast setting may not be noticed.

Another type of buzz is caused by the vertical sweep coupling into the audio. As the vertical has a sharp wave front and fairly high amplitude, a very slight coupling may pick it up. Test for it by turning the volume control completely off and listen. A

shield installed between the 6J5 vertical oscillator and the 6AV6 (or 6SN7) audio amplifier will remove it.

Hum is usually power supply hum and requires an electrolytic filter on the 290v bus.

KAYE-HALBERT Chassis 253

The vertical white line due to horizontal drive.

The vertical white line due to horizontal drive can be eliminated by the following:

1. Remove the size control (*R70*) from *R69* (220 ohm, 2-w resistor) and ground. Ground the bottom of *R69*.

2. Shunt the 350-ohm size control with a 1,200-ohm, 1-w resistor, connecting the resistor to the center-tap and one end of the pot. Connect the size control from the junction of *R68* (drive control), *C58* (20 μ f) and the fuse to the junction of *R71* (screen resistor of horizontal-output tube), *C45* (.03 μ f), and 6W4 pin 5.

3. Connect *C38* (500- μ mf discharge capacitor) to the junction of *C39* (output coupling capacitor of the horizontal oscillator) and *R67* (470k-ohm grid resistor of the horizontal-output tube) instead of its present connection of the *R65* (150k-ohm plate resistor of horizontal oscillator) side of *C39*. Some 6AV5 tubes have been used instead of 6AU5's as horizontal-output tubes. 6AV5's are easier to drive and will result in a white drive line.

4. Connect a .1- μ f, 400-v paper tubular capacitor, preferably phenolic molded, from pin 7 of the horizontal transformer to pin 3 of the 6W4. Change *C39* to a .002- μ f, 600-v paper tubular capacitor.

KAYE-HALBERT Chassis 253
Preventing agc blocking.

To prevent agc blocking, remove the 100- μ mf, 2,000-volt capacitor *C42* which is connected in the plate circuit of the agc keyer tube. The shielded wire connected at this point has the necessary 100- μ mf capacitance.

KAYE-HALBERT Chassis 253
Inability to focus properly.

Focus trouble may be due to insufficient focus-coil current. Check that *R90*, 1,200-ohm, 1-w, is removed. This resistor shunts the focus coil. Move focus coil as far forward as possible. If necessary, add bleeder consisting of 18,000-ohm, 2-watt resistor from 320-volt line to 150-volt line and 18,000 ohm, 2-watt resistor from 150-volt line to ground.

KAYE-HALBERT Chassis 253
Interference to broadcast receivers.

Interference to broadcast receivers may occur if the television receiver is close to a radio receiver. The high-voltage sharp pulses in the yoke are radiating through the picture tube face. It may be reduced with a bypass installed as follows:

Mount a 500- μ mf, 20-kv capacitor on top of the chassis near the picture tube anode lead. Remove insulation from the anode lead and connect the lead to the top of the capacitor. Make the lead from the picture tube to the capacitor as short as possible. Do not mount the capacitor underneath the chassis, on the picture-tube bracket, or use a separate wire from the capacitor to the anode cap.

KAYE-HALBERT Chassis 253
Critical tuning of sound on weak signals.

Sharp tuning of the sound on weak signals indicates regeneration in the sound i-f circuits due to high gain. Reducing the gain slightly by detuning the 1st sound i-f transformer is an easy way to remedy this condition.

KAYE-HALBERT Chassis 253
Removing microphonics.

Microphonics may occur if the speaker vibrates the 6J6 in the tuner. To correct this trouble try several 6J6 tubes in order to find one which is non-microphonic or mechanically dampen the tube with a tight fitting lead shield.

KAYE-HALBERT Chassis 253
Foldover at top of picture.

Foldover at the top of the picture may be corrected by removing the 1,500- μmf capacitor *C50* across the vertical-blocking oscillator transformer. This shortens the vertical retrace time. To reduce the higher peak voltages thus created also change *R77* (resistor connected to terminal 2 of the integrator) from 39 k to 82 k.

KAYE-HALBERT Chassis 253
Reducing buzz.

Buzz sometimes occurs as a result of the blue lead carrying horizontal pulses getting close to the volume-control wires where they break out of the shielding. Re-dress the leads to remedy this situation. Buzz may occur in some models using the above chassis if the speaker frame is not connected to the chassis. This connection should be made.

KAYE-HALBERT Chassis 253
Reducing foldover at top of picture.

To reduce foldover at the top of the picture, change *R87* and *R88* (damping resistors across the vertical yoke windings) from 560 ohms to 330 ohms at $\frac{1}{2}$ watt. This change is already made in later production runs.

KAYE-HALBERT Chassis 253
Improving horizontal stability.

To remove the tendency toward horizontal instability insert a parasitic suppressor resistor in the grid circuit of the horizontal-output tube. This resistor is a 47-ohm, $\frac{1}{2}$ -watt unit which is connected to pin 1 of the 6AU5. Later production runs already have this change.

KAYE-HALBERT 21-inch Chassis
Snowy picture.

The shield on the r-f amplifier on the 21-inch sets is quite close to the picture tube and in some instances is slightly tilted. If the r-f amplifier tube is also tilted the pins may lose contact with the socket or only make partial contact. This can result in a weaker signal than is normally expected. The tube should be checked for contact.

KAYE-HALBERT 1952 Chassis
Increasing contrast.

All television receivers later than serial No. 61000 have increased contrast. This is accomplished by changing *R41* (cathode circuit of the 2nd video amplifier) from 330 ohms, $\frac{1}{2}$ watt to 220 ohms, $\frac{1}{2}$ watt. Contrast is increased about 30 percent. With the above values the 6K6 tube

dissipation and the contrast control are within rating.

Even more increase in contrast can be obtained by connecting a 5- μ f capacitor across *R41*. If this capacitor were to be connected from pin 8 of 6K6 to ground, the contrast control will not work.

KAYE-HALBERT 1952 Chassis
Replacement of rectifier tubes.

Sometimes the two 5Y3's used in the receiver are replaced with two 5W4's. This is bad practice and is definitely not recommended. The reason is that the B-plus voltage is raised considerably if this is done. The higher voltage uses up part of the tolerance or safety factor built into the design. This is shown in the following table where voltages and currents were measured with all controls adjusted correctly and with the line voltage at 117 volts.

As a result of the tabled measurements, the following conclusions are made:

1. Two 5U4's cannot be used as direct replacements for the 5Y3's. Output current and voltage exceed maximum tolerance.

2. A single 5U4 could be used as an emergency replacement operationally but the hum level in the audio output would be objectionable.

3. A single 5U4 can be used as a full-wave rectifier. Labor required is small since it requires only the

removal of a jumper and transfer of one lead. Output current and voltage are a small percentage higher but within tolerance.

4. It is recommended that 5Y3's be replaced with one 5U4, wired as a full-wave rectifier.



KENT Models 914, 916, 918, 921, 925, 926, 927, 930, 2010, 2011

Replacement of yoke.

When a 14-mh yoke (part No. 70F14S) is used, the following circuit changes are made.

1. Terminal polarity of width coil is reversed in relation to pin 5 and 8 of the horizontal-output transformer.

2. Red lead of the deflection yoke is moved from pin 8 to pin 5 of the horizontal-output transformer.

Note: This change is made by utilizing the spare No. 2 pin of the 6W4 damper tube socket.



MAGNAVOX Chassis CT214, CT218, CT221

Reducing possibility of hum.

To reduce the possibility that hum might be encountered, the fol-

<i>Condition</i>	<i>Output voltage (dc) of filter</i>	<i>Output current</i>
(2) 5Y3's (normal operation)	321 volts	220 ma
(2) 5U4's (direct replacement)	350 volts	240 ma
(1) 5U4 (emergency substitution)	315 volts	215 ma
(1) 5U4 (set rewired for single tube full-wave operation)	331 volts	228 ma

lowing modifications are incorporated:

1. Remove the black wire joining the 20- μ f, 50-volt section of capacitor *C91* and 6V6 (*V9*) cathode (pin 8): This removes the 20- μ f section of the capacitor which is not to be used.

2. Add a 20- μ f, 150-volt electrolytic capacitor (No. 270027-6) from pin 8 (the cathode of the 6V6) to chassis ground. Be sure to connect the *positive* terminal of the capacitor to ground as the cathode of the tube is at -85 volts potential.

3. Remove yellow wires which tie together at the negative terminal of capacitor *C91* and splice together, solder, and tape. Connect this negative capacitor terminal to the chassis ground.

4. Remove the grey wire from the 10- μ f section of capacitor *C91*. Tie the 10- μ f section of capacitor *C91* to the 25- μ f section of this capacitor.

5. Remove the jumper connection from the 10- μ f section and the 30- μ f section of capacitor *C92*. (Note: In the CT218 chassis the B-lead to the r-f unit will use the 10- μ f section of capacitor *C92* as a tie-in point. It will be necessary to remove this lead and connect it to the 30- μ f section of this capacitor and then remove the jumper between the 10- and 30- μ f sections.)

6. Tie the grey wire (see step 4 above) to the 10- μ f section of capacitor *C92*.

7. Remove the red wire (pin 1 of the speaker cable socket) from one end of the 1,500-ohm, 2-watt resistor (*R137*, in screen-grid circuit of audio-output tube), and connect this wire to the other end of this resistor.

The above modifications have already been made in later production runs of the above chassis.

MAGNAVOX Chassis CT214,
CT218, CT221

Vertical sync-pulse interference.

To reduce vertical sync-pulse interference it is necessary to relocate one resistor connected to the sync clipper (*V16B*). Unsolder the end of the resistor connected to pin 1 of the sync clipper *V16B*, and wire it to the open lug (second from end) on the terminal strip located between the vertical-output transformer and the rear of the chassis. Then connect a jumper wire between the lug to which this resistor is connected and pin 1 of *V16B*.

This modification has already been made in later production runs.

MAGNAVOX Chassis CT214,
CT218, CT221

Cross modulation on strong signals.

If the r-f amplifier tube operates on the nonlinear portion of its characteristic curve, detection can take place causing cross-modulation interference. Shifting the operating point of the r-f amplifier to the linear portion of the curve will eliminate or minimize the possibility of this detection.

The r-f tube bias is variable, on strong signals this bias is so adjusted to provide operation on the nonlinear characteristic. If the grid return is connected to ground, the tube will operate at all times on the linear characteristic. Padding the antenna may be necessary if the tube overloads on strong signals.

It is suggested that you remove the grid return (green wire) and solder it to the chassis ground where the shield is grounded. You will find the terminal board to which this shielded lead is connected on the side of the chassis near the front.

MAGNAVOX Chassis CT214,
CT218, CT221

Improving vertical sync in high-noise areas.

Here is a service measure that will improve vertical synchronization where vertical hold is unstable because of high noise level. Connect a jumper across the 82,000-ohm resistor (*R149*) in the integrating network. This resistor is mounted on the terminal board adjacent to the vertical-output transformer.

MAGNAVOX Chassis CT214,
CT218, CT221

Picture distortion.

In almost all cases of picture distortion, unless the distortion follows nearly a sine-waveform (which would result from the introduction of 60- or 120-cycle hum into sync or deflection circuits), it may be concluded that separation of the sync is inadequate and video is entering the sync chain. This is sure, if distortion is a variable under changes in the scene. Such is the effect if the picture control is too-far advanced.

This may often be corrected by changing the 6AL5 tube, *V15*, even though the tube tester indicates the tube to be satisfactory. If this does not correct the condition, test the sync separation (including d-c restorer) circuits with oscilloscope and voltmeter.

MAGNAVOX Chassis CT214,
CT218, CT221

Faulty horizontal-output tubes.

In some cases these tubes have developed internal short circuit which is capable of causing burnout of the horizontal-output transformer. For this reason a .25-amp fuse has been added in the plate circuit in later production.

These tubes also have been known to develop spurious oscillation, causing the picture to show small segments, regularly spaced, displaced from the main body of the picture.

A bluish glow on the inside surface of the glass envelope is caused by fluorescence of the glass and is not an indication of gas. Gas is evidenced by a blue glow between the tube elements.

Another manifestation of improper 6BG6G tube operation is an elongation (stretching) of the picture on the left side after about ten minutes operation. After the tube has cooled, proper linearity is restored. Under such operation, the adjustment of rear-chassis controls (especially the speed and drive controls) may cause the left-hand side of the picture to be "jumpy" or to move suddenly. In some cases the picture may move back and forth without adjustment of the controls.

In these cases, replacement of the tube is prescribed. The complaint is most evident with tubes of certain manufacture.

MAGNAVOX Chassis CT214
Extending high-frequency video response.

A green (colored) peaking coil, part No. 360332G10, is inserted

between resistor *R138* (2,000-ohm plate load of 1st video amplifier, *V14A*) and the plus 135-volt bus. This extends the high-frequency response of this stage of video amplification. This change has already been made in later production runs.

MAGNAVOX Chassis CT214
Improved horizontal stability
 (see Fig. 1).

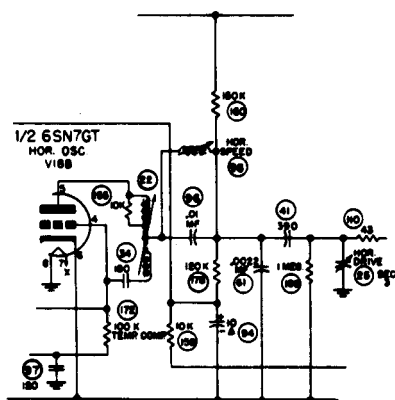


Fig. 1 — Magnavox

An iron-slug speed coil (part No. 360346G1) as horizontal-oscillator frequency control is used in later production runs of the above chassis instead of the 120- μmf unit originally employed. Should it be desired to install this unit for improved stability of horizontal deflection, instructions outlined below should be followed:

1. Remove fixed capacitor *C33* (connected to pin 3 of sync clipper) and replace with mica capacitor 180 μmf , 10%, 500 volts (part No. 250159G85). Note: The capacitor which is removed may be used in step 3 below.

2. Remove horizontal speed capacitor. This will be the center capacitor of the three-gang trimmer *C25*.

3. Connect a fixed capacitor 120 μmf , 10%, 500 volts (part No. 250159G83) from tie lug at the junction of resistor *R172* (grid circuit of horizontal oscillator) and resistor *R181* (cathode circuit of horizontal afc tube) to the grounded terminal of *V18* (6SN7GT pin No. 8).

4. Mount horizontal speed coil (part No. 360346G1) with mounting bracket (part No. 633750G2), directly above the trimmer *C25*. The tuning slug of the coil should be accessible through the opening marked horizontal speed.

5. The horizontal speed coil should be connected in the circuit as shown in the schematic.

6. Connect one side of coil to 2nd lug from the end of strip nearest horizontal-linearity coil *L13*. Remove resistor *R155* (10,000 ohms) and retain for use in step 8.

7. Connect opposite side of coil to center tap of horizontal-oscillator transformer *T22*. Dress lead so that it will follow contour of wires leading to tie-lug strip mounted between transformer *T22* and the 6VGT audio-output stage. Connection should be made from opposite terminal of horizontal speed coil to 2nd tie lug from the end of the tie-lug strip nearest the front of the chassis.

8. Connect resistor *R155* removed in step 6, across terminals 1 and 2 of tie lug (across one-half of the coil).

9. Connect .01- μf , 300-volt capacitor (part No. 250161G53) across coil. The connection should be made across the tie-lug points 2 and 3.

Note: Some production models do not incorporate the tie lug described in step 7. For these models steps 8 and 9 should be made as follows:

8a. Mount resistor *R155* directly across the horizontal-oscillator transformer coil terminals.

9a. Mount the .01- μ f capacitor directly across the terminals of the horizontal speed coil.

10. Connect a 4.7-meg resistor between lug F on the discriminator transformer *T4* and the open lug of the terminal strip mounted directly under the 6AU6 tube socket (*V6*). Then connect a lead from this lug to pin 1 of the sync clipper tube socket (*V16*, 6SN7).

MAGNAVOX

Chassis CT247,
CT248, CT249

Improving vertical linearity.

To improve vertical linearity proceed as follows:

1. Add *R210*, 10,000 ohm, 10%, 1/2-watt resistor (230104-74) in series with discharge capacitor *C117* (plate circuit of vertical multivibrator).

2. Replace *R129* (1-meg) resistor in series with height control) with one 820-ohm, 10%, 1/2-watt resistor (230104-97).

3. Replace *R197* (1,500-ohm resistor connected to terminal 3 of the integrator) with one 2,200-ohm, 10%, 1/2-watt resistor (230104-66).

4. Replace *R120* (2.2-meg resistor in grid circuit of vertical-output tube) with one 3.9-meg, 10%, 1/2-watt resistor (230104-105).

5. Replace *C118* (.047- μ f coupling capacitor to vertical-output tube) with one .1- μ f, 20%, 600-volt capacitor (250201-13).

MAGNAVOX

All models
with grill cloth

Loose grill cloth.

A television receiver may be encountered with "sagging" grill cloth. This condition is more prevalent at the time of the year when extreme humidity changes are common.

Correction is accomplished by spraying a fine mist of water on the cloth. Use a fly spray gun and be careful not to apply too much water or the speaker cone may be damaged. Shrinkage of the cloth will tighten it after it has dried.



MAJESTIC

Chassis 94, 97, 98

Intercarrier buzz (see Fig. 2).

Because of unstandardized FCC regulations, some tv stations are transmitting signals whose white level is near zero carrier. This condition may cause an objectionable buzz on receivers using the intercarrier sound system. To minimize this buzz on 94, 97, or 98 series receivers, the following circuit revision is recommended. Note: This revision has been made on production receivers which are identified by a rubber-stamped letter "B" on the rear panel of the chassis.

All reference to the 6AU6 ratio-detector driver (*V6*) will be indicated here as merely "6AU6" for simplicity. Refer to the schematic diagram for location of components listed below.

1. Remove the .02- μ f, 400-volt paper capacitor (6AU6 plate decoupling at junction of 1-k (*R34*) and 47-k (*R25*) resistors, located at a

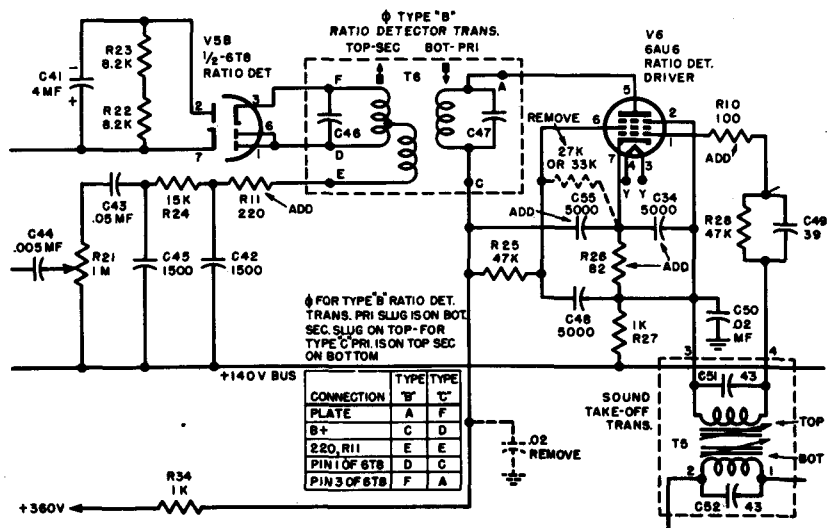


Fig. 2 — Majestic

terminal of the ratio-detector transformer).

2. Remove the 6AU6 screen bleeder resistor (located at 6AU6 pins 6 and 7). This resistor is 33 k on 94 series and 27 k on 97 and 98 series receivers.

3. Clip the small bus wire which connects 6AU6 pins 2 and 7.

4. Carefully unsolder the lead of the 5,000- $\mu\mu\text{f}$ disc capacitor (C48) which connects to 6AU6 pin 7 and resolder this lead to 6AU6 pin 2. Do not clip this lead or it will be too short.

5. Insert an 82-ohm, $\frac{1}{2}$ -watt resistor and a 5,000- $\mu\mu\text{f}$ disc capacitor in parallel between 6AU6 terminals 2 and 7. Refer to the schematic diagram; these parts are marked R26 and C34.

6. Insert a 5,000- $\mu\mu\text{f}$ disc capacitor (C55) between junction of 1-k (R34) and 47-k (R25) resistors lo-

ated at the ratio-detector transformer, and 6AU6 pin 7, keeping leads as short as possible. Use spaghetti.

7. Remove from 6AU6 pin 1 the leads of 47-k resistor (R28) and 39- $\mu\mu\text{f}$ capacitor (C49) and insert from that junction (R28 and C49) a 100-ohm, $\frac{1}{2}$ -watt resistor (R10) to 6AU6 pin 1.

8. Remove from a terminal on the ratio-detector transformer the leads of 15-k resistor (R24) and 1,500- $\mu\mu\text{f}$ capacitor (C42), and insert from that junction (R24) and (C42) a 220-ohm, $\frac{1}{2}$ -watt resistor (R11) to the same terminal on the ratio-detector transformer.

9. Remove jumpers between terminals 5 and 6 and between terminals 6 and 7 of the 6T8 (V5). Remove the leads from 6T8 pin 6 and reconnect to 6T8 pin 7. Insert jumper between 6T8 pins 5 and 7. Insert jumper with spaghetti between 6T8 pins 6 and 1.

10. On 97 or 98 series receivers only: Clip the yellow lead which connects to 6AU6 pin 4 and reroute this lead so that it runs around the other side of the 6AU6 tube socket. Reconnect it to 6AU6 pin 4.

11. After these operations are completed, check against the schematic diagram, which indicates the revised circuit.

12. Align the sound circuit, proceeding as follows:

a. Connect negative lead of a d-c VTVM to junction of R22 and R23 (8.2-k resistors located at 6T8 ratio detector), and positive lead to either side of C41, 4- μ f electrolytic capacitor.

b. Tune in a station, and utilizing the 4.5-mc difference frequency, tune the secondary of the take-off transformer (bottom of T5) and the primary of the ratio-detector transformer (T6) for maximum deflection on the VTVM.

c. Leave the negative lead of the VTVM connected as above, and reconnect positive lead to junction of C43, C45, and R24 (output of de-emphasis network).

d. Adjust secondary of ratio-detector transformer (T6) for zero on VTVM (between a plus and minus peak).

Note: If, after the above procedure is followed, it is found that the buzz persists, particularly on a single station in a fringe area, align T5 and T6 by ear while listening for maximum audio signal with corresponding minimum buzz. An audio-output meter across the speaker voice coil may be helpful.

13. Check sound on all channels. If, after careful alignment, instability is encountered (tendency to-

ward regeneration) insert a 47-k screen bleeder resistor between pins 2 and 6 of 6AU6 ratio-detector driver. Replacement of the 6AU6 may also relieve the instability. If so, the circuit should be realigned.

MAJESTIC

Chassis 97
through 103, 105

Minimizing intercarrier buzz.

This type of buzz is usually more noticeable on a test pattern with a 400 or 1000 cycle tone modulation. If, however, it is determined that the buzz is objectionable on a live program, when contrast is not advanced too far clockwise, the following corrections are suggested:

1. Check sound alignment according to the service notes.

2 If possible, align video i.f. visually (see service notes), making sure that 24.75-mc and 22.0-mc markers are both at the 50 percent points.

MAJESTIC

Chassis 97, 98

Increased protection for horizontal-output transformer.

To provide additional protection to the horizontal-output transformer, the $\frac{1}{4}$ -amp fuse is removed from the 6BQ6-GT cathode circuit in all models except model 1900 and inserted, instead, between terminal 1 of the horizontal-output transformer and the linearity coil. Where this change has not been incorporated, it is recommended that it be inserted when such receivers are being serviced.

MAJESTIC

Chassis 99
through 103, 105

Increasing brightness range.

Resistor R26 (connected to one side of the brightness control) is

changed from 100 k to 47 k and the value of *C32* (connected between 470,000-ohm resistor attached to brightness-control tap and ground) is changed from .05- μ f to .2- μ f to provide an increase in brightness range. This change has already been made in later production runs.

MAJESTIC Chassis 99 through 103, 105 with Sarkes Tarzian tuners

Improving ease of video i-f alignment.

On receivers using Sarkes Tarzian tuners, the ease of video i-f alignment may be improved by adding a capacitor *C84* between the agc lead at the terminal strip on the rear plate of the tuner to ground. This capacitor, added in later production, is a 5,000- μ f ceramic unit.

MAJESTIC Chassis 99 through 103, 105

Increasing vertical size.

To increase vertical size, *R103* and *C81* are incorporated into the plate and screen circuits of *V13*, the vertical-output stage. *R103* is a 47,000-ohm, 1-watt resistor which is inserted between the screen grid and the boost voltage. *C81* is a .25- μ f, 600-volt capacitor that is connected between the plate and screen grid of *V13*. These modifications have already been made in later production runs.

MAJESTIC Chassis 99 through 103, 105

Increasing sync amplitude.

To increase sync amplitude, *R50* (22,000-ohm plate resistor of the sync amplifier) is disconnected from terminal 3 of the horizontal-deflec-

tion coil and is reconnected directly to the 225-volt B+ line.

MAJESTIC Chassis 99 through 103, 105
Improved sync clipping and better horizontal hold
(see Fig. 3).

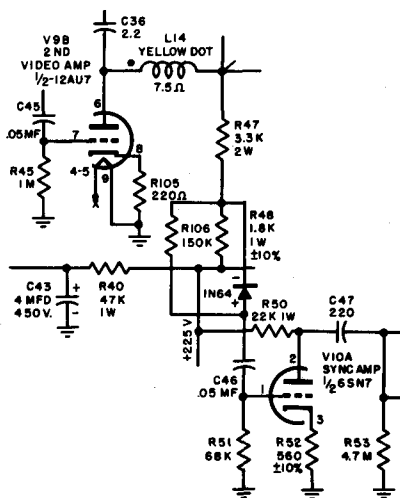


Fig. 3 — Majestic

A crystal diode 1N64, is connected in series with the sync take-off lead to provide additional clipping action. The value of *R51* (grid resistor of sync amplifier) is changed from 1 meg to 68,000 ohms.

Also, in order to improve horizontal holding ability, *R106* (150-k resistor) is added across the 1N64 crystal.

A partial schematic diagram showing these changes as well as the change described under "Increasing sync amplitude" for these same chassis, is shown here.

MAJESTIC Chassis 99
through 103, 105

Additional shock hazard protection.

To provide additional shock hazard protection a 100-k resistor (*R104*) is added from one side of the a-c line to ground. This change is already made in later production runs.

MAJESTIC Chassis 99
through 103, 105

Preventing voltage breakdown of C49.

Capacitor *C49* (.05- μ f, 600-volt unit connected to pin 5 of the sync output tube) is disconnected from ground and reconnected to 275-volt B+ bus to lower the operating voltage across this capacitor. This change has already been made in later production models.

MAJESTIC Chassis 99
through 103, 105

Preventing excessive ringing.

To eliminate excessive ringing, the value of *C71* (across one of the horizontal-deflection coils) is changed from 75 μ μ f to 39 μ μ f, 1,500 volts. If a 39- μ μ f capacitor is not available, place a 75- μ μ f capacitor in series with the existing 75- μ μ f capacitor. Later production models already incorporate this change.

MAJESTIC Chassis 99
through 103, 105

Increased overload protection in horizontal-output stage.

For increased overload protection in the horizontal-output stage, *V15*, *R108*, 15-ohm resistor, is added in the plate lead from pin 5 of *V15* to lug 7 of the horizontal-output

transformer. Resistor must have complete sleeve of vinyl tubing.

For additional horizontal-circuit protection, the 1/4-amp fuse is rewired to be in the 225-volt B+ line, terminating at the junction of *R94* (5,600-ohm, 2-watt resistor in *V15* screen circuit) and the lead to lug 6 of *T10*, the horizontal-output transformer.

These changes have already been included in later production models.

MAJESTIC Chassis 99
through 103, 105

Improving vertical interlace.

The following changes, already made in later production, improve vertical interlace stability.

1. *R107* (10-k resistor) is added in the boost voltage line between the horizontal-linearity coil and the junction of *R103* (screen resistor of vertical-output tube) and *R69*, the vertical-size control.

2. *C80* (.05- μ f capacitor) is connected from the junction of *R103* and *R69*, to 225-volt B+ bus.

3. *C83* (.25- μ f, 200-volt capacitor) is connected across the vertical-deflection coils.



MECK Chassis 9018,
9022, 9024

Insufficient raster width.

If there is insufficient raster width which cannot be corrected by adjustment of the horizontal-size and horizontal-drive controls, or by tube substitution in the horizontal oscillator or horizontal-output tube, then add a .05- μ f to .1- μ f capacitor across the width coil.

MECK

Chassis 9018

High-voltage arcing.

Pin connections of the high-voltage rectifier tube, the high-voltage transformer, and the lug in the second-anode circuit are coated with wax prior to shipment from the manufacturer's plant to eliminate arcing. It has been found that occasionally this wax coating has been chipped, and in humid weather some arcing will occur. This can be corrected by an application of wax which can be brushed on all solder joints and lugs in the second-anode circuit. Use dental wax for this purpose.

MECK

Chassis 9018

Correcting difficulty in alignment.

To assure proper alignment of the video i-f stages of the above chassis, it may be necessary on occasion to change values of some associated components of the i-f strip. The changes will depend on the tuner used in the particular set with which you are dealing. Circuit changes outlined below should be undertaken only in the occasional chassis in which alignment is found to be very difficult.

When using the VC (Variable Capacitor) tuner, part No. TT-10006:

1. Parts values are as shown in the service notes in i-f circuits employing the 6AU6, 6BA6, or 6BJ6 tubes.

2. When using separate diodes for the 6H6 or 6AL5 video detector, the 8.2-k resistor in the 3rd i-f grid should be decreased to 4.7 k.

3. In i-f strips employing 6AG5, 6BC5, or 6CB6 tubes, the resistor from the grid of the 3rd video i-f to

ground should be changed from 8.2 k to 22 k.

4. Some units have been shipped with 680- μmf capacitors used as screen bypasses. These should be increased to 5,000 μmf , if necessary.

5. If a .05- μf paper capacitor is found between the 1st i-f screen and ground, it should be removed.

6. For i-f strips employing the 6SH7, 6SG5, 7G7, or 7H7 tubes, the 22-k resistor in the grid of the 2nd video i-f should be changed to 15 k; the resistor in the grid of the 3rd video i-f which is now 8.2 k should be changed to 2 k; and 82-ohm resistor in the 2nd i-f cathode should be bypassed with a 5,000- μmf ceramic capacitor.

7. The unit may now be aligned to assure simultaneous picture and sound by setting the 2nd i-f stage at 23.3 mc, the 3rd at 24.5 mc, and the 4th at 25.8 mc. The tuner i-f slug may be used for balance. (This applies only to part 6 above).

Note: Due to the double-tuned output of the TT-10006 tuner, no peak will be obtained with the generator through tuner adjustments. However, when the i-f strip is properly aligned, the tuner i-f slug will tilt the curve for proper shape.

When using the TT-10003, TT-10004, and TT-10007 tuners:

1. With the i-f strips using the 6AU6, 6BA6, or 6BJ6 tubes, no changes will be necessary in associated components.

2. When using the 6BC5, 6CB6, or 6AG5 tubes, the 8.2-k resistor from the 3rd video i-f grid should be reduced to 4.7 k. Plate decouplers may be increased from 100 ohms to either 270 or 470 ohms. Screen bypass may

be increased from 680 μf (if used in your particular unit) to 5,000 μf .

3. Parts are as shown in the service notes for all i-f strips employing 6SH7, 6SG7, 7G7 and 7H7 tubes.

Note: Before attempting alignment after the noted changes are made to your particular chassis, be certain the screen leads are dressed next to the chassis.

MECK Chassis 9018
Elimination of vertical black and white lines in picture.

Vertical black and white lines may occasionally appear at the left-hand side of the picture-tube screen. This condition can be remedied easily by the addition of a 500- μf , 5-volt capacitor, placed in parallel with the 500- μf , 5-volt section of the CL-10068 electrolytic can. This section is used for filtering of the $-2\frac{1}{2}$ volt bias supply.

MECK Chassis with
1X2 rectifier

Preventing failure of h-v rectifier.

Failure of the 1X2 high-voltage rectifier is directly due to a variation of current demand of individual cathode-ray tubes. The operating potential of the 1X2 tube can be lowered by grounding one side of the high voltage filter capacitor. At the time of replacing a defective 1X2, remove the black lead from pin 5 (plate) of the 6W4 socket. This lead which ties to the base of the high-voltage capacitor should then be grounded on the 6W4 socket.

MECK Chassis with
TT-10006 tuner
Intermittent or low-sensitivity tuners (see Fig. 4).

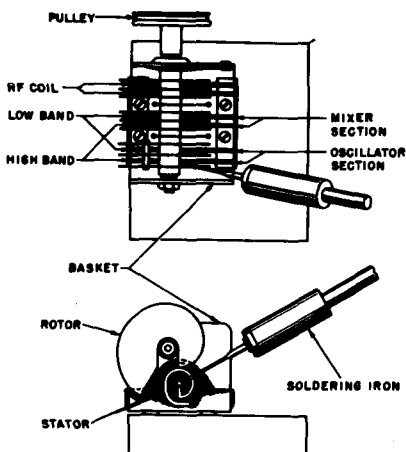


Fig. 4 — Meck

The TT-10006 tuner depends upon a variable inductance for its correct operation. This variable inductance unit consists of the carriage, mounted on top of the tuner, the stator coil assembly, and the rotor plate assembly. The carriage is the U-shaped bracket which holds the copper rotor plate assembly and the rotor shaft. The stator coil assembly consists of six printed coils which are molded on linen bakelite strips. The center of each printed coil is terminated in a tinned eyelet which extends through the linen bakelite.

The tuner manufacturer uses tinned dipped eyelets for this coil center; however, a small quantity of electro-tinned eyelets were inadvertently used in one production run of the tuners. Higher temperatures are required to flow solder on electro-tinned eyelets than on the dipped tinned eyelets.

Tuners in which this bond between the coil center and the eyelet is intermittent, can be repaired with a small soldering iron with the tip

turned down and filed into the shape of a small screw driver blade. Run one-quarter inch of solder which has a very small diameter down the screwdriver blade to the eyelet. This operation should be done with the rotor blades turned out as far as possible, and should be necessary only for the oscillator and mixer coils as shown in the figure. It is unnecessary to remove the tuner from the television chassis to carry out this soldering operation; however, with the round-tube models, it may be necessary to bend the point of the iron at right angles in order to place the tip of the iron in the correct position.

If, after soldering, arcing occurs between the rotar plates, spring the rotar plates slightly away from the coil. Springing of this rotor plate slightly will not alter the operation of the tuner unit.

The above operation should be used only in those tuners exhibiting intermittent qualities or those tuners exhibiting insensitivity of either high or low bands.

A defective receiving tube in this tuner unit can also account for this intermittent condition.

MECK All Chassis **High-voltage corona and arcing.**

Internal high-voltage arcs within the horizontal-output transformer are difficult to trace. When you trace a malfunction of the horizontal sweep to the horizontal-output transformer, a substitution check is the best method of determining whether or not the transformer is the trouble spot. Arcing between horizontal-output transformer windings will eventually lead to the melting of the transformer

wax and the eventual break of the circuit due to a burning wire.

Visible arcing between components or between a component and some portion of the chassis can normally be eliminated through changing of the lead dress from the horizontal transformer to the caps of the 6BG6 and the high-voltage rectifier tube or "ball soldering" of the soldered joints on the socket of the high-voltage rectifier tube. If arcing or excessive corona is evident even after all high-voltage rectifier joints have been ball soldered, place an application of corona dope (*Walsco*, *General Cement*, or equal) over each soldered joint.

Other visible arcing can occur on the socket of the high-voltage rectifier tube due to an improper connection between pin 8 and the corona ring. Generally this is noticed as excessive corona, rather than arcing. A faulty connection between these points will also result in poor horizontal sync.

Most 1B3 rectifiers contain an internal connection between pins 7 and 8. If this circuit between pins 7 and 8 is not completed within the tube or externally on the tube socket, arcing will occur between the two pins on the socket and through the socket itself. When replacing a 1B3, the circuit can be checked with an ohmmeter and if the connection between pins 7 and 8 on the tube check open, close the circuit with a short length of wire between these two pins on the lugs 7 and 8 on the socket base.

Arcing within the 6W4 damper tube socket is normally attributed to a high boost voltage. The boost voltage is increased with either improper settings of the vertical control or with

failure of the vertical output tube. With such conditions the boost voltage raises from a normal of about 500 volts to 580 to 600 volts. 6W4 arcing can normally be eliminated through the replacement of a defective vertical-output tube or through proper control settings. If you find an extreme case of arcing on this socket, change from the molded bakelite type socket to a mica-filled socket.

Leakage which permits arcing through the 500- μ f high-voltage capacitor can occasionally be detected with an ohmmeter; however, breakdown of this part generally occurs only at high potentials and can be proven only by substitution.

Occasionally, a surge current will open the $\frac{1}{4}$ -amp fuse in the high-voltage compartment. Often a problem which merely appears to be an open fuse is actually an intermittent high-voltage arc which can be located only by shorting the fuse and waiting for the arc to appear. A short through the .035- μ f paper capacitor in the horizontal output transformer primary circuit normally will result in the burning of the 22-k, 1-watt resistor in the AFC coil circuit.

Filaments of high voltage rectifier tubes are subject to burnout from two distinctly different causes. One type of filament failure is due to arcover from the plate to the cathode (filament in high-voltage rectifiers). Inverse peak voltage rating for the 1X2 is 15,000 volts; the inverse peak voltage rating for the 1X2A is 20,000 volts and the inverse peak voltage rating for the 1B3 is 30,000 volts. Filament failure of the 1X2 due to arcover often can be solved by replacement of the 1X2 with a 1X2A tube.

The other chief burnout cause of high-voltage rectifier filaments is excessive potential across the filament. Both 1X2 and 1B3 tubes have a filament rating of 1.25 volts. Early round-tube receivers used a filament winding on the high-voltage transformer which was designed to place the required 1.25 volts across the 1B3 filament. This voltage was produced with a two-turn winding on the core of the transformer and the placement of a 3.3-ohm resistor in series with the filament. Early rectangular-tube receivers used the same 1B3 filament circuit; however, it was found that occasionally later high-voltage transformers gave too much voltage on the high-voltage rectifier filament. In production, the dropping resistor was increased from 3.3 to 8 ohms. When replacing a high-voltage rectifier in a rectangular-tube receiver, check the value of this resistor, if it is 3.3 ohms change the resistor to 8 ohms. Another field solution for the lowering of filament potentials is the removal of one turn of the filament winding from the core of the horizontal-output transformer. Note: A dropping resistor is not used in 20-inch models.



MERCURY

Chassis 106

Foldover on left side of picture.

Foldover on the left-hand side of the picture is usually caused by improper phasing. The following items will usually correct this condition:

1. Check the wiring of electrolytic capacitor *C71*. This is a 10- μ f, 250-volt capacitor which normally con-

nects in series with *C2A*, a 10- μ f, 250-volt capacitor, from ground to the B-plus (red) lead of the primary of the vertical-output transformer *T4*. Occasionally *C71* is miswired and connected to an adjacent terminal on the terminal strip. This upsets normal phasing conditions. In this case rewiring *C71* to correspond to the schematic diagram in the service notes will correct the trouble.

2. If the wiring of *C71* is correct, raise the value of *R51* up to a maximum of 5,600 ohms. This may be raised in small steps until the phasing is corrected. *R51* may be located as the 2,700-ohm resistor which connects from the junction of pins 7 and 5 of the 6AL5 horizontal-phase detector to ground.

MERCURY Chassis 106
Critical vertical hold
 (see Fig. 5).

In some locations it will be found that the vertical sync is extremely light, and it becomes diffi-

cult to adjust the vertical-hold control so that the picture will not roll up or down under certain combinations of conditions. This trouble can be remedied by removing resistor *R26*. This component can be identified as the 3,900-ohm resistor connected from the first section of the vertical integrating network to ground (see figure).

MERCURY Chassis 106
Centering range of focus control.

Occasionally it will be found that a chassis will not go through focus with the focus control at either extreme of rotation. This can be corrected by removing the back from the cabinet so that the focus coil can be reached. If the focus control is in its fully counterclockwise position when the best focus is obtained, it will be necessary to add a magnetic shunt to the focus coil. This can take the form of a small piece of steel approximately 1/2" x 1" from 1/32" to 1/16" thick. This should

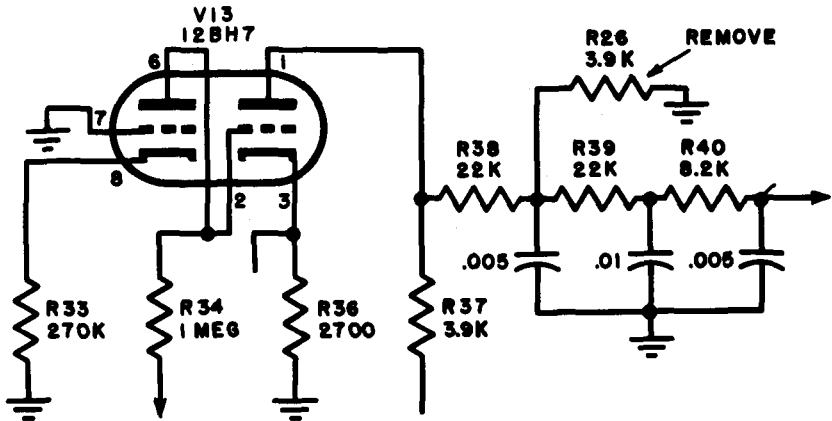


Fig. 5 — Mercury

be snapped onto the outer surface of the focus coil magnet with its long dimension running from front to rear. The best position to apply this is usually on the left side of the picture tube when facing the rear of the chassis. The focus coil magnetism will hold the shunt solidly in place. After applying the shunt, the ion-trap magnet should be readjusted and the set then checked for focus. If the correction was insufficient, a second shunt can be applied adjacent to the first one.

If the original poor focus condition occurs with the focus control in the maximum clockwise position, it will probably be found that one or more shunts are already on the focus coil. In this case, these should be removed one at a time, the ion-trap magnet readjusted, and the set then checked for focus.



MIDWEST Chassis BT-20, CV-20
Improving sync stability.

To remove video information from the sync circuits, return the .5- μ f capacitor connected to one side of the horizontal yoke to the 400-volt bus instead of to the 270-volt bus.

Also, change the 2.2-meg resistor at pins 1 and 7 of the 12AT7 sync separator to 1 meg.

MIDWEST Chassis BT-20, CV-20
Shifting raster to left.

If it is required to shift the raster to the left in order to improve horizontal centering, connect the 5,000-ohm section of the metal-clad bleeder, RW-18D, to the 400-

volt point instead of to the cold end of the yoke as shown in the service notes.

MIDWEST Chassis BT-20, CV-20
Poor sync and low sensitivity.

Poor sync, poor sensitivity, and erratic sync are caused by a faulty picture i-f crystal detector. Replace the 1N60 or 1N64 used with a 1N34 or a 6AL5 tube. Mounting hole for the 7 pin miniature socket required for the tube is provided in the CV-20 chassis.

MIDWEST Chassis CV-20
Preventing sound i-f oscillation.

To prevent oscillation in the sound i-f strip, proceed as follows:

1. Press the blue lead from the plate of the 2nd i-f tube against the chassis.

2. Reroute the red 400-volt wire from the metal-clad bleeder resistor away from the sound i-f transformer and the 1st video-amplifier grid.

MIDWEST Chassis DJ-19,
DM-16, DMA-16, DR-16,
DX-19, DXA-19

Improving low-frequency response.

The 1-k, 1-watt resistor in the 6AQ5 video-tube plate circuit should be changed to 1.5 k, 1 watt, 10%. This will make a total of 3,000 ohms in the plate load for better low-frequency response.

MIDWEST Chassis DJ-19,
DM-16, DMA-16, DR-16,
DX-19, DXA-19

Improving tuning characteristics.

The grid resistor of the 3rd picture i-f stage should be changed from

12 k, 10% to 22 k, and the picture i-f alignment frequencies revised as follows:

1st stage	23.4 mc
2nd stage	22.2 mc
3rd stage	25.3 mc
4th stage	21.0 mc
Detector	25.5 mc

The 1st sound trap should be adjusted to slightly less than 21.25 mc to reduce the response below that frequency. This will improve the tuning characteristics.

MIDWEST Chassis DJ-19,
DM-16, DMA-16, DR-16,
DX-19, DXA-19

Improving sensitivity and sync stability.

To improve both sync and sensitivity a 5,000-ohm, 10-watt resistor should be put in parallel with the end section of the *Candohm* resistor from the terminal supplying 215 volts to the 100-volt terminal. This will increase the B voltage on the picture i-f tubes and on the tuner.

MIDWEST Chassis DM-16,
DMA-16, DX-19, DXA-19

Reducing heater voltage of h-v rectifier.

A 3.3-ohm, 1/2-watt resistor may be added in series with the 1B3 heater lead to reduce heater voltage. This should be added from pin 7 to top of first h-v filter capacitor in place of solid wire jumper, and the heater lead removed from pin 7 and connected to the filter capacitor.

MIDWEST All Chassis
Receiver overloading due to excessive signals (see Fig. 6).

Where too much signal is picked up, resulting in overload, the picture

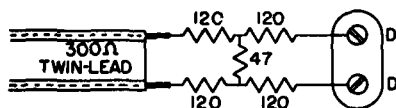


Fig. 6 — Midwest

shows only the edges of black areas; this is the result of loss of all low-video frequency detail. To correct this trouble insert an attenuator pad in the 300-ohm line to the receiver antenna terminals. The values shown here are recommended, using only carbon resistors and adding sections until detail is obtained in the picture.

MIDWEST All Chassis
Interference from unwanted signals.

Interference from unwanted signals, such as the image of an f-m station or high-frequency diathermy and automatic-control devices, should be eliminated as far as possible with relocation of the antenna.

To reduce interference from short-wave stations, parallel tuned traps may be installed, one in each lead of the twin lead. A high-pass filter may also be used. For strong short-wave interference an additional r-f filter may be necessary in the power line along with the two .01- μ f capacitors from the lines to chassis.

Interference from vhf stations may be attenuated by an open-stub wave trap. Cut a length of twin lead which is 1/4 the wave length of the interfering station (reduce length by the velocity factor) connect, one end across the antenna terminals and leave the other end open. This effectively shorts the lead-in at the interfering frequency only. If using 300-ohm twin lead (with a velocity factor of 82 percent) divide 201 by

the station frequency in mc for the answer in feet. In fringe areas a directional, narrow-band antenna will discriminate against interference; a tuned booster would also increase the selective characteristics of the receiving set-up.



MONTGOMERY WARD

Model 05BR-3034A,
15BR-3035A, 15BR-3048A,
15BR-3053A, B

No picture due to tuner.

If the receiver is "dead" and the picture tube shows nothing but a raster (no snow) first check the i-f and video-amplifier stages before looking into the tuner. If the set is dead and snow appears on the face of the picture tube, first determine whether a signal is being transmitted and then check the antenna or lead-in connections before suspecting the tuner for trouble.

The tuner can easily be serviced by removing the three hex-head nuts holding the bottom cover in place. Removing the bottom cover makes all the tuner components within easy reach and all parts can be serviced. When working inside the tuner do not move any component a great distance or a change in the distributed capacitance will result and offset the alignment. When replacing components be sure to obtain the same lead lengths and replace the components in the same position.

A majority of tuner troubles are often open and high resistance ground or cold solder connections, defective trimmers or coils, and defective contacts.

Open or high resistance connections can easily be repaired by placing a hot soldering iron at the solder connection.

Defective contacts may cause an intermittent condition or the loss of one or both bands. Contact replacement is easily accomplished by removing the two switch plate tension springs, the hex-head bolt and switch lever bracket. Lift up switch lever and replace contacts.

MONTGOMERY WARD

Model 05BR-3034A

Reducing video interference.

To insure minimum video interference, dress the speaker leads away from the 6AL5 (detector tube V7).

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023A, B, C

Increasing picture size in low line voltage areas.

If greater picture size is required in areas having low line voltage, shunt the terminals of the horizontal-deflection yoke with a 470- $\mu\mu\text{f}$, 2,000-volt (or equivalent) capacitor.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Minimizing intercarrier buzz.

This type of buzz is usually more noticeable on a test pattern with a 400 or 1,000-cycle tone modulation. If, however, it is determined that the buzz is objectionable on a live program, when contrast is not advanced too far clockwise, the following corrections are suggested:

1. Check filter capacitor C38 (40- μ f, 350 volts) for leakage or an open condition.

2. If possible, align video i.f. visually (see service notes) making sure that 24.75-mc and 22.0-mc markers are both at the 50 percent points.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Increased protection for flyback transformer.

To provide additional protection to the flyback transformer, the $\frac{1}{4}$ -amp fuse is removed from the 6BC6 cathode circuit and inserted, instead, in series with terminal 1 of the flyback transformer. This change has already been made in later runs.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Replacement of 6AG5.

The 6BC5 tube is an exact replacement for the 6AG5 which has been used in earlier receivers. When replacement of the 6AG5 is required, use the 6BC5, whose transconductance is held to closer tolerance. Slight realignment may be required when this change is made.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Sound and picture coincidence.

If sound and picture are not coincident on weak signals on early production receivers, change R26 screen voltage divider on 6AU6 ratio-detector drive tube from 10 k to 33 k, $\frac{1}{2}$ watt.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Increased safety factor for filter capacitors.

For increased voltage safety factor, the triple-section 40-40-40 μ f, 450-450-450 volt single-can electrolytic filter capacitor is replaced by two units (C80 and C81) of higher voltage rating (475 volts each section). This change has been incorporated in later production runs.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Picture twist due to afc unbalance.

To minimize picture twist due to unbalance of positive and negative sync voltage at 6AL5 afc diodes, the following revisions are made:

1. Plate resistor R98 of 6SN7 sync amplifier-splitter (V12B) is changed from 3.9 k to 6.8 k.

2. Plate resistor R99 of above tube is changed from 3.9 k to 2.2 k.

3. Vertical integrator resistor R97 is changed from 22 k to 33 k.

4. Sawtooth feedback resistor R94 is changed from 4.7 k to 3.9 k.

These changes have already been made in later productions runs.

MONTGOMERY WARD

Models 05GCB-3019A,
16K1/63-3019,
94GCB-3023 A, B, C

Picture twist at low contrast and brightness settings.

If twist is apparent even at low settings of the brightness and contrast controls, check:

1. Proximity of 6.3-volt filament wires to horizontal afc coil. If filament wires run close reroute them further from the afc circuit.

2. Wire from horizontal-hold control to R77, 100-k resistor at grid (pin 4) of 6SN7 horizontal-sweep oscillator. If unshielded, replace with shielded wire.

3. Horizontal-sweep oscillator 1.5-k cathode resistor (R76). Slight increase of resistance value may reduce twist.

Note: Twist may be due to the operation of the d-c restorer circuit, to parasitic oscillations in the horizontal-sweep circuit, or to an unbalanced afc circuit. Check the cures for these troubles given here.

MONTGOMERY WARD

Model 05GSE-3020A

Improved horizontal hold (see Fig. 7).

Some of these sets may exhibit a tendency toward requiring a different setting of the horizontal-hold control when the set is first turned on (cold) and after it has warmed up (hot).

To correct this condition changes are made in the 6AL5 phase de-

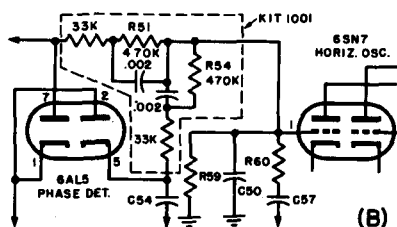
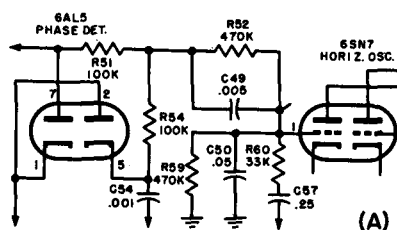


Fig. 7 — Montgomery Ward

tector circuit. Chassis already having these changes incorporated are stamped "YB" on the rear flange. Sets without these changes are stamped "YA." Part (A) of the figure shows the original (YA) 6AL5 circuit and part (B) shows the revised (YB) circuit. All parts necessary to make this change are supplied pre-connected in kit form. The component parts in this kit are listed below:

KIT NO. MWP-1001 FOR 3020 HORIZONTAL PHASE DETECTOR CIRCUIT:

Ref. No.	Part No.	Description
R104, R54	27E333-2	33k-ohm, 1/2-w, 10% resistors
R51, R54	27E1009-25	470k-ohm, 1/2-w, 5% resistors
C85, C86	23E205	.002- μ f, 200-volt capacitors

PARTS NO LONGER USED AFTER CIRCUIT REVISION:

Ref. No.	Part No.	Description
R51, R54	27E1009-27	100k-ohm, 1/2-w resistors
R52	27E474-2	470k-ohm, 1/2-w resistors
C49	23E208	.005 μ f, 200-volt capacitors

MONTGOMERY WARD

Model 05GSE-3020A

Replacement of tuner tubes.

A 6CB6, 6AG5, or 6BC5 is used in the r-f amplifier and modulator tube sockets. Always use the same type tube for replacement. Intermixing these tubes may result in loss of sensitivity caused by the differences in tube capacitances detuning the circuits and making it necessary to realign the r-f amplifier and modulator stages by spreading or squeezing turns on the coils. The 6CB6 cannot be used in the video i-f amplifier stages.

MONTGOMERY WARD

Model 05GSE-3020A

Replacement of horizontal-output transformer (see Fig. 8).

Horizontal-output and h-v transformers 22E57-2 or 22E57-3 replace the transformer part No. 22E57 used in receivers having "Series YA, YB, and YC" stamped on the back of the chassis.

Due to changes in construction of the flyback transformer it is necessary to revise the circuit slightly and change several components for proper operation of the set when replacing the 22E57 transformers (see circuit and wiring changes). To do this proceed as follows:

1. Replace the horizontal-output and h-v transformer with new transformer and connect as shown.

2. Change the 10,000-ohm, $\frac{1}{2}$ -watt peaking resistor *R72*, located in the 6SN7 horizontal-oscillator output circuit, with an 8,200-ohm, $\frac{1}{2}$ -watt resistor, part No. 27E822-2.

3. Change the 220,000-ohm, $\frac{1}{2}$ -watt plate-load resistor *R79* located in the 6SN7 horizontal-oscillator

plate circuit to 270,000 ohms, 1 watt, part No. 27E274-3.

4. Change the 15,000-ohm, 2-watt resistor *R74* (some sets used two 7,500-ohm, 1-watt resistors in series) in the screen circuit of the 6BG6G horizontal-output tube to a 27,000-ohm, 2-watt resistor, part No. 27E273-5.

5. Change the 560,000-ohm, $\frac{1}{2}$ -watt resistor *R80* across the drive control in the grid circuit of the 6BG6G horizontal-output tube to a 1-meg, $\frac{1}{2}$ -watt resistor, part No. 27E105-2.

6. Disconnect the 100- μ f, 10-volt bypass capacitor *C60* and the 68-ohm, $\frac{1}{2}$ -watt resistor *R73* in the cathode circuit of the 6BG6G horizontal-output tube and remove.

7. Connect a jumper wire from lug 3 to lug 2 on the 6BG6G socket to ground the cathode.

8. Disconnect the 4,700-ohm resistor *R81* located across the horizontal-linearity coil *L15* and remove.

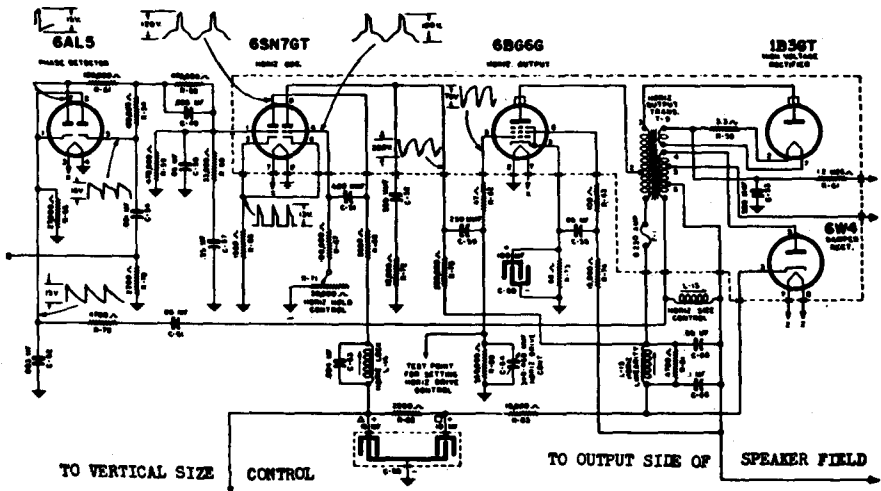
9. Disconnect the 15,000-ohm, 5-watt resistor *R83* (some sets used four 15,000-ohm, 1-watt resistors in series-parallel) and remove.

10. Clip out the lead between the horizontal-lock coil *L14* and electrolytic capacitor *C68* and reconnect the horizontal-lock coil with a longer length of wire to the B+ lug on the double-tie lug located adjacent to the vertical-size control.

11. Clip the lead coming from the vertical-size control at the electrolytic capacitor *C68*, shorten and connect this lead to the B+ lug on the double-tie lug located adjacent to the vertical-size control.

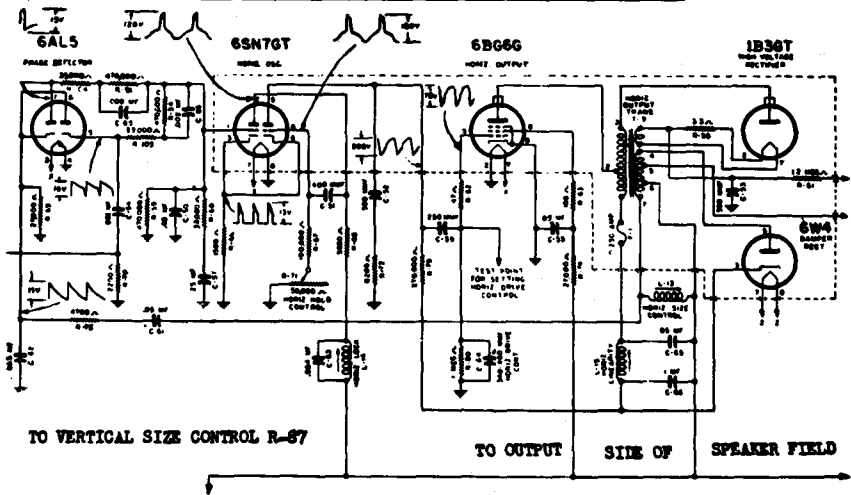
12. Replace the horizontal-size control (part No. 20E415) coil *L13* with a new coil, part No. 20E639.

CIRCUIT USED WITH 22E57 (ORIGINAL) TRANSFORMER



(A)

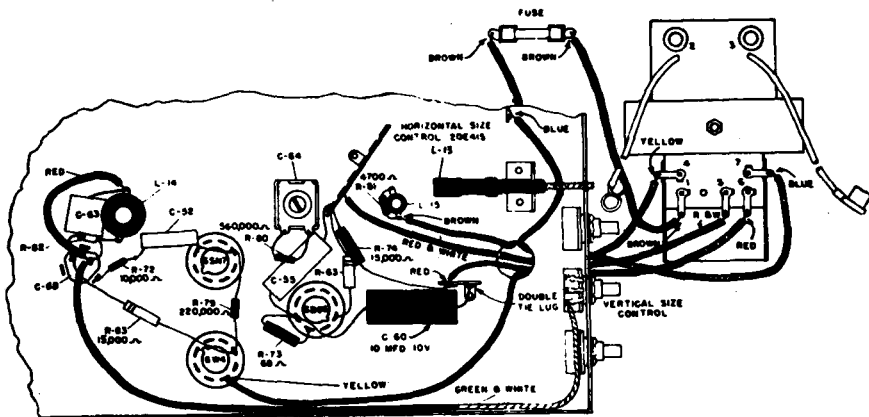
CIRCUIT USED WITH NEW TRANSFORMER



(B)

Fig. 8

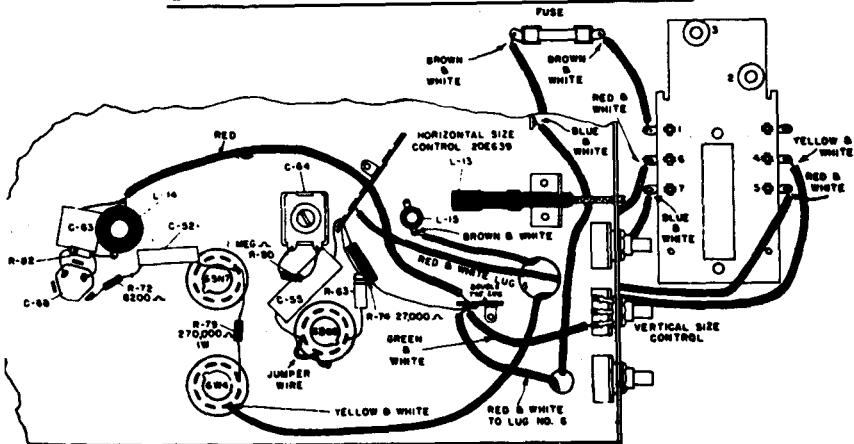
LAYOUT USED WITH ORIGINAL TRANSFORMER



ITEMS REFERRED TO IN STEP BY STEP INSTRUCTION COPY ARE SHOWN IN HEAVY DARK OUTLINE.

(C)

LAYOUT USED WITH NEW TRANSFORMER



ITEMS REFERRED TO IN STEP BY STEP INSTRUCTION COPY ARE SHOWN IN HEAVY DARK OUTLINE.

(D)

Montgomery Ward

MONTGOMERY WARD

Models 05WG-series Improving signal-to-noise ratio in fringe areas (see Fig. 9).

Near the end of production a change was made in the agc circuit to improve the signal-to-noise ratio for fringe-area operation. This

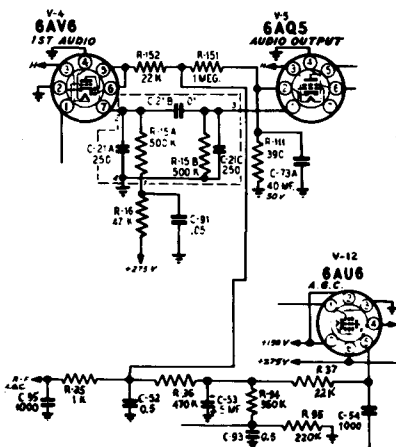


Fig. 9 — Montgomery Ward

Remove the Following Components
in the Plate Voltage-Divider Circuit
of the Agc Tube

1. R94, 470k ohms (part No. B85474)
2. R95, 820k ohms (part No. B84824)
3. C53, .1- μ f, 200 volts (part No. B65104)

Replace With:

- R94, 560k ohms (part No. B84564)
- R95, 220k ohms (part No. B84224)
- C535- μ f, 100 volts (part No. 45X361)

Add:

1. R151, 1-meg resistor (part No. B84105) between junction of R36 and C52 (both in the agc filter network) and pin 2 of 6AQ5 audio-output tube.
2. R152, 22k ohm resistor (part No. B85223) between junction of R36 and C52 and pin 6 of 6AV6 (or 6AT6) 1st audio amplifier.

change is incorporated in the schematic diagram shown here.

If it is desired to incorporate this circuit change in earlier production (models 05WG-3030C, 05WG-3036A & B, or 05WG-3039A & B) the changes in the table should be made.

MONTGOMERY WARD

Models 05WG-series Improving contrast ratio.

A change was made to improve the contrast ratio in late-production sets. This consisted of reducing the voltage applied to pin 10 of the picture tube from +390 to +275 volts. Physically this change can be made by removing the red wire from pin 10 of the picture-tube socket, from pin 8 of the deflection yoke and focus-coil socket and connecting it to pin 6 of the 6AU6 agc tube.

MONTGOMERY WARD

Model 15BR-3035A Replacing crystal detector.

To check a suspected defective germanium crystal detector, place the

selector switch in either the TV or PH position and connect the leads of an ohmmeter across the crystal.

The backward resistance should be 300k ohms or more; the forward resistance should be approximately 200 ohms.

Extreme caution should be observed when working with a soldering iron near the crystal as heat may permanently damage it.

If replacement is necessary, grasp each lead with pliers while soldering into place. The pliers will then dissipate the heat and prevent damage to the crystal. The band or ring on the crystal is the ground side. Improper connection will produce a positive avc voltage. The crystal should be dressed outside of the transformer terminal lugs.

MONTGOMERY WARD

Models 15BR-3053 A, B

Preventing high-voltage corona and arcing.

In the process of inspection, repairs, changing of tubes or transformers, or for any other reason where it is necessary to work within the high voltage power supply, the following should be closely observed.

1. Terminals on the 1X2 socket must be dressed toward the inside of the corona ring and be free of sharp protrusions.

2. The corona ring must be dressed in such a way as to make its presence useful; that is, properly centered and about $\frac{1}{8}$ inch below the socket terminals.

3. All leads must be dressed as far away as possible from the transformer winding. Excess lead length should be transferred to the underside of the chassis.

MONTGOMERY WARD

Models 16K1/63-3019,
94GCB-3023A, B, C

Minimizing intercarrier buzz (see Fig. 10).

To minimize intercarrier buzz on earlier receivers, the circuit revision described below is recommended.

Note: All reference to the 6AU6 ratio-detector driver (*V6*) will be indicated here merely as "6AU6" for simplicity. Refer to the figure for identification of components.

1. Remove the .02- μ f, 400-volt paper capacitor (at junction of 1-k resistor *R34* and 47-k resistor *R25*, located at a terminal of the ratio-detector transformer).

2. Remove the 33-k 6AU6 screen-bleeder resistor (located at 6AU6 pins 6 and 7).

3. Clip the small bus wire which connects 6AU6 pins 2 and 7.

4. Carefully unsolder the lead of the 5,000- μ f disc capacitor (*C48*) which connects to 6AU6 pin 7, and resolder this lead to 6AU6 pin 2. Do not clip the lead or it will be too short.

5. Insert an 82-ohm, $\frac{1}{2}$ -watt resistor (*R26*) and a 5,000- μ f disc capacitor (*C34*) in parallel between 6AU6 terminals 2 and 7.

6. Insert a 5,000- μ f disc capacitor (*C55*) between junction of 1-k resistor (*R34*) and 47-k resistor (*R25*) located at the ratio-detector transformer and 6AU6 pin 7, keeping leads as short as possible.

7. Remove from 6AU6 pin 1 the leads of 47-k resistor (*R28*) and 39- μ f capacitor (*C49*) and insert from that junction (*R28* and *C49*) a 100-ohm, $\frac{1}{2}$ -watt resistor (*R10*) to 6AU6 pin 1.

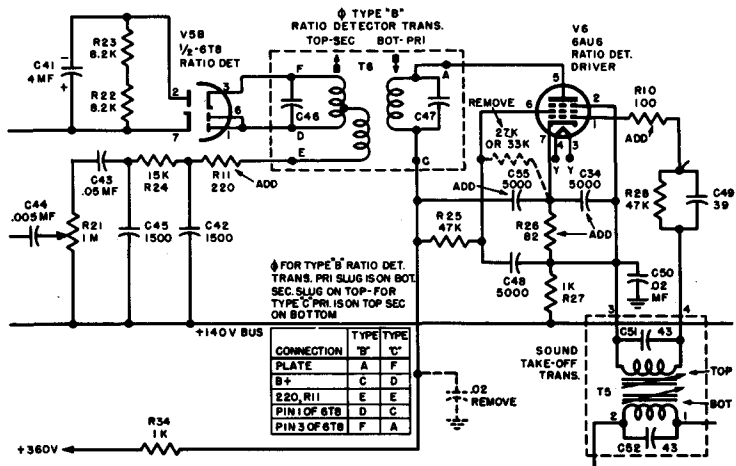


Fig. 10 — Montgomery Ward

8. Remove from a terminal on the ratio-detector transformer the lead of 15-k resistor (*R24*) and 1,500- μ mf capacitor (*C42*) and insert from that junction (*R24* and *C42*) a 220-ohm, ½-watt resistor (*R11*) to the same terminal on the ratio-detector transformer.

9. Remove jumpers between terminals 5, 6, and 7 of the 6T8 (*V5*). Remove the 8.2-k resistor (*R22*) from 6T8 pin 6 and reconnect to 6T8 pin 7. Insert jumper between 6T8 pins 5 and 7. Insert jumper (with spaghetti) between 6T8 pins 6 and 1.

10. Align the sound circuit (see service notes).

Note: In absence of alignment equipment, the above adjustments can usually be performed with acceptable accuracy by tuning in an offending tv channel and utilizing the 4.5-mc difference frequency as the signal source. While tuning *T5* and *T6*, listen for maximum audio signal with corresponding minimum buzz. An audio-output meter across the speaker voice coil may be helpful.

11. Check sound on all channels. If, after careful alignment, instability is encountered (tendency toward regeneration), insert a 47-k (screen-leeder resistor between 6AU6 pins 2 and 6).

MONTGOMERY WARD

Models 25WG-series Correction of vertical instability.

The above model television receivers may show signs of vertical instability after a short time. The first indications of the set's developing this trouble will be the positioning of the vertical-hold control toward the extreme right-hand position to be able to stop the picture from rolling. If you cannot cause the picture to roll both up and then down by varying the vertical-hold control from its extreme left-hand position to the extreme right-hand position, proceed as follows:

1. Remove the 6BL7 tube and in its place install a 6SN7GT tube.

a. Adjust the vertical linearity and vertical size to fill the screen.

b. In the event that you cannot fill the screen by replacing the 6BL7 with a 6SN7GT due to low line voltage, it will be necessary to make the changes listed in steps 2, 3, 4, and 5.

2. Remove the 1.5-k resistor connected between one side of the vertical-linearity control and pin 6 of the 6BL7, and in its place install an 820-ohm resistor.

3. Remove the 1-meg resistor connected between pin 4 of the 6BL7 and chassis, and in its place install a 2.2-meg resistor.

4. Remove the 15-k resistor connected between boost B+ and the vertical-deflection yoke, and in its place install a 6.8-k, 2-watt resistor.

5. Remove the 6BL7 tube and in its place install a 6SN7-GTA tube.

Note: Some of the early sets of the A issue on the above models may use a part No. 51X159 vertical-output transformer. If this is the case, the vertical-output transformer will also have to be changed to part No. 51X156 when the above changes are made. The transformer can be identified by the part number stamped on the top or side.

MONTGOMERY WARD

Models 25WG-3075A, B,
-3077A, B, -3079A

Poor focus and washed-out picture.

The above model television receivers, which use the 21MP4 low voltage, electrostatically focused picture tube may show signs of poor focus and picture wash-out in the center of the picture tube:

This condition can be corrected by installing the ion trap so that it will be positioned on the side of the picture-tube neck where the electron

gun is closest to the glass of the neck. In nearly all cases, the correct position of the ion trap to correct this condition will be on the left side of the picture tube when viewed from the rear of the chassis. If you should encounter poor focus and picture wash-out with the ion trap on the right side, as viewed from the rear of chassis, reverse the ion trap and adjust it for maximum brilliance on the left side.

MONTGOMERY WARD

Models 84HA-3010 A, B, C
Improved horizontal sync
(see Fig. 11).

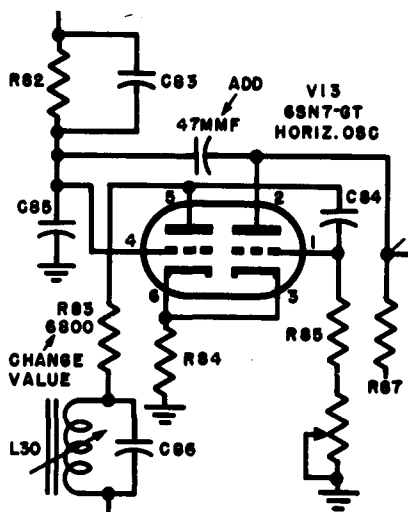


Fig. 11 — Montgomery Ward

To improve the horizontal sync, proceed as follows:

1. Install a 47- μ f ceramic capacitor between pins 2 and 4 of V13, the 6SN7 horizontal-oscillator tube.

2. Change R83 in the horizontal-oscillator circuit from 5,600 ohms, 1/2 watt to 6,800 ohms, 1 watt.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Increased contrast ratio

(see Fig. 12).

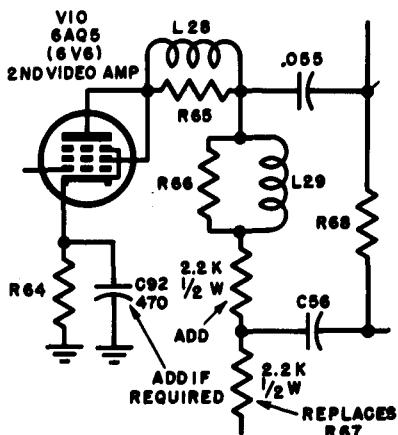


Fig. 12 — Montgomery Ward

To obtain a greater white to black ratio proceed as follows:

1. Install a 2,200-ohm, 1/2-watt decoupling resistor as shown in the figure.
2. Change R67 from 4,700 ohms to 2,200 ohms.
3. Change the connection of C56 as shown.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Improved horizontal linearity.

Install a 20,000-ohm to 30,000-ohm, 10-watt resistor between pins 4 (or 6) and 8 of V21, the 5U4 rectifier tube if a non-correctable bulge appears on the left-hand side of the picture.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Improved definition and focus.

1. Some sets do not have C92, a 470- μF mica capacitor, connected in parallel with R64, the cathode resistor for V10, the 2nd video amplifier. Install this capacitor if it is not in the set.

2. Improved range of the focus control, R103 in the power-supply chassis, may be secured by removing R116, an 1,800-ohm, 2-watt resistor. This resistor is shunted across the focus control.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Increased sensitivity on high-band channels.

1. Increased sensitivity on the high-band channels may be secured by removing the grounding leads from socket terminal 4 of V1 (r-f amplifier) and socket terminal 7 of V2 (mixer) and grounding these leads directly to the chassis.

2. Capacitors C9 and C11 (4.7- μF capacitors in the r-f amplifier plate circuit and the mixer grid circuit, respectively) in the tuner assembly should also be removed when the above change is made.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Reduction of 4.5-mc interference.

4.5-mc signal hash in the picture may be reduced by installing a 1 1/2" x 4" metal shield between the discriminator transformer and the tuner chassis. The discriminator coil slug also should be grounded.

MONTGOMERY WARD

Models 84HA-3010 A, B, C

Picture tube protective circuit (see Fig. 13).

Circuit No.	Part No.	Description
C93	CM20A102K	1,000- μ f, 500-volt mica capacitor
C94	45A103	8- μ f, 475-volt electrolytic capacitor
C95	46AY503J	.05- μ f, 600-volt tubular capacitor
C96	46AZ502J	.005- μ f, 600-volt tubular capacitor
R119, R121	RC20AE105M	1-meg, $\frac{1}{2}$ -watt carbon resistor
R120	RC40AE223M	22,000-ohm, 2-watt carbon resistor
R122	RC20AE223K	22,000-ohm, $\frac{1}{2}$ -watt carbon resistor
PL6	10A287	Connector

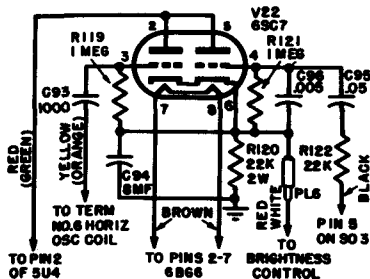


Fig. 13 — Montgomery Ward

After these sets reached the field, a picture-tube protective circuit kit was made available for installation. The purpose of this circuit is to cut off the intense electron beam in the picture tube in event of failure in either the horizontal- or vertical-sweep circuits. This prevents burning a line into the face of the picture tube and rendering the tube useless.

Components in this circuit are assembled on a small sub-chassis that becomes a part of the power-supply unit. The wiring diagram for the protective circuit is shown here. In addition to the components added to the power-supply chassis, the following alterations are made in the receiver chassis:

1. Resistor *R29*, in series with the brightness control, is changed from 47,000 ohms to 150,000 ohms.

2. Resistor *R120*, in the protective circuit, replaces *R30* (also in series

with brightness control) in the receiver chassis. Therefore, *R30* is no longer used.

Table shows a list of the additional parts used in this modification.

MONTGOMERY WARD

Models 94GCB-3023 A, B

Picture twist at high brightness settings (see Fig. 14).

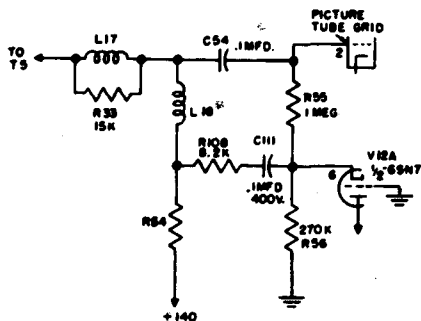


Fig. 14 — Montgomery Ward

If picture twist occurs mainly upon advancing the brightness control, the d-c restorer circuit should be altered as follows:

1. Change resistor at picture-tube grid (*R55*) to 1 meg.

2. Add .1- μ f, 400-volt capacitor (*C11*) in series with an 8.2-k, $\frac{1}{2}$ -watt resistor (*R108*) connected from the cathode (pin 6) of the d-c re-

storer (*V12A*) to junction of *L18* and *R54*.

Note: *R108* is 7 k in earlier production receivers.

MONTGOMERY WARD

Models 94GCB-3023 A, B

Reducing picture blooming.

To reduce picture blooming on the picture tube drop the screen voltage from 360 volts to 250 volts as follows:

1. Change resistor *R32* at picture-tube screen grid from 1 k to 100 k, $\frac{1}{2}$ watt.
2. Add a 220-k, $\frac{1}{2}$ -watt resistor (*R115*) from picture tube screen grid to ground.

MONTGOMERY WARD

Models 94GCB-3023 A, B

Horizontal parasitics.

If parasitics in the horizontal-sweep circuit are encountered, proceed as follows:

1. Change *R75*, located at pin 2 of the horizontal-sweep oscillator (*V15*) from 5.6 k to 4.7 k, $\frac{1}{2}$ watt. (Some receivers may have a 3.9-k resistor here).
2. Reverse the leads on the horizontal afc coil (*L9*).
3. If necessary, relocate the horizontal afc coil.

MONTGOMERY WARD

Models 94WG-series

Alignment in fringe areas

(see Fig. 15).

In areas of low signal strength it may be desirable to increase the i-f sensitivity by aligning the i-f strip with a -1 volt setting of the contrast control. If this is done, the response curve will be approximately as shown in the figure. The marker signals

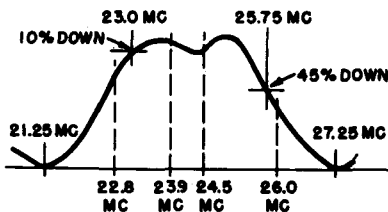


Fig. 15 — Montgomery Ward

should have the same relative positions as for -3 volt alignment.



MOTOROLA

Chassis TS-14,

23, 52, 53, 60, 74

Increased vertical-sync stability (see Fig. 16).

The following circuit revisions were running production changes to minimize vertical collapse with certain settings of the size and linearity controls, and to provide more positive vertical sync. They can easily be installed in existing chassis where troubles of this nature are encountered, such as in fringe or weak-signal areas.

1. Add the differentiating circuit at the input of the first clipper. This helps to prevent noise from reaching the clipper grid. It consists of a 100- μ f mica capacitor (part No. 21R6554 or equivalent) and a 470,000-ohm, $\frac{1}{2}$ -watt resistor (part No. 6R6032 or equivalent) connected in parallel and inserted between the 10,000-ohm series resistor and the coupling capacitor to the first clipper grid. The first clipper grid resistor is changed from 1 megohm to 2.2 megohms (part No. 6R3927 or equivalent).

2. Change the coupling capacitor to the 1st clipper grid from .001 μ f

to .005 μ f (part No. 8R9869 or equivalent).

3. The sync-pulse amplitude out of the second clipper can be increased by applying a small positive voltage to its grid. This is done by connecting a 390,000-ohm, $\frac{1}{2}$ -watt resistor (part No. 6R5646 or equivalent) from the plate supply to the grid of the tube. To keep the pulses to the phase detector balanced in amplitude, the plate load of the second clipper is changed from a 5,600- to a 4,700-ohm, $\frac{1}{2}$ -watt resistor (part No. 6R6080 or equivalent) when this change is made.

4. The coupling capacitor from the integrator to the vertical sweep-generator grid is changed from .002 μ f to .005 μ f (part No. 8R9869 or equivalent).

5. The feedback capacitor from the vertical-sweep output-tube plate circuit to the vertical-sweep generator-tube grid circuit is changed from .005 μ f to .006 μ f (part No. 8K790-026 or equivalent).

6. Isolate the screen grid of the vertical-output tube by inserting a

100-ohm, $\frac{1}{2}$ -watt resistor (part No. 6R6018 or equivalent) between it and the plate at the socket.

7. Change the saw-forming capacitor from .05 μ f to .04 μ f, 600 volts (part No. 8K400028 or equivalent).

MOTOROLA Chassis TS-67 Overheating of horizontal-output transformer.

Cases of the horizontal-output transformer overheating in these chassis have been traced to a resonant condition in the horizontal-linearity circuit. This condition is, in turn, due to the improper setting of the core in the horizontal-linearity coil. For proper adjustment, proceed as follows:

1. Replace the fuse temporarily with a milliammeter having a 150-ma scale.
2. Adjust the slug throughout its range. It will show a peak on the meter of 125—130 ma at both ends of its range.
3. Find the point in between where the meter dips to approximately 90

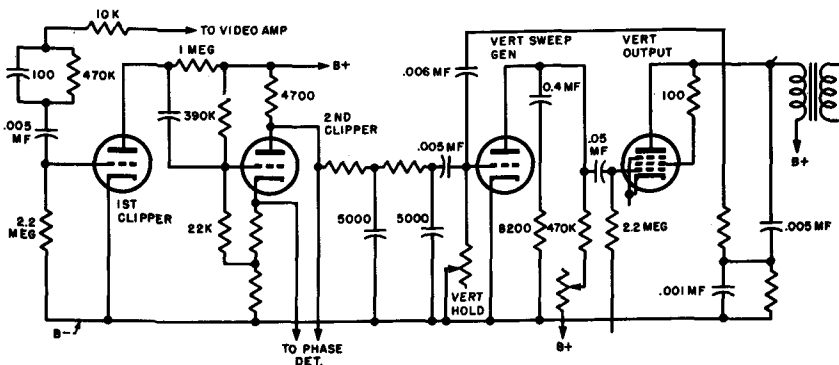


Fig. 16 — Motorola

ma with good horizontal linearity. This is the proper setting of the core.

Note: If this dip does not occur, it indicates a defective component in the linearity circuit, i.e., *C119* (.03 μf), *C120* (.04 μf), or the coil itself (*L69*).

4. Replace fuse.

MOTOROLA Chassis TS-89, 95, 119, A, B, C
Horizontal radiation reduction.

A 10,000- μf ceramic disc-type capacitor is added from each side of the a-c line to chassis. These capacitors are installed right on the power-input receptacle. A paper-backed foil shield to cover the upper half of the picture tube is also added. These changes help to minimize horizontal-oscillator interference to broadcast receivers and should be added to sets where this condition is troublesome. Later production runs already include this change.

MOTOROLA Chassis TS-89, TS-95
Improved compensation
(see Fig. 17).

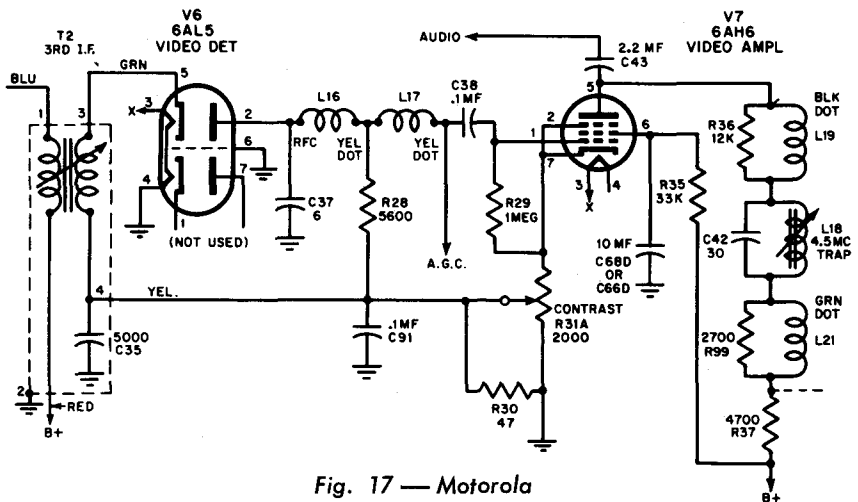


Fig. 17 — Motorola

An improvement in picture quality is achieved with a change in compensating coils. *L17* (in video-detector circuit) is changed from a red-dot coil to a yellow-dot coil; *L19* (in plate circuit of video amplifier) is changed from a red-dot coil to a black-dot coil; and *L21* (in plate circuit of video amplifier) is changed from a green-black dot coil to a green-dot coil. With this change in compensation, the R-C network on the tapped contrast control, *R31A*, is eliminated. Later production runs already include this modification.

MOTOROLA Chassis TS-89, TS-95
Vertical sync stabilization
(see Fig. 18).

The R-C network, *C92* (100 μf) and *R100* (470 k), which has a short time constant, is added in the grid-input circuit of the 1st clipper. This short time constant circuit keeps noise pulses, most of which have a much longer time duration, from reaching the clipper, resulting in more stable syncing of the vertical

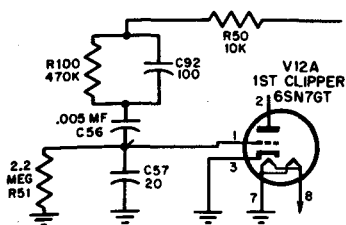


Fig. 18 — Motorola

oscillator. The grid resistor, *R51*, changes from 1 meg to 2.2 meg with the addition of this network. The addition of this network is advisable in noisy areas. Later production runs incorporate this change.

MOTOROLA Chassis TS-89, TS-95
Elimination of vertical collapse.

The addition of a 100-ohm screen-isolation resistor, *R101*, in the vertical-output stage, *V14* (between pins 6 and 7), prevents a tendency of some tubes to break into momentary oscillation. Where a momentary collapsing of the raster is troublesome, this resistor will remedy the condition. Later production already includes this change.

MOTOROLA Chassis TS-89, TS-118, TS-174
Eliminating speaker hum.

In some of the 1951 combination models such as 17F1, 17F2, 17F3, etc., a speaker hum may be noticed even with the a-c power switches in both the tv and radio chassis turned off. This has been traced to incorrect polarization of the leads from the am-fm radio chassis to the speaker. The remedy is to reverse these leads at the speaker pin jacks. In reinstalling the am-fm

receiver chassis, if it becomes necessary to remove it for service, care should be taken to plug the speaker leads in so that the ground wire from the radio chassis plugs into the pin jack tied to number 2 terminal on the receptacle which receives the speaker plug from the tv chassis. This number 2 terminal is the ground connection from the tv chassis.

MOTOROLA Chassis TS-101, TS-119

Leakage of damper-heater winding of power transformer.

There have been a few cases of a short or high-resistance leakage to core, developing in the damping-diode heater winding in the power transformers. A quick method of repair in such cases is to clip the damping-diode heater leads off short at the power transformer and to install a separate isolation transformer. The part No. is 25B790140. It is the same transformer used in the TS-89, etc. series chassis. This saves replacing the power transformer.

MOTOROLA Chassis TS-101, TS-119

Sound beat interference in picture.

On some chassis, a sound beat interference in the picture has occurred, this is caused by pick-up from the discriminator circuit. If careful lead dress around the discriminator does not cure this condition, check the discriminator transformer secondary tuning capacitor *C44*. It should be connected so that the outside plate goes to the low side of the coil.

In good-signal areas probably the easiest way to cure the trouble is to slightly detune the primary of the discriminator transformer. This should not be done in fringe areas. Inserting suppressor resistors at the 6AL5 discriminator tube socket will also remedy the condition. Remove all connections from pins 1 and 2 of the socket (V9). Connect a 220-ohm resistor (part No. 6R3933 or equivalent) to each of these pins. The leads that were originally removed from pins 1 and 2 are then connected to the other ends of the resistors respectively.

MOTOROLA Chassis TS-101,
TS-119

Improved vertical linearity
(see Fig. 19).

Some chassis exhibit a compression at the top, and sometimes also at the bottom of the picture, which is difficult to remove with settings of the vertical-linearity and vertical-size controls. In these cases the addition of a 22,000-ohm, 1/2-watt resistor (part No. 6R6397 or equivalent) from the high side of the vertical-yoke winding to the high side

of the peaking resistor R64 will remedy the condition.

In installing this resistor it will be found best to use the terminal strip which serves to effect the junction between the green yoke lead and the yellow transformer lead. The resistor can be connected between this lug and the adjacent lug on the same strip which is at present unused. Then a wire can be run from this point to the terminal strip lug which forms the junction for R64, the peaking resistor, C60, and C61. Care should be taken in making this connection not to break the terminal on the 4.5-mc trap coil, L19, by careless movement of C64, the .1- μ f coupling capacitor to the picture-tube cathode.

MOTOROLA TS-114A, -118 A, B,
-172A, -174 A, B

Critical horizontal hold.

The horizontal-hold control should have a sync range of approximately 180 degrees. If the control is too critical, adjust as follows:

1. Short out horizontal-oscillator coil L23. This may be done by shorting the two pins of the receptacle

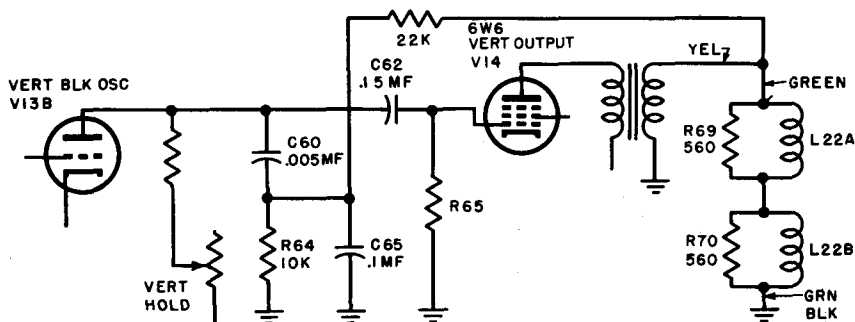


Fig. 19 — Motorola

(terminal strip in some sets) on top of the chassis.

2. With the centering lever, move the picture to the left so that the right edge of the raster can be seen. Adjust the horizontal-hold control to about the middle of its range and note the width of the blanking pulse. The blanking pulse appears as a gray bar at the right edge of the picture.)

3. Remove short from horizontal-oscillator coil.

4. Adjust horizontal-oscillator coil until the same amount of blanking pulse can be seen as was noted in step 2.

MOTOROLA Chassis TS-119,
A, B, C

Picture bending.

The horizontal-oscillator coil, L24, has been moved up on top of the chassis in later production runs to correct a slight bending of the picture, especially at the top. With this change a 100- μ mf mica capacitor, C87, is connected from pin 5 of the horizontal-oscillator tube, V16, to chassis.

MOTOROLA Chassis TS-119,
A, B, C

Increased horizontal size range (see Fig. 20).

Increased range of the horizontal-size control is achieved with use of the redesigned horizontal-size coil, L25, part No. 24B710098. The new coil embodies an additional winding which is connected in series with the yoke as shown. This coil is employed in later production runs.

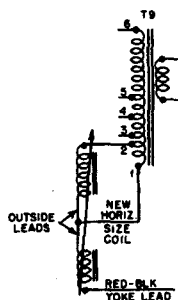


Fig. 20 — Motorola

MOTOROLA Chassis TS-119,
A, B, C

Horizontal tearing with noise (see Fig. 21).

In the above chassis horizontal fine tearing with noise, especially in fringe areas, may be greatly reduced by use of a triode as a phase detector in place of the double diode. With this change one-half of V13 (6SN7) is used as a phase detector in place of the 6AL5. See schematic diagram for circuit changes. Later production runs with chassis TS-119C already include this modification.

MOTOROLA Chassis TS-119,
A, B, C

Improved video compensation.

The video-compensating coils and the video-amplifier circuit have been revised in later production runs for improved picture quality.

L17 (in video-detector circuit) changes from a blue-dot coil to a white-dot coil; L18 (in video-amplifier plate circuit) changes from a black-dot coil to a red-red dot coil; R30, the video amplifier plate load, changes from 5,600 ohms to 3,900 ohms; C93 and R103 in the cathode-circuit compensating network of the

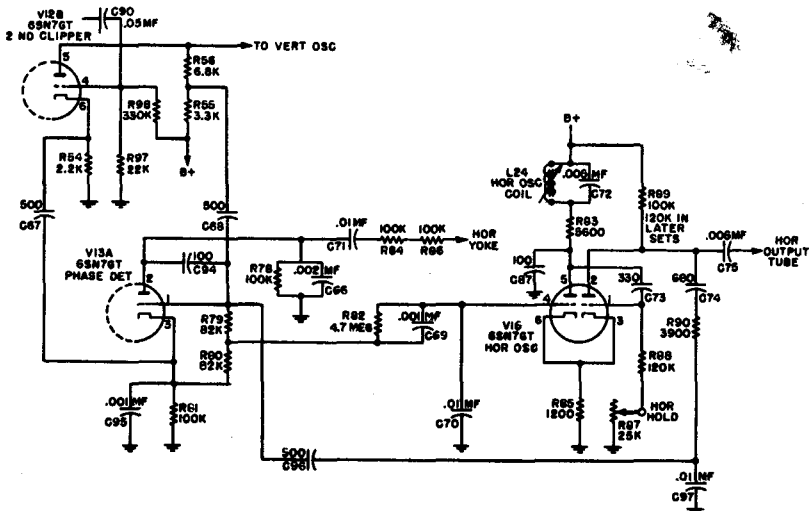


Fig. 21 — Motorola

video amplifier are deleted; and *L18* and *L19*, the 4.5-mc trap are interchanged, with this revision.

MOTOROLA Chassis TS-216,
TS-275

Audio buzz reduction.

On some of the early chassis, the lead connecting the volume control to the grid of the first-audio amplifier was routed too close to the vertical saw-forming network, consisting of the charge capacitor *C62* in the TS-216, and *C267* in the TS-275, and the accompanying peaking resistors. The 60-cycle saw voltage was picked up by the lead and applied to the audio grid to produce buzz. The remedy is to dress this lead as far as possible away from the saw-forming network.

MOTOROLA Chassis TS-216
Audio buzz reduction.

In the early versions of the chassis, some coupling of vertical-scan-

ning frequency into the grid of the first-audio amplifier took place from the blue plate lead of the vertical-output transformer. This produces audio buzz. In extreme cases, it has been found that the best remedy is to unsolder the blue vertical-output transformer plate lead from pin 1 of the 12BH7 vertical-output tube. Pull this lead back up to the top of the chassis. Run it on top of the chassis to one of the ground kick-out holes near the vertical-output tube socket and dress it through this hole down to the socket. Resolder to pin 1.

MOTOROLA Chassis TS-324
Insufficient width in low line voltage areas.

Some early production chassis lacked sufficient horizontal sweep to completely fill the screen at low-line voltages. These early chassis were not equipped with the raster-corrector magnets. A simple method of ob-

taining an increase in horizontal size is to install a pair of these corrector magnets. Because the chassis uses a metal-cone picture tube, it is necessary to use a shield over the magnets to prevent corona. The part numbers for the magnets, complete with shield, are 1V721584 for the right-hand assembly and 1V721585 for the left-hand assembly. It will be found that the addition of these magnets will, in most cases, remedy the trouble.

MOTOROLA Chassis TS-325,
-326, -351

Yoke ringing.

The value of the shunt capacitor, C285, is rather critical in the later deflection yokes, and ringing can result if it varies too much from optimum. The 27- μmf capacitor used satisfactorily in earlier yokes, has been found to be too low for the disturbed capacitance of later yokes. Although 47 μmf is about right for these yokes, 50- μmf and 56- μmf capacitors have been used. If ringing is encountered, replace the capacitor with one of correct value, as found by experiment. The capacitor must have a 2,000-volt rating.

MOTOROLA Chassis TS-325,
-326, -351

Reducing beat interference.

It has been found that a beat type of interference, appearing as either a stippled effect or diagonal lines, can be lessened by moving the high side of R225, the detector-load resistor, to the junction of L210 and L211.

MOTOROLA Chassis TS-325,
-326, -351

No agc due to faulty 6CB6.

There have been cases of 6CB6 tubes developing a high-resistance leakage between grid and filament. This will adversely affect the agc so that either an overload condition or loss of sensitivity results. It has been found that in the great majority of cases, the defective tubes will show a high-resistance leakage between grid and filament when measured cold with a VTVM.

MOTOROLA Chassis TS-325,
-326, -351

Audio buzz reduction.

In the above series of chassis, pickup of the vertical-scanning frequency by the grid of the first-audio tube V209A can occur if the lead connected from pins 6 and 2 of the 12BH7 vertical tube to the charge capacitor C267 is dressed too close to pin 1 (grid) of V209A. This produces audio buzz. Re-dress lead as far away as possible from pin 1 of V209A.

MOTOROLA Chassis TS-325,
-326, -351

Audio beat on channel 7 (see Fig. 22).

If you should encounter an audio beat on channel 7, it can be corrected by the following steps:

1. Replace the shielded contrast lead with an unshielded lead.
2. The shielded volume - control lead is originally routed between the terminal strip (A) and the audio i-f strip. Reroute this lead to the other side of the terminal strip to minimize the 4.5-mc pickup in the lead.
3. The ground lead from the center pin of the ratio-detector socket (V208, 6AL5) is originally dressed

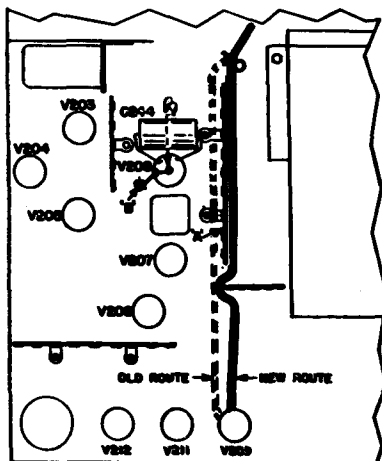


Fig. 22 — Motorola

over the 10- μ f electrolytic (C244) to a chassis ground kick-out. Move the lead from this kick-out to the kick-out near the tube socket on the video i-f side (B).

MOTOROLA Chassis TS-325,
-326, -351

Failure of yoke damping resistors.

There have been a few failures of the damping resistor across the horizontal-deflection coil in replacement yokes. Investigation has shown that a number of yokes were sent out with a half-watt resistor in this position instead of the prescribed one watt. The smaller resistor apparently will not withstand the high-voltage pulse, and breaks down.

MOTOROLA Chassis TS-325,
-326

Excessive 25BQ6 failure.

Due to heater-to-cathode flash-overs in some 12AX4 tubes, some chassis require frequent replacement of the 25BQ6 horizontal-output tube

due to open heater. This was traced to a heater-to-cathode arc caused by the high-voltage pulse on the 12AX4 cathode flashing over to the heater and may be remedied by installing a disc-type 5,000- μ f ceramic capacitor, part No. 21R115312 from pin 7 of the 12AX4 damping diode (V215) to ground. Use the chassis ground kick-out immediately adjacent to pin 7. The capacitor serves to bypass the pulse and prevents the breakdown. This capacitor has been added in production.

For a more balanced heater current distribution, in case of heater failure in one or the other of the parallel heater strings, later production sets have the 25BQ6 and 25L6 heaters interchanged in the heater circuit. This serves to protect filter capacitor C256A in case of 25L6 heater failure.

MOTOROLA Chassis TS-325,
TS-351

Audio buzz reduction.

On the above series of chassis, the lead connecting the arm of the vertical-hold control to the blue blocking-oscillator-transformer lead can be carelessly dressed where it passes the audio tubes, so that one or the other of these tube grids can have the vertical-scanning frequency impressed on it. This results in the production of audio buzz. The remedy is to re-dress this lead away from the audio grids.

MOTOROLA All intercarrier
chassis

Audio buzz reduction.

Audio buzz, when it occurs in intercarrier models, can generally be divided into two categories:

1. So called sync buzz, which is caused by interruption of the audio i.f. at sync-pulse rate.

2. Actual vertical-scanning frequency pickup by some part of the audio circuit.

To determine which type is the offender, disable the vertical oscillator with the buzz present in the speaker. If the buzz disappears with stoppage of the vertical oscillator, coupling of the vertical-scanning frequency into the audio circuits is taking place. Quite often a visual inspection will determine at what point or points such pickup is possible. Then a careful dressing of leads and components in the suspected area will run down and eliminate the trouble.

Another cause of buzz in the audio, which will not be eliminated when the vertical oscillator is disabled, can be due to an overload condition which leads to limiting in the video i-f strip or, more often, in the video amplifier. The maximum amplitude of the composite signal is represented by the sync-pulse level. If this level of signal causes a tube in the i-f strip to limit, it will mean that the video carrier is interrupted at sync frequency because the tube is periodically cut off at this rate. If the limiting is taking place in the video amplifier, the 4.5-mc beat frequency, which has become the new audio i.f., will be interrupted at sync pulse rate. The latter is by far the more common occurrence but, in either case, the buzz heard in the speaker is caused by this interruption at the vertical-sync pulse rate of 60 cycles. The interruption, of course, happens also at the horizontal-sync pulse rate but, since this is at a rate

of 15,750 cycles, it is less likely to be heard.

Limiting in the i-f amplifier is usually caused by loss of marked reduction of the agc voltage. As a general rule, a gassy or leaky i-f tube, which allows grid current to flow, will be responsible for this. A good check for this condition is to measure for a voltage drop across $R224$, the 1.5-meg resistor in the agc line. If a voltage drop exists, suspect one of the controlled tubes of leakage.

Another possibility is a bad germanium crystal. A defective crystal will usually also be accompanied by some degree of sync-pulse compression, which also leads to poor sync stability. It will be noted that the operating point of the video-amplifier tube in the TS-325, TS-326, TS-351, etc., series of chassis has been shifted slightly by returning the grid resistor to a positive 5-volt source, the cathode of the first-audio amplifier. In a normal to strong signal area, the probability of limiting in the video amplifier is greatly reduced by this means because the negative signal applied to the video-amplifier grid must first balance out this positive voltage, and the likelihood of strong signals being able to drive the tube to cut-off is greatly reduced.

It is possible that a poor picture tube can be responsible for sync buzz because the operator would have a tendency to set the contrast level too high to compensate for the poor tube. If he sets it at such a level that the video amplifier is operating just on the threshold of limiting, it is quite likely that a change in camera or in modulation at the transmitter will result in sync buzz.

Another possibility is incorrect operation of the area-selector switch, especially in the case of the early versions of this circuit. In the later or "B" versions of the TS-325, TS-326, and TS-351 area-selector switch circuit, the grid resistor of the video amplifier is returned to ground only in the fringe position. In the early version, this grid resistor was returned to ground also in the suburban position. The tendency on the part of customers located 30 or 40 miles from a transmitter is to operate the receiver with the area-selector switch in the suburban position. Unfortunately, at this distance, signal level is quite often high enough to cause the video amplifier to limit with attendant sync buzz. The remedy for this condition in the earlier sets is to rewire the video-amplifier grid-resistor return, in the suburban position of the switch, to the cathode of the first audio amplifier. This will permit operation of the switch in the suburban position without incurring sync buzz.

Still another possibility of sync buzz is misalignment of the video i.f. or of the sound i.f. Sometimes a relatively small readjustment of the sound take-off coil, of the ratio-detector transformer primary, or secondary tuning slugs may cure a buzz problem. Just as the vertical-scanning frequency can be picked up by the audio tubes or circuits, it is also possible that the sync pulses themselves may be picked up in the same manner. An example of this is the first audio tube picking up the sync pulses from the cathode lead of the picture tube. The remedy is to dress the lead away from the tube, or to shield

the tube. A shield has been added to the tube in later production.

MOTOROLA All chassis **Lamination buzz.**

A mechanical 60-cycle buzz is sometimes caused by loose laminations in a transformer. This transformer can be the power transformer, the filament transformer, the separate filament transformer used on some chassis for the heater supply of the damping diode, or the vertical-output transformer. If caused only by loose laminations, the remedy is to tighten the nuts on the clamping bolts. Sometimes the entire winding is loose on the core and this can be remedied by the careful insertion of wooden wedges between the winding and the core.

MOTOROLA All chassis **Extension for rear-panel controls (see Fig. 23).**

If your arms are not long enough to reach around a 20-inch tv set to adjust the rear controls while watching the picture from the front, you might like to make a gadget resembling the enclosed sketch.

The copper tubing is helpful in controlling the degree of bend to

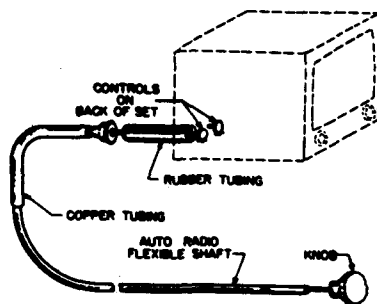


Fig. 23 — Motorola

prevent binding. The short length of rubber tubing is cut from windshield-wiper hose.

MOTOROLA All chassis
Corona and arcing in h-v compartment.

1. *Lead Dress.* If it becomes necessary to make repairs or replacements around the high-voltage compartment, be sure to check all lead dressing carefully. Any low-voltage lead or any lead near ground potential dressed too close to a high-voltage point can cause corona spray, or even an arc to be drawn from the high-voltage point; this can eventually start insulation burning.

2. *Solder Points.* Any soldering which is done on any part of the high-voltage circuit must be done with great care. No sharp points of solder should be left protruding; the joint should be smoothly rounded off. In addition, if the area was previously covered with high voltage insulating cement or wax, this coating should be restored upon completion of repairs. The wax is part No. 11M490397. The red high voltage insulating coating is part No. 11M-490423.

3. In attaching wires to socket terminals, transformer terminals, etc., again make sure that the wire is not left sticking up in a sharp point, but is buried completely in the solder, which seals the connection.

4. In general, no attempt should be made to repair high-voltage transformers by splicing breaks in windings, etc., because this cannot be done successfully in the field without serious hazard of arcing and corona later on. It is far better to replace

a defective transformer with a new one.

5. When repairs are completed, a careful inspection of the high-voltage compartment and leads in a darkened room, with the set in operation, is well worthwhile because corona, which might not be visible in bright light, will show up in a darkened room. The smell of ozone should always be investigated and a set which gives off this characteristic indication of corona should not be released until the source of corona has been found and eliminated.

Needless to say, the same is true when a set gives an audible indication of intermittent arcing which is not sustained enough to cause either the ozone smell or burning of insulation. The source should be found and eliminated because the condition may become worse and cause a fire when the set is reinstalled in the customer's home.



MUNTZ Chassis 16A series,
17A series

Vertical foldover and lack of height (see Fig. 24).

Vertical foldover and/or lack of height may occur in those chassis having the wax-impregnated, vertical-output transformers TO-0018A, B, TO-0023A, B, or C. The reason for the difficulties is the variations in the tiny air gap between the I- and E-sections of the laminated core. This gap may be adjusted in the following manner: (Note: Late chassis in the 17A series have a fixed gap.)

Tune in a test pattern, use a crayon pencil and mark a reference line at

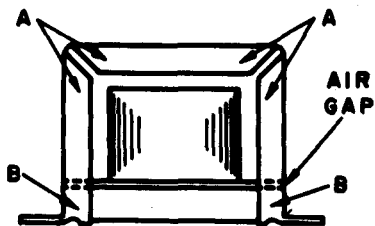


Fig. 24 — Muntz

the top and bottom of the test pattern. The results of your work can then be easily observed. Squeeze and compress the laminations very tightly, particularly at the sides of the channel shell container at positions A and B shown in the figure, to permanently hold the laminations a little closer together. This squeezing should be done with a pair of vise gripping pliers (of the type generally used in garage work) so as to produce a tight stack of laminations. After every adjustment, observe the test pattern and correct height- and vertical-linearity control settings. Repeat transformer and the chassis pan. above until best results are obtained.

MUNTZ Chassis 16A series,
17A series

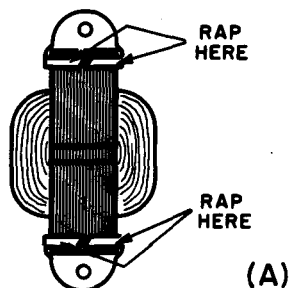
Pear-shaped picture
(see Fig. 25).

A pear-shaped picture may occur in those chassis having the wax-impregnated vertical - output transformers TO-0018A, B, TO-0023A, B, or C. An excessive air gap between the I- and E-sections of the core laminations is responsible. To correct, proceed as follows:

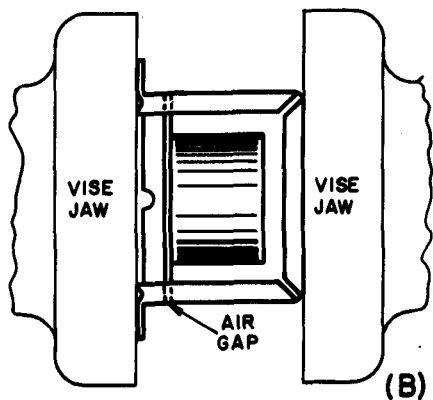
Unsolder the wires and remove the transformer from the chassis. Place a heavy weight beneath the transformer and rap the transformer with a hammer as shown in part (A) of

the figure. This will reduce the air gap between the laminations.

Another way is to place the transformer in a bench vise and squeeze it as shown in part (B) of the figure. Restor the transformer to the chassis by means of 6-32 by 1/4" nuts, screws, and lock washers. Before tightening, place a piece of light stiff cardboard (such as used on back of a paper tablet) between the transformer and the chassis pan. When tightening the bolts, the piece of cardboard will act as a buttress and permanently hold the stack tightly together.



(A)



(B)

Fig. 25 — Muntz

MUNTZ Chassis 17A series
Improved horizontal stability
(see Fig. 26).

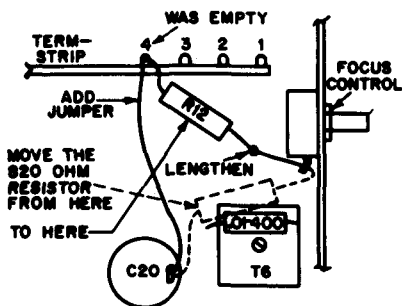


Fig. 26 — Muntz

A change in parts placement to improve horizontal stability was made in later production runs.

The 2-watt resistor $R12$, in series with the focus control, has been moved away from beneath the transformer $T6$ (horizontal-oscillator afc) and away from the $.01\text{-}\mu\text{f}$ capacitor $C62$. Heat radiated from the resistor was rising into the capacitor and coil, thereby affecting the stability of those parts.

Early-production receivers may be modified by moving the resistor as shown in the sketch.

MUNTZ Chassis 17A2 through 17A7
Premature failure of C50.

A study of repair records reveals that occasionally capacitor $C50$ ($.05\text{-}\mu\text{f}$ unit connected from tap on vertical-output transformer to ground) needs replacing. This is the capacitor which determines the interlace quality of the picture. When the unit needs replacing, wire the part from the tap (green lead) of the transformer to the $B+$ terminal (red lead) of the vertical-output transformer. In other words, instead of wiring the capacitor to ground, place it across the secondary of the ver-

tical-output transformer. Place the capacitor in the same position as originally found. Wiring the unit in this fashion insures its lasting ability.

MUNTZ Chassis 17A2, 17A3, 17A3A, 17A4, 17A7
Improved interlace
(see Fig. 27).

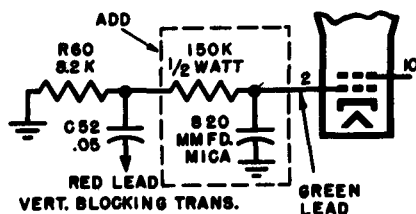


Fig. 27 — Muntz

Adding the circuit shown in the figure will produce a better interlace condition and will help to eliminate horizontal tearing when approaching an over contrast condition. The improved interlace will result in better picture detail. Use part Nos. CM-0046 ($820\text{-}\mu\text{f}$ mica capacitor) and RC-1503-18 ($150,000\text{-ohm}$, $\frac{1}{2}$ -watt resistor) when making this addition.

MUNTZ Chassis 17A3A, 17A7
Increased height and improved vertical linearity.

To add more height to the picture and to improve the vertical linearity, a 6BL7GT tube and vertical-output transformer TO-0027 are used in place of the 6SN7GT (vertical oscillator and output tube) and the vertical-output transformer TO-0023E.

The transformer TO-0027 must in every instance be associated and used

with the 6BL7GT tube. The same applies to transformer No. TO-0023E and the 6SN7GT. In other words, the schematic symbols are similar in each instance, but it is impracticable to plug a 6SN7GT into a set using a 6BL7GT, or vice versa, and expect the right result, unless the transformer is also changed to match the tube in use.

MUNTZ Chassis 17A7
Addition of h-v filter capacitor.

Some 20-inch rectangular tubes are supplied without an aquadag coating on the bell of the tube. When the aquadag is missing from the tube, a filter capacitor is necessary from the 1B3 filament to ground. The part number of the filter capacitor is CC-0090. Specifications are 500 $\mu\mu\text{f}$, 20 kv-dc. Location symbol is C74. It is located directly beneath the 1B3 tube, acts as the tube socket support, and replaces the ceramic support normally found there. The aquadag grounding spring, part No. SP-0047, is omitted as it is of no use.

If a picture tube is used which has no outer coating, this capacitor should be added.

MUNTZ Chassis 17B1
through 17B6
Eliminating corona in h-v supply.

The TO-0031 horizontal-output transformer delivers from 14 kv to 18 kv under various conditions. It may well be seen when using high voltage in the neighborhood of 16 kv that the horizontal-output and high-voltage rectifier circuits are very prone to corona discharge and arcing. To eliminate this condition do the following:

1. Re-wax the 1B3 lead wire where it enters the tube cap. Doing so prevents a corona condition to the top of the high-voltage case.

2. Re-wax the 1B3 lead wire at the terminal tie point on the bakelite board, to prevent a corona condition from this point to high-voltage case.

3. Re-wax the high-voltage winding where the 1B3 wire leaves the coil, to prevent a corona condition within the winding or to the mounting bracket.

4. Attempt to flow the wax between the edges of the winding and the core; doing so prevents an arc between the tertiary winding and the core.

5. Re-wax around the high-voltage cable where it enters the rubber suction cup at the picture tube. This prevents a corona spray during humid weather.

6. Re-wax the porcelain stand-off beneath the 1B3 socket; in other words, re-cover the *Insl-X* already on the stand-off to insure an adequate covering that might have been damaged in transit (replacement part only).

7. Examine the high-voltage wire for ruptures when replacing a high-voltage transformer. This rupture may take place during careless handling in transit and a break in the insulation of the high-voltage wire will cause a spray or running arc to various component parts. Wax over all the breaks found. Make wax flow smoothly as sharp wax points allow a point of corona discharge. Permit the wax to dry thoroughly before turning the set on.

MUNTZChassis 17B1
through 17B6**Replacement of h-v rectifiers.**

Type 1B3 tube manufacturers use various combinations of internally connecting socket pins; therefore, in the above set, always use pin 4 of the 1B3 socket to anchor one side of the 3.9-ohm filament resistor and one side of filament winding. Follow 1B3 socket numbering listed below when replacing socket.

Pin 1—no pin in socket

Pin 2—one side 3.3-ohm resistor

Pin 3—no pin in socket

Pin 4—other side 3.3-ohm resistor and one side filament winding

Pin 5—no pin in socket

Pin 6—other side filament winding and tied to pin 7

Pin 7—2nd anode high-voltage lead and lead to anti-corona shield

Pin 8—pin in socket bent over but not used

MUNTZ

Chassis 17B2

Oscillator-coil strip replacement in tuner.

With the introduction of the above chassis a new type of tuner was employed. This was necessary to conform with government regulation pertaining to oscillator reradiation. This tuner can be readily identified by the side shield and bottom cover. Due to the addition of these shields the circuit parameter has been changed, resulting in a modification of the oscillator coils to compensate for this effect:

In the oscillator section of PR-0190-1 of the barrel switch channels 2 through 9 must contain coils

stamped with a "G" following the channel number. Oscillator coils for channels 10 through 13 will remain type "F" following channel number. The type "F" coils are the same as used previously. The antenna coil sections of the barrel switch will remain type "F" coils for all channels.

It is easy for a service man to mistakenly substitute a type "F" oscillator coil where a type "G" oscillator coil is required, or vice-versa, as they are mechanically interchangeable, but not electrically. The improper replacement will result in loss of efficiency. This will manifest itself in the form of low gain resulting in weak pictures and poor sync.

MUNTZ

Chassis 17B5, 17B6

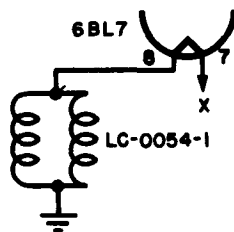
Increased stability of vertical oscillator (see Fig. 28).

Fig. 28 — Muntz

Some tube suppliers are permitting wide variations of construction to exist within the 6BL7GT tube. To insure lasting service and minimize the possibility of vertical roll, we are slightly lowering the filament voltage. This deviation will take place until pending tube revisions prove satisfactory, and will be found in chassis above serial No. 255627.

Added in series with the 6BL7 filament only are two choke coils, part No. LC-0054-1, (1 μ h insulat-

ed). These are a standard stock item and make excellent filament-dropping resistors.

There is a good watt of heat dissipated from the chokes. For this reason, if you alter sets previous to the above serial number, use a piece of No. 22 gauge hook-up wire to remove the chokes away from beneath the 6BL7 tube; also keep away from the electrolytic capacitor. If the tube in the set is known to cause roll, replace with a *new* tube.

MUNTZ Chassis M169
Premature failure of filter capacitors.

To prevent premature failure of the 3-section electrolytic filter capacitor, the two 40- μ f sections should have a d-c working voltage rating of 500 volts and a maximum surge voltage rating of 565 volts dc. Part No. CE-0026-A should be used instead of the original unit, part No. CE-0026, to prevent premature failure.

MUNTZ Chassis M169
Insufficient vertical size.

When there is insufficient vertical size, replace the 6SN7 vertical-oscillator tube. If this does not effect an improvement, reduce the size of the 1.5-meg resistor in the plate circuit of the vertical oscillator. This resistor, which is connected to one side of the vertical-size control should be reduced to 1.2-meg. A 1.2-meg resistor is obtainable from between pins 1 and 8 of the 6AU6 video amplifier. Merely interchange the 1.5-meg resistor in the vertical-oscillator circuit with the 1.2-meg resistor in the video amplifier.

MUNTZ Chassis M169
Frying sound at low picture-control settings (see Fig. 29).

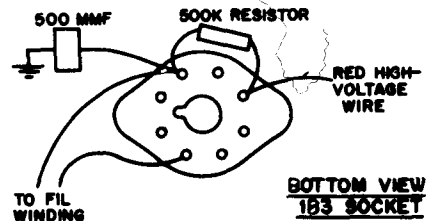


Fig. 29 — Muntz

A frying sound from the rear of the cabinet that occurs at low settings of the picture control may be caused by a slight corona condition from the high-voltage leads to ground beneath the 1B3 tube socket. To remedy, wire the 1B3 tube socket as shown in the figure.

Connect a 500k-ohm high-voltage series resistor between pins 2 and 4 of high-voltage socket and connect the high-voltage leads to pin 4. The high-voltage filter now connects to socket pin 2 and filament leads connect to pins 2 and 7. The air space will be increased and prevent the high voltage from arcing to ground.

MUNTZ Chassis M169
Vertical picture bounce (see Fig. 30).

If vertical picture bouncing occurs, the addition of a carbon resistor of 33,000 ohms, $\frac{1}{2}$ watt, 10% will stabilize the vertical-hold circuit. This resistor is inserted as shown.

MUNTZ Chassis M169
Improved horizontal stability.

Lack of horizontal stability may be caused by a reduction in the val-

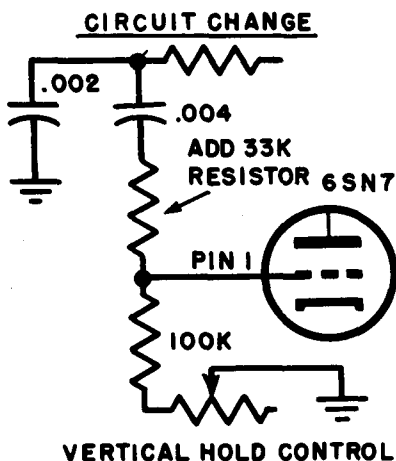
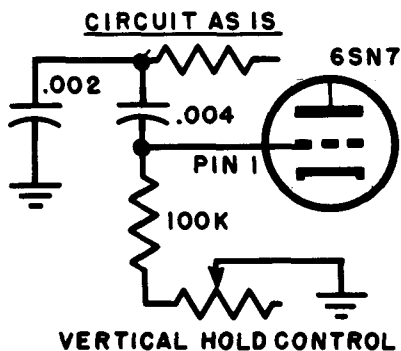


Fig. 30 — Muntz

ues of the 2 paralleled 30,000-ohm, 2-watt resistors in the grid circuit of the 6BG6 horizontal-output tube. Remove these resistors and substitute a 20,000-ohm, 10-watt (part No. RW-2002-210) resistor.

MUNTZ Chassis M169
Eliminating i-f regeneration in fringe areas.

I-f regeneration, oscillation, or intercarrier sound harmonics may occur at low-signal levels. The symp-

toms are as follows: Snow, severe horizontal frayed or ragged picture edges may occur. In other instances where signal input is poor this condition can also be identified by watching the background of the picture. It will contain a herringbone or pebbly effect. This can be verified by watching the screen while removing the 6T8 tube. Still another way of identifying this condition is to short out the antenna terminals and turn to channel 4 (assuming no station is on channel 4) and observe the screen for unusual streaks of light.

To remedy, proceed as follows: Remove the i-f sound trap LO-0034 from the circuit entirely by disconnecting the jumper from pin 7 of 1st i-f amplifier to the trap lug. Cut at the lug end. Solder the loose wire end to the chassis ground lug located ahead of 1st i-f amplifier. This eliminates the sound trap from the circuit.

MUNTZ All chassis with FU-002-1 primary-circuit fuse

Preventing premature fuse failure.

Substitute a 3.2-amp *Slo-Blo* fuse (part No. FU-0005-1) for the present primary-circuit fuse, FU-0002-1. This new fuse will give good protection to the component parts of the tv set with the advantage of eliminating premature failures which were of an erratic nature with the fuse originally used.

MUNTZ Chassis with T0-0031 horizontal-output transformer

Replacement of tertiary winding in horizontal-output transformer.

In most instances break-down of transformer TO-0031 occurs in the tertiary winding. The manufacturer has a replacement coil, part No. MZT-0031, which will result in a rapid and less costly repair. This work is easily done in the home and eliminates the time consuming operation of returning the chassis to the shop for repair.

If tertiary proves defective, break the top two lead wires from terminal board and remove the two long bolts. Remove the 1B3 socket assembly to obtain sufficient slack in wires. The ferrite core is made of two U shaped castings, ends placed together and meeting within the coils, separated by a small paper gap. Should the coil bind on core, which often happens when burnt, take two pairs of pliers and work the core sections loose. Use a slight twisting action. Pull rear core section loose and remove the defective coil. *Warning:* Excessive pressure will damage or chip the ferrite core of the TO-0031 transformer as it is extremely brittle. Do not lose the white paper core spacers.

Place the new coil MZT-0031 on the front core section putting coil form-slots down and to the rear. Reassemble transformer using the threadless bolt through upper coil form. Solder lead wires to their respective lugs leaving smooth solder joints. Dress 1B3 filament lead between the bakelite coil form and the core. Wax all 1B3 and 6BQ6 leads at both ends to remove corona spray. Also wax the anode lead where wire enters rubber suction cup as well as any ruptures in the anode lead. The wax is part No. MZW-6698. For bench work use a wax pot. For melt-

ing wax in home repairs, use a clean iron and allow wax to run smoothly over surface to prevent corona spray wherever necessary.

MUNTZ

Chassis below serial No. 22000

Addition of h-v filter capacitor.

Sets below serial No. 22000 did not contain a high-voltage filter capacitor as the coating on the outside of the picture tube has a capacitance effect and the capacitor was not necessary. Therefore if you wish to put new picture tube (without outer coating) in a chassis below No. 22000, it will be necessary to add the high-voltage filter capacitor part No. CC-0070 (500 $\mu\mu\text{f}$, 20,000 volts dc).

MUNTZ

All chassis

Audio buzz caused by power transformer.

The power transformer can cause an annoying buzz. Mechanically the transformer laminations vibrate in response to the 60-cycle current. The way to stop this is to remove the four hexagon nuts (located on top of the chassis) that hold the transformer to the chassis. Lift the transformer clear off the chassis, but do not disconnect the wires. Tighten the four nuts on the top of the transformer, thus pulling the laminations so close together that the buzz in the form of vibration is no longer audible.

In some cases, it may be necessary to place a stiff cardboard shim between the transformer laminations and the side of the chassis. Doing so will prevent the flux field from vibrating the side of the chassis pan.

MUNTZ

All chassis

Audio buzz due to excessive contrast.

High settings of the contrast control may produce hum and buzz. Place a resistor in series with the contrast control and eliminate the complaint. The value should be somewhere between 100 and 400 ohms, depending on the amount of pick-up in antenna. Do this only under unusual circumstances.

MUNTZ

All chassis

Internal picture-tube short.

An arc may occur running in the neck of the picture tube; this is visible just ahead of the ion trap. In other instances the brilliance control has a reverse action and retrace lines become evident and bright. Analyzing these problems prove a short to be existent within the gun of the picture tube between cathode (pin No. 2) and control grid (pin No. 11).

Modern-day picture tubes have a large space within them. Minute particles of fluorescent material are jarred free from the inside glass face of the tube. During manufacturing, installing, and shipping, the tube is often turned with its screen upward. In this position the glass is like a funnel, guiding the particles of foreign material into the gun structure. These collect upon the cathode and grid-feed leads. The fact that the foreign material is present does not necessarily mean the tube is defective in all cases, but only that the foreign particles must be removed.

Here are two successful methods: Tip the chassis over until the picture tube rests upon its face. Tap the base of the picture tube in a way to jar

free the loose foreign material that has collected within the gun structure. *Caution:* When placing the picture tube face downward, be careful that no weight is permitted to press upon the end of the volume-control shaft or damage to that part will result. Place a soft cloth on the work bench so the face plate cannot be scratched or damaged.

The second method is as follows: Ground pin No. 2 (green wire) beneath chassis; connect one end of a jumper wire to 480-volt boost, pin 3 of 6W4 tube. Turn the set on; connect the loose end of the jumper wire to pin No. 11 (yellow wire). At the instant the jumper touches pin 11, the foreign material will be burned free within the picture tube.

MUNTZ

All chassis

Elimination of audio buzz.

Buzz is most commonly due to improper tuning of the receiver controls. Buzz may also be the result of an improperly adjusted oscillator-coil slug (beneath the channel selector knob). If it is evident in the picture that the oscillator slug will not tune in the station properly, then the oscillator trimmer in the tuner is out of alignment. Instructions for resetting the trimmer are given in the service notes.

There are times when the tv stations are responsible for buzz since they transmit it with the picture in the form of overmodulation or phase shift. This can be determined by comparison (after adjustment of oscillator slugs) simply by turning to another transmitting station.

Hum may be due to misalignment of the ratio-detector secondary-tuning slug. Tune in a good station, with

picture control normal, and volume control turned down to where station can just be heard and hum is evident. Use a nonmetallic screwdriver and adjust slug to best fidelity in audio signal, which will reduce hum to a minimum.

Buzz is also caused by overloading of the video stages due to a very strong television signal. Insertion of an attenuation pad between the transmission line and receiver should decrease the incoming signal to normal level.

Other faults in the receiver which may cause buzz or hum are misalignment of the video i-f stages and changes in component values.

In early production of the 17A-series chassis a blue-covered 50-volt capacitor was used beneath the 6T8 socket. Some blue capacitors have two faults; one is an open condition, the other a poor power factor. Hold a good capacitor across the blue one in the set. If the hum is reduced, put in the good unit and take out the offender.



NATIONAL Model NC-TV-7
Fuse blowing.

If frequent fuse blowing occurs in series 249 of the above model, especially when the receiver is first turned on, replace the 2-amp fuse with a 3-amp fuse.

NATIONAL Model NC-TV-7
Resistors overheating and changing value.

The resistors listed below should be examined for evidence of overheating and changed value. The

changes indicated should be made when necessary.

R90 (connected to pin 2 of vertical-sweep output tube) — Change from .82 meg, 1/2 watt to .56 meg, 1/2 watt.

R86 (connected to junction of 1,500- μ mf capacitor wired to pin 2 of vertical oscillator and similar capacitor wired to pin 2 of vertical-output tube) — Change from 2.2 meg, 1/2 watt to 1.8 meg, 1/2 watt.

R77 (connected to pin 5 of vertical oscillator) — Change from 100,000 ohms, 1 watt to 2 watts.

R94 (connected to pin 5 of horizontal oscillator) — Change from 100,000 ohms, 1 watt to 2 watts.

R81 (connected to pin 1 of vertical oscillator) — Change from .47 meg, 1/2 watt to 1 watt.

R104 (connected to pin 2 of horizontal-output tube) — Change from 47,000 ohms, 1 to 2 watts to two 100,000-ohm, 2-watt resistors in parallel. To do this, the single lug terminal strip should be replaced by a double terminal strip with a ground lug in the center.

NATIONAL Model NC-TV-7
Horizontal tearing
(see Fig. 31).

Tearing or horizontal displacement of the picture in series 229, 240, and early 249 receivers may occur in the presence of very strong signals. This is caused by overload in the detector circuit. To remedy proceed as follows:

1. Change *R29* (connected to pin 7 of video amplifier) from 3,900 to 8,200 ohms.

2. Change *R21* (from pin 2 of 6AL5 to ground) from 22,000 to 56,000 ohms.

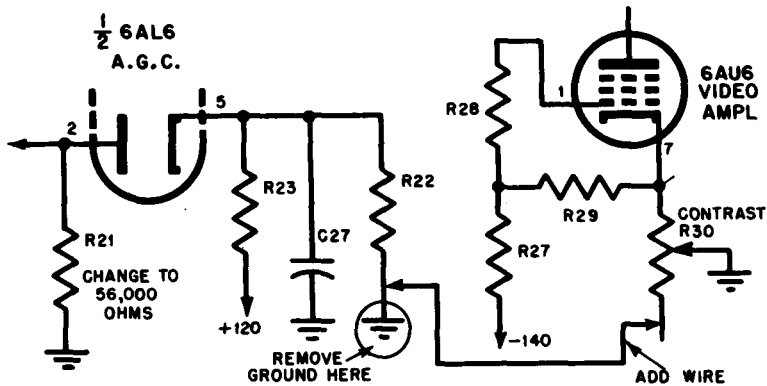


Fig. 31 — National

3. Remove ground end of 1,000-ohm resistor on pin 5 of 6AL5 and run a wire from it to unused end of contrast control, as shown. It may be necessary to add a lug for support of the resistor in its new position.

NATIONAL Model NC-TV-7
Flutter at picture top.

Flutter at top of picture in series 229, 240, or 249 may be due to horizontal coupling capacitor being too large.

C83 (connected to pin 4 of the horizontal oscillator) should be 100 to 120 $\mu\mu\text{f}$ instead of 220 $\mu\mu\text{f}$.

NATIONAL Model NC-TV-7
Oscillation in receiver.

Oscillation in series 229, 240 receivers indicates that additional bypassing is needed. Proceed as follows:

1. Add a .01- μf , 600-volt capacitor from pins 3 and 5 of the 6X5 to ground.

2. Change 6AU6 (V9) ratio-detector driver, bypass capacitor C41 from .02 μf , 400 volts to .005 μf ; 400 volts.

NATIONAL Models NC-TV-10, 12W, 1201, 1225

Bending at top of picture.

Erratic horizontal sync action or "flagging" on top part of raster or test pattern may often be corrected as follows:

Change C93 and C94 from 1,000 $\mu\mu\text{f}$ to 500 $\mu\mu\text{f}$ each. These capacitors are coupling capacitors to pins 7 and 5, respectively, of the horizontal phase detector from the sync amplifier-splitter.

NATIONAL Models NC-TV-10, -12
Improved picture definition.

For improved frequency response in the video detector and amplifier, replace the video-detector peaking coil SA:5489, Sub 0 with coil SA:5489, Sub 1.

NATIONAL Models NC-TV-10, -12
Improved balance of horizontal-sync circuit.

For better balance of the horizontal-sync circuit, change R99, 3,900-ohm resistor (J569-32) in cath-

ode circuit of sync amplifier-splitter to a 4,700-ohm resistor (J-569-33).

NATIONAL

Models NC-TV-10, -12
Insufficient width in low-voltage areas.

If there is insufficient horizontal width in areas of low line voltage, add a .05- μ f, 600-volt capacitor across L37, the horizontal-width control.

NATIONAL

Models NC-TV-10, -12
Erratic horizontal sync.

To prevent erratic horizontal-sync action or horizontal-oscillator squeal, replace R80 (180,000-ohm, 1/2-watt resistor connected to pin 5 of the horizontal-sweep oscillator) with a 220,000-ohm, 1-watt resistor.

NATIONAL Model NC-TV-10
Obtaining higher voltage and deflection.

The horizontal-flyback transformer, RCA designation 211T1, is to be replaced by type 211T3. No further changes are necessary for their use on the above receivers.

For models following model 261, the following changes are to be made:

1. The value of R80 (connected to plate, pin 5, of horizontal oscillator) shall be changed from 270,000 ohms (J569-54), to a 180,000-ohm (J569-52), 1/2-watt resistor.

2. The resistor R89 in the power supply, which consists of two 12,000-

ohm, 10-watt *Koolohm* resistors (E959-21) connected in parallel are replaced by two 4,200-ohm, 10-watt *Koolohm* (or equivalent) resistors connected in series.

These changes have been made in later production runs.

NATIONAL Model NC-TV-10
Extending range of focus control.

To extend the range of the focus control in a counterclockwise direction with the use of a minimum of parts and without changing the range in the clockwise direction, proceed as follows:

An 1,800-ohm, 1/2-watt resistor (J569-28) is to be connected between the arm of the focus potentiometer R59 and the focus-control lug which is electrically nearest the receiver (away from the power supply). The leads to these lugs are red and blue wires. This change is already incorporated in later production runs.

NATIONAL Model NC-TV-10
Improved sync operation
(see Fig. 32).

A sync-amplifier stage employing a type 6C4 tube is added to the receiver. This change is already made on receivers with serial numbers whose first three digits are 261 or larger.

The components added to are as follows:

Symbol	Part No.	Description
C101	D827-11	Paper capacitor, .1 μ f, 400 volts
R103	J569-49	Resistor, 100,000 ohms $\pm 10\%$, 1/2 watt
R104	J569-57	Resistor, 470,000 ohms $\pm 10\%$, 1/2 watt
V22	6C4	Sync amplifier tube

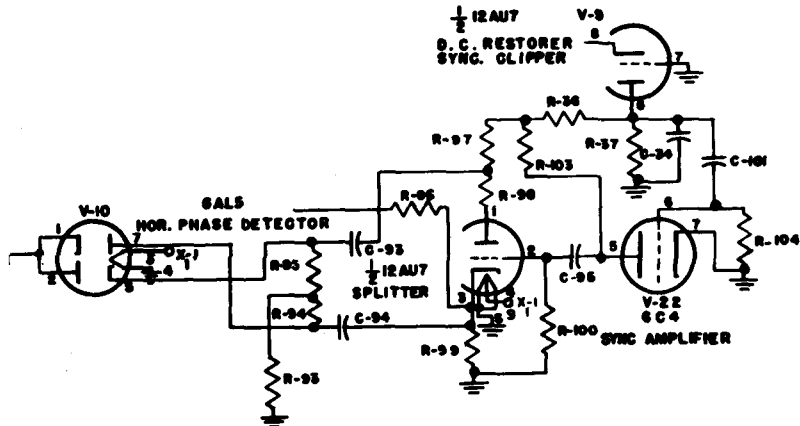


Fig. 32 — National

The affected portion of the schematic diagram is shown in the figure. Note the phase reversal at the horizontal phase detector tube *V10*.

NATIONAL Model NC-TV-10 Improved horizontal sync.

To prevent heating of components of horizontal-sweep oscillator causing shift in setting of horizontal-sync control, wax dripping, and failure of capacitors, proceed as follows:

Remove the assembly consisting of two 12,000-ohm, 10-watt resistors (*R89*) with their two mounting terminal lugs after first removing jumper from one end of resistors to pin 4 of *V18* (5V4G). Remount this assembly in the same holes but on the opposite side of the chassis flange. Connect a new red wire from the resistor end from which the above jumper was removed to pin 4 of *V18* (5V4G). The red wire is 5 inches long overall.

Change *C74* and *C77* to 270 μmf , silver mica (H500-6). These capacitors are coupling capacitors between

the two sections of the horizontal-sweep oscillator and between this oscillator and the horizontal-output tube, respectively. Heat causes capacitance of J665-47 to change and its resistance and *Q* to decrease; the leakage eventually becoming excessive and permanent. This shows up as loss of horizontal-sync action.

This change is made on later production runs of the above model and should be made on all sets in the field when returned for service.

NATIONAL Model NC-TV-10 Increasing audio output.

Low audio may occur in some receivers of series 254, 261. This can be caused by insufficient gain in the ratio-detector driver tube. Where symptoms indicate need for such action, make the following changes:

1. Increase *R43* (connected between pins 6 and 7 of the driver tube) from 10,000 ohms to not more than 18,000 ohms. Watch out for oscillation.

2. Decrease value of *R44* (connected between pin 6 of driver and terminal A of ratio-detector transformer) and *R43*. Omit *R43* if receiver does not oscillate.

3. If necessary, disconnect pin 7 of *V11* from *R42* (1,000-ohm resistor) and insert 68-ohm bias resistor and .001- μ f bypass capacitor.

NATIONAL Chassis ER-315
Blanking vertical-retrace lines.

To provide for blanking of the vertical-retrace lines, proceed as follows. The primary leads on the vertical-output transformer are reversed so that the red primary lead goes to the plate and screen pins of the 6V6. Also, all connections to the power-plug socket point X2-2 are put on point X2-3, and vice versa. These changes are made to allow the proper phasing of the vertical pulse so that by the addition of a .05- μ f capacitor from the cathode of the picture tube to the secondary winding of the vertical-output transformer terminal X2-2, blanking of the vertical-retrace lines is accomplished. This change is already made on later production runs.

NATIONAL Chassis ER-315
Horizontal oscillation.

If trouble is experienced with oscillation in the horizontal-output tube, reverse the values of *C60* and *C61*. Capacitor *C60* is a 390- μ f unit connected between pin 5 (plate) of the horizontal-sweep oscillator and ground while *C61* is a 270- μ f unit connected from this same point to the 68-ohm parasitic-suppressor resistor in the grid circuit of the horizontal-output tube. This change is already made on some runs.



NORTH AMERICAN PHILIPS

Models PT 200, PT 300

Elimination of audio buzz.

Under certain conditions a buzz may be heard in the sound. This may be caused by:

1. Misadjustment of the fine-tuning control. This control should be tuned for most clearly defined picture with best sound. If no definite sound peak is obtainable with rotation of the fine-tuning control, it may be necessary to adjust the tuner oscillator.

2. Contrast control too far clockwise thus overloading the video amplifier.

3. Misalignment of the intercarrier sound system. If this condition exists it may be corrected by the following procedure:

a. Connect VTVM across *R55* (ratio-detector load). Observe polarity.

b. Set VTVM on 10-volt scale and tune in channel.

c. Make the following adjustments for maximum voltage in the order stated: adjust slug *L23* (grid circuit of ratio-detector driver) for maximum voltage; adjust bottom slug of *T3* (ratio-detector transformer) for maximum voltage; adjust top slug of *T3* for maximum; and repeat these adjustments.

4. Overloading of the video stages due to a very strong television signal. Such a strong signal can be attenuated by shunting a 10- to 100-ohm resistor across the secondary of the tuner antenna coil. This is the snap-in type and can be easily removed.

Note: Station buzz may be due to the transmission of a nonstandard picture signal by the station. This condition is usually momentary.



OLYMPIC Models DX-214, -215,
DX-950, TV-246, TV-944
Improved sound operation.

If sound distortion, weak sound, sound i-f oscillation, critical adjustment of the fine-tuning control, and/or microphonics on some stations occur, proceed as follows:

1. The ground lead of the mica bypass capacitor (270 μ mf or 330 μ mf) connected from pin 1 to ground on V7 (6AL5 discriminator) should be removed from any existing ground and soldered to the chassis near the riveted end of the voltage divider 8,200-ohm section. Keep leads as short as possible and dress capacitor close to chassis.

2. The B+ bypass capacitor connected from B+ side of 1st sound i-f coil (L18 on TV-246 models, L1 on DX models) should have the ground lead removed from any existing ground and soldered to the center shield of V4 (6BA6 1st sound i-f tube) socket. The small ground strap between the center shield and rivet on socket V4 should be soldered to the rivet, and the head of the rivet should be soldered to the chassis on the top side. Ground leads from socket lugs to existing ground points should be made as short as possible and should be soldered to the chassis as close to the socket as possible. This is important on all sound i-f sockets (V4, V5, V6, V7). Align all sound adjustments.

3. The 22,000-ohm grid resistor (R4 on DX models, R16 on TV-246 models) connected from pin 1 to ground on 2nd sound i-f amplifier V5 may be increased to 47,000 ohms, 1/2 watt to provide increased sound. If oscillation occurs after complete alignment of sound i-f., change resistor back to original 22,000 ohms.

4. In some chassis, it is possible to replace V4 and V5 (6BA6) with 6AU6 tubes and obtain increased sound, provided an additional 1,500- μ mf ceramic bypass capacitor is connected from pin 7 (cathode) to center-shield ground on V5. Shorten all ground leads as explained in item 2. Align all sound i-f adjustments.

5. Align all sound traps and sound i-f adjustments after making any of the above changes. Follow procedure in service notes.

OLYMPIC Models 700-series
Fuse blows on voltage surges.

If the fuse blows on line-voltage surges, resulting in a small picture, foldover on both sides, and damping bars, proceed as follows:

Remove fuse from present circuit. Then remove green lead from terminal 1 on TR-2293 (horizontal-output transformer) and connect to terminal 8. Connect fuse between terminals 8 and 1. Remove yellow wire from terminal 8 and connect to 7. Dress fuse away from high-voltage terminals.

OLYMPIC Models 700-series
Increasing picture width.

If there is insufficient picture width, connect a .05- μ f, 600-volt capacitor across the width control (terminals 5 and 6 on transformer). In severe cases of low line voltage, a

.1- μ f, 600-volt capacitor may be used. Also try changing the 6BQ6GT.

OLYMPIC Models 700-series
Removing vertical-retrace lines.

Vertical-retrace lines may be visible at low contrast. This may be due to low transmitter sync level, or variations in picture-tube characteristics. To remedy proceed as follows:

Connect .05- μ f, 600-volt capacitor from green lead of vertical-output transformer (TR-2189) to yellow lead (pin 11 of *V13*, picture tube). These leads run to adjacent tie points on the terminal strip near the vertical-output transformer.

OLYMPIC Models 700-series
Interference due to sound i-f oscillation.

If beat interference, hash in picture or sound, or separation of sound and picture occurs on high band, these may be due to oscillation in sound i-f stage. To remedy proceed as follows:

Ground cathode resistor (*R1*, 150 ohms) of 1st sound i-f amplifier directly to center shield of *V3* socket instead of to terminal-strip ground. Connect 1,500- μ f ceramic capacitor between pin 7 (cathode) and socket center shield. Check alignment of sound i.f., sound traps, and discriminator.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Increasing vertical height.

To improve vertical height, try replacing the vertical-output tube *V15*, which may be either a 6SN7GT or a 12BH7. Due to resistor shortages, *R55* and *R56* (3,300-ohm, 2-

watt resistors connected in series to the red lead of the vertical-output transformer) have been replaced on some receivers by one 6,500-ohm, 5-watt wirewound resistor. To obtain increased height where *R55* and *R56* are used, short out either one of them. Where a 6,500-ohm resistor is used, shunt another 6,500-ohm, 2- to 5-watt resistor across the present one or replace it by a 3,300-ohm, 2-watt resistor.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Reducing picture width.

Due to the scarcity of power transformers, part No. TR-1966, it has been necessary to substitute another specification, TR-1688, giving slightly lower B+ voltages. To obtain sufficient width on all models where TR-1688 has been substituted, the width control has been removed from the circuit by connecting both width-control leads to terminal 3 of the 6BQ6GT tube (*V17* socket).

If it is necessary to reduce the width of the picture, restore connections of the width control by re-wiring to terminals 5 and 6 of the flyback transformer.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Horizontal tearing at various contrast settings.

When tearing of picture occurs at high or medium contrast control settings, *R36*, 1,000-ohm sync take-off resistor connected in plate circuit of 2nd video amplifier, should be reduced to 700 or 800 ohms. When tearing or distortion occurs at

low contrast settings, *R36* is too low and should be increased to 1,200 ohms.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Insufficient picture width in low-voltage areas.

To increase picture width in areas of low line voltage, change *R76*, 56,000-ohm, 1-watt resistor connected to one side of the coupling capacitor to the horizontal-output tube, to 22,000 ohms at 1 watt.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Preventing failure of C18.

Capacitor *C18*, .01- μ f, 600-volt capacitor connected to the plate of the 6V6 audio-output tube, should be returned to the 6V6 screen (pin 4) instead of to ground to reduce the possibility of voltage breakdown.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Increased range of vertical-hold control.

To increase the range of the vertical-hold control, resistor *R50* is eliminated from the circuit. This resistor is a 6.8-meg unit connected to one side of the vertical-hold control.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Horizontal tearing at high-contrast settings.

If tearing occurs, especially in fringe areas, resulting in a distorted picture at high contrast settings, check for a short, leaky, or open .05- μ f capacitor *C37*. This capacitor is the coupling capacitor between the video amplifier and the sync amplifier. Reduced capacitance in *C38*, 220- μ f mica coupling capacitor between pins 2 and 4 of the sync amplifier-separator, will produce the same effects.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Reduced shock hazard.

To reduce shock hazard between the chassis and ground, a 120,000-ohm, 1-watt resistor is connected across *C48*, .01- μ f, 600-volt capacitor in the primary of the power transformer. This connects the side of the a-c line not connected to the power switch to ground through the resistor. Later productions runs already have this change.

OLYMPIC Models 752, 753,
755, 758, 764, 765,
766, 767, 773, 791

Tearing and erratic horizontal hold in strong-signal areas.

To prevent picture distortion, tearing, and erratic horizontal hold in strong-signal areas, proceed as follows:

Remove resistor *R26*, 330 k, $\frac{1}{2}$ watt, located on peaking-coil terminal strip adjacent to *V11*, 6AL5 video detector. Removal of this resistor provides higher agc voltage for picture i-f tubes. Weak or gassy picture i-f tubes *V8*, *V9*, or *V10* will cause similar trouble.

OLYMPIC Models 752, 753,
755, 764, 766, 767

**Dark or shaded area at left
side of picture.**

If the picture is dark or shaded on the left side of the screen, proceed as follows:

Change *R57*, 100,000-ohm, 1/2-watt resistor to 47,000 ohms, 1/2 watt. This resistor is located between two lugs on horizontal-linearity control *L18*. Make certain that the red lead to pin 10 on picture-tube socket *V13* is free and clear of the other leads to socket.

OLYMPIC Models 752U, 753U,
755U, 764U, 766U, 769
Improving vertical linearity.

If any of the above models show poor linearity, evidenced by stretching of the picture in the center and compression of the top of the picture, proceed as follows:

1. *C47* (4- μ f, 450-volt electrolytic) connected to red lead of vertical-output transformer should be changed to a 20- μ f, 450-volt electrolytic. If a 20- μ f unit is not available, use a 50- μ f electrolytic.

2. *R55* (3,300-ohm, 2-watt resistor) connected to red lead of vertical-output transformer should be changed to a 1,000-ohm $\pm 20\%$, 1-watt resistor.

3. Change connections of *R54* (3,300-ohm resistor) and *C46* (.05- μ f, 600-volt capacitor) both forming the vertical-peaking network. Disconnect ground side of network and connect to pin 6 (cathode) of 6SN7 (*V14*).

4. Check 6SN7 (*V15*).

Note: If one change is made, all changes must be made. These modifications have already been per-

formed on chassis with serial Nos. R584500 or S612800 and above.

OLYMPIC Models 762, 783, 967,
968, 970, 973, 20T21

Arcing and corona in h-v cage.

Under conditions of unusually high humidity and heat, some arcing and corona discharge may occur on the underside of the 1B3-GT socket assembly. This condition can be corrected by the following procedure:

1. Remove screws holding high-voltage cage to chassis; remove tube-clip leads and high voltage clip lead. It is unnecessary to unsolder any leads.

2. Turn cage over. Remove two screws holding bakelite plate to side of cage and mount two ceramic insulators (part No. SB51-13) to plate. Fasten two spade bolts to opposite ends of ceramic stand-offs and mount assembly to end of cage in approximately the same former position.

3. Solder the tube socket retainer ring to the nearest corona button. Reassemble cage to chassis.

4. Check rubber cover on high-voltage capacitor and on second-anode lead for dust and moisture. Dress leads carefully.

OLYMPIC Models 762, 783, 967,
968, 970, 973, 20T21

Horizontal-oscillator drift.

If horizontal-oscillator drift occurs so that the picture turns into bars sloping downward to the left, proceed as follows:

1. Replace *C75*, 150- μ f mica capacitor with 150- μ f $\pm 10\%$, N750 negative temperature coefficient ceramic capacitor (part No. CCD-U181K. This capacitor is connected from terminal "F" of hori-

zontal-oscillator coil TR-2294 to pin 4 of *V18*, 6SN7 tube.

2. Reset horizontal oscillator as outlined in service notes.

OLYMPIC Models 762, 783, 967, 968, 970, 973, 20T21.

Eliminating picture flashing and improving sync.

To eliminate picture flashing and improve sync for fringe-area operation, proceed as follows:

1. Remove green lead from terminal 3 of contrast control, and connect 3,500-ohm resistor between green lead and chassis ground on terminal strip located between audio-output transformer and filter choke.

2. Remove the black lead on center terminal of contrast control from ground terminal and connect to -90 volts. These are adjacent terminals on same strip.

3. Remove *R32*, 1-meg resistor from -4 volts and connect to -90 volts. This resistor is located on pin 2 of *V13*, 12AU7. The -90 volt point is the next lug on the same terminal strip.

4. Remove *R33*, 560-ohm resistor, and *C40*, 330- μ f capacitor, from -90 volts and connect to ground lug. This combination is connected to pin 8 of *V13*, 12AU7.

5. Remove *C41*, .05- μ f, 600-volt capacitor, connected between *L14*, 4.5-mc trap, and pin 7 of *V13*. Replace with wire lead connected directly between same points. Connect 100,000-ohm, 1/2-watt resistor from B+ 250 volts to same terminal on *L14*, 4.5-mc trap.

6. Remove brown lead on TV-Phono switch from B+ 150 volts and connect to B+ 250 volts (next lug on same terminal strip). Located

on same terminal strip is *R36*, 560-ohm, 1/2-watt resistor which is changed to 1,200-ohm, 1/2-watt resistor or a 1,000-ohm, 1/2-watt resistor is connected in series with *R36*.

7. Remove 3,300 ohm, 2-watt resistor *R35* from +150 volts and place on ground lug of same terminal strip. Other lead of this resistor remains connected to 4.5-mc trap.

8. Replace *C49*, .01- μ f, 600-volt capacitor, with a .001- μ f, 600-volt unit. This capacitor is in the vertical-sync circuit, one lead being connected to terminal 3 of vertical-integrator network, other lead to adjacent terminal strip. In some sets the capacitor was omitted and replaced with a short lead. A .001- μ f, 600-volt capacitor should be used in either case.

Later production runs already include these modifications.

OLYMPIC Models 762, 783 **Improved sensitivity and picture stability in fringe areas.**

The sound and picture sensitivity and picture stability will be improved by the following changes:

1. Make certain that *C48* (.05- μ f at 600 volts) is connected to the junction of *C41* and *R35* on 4.5-mc trap as per service notes. It must *not* be connected to pin 2 of *V16* (early production).

2. Change *R36* (sync take-off) from 560 to 1,000 ohms at 1/2 watt.

3. Cut lead on pin 1 of *V3* (6BA6) and connect to terminal A of *L5* so that lead shorts terminals A and B.

4. Connect 220- μ f mica capacitor between pin 1 of *V3* (6BA6) and pin 2 of *V11* (6CE6). Use lug on cathode trap *L9* for ease of wiring.

Connect 22,000-ohm, $\frac{1}{2}$ -watt resistor from pin 1 of V3 (6BA6) to ground.

5. Connect 47,000-ohm, $\frac{1}{2}$ -watt resistor from pin 6 of V4 (6AU6) to ground. This stabilizes limiter screen voltage.

6. Connect .002- μ f, 600-volt capacitor across C10, 330- μ f mica, to improve tone quality and reduce back-ground noise.

7. Picture i-f alignment is changed so that fringe response curve in service notes has picture carrier 25.75 mc at 70 percent from base line instead of 50 percent, and the shoulder marker is 23.0 mc instead of 22.75 mc. This realignment is accomplished by turning L301 and L4 counterclockwise (out) one-half turn, and flattopping the curve by turning L10 counterclockwise (out) one-half turn. These adjustments should be made with a sweep generator and marker generator for best results.

8. Check for proper setting of L1, and L2, and L3 as explained in service notes. Insert an attenuator network in series with antenna if set is being tested in local signal area so that fringe conditions can be simulated. In certain areas better results will be obtained with the sensitivity switch in the local position.

OLYMPIC Model 970 **Lubrication of cabinet base.**

The base for model 970 is equipped with a turntable top which permits rotation in either direction so that the set may be viewed from any angle desired.

Because of the rather heavy weight of the receiver it is suggested that upon installation of the set and base, the turntable bearing be lubricated with 3-in-1 oil or its equivalent. If

this is not done, the turntable will tend to stick.

OLYMPIC All 1951 models **Arcing and corona in h-v cage.**

To make certain that arcing and corona trouble will not occur under conditions of high humidity or heat a new type material is used for the 1B3GT socket assembly plate. Plates made of this new material can be identified by an unused $\frac{3}{16}$ inch hole at one corner, on the opposite end of the 2 mounting holes.

New plate assemblies are supplied by the manufacturer.

OLYMPIC All 10-, 12 $\frac{1}{2}$ -, 16-inch models **Improved sweep circuits.**

To improve linearity, increase vertical and horizontal deflection, and improve horizontal stability, the following changes, incorporated in later production runs, may be required:

1. Change the red lead of vertical-output transformer from B+ to +330 volts. This red lead may be removed from the lug on the electrolytic capacitor and placed on the opposite lug.

2. Change R88, 56,000-ohm, $\frac{1}{2}$ -watt resistor, to 3,300 ohms, 1 watt. This is the resistor attached to the horizontal-linearity coil.

3. Change R82, 120,000-ohm, 1-watt resistor, to 68,000 ohms, 1 watt. This resistor is at terminal C of the horizontal-oscillator coil.



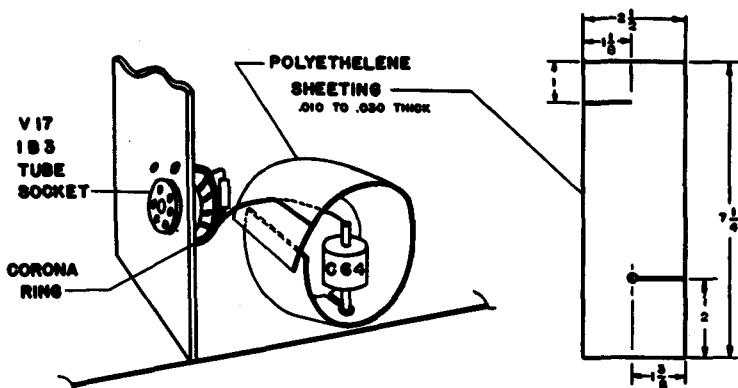


Fig. 33—Pacific Mercury

PACIFIC MERCURY

Models 150-series Arcing around h-v filter capacitor (see Fig. 33).

Beginning with serial number 63,000, the filter capacitor (C64) in the high-voltage rectifier circuit is being wrapped with polyethylene sheathing. This capacitor has a working voltage of 15,000 volts and is connected from pin 7 of the type 1B3 high-voltage rectifier tube (V17) to ground. This change is instituted to eliminate any possibility of arcing around C64 in high-altitude areas, or in localities that have abnormal humidity conditions.

PACIFIC MERCURY

Models 150-series Unstable horizontal sync.

If horizontal sync is unstable, re-adjust the horizontal oscillator as follows:

1. Set the noise-balance control to maximum clockwise.
2. Connect an oscilloscope to terminal C on the synchroguide transformer (T8) through a small capacitor from 10 to 50 μf .

3. Connect a d-c VTVM from the grid of the type 6AU5 horizontal-output tube (V15) to the chassis. Use a high-impedance probe.

4. Set the trimming capacitor adjustment screws in tight for the horizontal-locking range (C51a) and the horizontal drive (C51b).

5. Back off the trimmer for the horizontal-locking range one-quarter turn.

6. Back off the trimmer for the horizontal drive until the VTVM registers —9 volts (approximately one full turn).

7. Adjust front screw of synchroguide to lock in picture horizontally.

8. Adjust inside core of synchroguide to give correct waveform. Re-adjust front screw simultaneously to keep in sync. Use nonmetallic screwdriver on inside core.

9. Trim front screw to get approximately three bars break-out when switching channels, with horizontal-lock control in maximum clockwise position.

The horizontal-lock control should produce the following conditions:

1. Sync should hold with control in maximum counterclockwise position.

2. Sync should pull in when switching channels over at least half of the rotation range of the control.

3. Picture should not jitter at any position of the control.

a. If sync does not hold in maximum counterclockwise position, back off front screw of synchroguide. Retain correct waveform by adjustment of inside core.

b. If sync does not pull in when switching channels over half of rotation range, back off *C51a*, one-quarter turn at a time, until correct lock-in range is established.

c. If the picture jitters at any position of the horizontal-lock control, advance the control in a clockwise direction to the position that produces the greatest amount of jitter and adjust the front screw of the synchroguide in a clockwise direction until the jitter stops. If jitter is not eliminated, advance *C51a* trimmer adjustment. If jitter persists, shunt a 100- μmf capacitor across *C51a*. Recheck break-out on clockwise end when switching channels. Back off *C51a* if sync does not pull in over at least half of rotation range of horizontal-lock control.

PACIFIC MERCURY All 17- and 20-inch models

Minimizing picture ringing.

In order to obtain better matching between the horizontal-output transformer (*T9*) and the yoke (*L10*), and to minimize ringing, *C19*, the 100- μmf , 2,000-volt capacitor in the high-voltage circuit is being repositioned between terminals 7 and 3 of *T9*, the same as in models using

21-inch picture tubes. If this change is made in the field, the width control (*L12*) will require readjustment.

In high line voltage areas the width may be too great. In this case *C19* may be removed entirely.

PACIFIC MERCURY

All models with electrostatic focus picture tubes.

Internal picture-tube arcing.

All electrostatic focus picture tubes have a tendency to arc internally. The arcing occurs between the Ultor anode (high voltage) and the focus electrode (pin 6), which is connected to B+ 450 volts. The visible effect is an instantaneous blinking of the picture. This internal arcing causes a secondary audible arcing in other parts of the high-voltage circuit, particularly around the corona ring, and a pulse of high-amplitude current flows through the B+ circuit, occasionally of sufficient magnitude to burn out the 1/4-ampere fuse in the B+ line.

A 47,000-ohm resistor in series with the focus electrode lead will eliminate the secondary arcing in the high-voltage circuit and will reduce the amplitude of the current pulses sufficiently to protect the fuse. Although this will not eliminate arcing within the picture tube the addition of this resistor will limit the effect of the arcing to the momentary blinking of the picture, which is of little consequence.

The 47,000-ohm resistor is being added in production in series with pin 6 of the picture tube in all models using electrostatic focus. This addition should be made in the field by servicemen, on any set made before the production change was instituted.

PACIFIC MERCURY All models
Horizontal-sync instability
 (see Fig. 34).

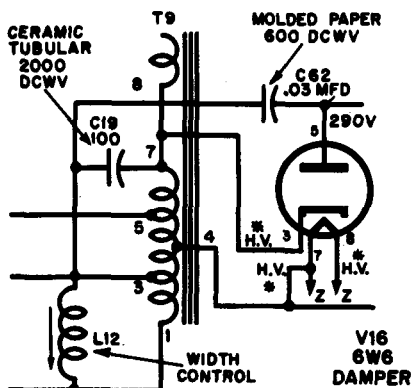


Fig. 34—Pacific Mercury

Horizontal-sync instability and the appearance of dark irregular patches in the picture may indicate failure of the 100- μf capacitor, *C19*, in the horizontal-output circuit. This capacitor, with a rating of 1,500 volts, has shown a tendency to arc internally and exhibit corona. Therefore this mica capacitor is being replaced in production with a 100- μf ceramic tubular type, having a rating of 2,000 volts. Servicemen should replace *C19* with a similar capacitor, if the above symptoms appear in a receiver, even though the mica capacitor seems to be good, since the internal arcing is very difficult to detect.

Note: Capacitor *C19* is connected from terminals 4 to 1 on *T9*, on sets with 17-inch and 20-inch picture tubes.

PACIFIC MERCURY All models
Preventing failure of C62
 (see previous figure).

The failure of *C62*, the .03- μf paper capacitor on the plate circuit of *V16*, the 6W4 type damper tube, will lower the B+ voltage and reduce the picture size. If *C62* shorts out completely, there will be no B+ and consequently the picture tube will not light up.

This capacitor had a 400-volt rating and is being replaced in production with a molded capacitor with a 600-volt rating. If it is necessary to replace *C62* in the field, use a molded .03- μf capacitor rated at 600 volts.



PACKARD BELL Models 2101, 2102, 2105, 2105A, 2111, 2112, 2113, 2114, 2202-TV, 2204-TV, 2301, 2302, 2311, 2801-TV, 2801A-TV, 2803, 2811

Alignment in fringe areas
 (see Fig. 35).

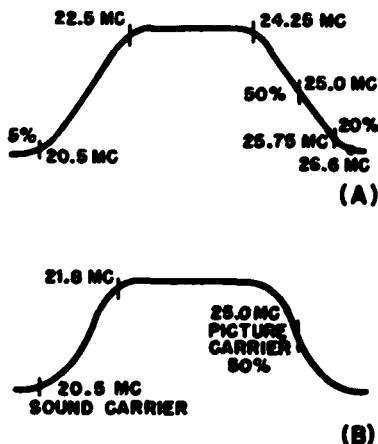


Fig. 35 — Packard Bell

In order to gain the added sensitivity necessary in some fringe areas, it is recommended that the picture i.f. be aligned as shown in part (A) of the figure. Normal response is shown in part (B).

It will be noted that the bandwidth has been reduced to approximately 2.5 mc. This will result in some loss of horizontal resolution, which, with insufficient signal strength, would be lacking in any case. Consequently, the resultant loss in resolution is more than compensated for by the increased i-f sensitivity.

PACKARD BELL Models 2111,
2112, 2113, 2114,
2311, 2811

**Improved sensitivity in
fringe areas (see Fig. 36).**

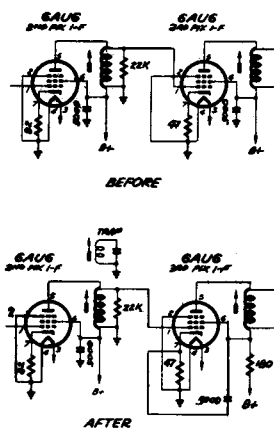


Fig. 36 — Packard Bell

The circuit shown in the figure will provide a marked improvement in overall i-f gain and stability. The

trap shown is available from the manufacturer as part No. 29538. A change in the screen bypass in the 3rd picture i-f stage will also be noted. Realignment will be necessary after these changes, as follows:

1. Connect signal generator to antenna terminals and loosely couple sweep generator to converter tube.

2. Connect oscilloscope to point D (in picture detector).

3. Set signal generator to 20.5 mc, maximum output and sweep generator to center picture i-f frequency, sweep 10 mc.

4. Adjust trap (bottom of chassis) so that the sound carrier marker (20.5 mc) is at minimum on the curve.

PACKARD BELL Models 2111,
2112, 2113, 2114
**Eliminating horizontal-sweep
whistle in sound.**

To prevent feedback of horizontal-sweep signal into the sound circuits producing a station whistle, connect a .05- μ f, 600-volt capacitor from the blue wire on the fuse clip to ground.

PACKARD BELL Models 2111,
2112, 2113, 2114

**Improved sync stability in
fringe areas (see Fig. 37).**

Most of the instability encountered in weak-signal areas is caused by noise pulses of long duration. The changes to the sync amplifier as shown in part (A) of the figure are to be used in fringe areas only. The lead dress of the .01- μ f coupling capacitor is critical. See part (B) of the figure for proper lead dress.

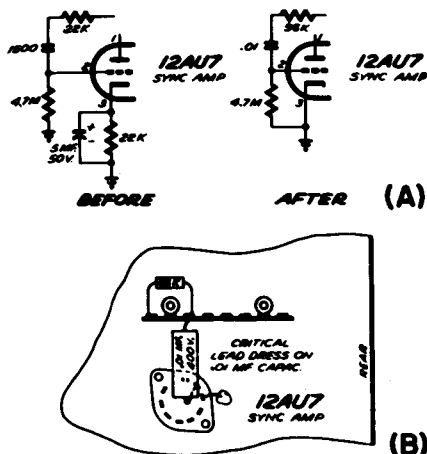


Fig. 37 — Packard Bell

PACKARD BELL Models 2301,
2302, 2803

Excessive picture width.

In the event that there is excessive picture width, it may be reduced by replacing $C51$, the $.01\text{-}\mu\text{f}$, 600-volt capacitor connected across the width coil, with a $.003\text{-}\mu\text{f}$ unit.

PACKARD BELL Models 2301,
2302, 2803

Providing wider tolerance for sound i-f driver.

To provide for wider tolerance for the sound i-f driver (6AU6, $V1$), resistor $R1$, 82-ohm resistor in the cathode circuit of the tube, is changed to 120 ohms.

PACKARD BELL Models 2301,
2302, 2803

Increasing range of height control.

To provide more adequate control of picture height, $R64$ (limiting resistor in series with height control) is changed from 1 megohm to 1.5 megohms.

PACKARD BELL Models 2301,
2302, 2803

Reduction of sync buzz.

Originally, the ratio-detector circuit was designed around a Muter ratio-detector coil. At that time, $C6$ (connected to pin 2 of the ratio detector) was a $330\text{-}\mu\text{f}$ ceramic capacitor. However, later Standard Coil and Teleradio coils were used in addition to the Muter. When such occurs, it becomes necessary to change the value of $C6$. The proper value of $C6$ for each coil is as follows:

Teleradio — $5,000\text{-}\mu\text{f}$ ceramic capacitor (part No. 23931)

Standard Coil — $1,000\text{-}\mu\text{f}$ ceramic capacitor (part No. 23965)

Muter — $330\text{-}\mu\text{f}$ mica capacitor (part No. 23214)

The transformers can be easily identified by referring to their bases; the coil form is secured differently in each make. The Teleradio uses a small brass collar to secure the coil to the base. The coil form on the Standard Coil protrudes through the base far enough to allow a swedged fit. The Muter uses an aluminum clip collar similar to those used on many small i-f coils.

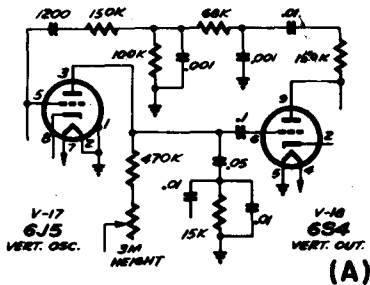
When a change is made, be sure to use the correct value for $C6$ and to realign the ratio-detector circuit.

PACKARD BELL

Models 2311, 2811

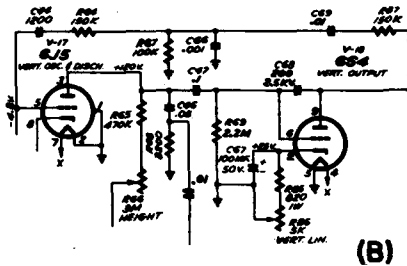
Providing wider tolerance for 6S4 (see Fig. 38).

To provide for wider tolerance of 6S4 (vertical-output tube) characteristics without vertical peaking, the circuit is rewired as shown in part (B) of the figure. The original circuit appears in part (A). Later



PACKARD BELL Model 2803
Correcting hum on phono.

To correct hum on phono, connect C65, a 50- μ f, 50-volt electrolytic capacitor, from the center tap of the power transformer to ground. A 22-ohm, 1/2-watt resistor should be added in series with the above to reduce arcing at the switch contacts.



PACKARD BELL
 All early 22-tube chassis
Preventing heater-cathode breakdown in damper and picture tube (see Fig. 39).

To prevent heater-cathode breakdown in damper and picture tubes and to increase the range of the brightness control, it is advisable to make the changes shown in the figure. These changes should be made in all units showing serial numbers below 900.

Fig. 38 — Packard Bell

production runs already include these modifications.

PACKARD BELL
 Models 2311, 2811
Providing wider tolerance for 6SN7.

To allow wider tolerance of 6SN7 (horizontal oscillator) characteristics without producing horizontal picture bend, the following changes are made:

1. Resistor R51 (plate resistor connected to pin 2 of the horizontal oscillator) is changed from 150,000 ohms to 100,000 ohms.
2. Capacitor C35 (also connected to pin 2 of the horizontal oscillator) is changed from .001 μ f to .002 μ f.

The above changes were incorporated in model 2311 from serial No. 13806 and in the model 2811 from serial No. 33750.

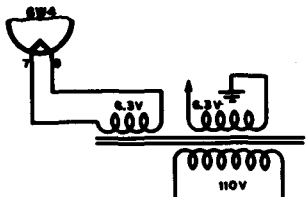
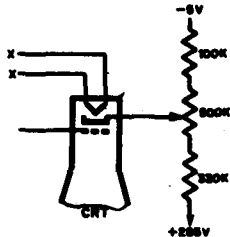
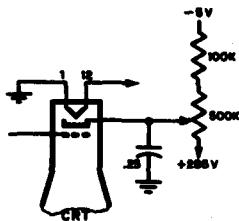


PHILCO Models 48-700,
 -1000, -1001, -1050,
 -2500, and 49-models
 with turret tuner

Reducing receiver drift (see Fig. 40).

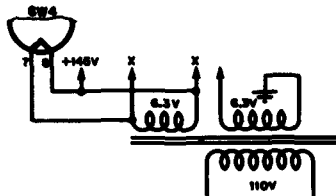
To reduce the receiver drift, install the discriminator transformer, part No. 32-4317, if not already done. The circuit for this new transformer is shown in part (A) of the figure.

The oscillator grid-tank capacitor (see part B of the figure) should also be replaced by a special 10- μ f negative-temperature-coefficient compensating capacitor, part No. 30-1224-51. Make sure that the



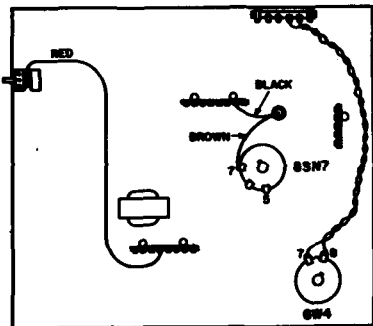
BEFORE CHANGE

(A)



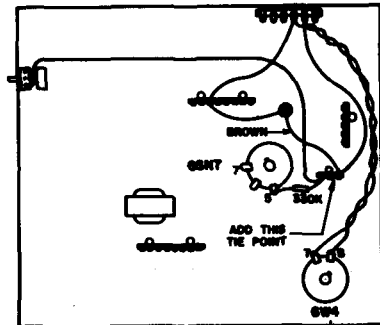
AFTER CHANGE

(B)



BEFORE CHANGE

(C)



AFTER CHANGE

(D)

Fig. 39 — Packard Bell

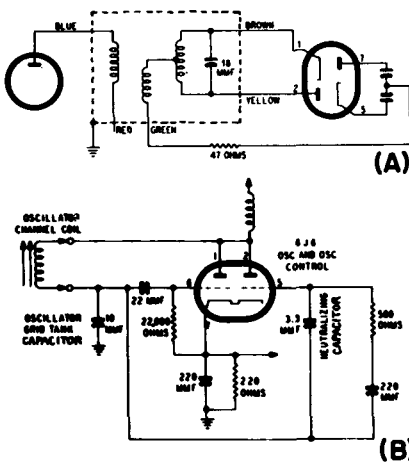


Fig. 40 — Philco

32-4317 discriminator transformer is used when installing the special 10- μf capacitor.

The discriminator transformer, the special 10- μf temperature compensating capacitor, and other required parts, including detailed installation instructions, are available in kit form, part No. 45-9535.

PHILCO Models 48-700, -1000, -1001, -1050, -2500, and 49-models with turret tuner

Installation of fine-tuning control (see Fig. 41).

In areas where the signal strength is very low, generally where the station produces less than 2 volts dc at the Align Test jack, or where new transmitters are scheduled to go on the air, an electronic fine-tuning control, known as a Channel Adjuster, can be added to the receiver.

The Channel Adjuster consists of a potentiometer, which is connected across a positive and negative voltage supply; the arm is connected to

the afc bus of the receiver. By rotating the potentiometer, the voltage on the afc bus is adjusted manually from negative through zero to positive. This manually adjusted voltage is fed to the heterodyne-oscillator control tube, thus controlling the heterodyne-oscillator frequency manually.

An off-on switch is included, and is used to turn the Channel Adjuster circuit off in areas, or for stations that provide sufficient signal to supply adequate afc voltage. The basic circuit for the Channel Adjuster is shown in the figure.

The Channel Adjuster off-on switch and the contrast control are incorporated into a dual-potentiometer assembly. The inner shaft is for the Channel Adjuster and off-on switch, and the outer shaft is for the contrast control.

When the Channel Adjuster is installed, a refinement may be made to the oscillator-control circuit to increase the deviation from about .5 mc to at least .75 mc. This refinement consists of changing the 3.3- μf neutralizing capacitor (see figure under "Reducing receiver drift") to a 2.2- μf capacitor, part No. 30-1221-4.

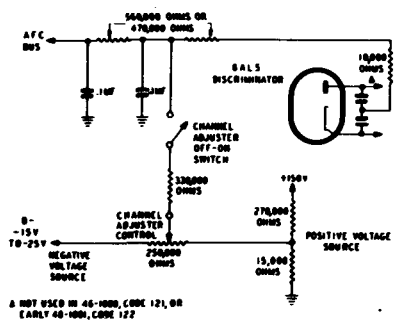


Fig. 41 — Philco

When setting up a receiver incorporating the Channel Adjuster, turn the Channel Adjuster circuit off, and adjust the afc voltage for zero on each station. A 20,000 ohms-per-volt voltmeter, connected to the afc test jack, should be used as an indicating device for this adjustment.

The Channel Adjuster should be turned on, and adjusted for undistorted sound. If there is a tendency for the sound to drift and become distorted, a slight adjustment of the Channel Adjuster may be necessary during the operating period.

The Channel Adjuster is available in kit form, and includes all the necessary parts and detailed installation instructions.

Model	Channel Adjuster Kit Part No.
48-700	45-1653
48-1000, 48-1050,	
48-1001, 48-2500	45-1654
All 49-models	45-1659

PHILCO Model 48-2500
Apparent lid warpage.

Many cases of apparent lid warpage have been traced to cabinet distortion which occurs when the cabinet rests on an uneven floor. This distortion may be corrected by simply leveling the cabinet, by placing blocks under the legs.

PHILCO Model 50-702
Providing for high line voltages.

To provide for high line voltages the following modifications, already included in production run 2, are made:

1. *R54*, 5,600-ohm resistor in the plate circuit of the 2nd video am-

plifier, is changed to a 2-watt resistor (part No. 66-2565340).

2. *R51*, 4,700-ohm resistor in the plate circuit of the 1st video amplifier, is changed to a 1-watt resistor (part No. 66-2474340).

3. *R26* and *R9*, 10,000-ohm and 12,000-ohm resistors in the plate circuit of the oscillator tube, are replaced with a 5,100-ohm, 5-watt resistor (part No. 33-1335-18).

PHILCO Models 50-1403,
50-1630
Horizontal foldover
(see Fig. 42).

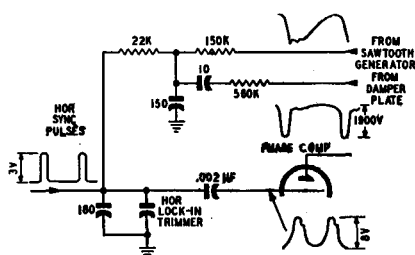


Fig. 42 — Philco

The following circuit change may be added to the above models using the phase-comparator circuit if horizontal foldover is present, and is used in all models built after and including the code 125 of the 1403 series, as well as the code 122 of the 1630.

In tracking down the cause of horizontal foldover, which produces a haze along the left-hand edge of a picture, it has been found that the trouble is usually due to the use of a short horizontal-blanking interval allowed for retrace; that is, the backporch of the blanking pedestal is short. The circuit shown in the

accompanying figure compensates for this condition by advancing the sweep with respect to the sync pulse in the phase comparer circuit.

The desired effect is to speed up the sweep so that the retrace will be completed when the beam is unblanked. This is accomplished by delaying the sawtooth voltage applied from the horizontal-sweep oscillator to the phase comparer so that in establishing a stable operating point the phase comparer causes the sweep to be advanced in phase. The delay of the sawtooth is effected by adding a series resistor and a shunting capacitor in the lead from the horizontal oscillator, as shown in the figure.

PHILCO Model 50-T series
Operation with disconnected yoke.

Operating the above models with the deflection yoke disconnected removes the load from the 6BG6G tube, causing excessive screen current and damage to the screen-dropping resistor. A deflection yoke should always be connected when the receiver is in operation. If a complete picture-tube assembly is not available, a yoke by itself will be satisfactory.

PHILCO Model 50-T series
Horizontal streaks.

In some cases, horizontal streaks may be caused by video or a-c voltage being fed back into the 1st video i-f stage. One cause of this coupling is the leads running to the contrast control being too close to the 28.1-mc trap. These leads carry the video voltage. In this case, these wires should be dressed away from

the trap, and as close to the chassis as possible.

In some extreme cases, it may be necessary to reroute these wires as in later production. In later production models, the wires are routed from the contrast control out through a hole near the control, down the front of the chassis, into a ventilation hole near the bottom-right corner, and thence to the output stage. In all cases, all leads must be dressed away from the 28.1-mc trap.

PHILCO Models 50-T1104,
-T1400 through -T1406,
-T1430, -T1432

**Placement of 1B3 anode cap
(see Fig. 43).**

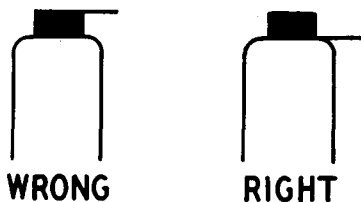


Fig. 43 — Philco

It is possible to place the anode cap on the 1B3GT tube in the above receivers so that it is too close to the top of the high-voltage cage. When placing the anode cap on the tube, make sure that it is placed as shown in the illustration.

If this is not done, corona and arcing may occur.

PHILCO Models 50-T1104,
-T1105

**Improper performance of
built-in antenna.**

In some cases, improper performance of the built-in antenna may

be traced to the way the lead from the antenna to the input terminals is dressed. This lead should be kept away from the end of the dipole element nearest the power transformer, and dressed so that it is entirely in the clear.

PHILCO Model 50-T1104
Eliminating Barkhausen oscillations.

Barkhausen oscillations may be eliminated by the following change, already made in production run 3: install a parallel combination consisting of a .0022- μ f capacitor, a 470-ohm resistor, and a 600- μ h choke (part Nos. 45-3505-54, 66-1475340, and 32-4264-1) in series with the lead between pin 4 of the horizontal-output transformer (T7) and pin 5 of the damper tube.

PHILCO Models 50-T1105, -T1106

Eliminating harmonic beat.

To eliminate harmonic beat, the following modifications (already included in production run 2) are made:

1. The f-m detector (7X7) is shielded. Shield-mounting clip 56-1567-1 and tube shield 56-2731 are used.

2. An r-f choke, part No. 32-4112-15, is added in series with the ungrounded lead to the filament of the f-m detector.

PHILCO Model 50-T1400 series
Reduction of vertical jitter
(see Fig. 44).

Vertical jitter in the picture due to line-voltage fluctuations in runs 1 and 2 of the above models may be greatly reduced or eliminated in

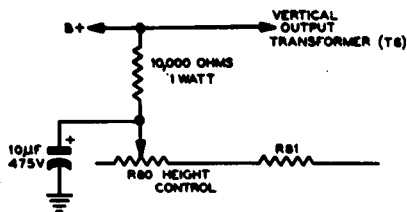


Fig. 44 — Philco

the special cases where necessary by adding an extra filter network to the B-supply feeding the vertical oscillator and discharge tube. This network consists of a 10,000-ohm resistor and a 10- μ f capacitor. The circuit is shown in the figure.

PHILCO Model 50-T1400 series
Horizontal tearing at minimum contrast *(see Fig. 45).*

Horizontal tear at the top of the picture may be caused by a horizontal-damper lead radiating energy

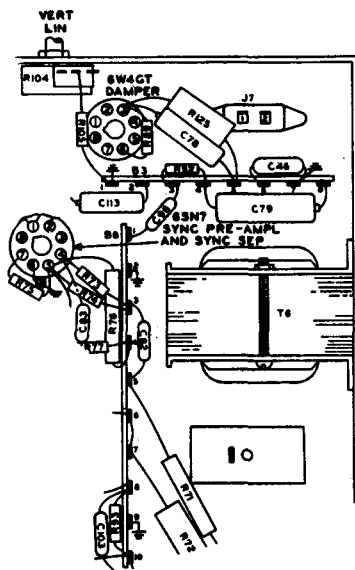


Fig. 45 — Philco

into the sync-separator circuit. The effect of this radiation may be reduced by re-dressing these leads as follows:

Re-dress the blue lead on terminal panel B3-3 to the mounting jack of the high-voltage capacitor, under C46, and under T6 to the capacitor mounting jack. This wire connects C51 (h-v filter) to C79, and radiates some horizontal-output signal to the lead connected from terminal panel B3-2 to B8-3, which is in the sync-separator grid circuit. Also re-dress this wire (from B3-2 to B8-3) on the 6SN7GT side of B8, under R76 to B8-3. See the figure for identification of components.

PHILCO Model 50-T1400
Horizontal-oscillator squeal
(see Fig. 46).

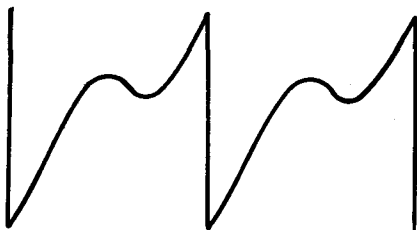


Fig. 46 — Philco

Starting with the production of code 125 of the above television receivers, a new type of horizontal-oscillator circuit was used in all sets. This particular circuit incorporates a stabilizing section in the blocking oscillator. When the horizontal oscillator is improperly adjusted, in many cases a peculiar shrill sound of about 1,000 cycles per second is heard, and an accompanying out-of-sync condition is noted on the pic-

ture. This phenomenon usually occurs with the horizontal-hold control at either the extreme counterclockwise or clockwise position. This condition is commonly referred to as "gunboating." To prevent this condition the following procedure is recommended.

1. Turn horizontal-hold control fully clockwise.

2. Adjust frequency core of horizontal-blocking oscillator transformer so as to obtain five blanking bars sloping to the right.

3. If gunboating still is apparent, rotate hold control away from fully clockwise momentarily, return to the fully clockwise position and try re-setting the frequency core.

In areas with moderately strong signals free of noise, the tendency to gunboat may be reduced by adjusting the stabilizing core of the horizontal-blocking oscillator transformer so that the top of the rounded portion of the presentation is below that of the narrow pointed top. See the figure.

PHILCO Models 50-T1400,
-T1401, -T1402, -T1430
Reducing vertical foldover.

Vertical foldover may be reduced by the following modifications, already made in later production:

1. R94 (peaking resistor connected to cathode of vertical-output tube) is changed from 5,100 ohms to 6,800 ohms (part No. 66-2688340).

2. C91 (.0082- μ f capacitor connected to blue lead of vertical-oscillator transformer) is changed to .015 μ f part No. 30-4651-8).

3. *R87* (10,000-ohm grid resistor of vertical oscillator) is removed.

4. Pin 2 (grid) of the vertical-oscillator tube (12AU7) is connected to the junction of *C91* (see step 2 above) and *R88* (820,000-ohm resistor connected to vertical-hold control).

5. *R88* is changed from 820,000 ohms to 470,000 ohms (part No. 66-4478340).

PHILCO Models 50-T1400,
-T1401, -T1402, -T1430

Centering range of focus control.

The range of the focus control may be centered by the following change, already incorporated into production run 6: *R66*, 180-ohm resistor connected to the arm of the focus control, is changed to 100 ohms (part No. 66-1104340).

PHILCO Models 50-T1400,
-T1401, -T1402, -T1430

Improving performance with low line voltage.

Improved performance may be obtained with low line voltage by the following change, already made in later production: *R67*, 5,600-ohm decoupling resistor connected to choke *L35* in the plate circuit of the oscillator, is shorted out.

PHILCO Models 50-T1400,
-T1402

Centering tuning of 1st video i-f transformer.

The tuning of the 1st video i-f transformer is centered by the following change, already made in production run 2: a 2.2- μmf capacitor (part No. 30-1221-4) is added between ground and the junction of

C6 (470- μmf capacitor) and *R128* (470-ohm resistor), both in the output-coupling circuit from the mixer to the 1st video i-f amplifier.

PHILCO Models 50-T1400,
-T1402

Improved vertical linearity.

Linearity may be improved by the following change, already made in later production: the arm of the height control is disconnected and rewired to the junction of *R89* (10,000 ohms) and *R96* (100,000). These resistors are wired between the damper cathode and one side of the horizontal-hold control.

PHILCO Models 50-T1400,
-T1402

Reducing a-c current through fuse (see Fig. 47).

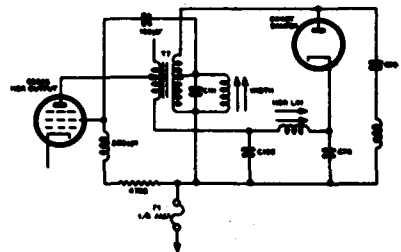


Fig. 47 — Philco

To reduce the a-c current through the h-v fuse, this fuse (*F1*) is rewired as shown in the figure. In addition, the value is changed from $\frac{3}{8}$ ampere to $\frac{1}{4}$ ampere (part No. 45-2656-8). Increased production is also afforded by this change, already made in production run 4.

PHILCO Models 50-T1400,
-T1402

Reducing harmonic beat.

To reduce harmonic beat, the following changes (already included in production run 5) are made:

1. A 330-ohm resistor (part No. 66-1338340) is added in series with the lead between the ungrounded (negative) end of C42 (2- μ f f-m detector load capacitor) and R20 (68,000-ohm f-m detector load resistor).

2. Lead from the junction of R19 (56,000-ohm de-emphasis filter resistor in f-m detector circuit) and pin 3 of J3 (f-m test jack) is disconnected from the junction of C40 and C41 (both 1,500- μ mf capacitors connected across detector load).

3. Capacitor C41 (connected to pin 4 of f-m detector) is removed.

4. Capacitor C40 is connected across R20, from pins 6 to 4 of the f-m detector.

PHILCO Models 50-T1403,
-T1404, -T1406

Increasing width.

To increase width and reduce the interaction between the width and linearity controls, the following changes (already included in production run 2) are made:

1. R108, connected to white lead of horizontal-oscillator transformer, is changed to 56,000 ohms (part No. 66-3564240).

2. C73, connected to one side of drive control, is changed to 390 μ mf (part No. 30-1220-35).

PHILCO Models 50-T1403,
-T1404, -T1406

Preventing parasitic oscillations in 6BG6.

To prevent parasitic oscillations in 6BG6 horizontal-output tube, C74, screen bypass capacitor is changed to .0047 μ f (part No. 45-3505-90). This change has already been made in production run 6.

PHILCO Models 50-T1443,
-T1404, -T1406

Increased width and improved linearity.

To increase width and to reduce squeeze on the right side of the picture, the following change (already made in production run 7) is made: a 680,000-ohm resistor is added in series with R113 (high-voltage filter).

PHILCO Model 50-T1443
-T1483, -T1630

Line-fuse failure.

Under certain operating conditions, the 5-amp line fuse may blow due to line surges although the receiver may be operating normally. Investigation has revealed that a 3.2-amp delayed-action fuse will provide the required protection and will not blow when surges occur.

If the receiver blows the 3.2-ampere, delayed-action fuse, troubleshoot the receiver before trying another fuse. The part No. of the delayed-action fuse is 45-2656-14.

PHILCO Model 50-T1443
Microphonics due to improper unpacking.

Codes 122 and 123 of the above models may be microphonic if their chassis do not float freely on the chassis shock mounts. When the receiver is placed in operation, the chassis-mounting bolts should be loosened, and all chassis-packing strips should be removed.

PHILCO Model 50-T1443
Improving picture quality.

Picture quality may be improved by the following changes, already included in production run 5:

1. A 180- μ h peaking coil (part No. 32-4143-5) is added in series with the lead between *R40* (plate-load resistor of video-output tube) and the junction of *L56* (series peaking coil of video-output tube) and shunt resistor *R44* (27,000 ohms).

2. A 6,800-ohm resistor (part No. 66-2688340) is added between ground and the junction of *R36* (47-ohm cathode resistor of video-output tube) and the contrast control.

3. *R36* (see step 2 above) is changed from 47 ohms to 10 ohms (part No. 66-0108340).

4. An 82,000-ohm resistor (part No. 66-3824340) is added between the screen (pin 3) of the video-output tube and ground.

5. A 15,000-ohm resistor (part No. 66-3154340) is added across *R40* and *R41* (2,500-ohm and 470-ohm resistors in the plate circuit of the video-output tube).

6. *C69*, .0033- μ f capacitor connected to cathode of the 1st video amplifier, is changed to 680 μ f (part No. 60-10685401).

PHILCO Model 50-T1443
Reducing beat interference.

Beat interference may be reduced by the following changes, already made in production run 6:

1. An r-f choke (part No. 32-4061-2) is added in series with the lead between *R60* (10,000-ohm de-emphasis resistor connected to pin 3 of the f-m test jack, *J3*) and the

junction of *R57* (47-ohm resistor connected to *R60*) and *C32* (100- μ f capacitor connected to *R60*).

2. *R32*, 47,000-ohm resistor connected to pin 7 of the video detector, is removed.

3. *L53*, peaking coil connected to pin 7 of the video detector, is removed and replaced with a 10- μ h choke (part No. 32-4143-10).

4. *L53* (see step 3 above) is connected in series with the lead to the ungrounded end of video-detector load resistor *R29* (3,300 ohms), between *R29* and the junction of *L69* (video detector peaking coil connected to .047- μ f output coupling capacitor) and pin 3 of align-test jack *J4*.

5. A 100- μ f capacitor (part No. 62-110009001) is added between pin 2 of *J4* and ground.

6. A 470- μ f capacitor (part No. 62-147001001) is added between ground and the junction of *R136* (contrast control) and *R130* (1,000-ohm resistor connected to cathode, pin 5, of avc rectifier).

PHILCO Models 50-T1600,
-T1632, -T1633
Blown B-supply fuse.

Under certain operating conditions, the 1/2-ampere, delayed-action fuse in the B— leg of the power supply may open without there being any overload. Any receiver found with this fuse blown should be checked first for overload, then the fuse should be replaced with a 6/10 - ampere, delayed-action fuse, part No. 45-2656-18.

The fuse is located inside the high-voltage power-supply cage, under the width and linearity controls.

PHILCO Model 50-T1630
Cleaning face of picture tube.

In some locations, a ring of dust will accumulate around the edge of the face of the picture tube, due to the high potential of the shell.

This ring of dust may be removed by removing the safety glass and cleaning the face of the tube with carbon tetrachloride.

PHILCO

Models 51-PT1200 series,
51-T1800 series

Installation of fringe-normal switch.

A kit, part No. 45-1732, is available for improvement of sync performance in fringe areas. The use of this kit will improve the sync performance in those weak-signal areas where strong continuous electrical disturbance is present. The kit includes a switch called the Fringe-Normal switch, which functions as follows, when thrown to the Fringe position:

1. Connects a 68,000-ohm resistor from the agc bus (at the Align Test jack, pin 3) to ground. This resistor acts as a voltage divider, and lowers the agc voltage on the control grids of the tubes under automatic gain control.

2. Connects an 80,000-ohm resistor between the plate of the diode clipper (diode noise gate, 12AU7) and ground. This changes the clipping level of the diode.

The kit is installed by simply plugging the accompanying cable and plug into the Align Test jack, J200. Since the Fringe-Normal switch is to be operated by the customer, when necessary, it is advisable to mount the switch in a position which is

readily accessible from the front of the cabinet. In later production, a knockout hole is provided in the cabinet back for mounting purposes.

The wiring of the Fringe-Normal switch should be modified by removing the lead connecting the frame of the switch to one of the terminals if an above-ground "hot" chassis condition is encountered.

It should be noted that strong-signal reception is virtually impossible when the Fringe-Normal switch is in the Fringe position, because the receiver overloads and causes the picture to become "washed out" and distorted in shape. It will, therefore, be necessary for those customers who receive both weak and strong signals to operate the switch when changing from station to station. In complete fringe areas, however, the switch may be left in the Fringe position,

It may be found that when the Fringe - Normal switch is in the Fringe position, and moderately strong signals with very low interfering noise are being received, the picture will have a tendency to distort or kink. This condition occurs when either the blanking or picture component gets into the picked-off sync, because of excessive clipping in the noise-gate circuit. The condition is aggravated by certain stations which allow the blanking or picture component of the video to project too far into the sync region of the video signal.

To remedy the condition, proceed as follows:

Cut the white lead with the blue tracer of the kit adapter socket cable, and then tape both ends. This will remove the 47,000-ohm shunt re-

sistor from across the 56,000-ohm resistor of the noise-gate diode voltage-divider network. This change will reduce clipping of the sync pulse in the noise-gate circuit.

Note: This change is not recommended in extremely weak signal areas, or where strong noise is encountered.

PHILCO Model 51-PT1200
Replacement of fine-tuning cam (see Fig. 48).

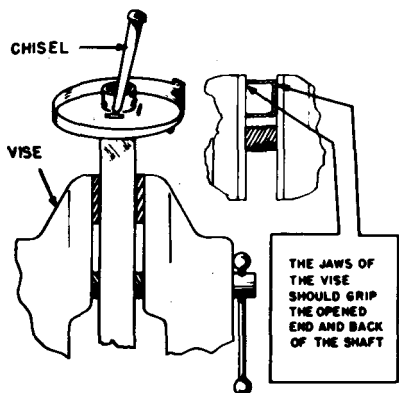


Fig. 48 — Philco

The tuner shaft arrangement in the above model is different in that the channel selector knob is secured to the channel-selector shaft by means of an Allen screw. Often a serviceman may inadvertently pull on the knob without removing the set screw. This will sometimes result in a cracked bakelite fine-tuning cam. The shaft and bakelite cam assembly, part No. 76-5846, is no longer available as a replacement item.

The bakelite cam part No. 54-8120-1 is available and can be mounted to the metal shaft by using the following procedure.

1. Remove the broken bakelite cam by chipping it away from the three ears with a pair of side cutters.
2. Flatten out the crimp in the three ears with a hammer or pliers.
3. Assemble the new cam and place in a vise as shown in the figure.
4. Spread the ears with a chisel or screw driver so that the cam fits tight to the shaft.

PHILCO Model 51-PT1207 series
Picture tube cable adaptor (see Fig. 49).

A picture tube cable adaptor for the above models can easily be made up with the following parts:

Two nine-pin miniature tube sockets (part No. 27-6203-5)

Two shells to encase plug and socket (part No. 56-2071)

A length of No. 18 wire

The procedure for making up this adaptor is given below. See part (A) of the figure.

1. Strip the No. 18 wire of all insulation and cut nine lengths of this wire to approximately $1\frac{1}{4}$ inch.
2. Insert the nine lengths of cut wire into the holes of both sockets. This is done to hold the nine wires in the proper position for soldering.
3. Solder the nine lengths to the bottom socket with non-corrode solder. Make sure the solder runs down the pins and makes good electrical bond with the socket pins and also fills the recesses of the socket so that the pins are rigid.
4. When all nine pins have been soldered to the bottom socket, remove the top socket and trim the nine pins to approximately $\frac{1}{4}$ inch above the face of the socket.

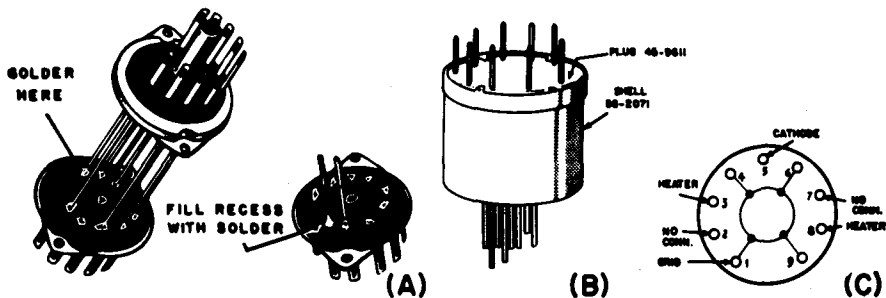


Fig. 49 — Philco

5. Slip the plug and socket shields over the cable and solder the cable wires to pins 5, 1, 3, and 8 of the plug and socket.

6. Secure the shells to the plug and socket by bending the four ears of the shell over the metal bracket around the tube socket.

The nine-pin plug has been made available under part No. 45-9611. The rest of the adaptor must be made up with a pin miniature tube socket and two shells which enclose the plug and socket. See part (B) of the figure. It is suggested that wires be connected to all lugs on the plug and socket, since some of the unused pins on the picture tube are connected internally and if one of the pins breaks off, connection might still be made to the tube elements. Part (C) of the figure shows the internal connections made to the pins on the 12WP4.

PHILCO

Models 51-T1443 series **Reducing picture bounce.**

To reduce picture bounce, the following changes (already made in production run 3) are made:

1. *R220*, 3,300-ohm resistor connected to one side of the contrast

control, is changed to 1,000 ohms (part No. 66-2108340).

2. *R221*, 120,000-ohm resistor also connected to one side of the contrast control, is changed to 150,000-ohms (part No. 66-4158340).

3. *C210*, .22- μ f capacitor in agc bus to 3rd i-f stage, is changed to .47 μ f at 400 volts (part No. 45-3505-34).

PHILCO

Models 51-T1443 series **Increasing picture brightness.**

To increase picture brightness, the following change (already made in production run 4) is made: *R313*, 220,000-ohm resistor connected to rotor of brightness control, is changed to 150,000 ohms.

PHILCO

Models 51-T1443 series **Improving picture quality.**

The following changes, already made in production run 6, are made:

1. *R307*, 470,000-ohm resistor in grid circuit of video-output tube, is changed to 1.2 megohms (part No. 66-5128340).

2. *R311*, 1,800-ohm resistor in plate circuit of video-output tube, is changed to 2,700 ohms (part No. 66-2275340).

3. R304, 5,600-ohm decoupling resistor, is inserted in the plate circuit of the 1st video amplifier between the shunt peaking coil and the B+ bus.

PHILCO Models 1600-series, 1800-series, 2100-series, 2500-series

Replacement of high-voltage resistor (see Fig. 50).

High-voltage resistor, part No. 33-1352, is used and has been used for some time in production instead of the older type, part No. 33-1346. The newer resistor has the advantage over the older type, in that it will stand the rough handling which is sometimes encountered in servicing and production of television receivers which resulted in some premature failures of the carbon-filament type.

All field replacements of 2-meg resistors should be made with the newer special carbon mix type. In all of the above series receivers two of these resistors are to be used in series as the d-c return path for the

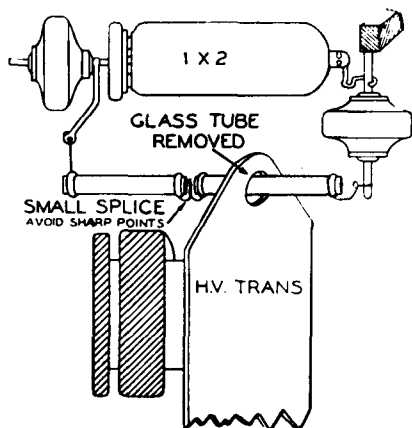


Fig. 50 — Philco

second stage of the voltage doubler. This statement is true regardless of whether the original wiring of the set used one 2-meg resistor, one 4-meg resistor, or two 2-meg resistors. The newer resistor is color coded red-green-green indicating 2.5 meg nominal value. The resistors under operating conditions are approximately 1.8 meg.

In all late production models of the above series, the 2-meg resistors are wired between the terminals of the rectifier tube and a ceramic stand-off terminal. When the new resistors are used for replacement in the 50-T1600 series, the two resistors are spliced together taking special precautions to see that the splice is short and kept within the radius of the resistor diameter. The splicing and the placement of the resistors in this series are shown in the figure. Please note that the glass tube originally used to enclose the original resistor is discarded.

Replacements of 2-meg resistor, in 45-1705, the high-voltage supply for the 48-2500, should be made using only *one* resistor. It is strongly recommended that all high-voltage resistor replacements be made using the newer resistor since it uses a special carbon mix developed to withstand the very high voltage gradient existing in this circuit. The use of standard type resistors in series, although they may appear satisfactory at first, is likely to result in premature failures.

PHILCO Models 7008, 7070, 7170

Reducing vernier-dial slippage.

Vernier-dial slippage may be reduced by installing one-half of a

1/4-inch rubber grommet between the knob and the pointer.

This may be done by removing the knob, installing the grommet with the cut edge toward the knob, then replacing the knob. The desired torque may be obtained by adjusting the position of the knob on the shaft.

PHILCO Model RT-10
Providing greater tolerance
for last i-f tube.

The cathode resistor connected to pin 7 of the 6AU6 tube in the last i-f stage is changed from 120 ohms, 1/2 w, 10% to 220 ohms, 1/2 w, 10% (part No. 66-1228346).

This change is made to decrease the number of 6AU6's which cannot be used because their contact

potential was higher than the cathode bias, thereby causing grid loading and corresponding loss in sensitivity.

This change was incorporated in run 4 of the above model.

PHILCO Model RT-10
Instability on f.m.
(see Fig. 51).

The following changes will correct the instability of the f-m section of the above model. The changes should be made following a definite procedure which is outlined below:

1. Study the pictorial diagram carefully.
2. Remove bare wire connecting pin 2 of socket B and ground lug D.
3. Remove ground end of C946 from pin 2 of socket B and connect to pin 3 of socket A as shown.

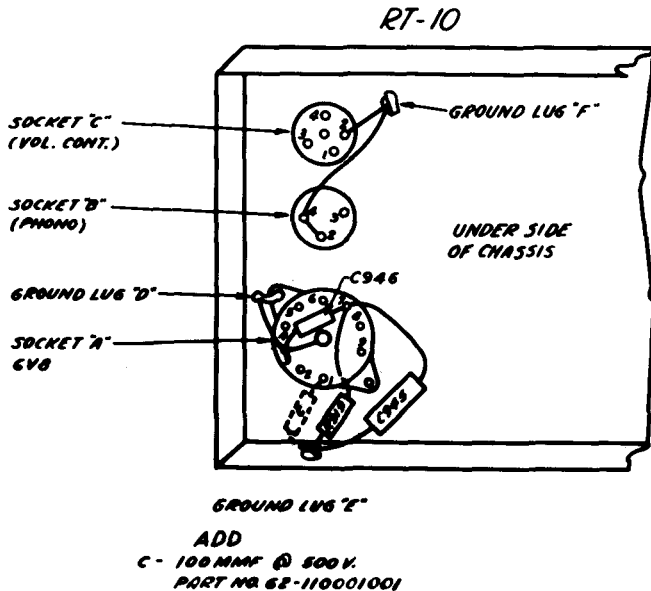


Fig. 51 — Philco

4. Remove ground end of *R919* from pin 2 of socket C and connect to ground lug E as shown.

5. Remove ground end of *C945* from ground lug F and connect to ground lug E as shown.

6. Connect pin 4 of socket B to ground lug F as shown.

7. Add capacitor C (100 $\mu\mu\text{f}$ at 500 volts, part No. 62-110001001) from pin 1 of socket A to ground lug E.

General Notes:

1. All leads shall be as short as possible.

2. The ceramic compensating capacitor connected across the f-m oscillator coil should be dressed away from the stator plates of the gang capacitor to prevent microphonics on f.m.

3. These changes are already incorporated in runs 2 and 3.

**PHILCO Model TV-70 series
Eliminating sync buzz.**

The following change is desirable to eliminate sync buzz in certain areas in the RF-71 chassis prior to run 13:

1. Remove the 12-k, 1-w resistor (part No. 33-3124346) supplying the plate and screen of the 6AU6 sound i-f tube.

2. Connect a 33-k, 1-w resistor (part No. 33-3334346) from plate and screen of the 6AU6 to B+ 200 volts at the 6V6 audio-output tube screen-bypass electrolytic capacitor.

**PHILCO Models TV-80 series,
TV-90 series
Addition of horizontal-linearity
control (see Fig. 52).**

A horizontal-linearity control may be added to the above models.

Symbols used to locate wiring points are taken from the wiring layouts shown. Necessary parts needed are as follows:

one horizontal-linearity coil (part No. 32-4501-1)

two capacitors .068 μf , 400 volts (part No. 30-4650-46)

one coil-mounting bracket (part No. 28-9226)

one terminal panel (part No. 12W-61139)

one machine screw (part No. 1W10581FA3)

one lockwasher (part No. 1W24254FA1)

one nut (part No. 1W19982FA3)

two self-tapping screws (part No. 1W19908FA3)

1. In H1 chassis, move ground connection of *C706* from ground lance *G1* to terminal strip *B1-3*.

2. Mount the 4-lug wiring panel with a machine screw, lockwasher, and nut in the location shown on the wiring layout. Use the .140-inch hole located near the ground lance *G1* for mounting the wiring panel. Bend the ground lance *G1* down so that it will clear the wiring panel.

3. Mount the linearity-coil bracket near the right rear mounting foot with two self-tapping screws. Holes exist in the sub-base.

4. Insert the linearity coil in the mounted coil bracket.

5. Remove the .047- μf , 600-volt capacitor (*C812*) which:

in H1 and H4 is between terminal strip *B2-2* and *B1-3*.

in J1 and J1R is between terminal strip *B2-1* and *B1-1*.

in J4 and J4R is between terminal strip *B2-1* and *B1-3*.

6. Disconnect the r-f choke *L805* from the damper-tube socket pin 1

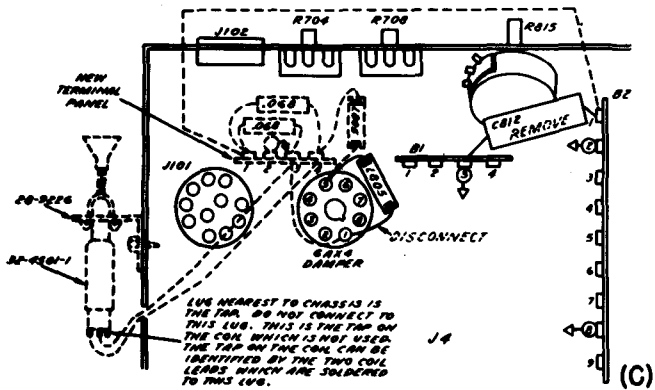
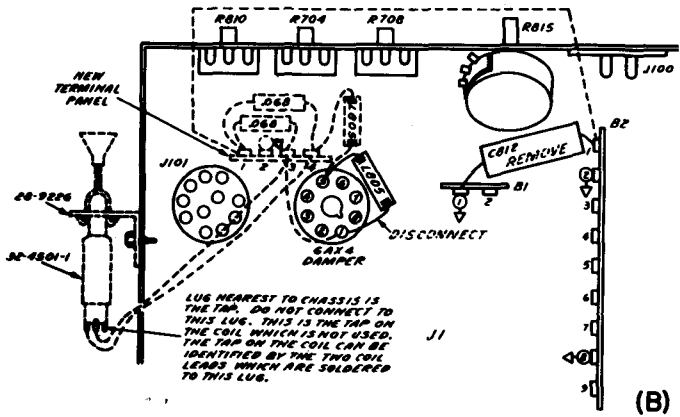
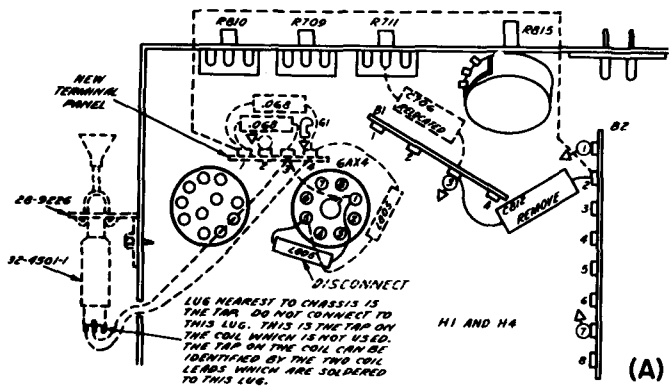


Fig. 52 — Philco

and connect this end to lug 4 of the new panel, as shown on the wiring layouts.

7. Connect damper-tube socket pin 1 to lug 3 of new wiring panel with a piece of hook-up wire.

8. Connect with hook-up wire lug 1 of the new wiring panel to terminal strip B2-2 in the H1 and H4 chassis, and to terminal strip B2-1 in the J1, J1R, J4, and J4R chassis.

9. Connect a .068- μ f, 400-v capacitor between lugs 1 and 3 of the new wiring panel.

10. Connect another .068- μ f, 400-v capacitor between lugs 1 and 4 of the new wiring panel.

11. Connect with hook-up wire the start and finish lugs of the linearity coil to lugs 3 and 4 of the new wiring panel, respectively. The tap of the coil remains unconnected. This tap is the lug nearest to the chassis and it may be recognized by noting the two linearity-coil leads soldered to it.

12. Put set into operation and adjust linearity coil for best horizontal linearity.

PHILCO Model TV-80 series **Picture quality improvement.**

To correct for objectional following white and possible harshness of picture quality due to television stations (in some areas) transmitting signals with overpeaked video, the following change is recommended.

Remove any capacitor that may be wired to pin 1 of 12BY7 video-output tube or the associated lug of the contrast control R301. Some chassis will have a 1,000- μ f capacitor at the contrast control and a

200- μ f capacitor at the video-output socket. Others will have a 100- μ f and a 220- μ f capacitor at this socket; others will have a 1,500- μ f capacitor wired to pin 1 of the video-output socket.

PHILCO Model TV-80 series **Long warm-up time.**

A few field reports indicate an above average warm-up time for the above models. About 30 seconds is considered normal at 117-volt line. Longer warm-up periods have been found generally due to the damper tube, 6AX4GT. In some few cases, it may be due to the combination of long warm up. of both the 6AX4GT and the horizontal-output tube. As a cure, first replace the damper tube, 6AX4GT, and then check the warm-up time. If this is still too long, replace the horizontal-output tube.

PHILCO Model TV-80 series **Reduction of yoke ringing.**

To reduce yoke ringing, it is suggested that the 56- μ f capacitor shunted across one of the horizontal windings in the yoke be replaced by a 68- μ f, 4,000-volt capacitor (part No. 30-1214-1).

PHILCO Model TV-80 series **Improving overall sync.**

To improve the overall sync and performance in weak-signal areas where strong electrical disturbances are present, a Fringe-Normal switch kit, 45-1883, has been designed. To install this kit, follow the procedure:

1. Remove the tv back and fasten the switch assembly, 76-8328, to the back with two machine screws (1W10583FA3), two lock washers

(1W24254FA1), and two units (1W19982FA3) furnished with the kit. Mount the switch with the yellow color dot toward the top of the cabinet in the rectangular slot and two mounting holes provided in the back.

2. Paste the 78-0879 label beside the switch with *Normal* position towards the top of the cabinet. In other words, the yellow dot on the switch is always the *Normal* position.

3. Insert the plug of the switch in the Video Test and Fringe Switch socket located on the RF-81 and RF-84 chassis.

4. Dress cable of switch away from hot tubes.

5. Replace tv back.

In areas where strong signals are received as well as weak signals, the switch must be in *Normal* position for reception of strong signals, otherwise, the set might be overloaded.

PHILCO Model TV-80 series
Reduction of snow in medium-signal areas.

A reduction in snow in medium signal areas can be achieved by making the following changes. These changes apply to both the RF-81 and the RF-84 chassis for the above series.

1. Resistor *R619*, a 15-megohm resistor connected to pin 6 of 6T8, is changed to 10 megohms at 10%.

2. Resistor *R610*, a 330k-ohm resistor in injector-grid circuit of sync separator 6BE6, is changed to a 470k ohm at 10%.

3. Resistor *R611*, a 180k-ohm resistor in injector-grid circuit of sync

separator 6BE6, is changed to 330k ohm at 10%.

4. Resistor *R603*, a 22-k, 2-watt resistor in plate circuit of sync amplifier, is changed to 18 k, 10%, 2 watts.

5. Remove grid end of *R600* (4,700-ohm resistor connected to grid of sync amplifier). Connect a .01- μ f, 400-volt capacitor (part No. 30-4650-41) between the end of *R600* and pin 2 of the 26U8 sync-amplifier tube. It will be necessary to mount a one-lug terminal panel near the base of the 6U8 sync amplifier in order to support the junction point of *R600* and the .01- μ f capacitor.

6. Wire a 1.5-megohm, 10% resistor from pin 2 of the 6U8 tube and pin 7 of terminal panel *B2*. This is the 7-lug panel mounted between the 6U8 and the chassis flange. Pin 1 is grounded.

PHILCO Model TV-80 series
Removing bend and wiggle in picture (see Fig. 53).

To remove picture bend and wiggle, follow the procedure given below. There are changes required in both the r-f supply and power supply.

The following changes are required in the H-1 and H-4 power chassis.

1. Replace capacitor *C804* (see part A of the figure) with a .001- μ f, 400-v capacitor, part No. 30-4668-35. This capacitor was originally a .01- μ f unit. This has already been changed in later production.

2. Remove lead between lug 2 of terminal panel *B3* and lug 3 of horizontal-centering hold control (*R810*). Refer to part (A) of the figure.

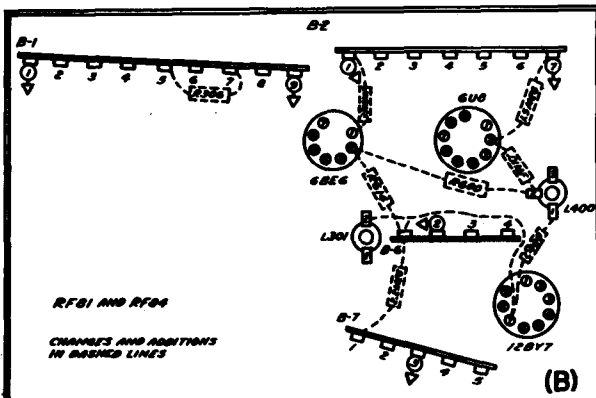
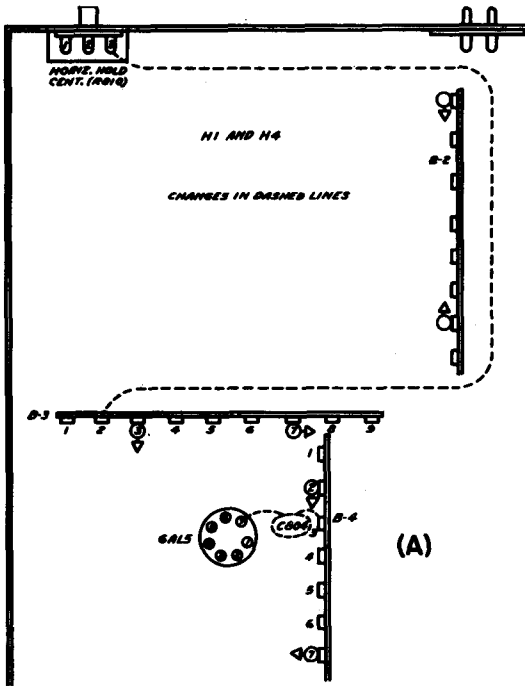


Fig. 53 — Philco

3. Add a longer wire between the points mentioned above, dressing the wire as shown in the figure.

(Note: The above changes apply for both the H-1 and H-4 power chassis. The horizontal-hold control for the H-4 power chassis is located on the top rear side of the chassis instead of on the rear apron.)

The following changes are also required in the RF-81 and the RF-84 chassis.

1. Remove wire between pin 7 of 12BY7 video-output tube and lug 2 of L400.

2. Remove C400 from lug 2 of L400 and wire pin 7 of 12BY7.

3. Remove wire between lug 2 of L400 and lug 2 of L301.

4. Add new wire between lug 2 of L301 and pin 7 of 12BY7, dressing it around terminal panel B6-4 as shown in part (B) of the figure.

5. Remove end of R600 from pin 2 of 6U8 sync amplifier and wire to lug 2 of L400.

6. Add a .01- μ f, 400-volt capacitor (part No. 30-4668-41) from lug 2 of L400 to pin 2 of 6U8 sync amplifier.

7. Add a 1.5-megohm, 10%, $\frac{1}{2}$ -watt resistor between pin 2 of 6U8 and lug 7 of terminal panel B2.

8. Add a 33- μ f capacitor between pin 1 of 6BE6 sync-separator tube and lug 1 of terminal panel B2.

9. Replace R306 (100k ohms), wired between lugs 5 and 7 of terminal panel B1, with a 180-k, 10%, $\frac{1}{2}$ -watt resistor.

10. Wire a 2.2-megohm, 10% resistor between lug 1 of terminal panel B6 and lug 1 of terminal panel B7.

11. Replace R614 with a 27-k, 10%, $\frac{1}{2}$ -watt resistor.

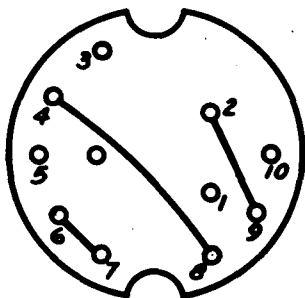
PHILCO Model TV-90 series Elimination of buzz.

Buzz may occur in the above receivers when the volume control is completely turned down. The trouble may be due to a mistake in wiring at the interconnecting cable socket, J101, on the power chassis. Instead of wiring the fixed-bias supply to pin 5 of this socket, it was wired to pin 6, which should be a blank pin.

Since both the video-output and audio-output tubes in the r-f chassis are supplied with a fixed bias through the interconnecting cable from the power chassis and depend on C102 (10 μ f, 50 volts) to hold the bias supply as signal-ground potential, without this connection it is possible for the sync components of the video signal fed to the video-output stage to also be fed to the audio-output stage. This causes a sync buzz which is particularly noticeable at low levels of sound.

This error in wiring is readily identified if the buzz in the sound disappears when the video-output tube is removed from its socket. This odd situation is caused by the nature of the wiring and the pin connections on the 6AQ5 tube — pins 1 and 7 are internally connected. Without the tube in the socket and its internal connection, the video at pin 1 will not reach pin 7 and be transmitted through R309 and R414 to the grid of the output stage in the sound section, as it does when the tube is in place.

PHILCO Models TV-84, TV-94 Operation of tv without radio section (see Fig. 54).



**REAR VIEW
OF PLUG**

Fig. 54 — Philco

In order to operate the tv without the radio section, a shorting plug must be used in place of the plug which attaches the radio section to the television receiver. This plug may be made up by using a plug (part No. 27-6274-1) as shown and shorting between the following pins: pin 2 to pin 9, pin 8 to pin 4, and pin 6 to pin 7.

PHILCO Chassis G-1, G-1A
Weaving horizontal line.

A few reports have been received from the field on the above receivers exhibiting a weavy horizontal line.

In order to correct this condition it is necessary to insert a 15-k damping resistor between terminal 6 on the horizontal-output transformer and the junction of the two yoke halves at J800, pin 3.

The weavy horizontal lines are caused by an unbalance of the ringing amplitude frequency between the two halves of the horizontal-yoke windings.

PHILCO Chassis G-1
Removal of vertical white lines.

Recently, a problem has exhibited itself on several of the above chassis where a few vertical white lines appear on the right half of the picture presentation extending from top to bottom. These lines may vary in number from one to four and are more pronounced at lower brightness and contrast settings. In order to eliminate these objectionable lines, a change in the grid circuit of the 6BQ6 horizontal-output tube is made. The grid resistor is reduced from 2.2 megohms to 680 k (part No. 66-4688346), and the 220 k vertical-output tube (6AH4) bias-coupling resistor is shorted.

PHILCO Chassis G-1
Picture blooming.

There have been several reports of noticeable picture blooming in models with the above deflection chassis. In order to correct this trouble it is necessary to raise the voltage on the first anode of the picture tube by 50 volts. To accomplish this, resistor R819 (connected to terminal 1 of the horizontal-output transformer) is reduced from 120,000 ohms to 68,000 ohms and resistor R818 (connected to R819) is increased from 150,000 ohms to 220,000 ohms. This effectively raises the voltage on the anode by 50 volts. When this change is made it is necessary to change capacitor C815, 10- μ f unit connected to the junction of R819 and R818, from a 450-volt rating to a 475-volt rating.

PHILCO Chassis RF-41,
RF-44, RF-71, RF-71A
Matching 72-ohm line.

The tapered-line assemblies used in the above tuners, 76-7070 and 76-7427, cannot be converted for use with 72-ohm input line. On installation where 72-ohm coaxial cable is used for the lead-in, and line reflections and mismatch cause a reception problem, an external matching transformer must be used. The Workshops Associates transformer, *D-72*, is a suitable one for matching 72 ohms to 300 ohms.

PHILCO Chassis RF-71,
RF-71A
**Improving sync performance
in noisy areas.**

In order to improve sync performance under heavy duty cycle noise which may occur in some cases, the following changes are made in the above chassis.

1. The 6AT6 noise-gate and cathode-follower tube is changed to a 6BF6. The wire from pin 7 of the cathode follower which originally went to B+ 235 volts is changed to the junction of the 100-k resistor *R608* (connected to pin 1 of sync separator), and 1,800-ohm resistor *R311* (connected to pin 6 of video-output tube). Another possible substitution for the 6AT6 tube is the 6AV6, 6BK6, or 6BT6.

2. The 3.3-megohm resistor *R606*, originally connected from pin 1 of the 6AT6 to the junction of *R609* (4.7 megohms), *R606* (5.6 megohms), and *R605* (1.2 megohms), is now connected to the junction of the 270-k resistor *R604* (connected to pin 2 of the sync separator), the 1.2-megohm resistor *R605* (connected to *R604*), and the 180- μ mf capacitor *C603* (connected to pin 2 of sync separator).

PHILCO Chassis RF-71
Improving sync stability.

On the above chassis, in order to effect better sync stability the following changes can be made. Resistor *R600*, 3.3-meg grid resistor of 6AT6 (or 6BF6) sync separator and noise gate, should be tied to the junction of resistors *R605* and *R604*. These resistors are 1.2-meg and 270-k resistors in the grid circuit of the sync separator (6AV7). It is also necessary to tie the plate (pin 7) of the 1st sync tube to the junction of *R311* and *C309*. These components are a 1,800-ohm, 1-watt resistor and a 10- μ f capacitor which form a decoupling filter for the 242-volt supply that feeds the plate of the 12AV7 sync separator.

PHILCO Chassis RF-71
Preventing leakage in 6AT6.

Leakage may occur in the diode-plate section of the 6AT6 1st sync separator and noise gate tube. Changing this tube to a 6BF6 (which is practically identical to it) will eliminate this leakage. This change has already been made in the RF-71A chassis.

PHILCO Chassis RF-71
Video buzz.

Video buzz has appeared on some of the above r-f, i-f chassis. The buzz will vary with changes in signal and contrast level.

In order to correct this when it does occur, open the junction between *R401* and *R403* (12-k and 2,500-ohm resistors in the plate circuit of the 6AU6 sound i-f tube) and tie resistor *R401* to the junction of *R311*, 1,800 ohms, and capacitor

C309, 10 μ f. These two components form a decoupling filter in the 242-volt line that feeds the sync separator.

PHILCO Chassis RF-71
Replacement of contrast control.

In the event of failure of the contrast control in the above chassis, it is possible that this failure may have been brought about by excessive current in the control which can exist under certain conditions. It is therefore recommended that when replacing the contrast control, the current in the video-output tube be reduced by increasing the bias. This increase in bias may be obtained by changing the resistor located between the grid of the video-output tube and the 17-volt bias supply from 1.2 megohms to 680k ohms.

This change has been made in production after run number 10. It is suggested that this change be made in the field when sets are serviced for any reason.

PHILCO Power chassis A1, C1, C3
Removing shadow.

To remove shadow from the picture-tube screen, the following changes (made in later production runs) are made:

1. The red lead from the 2.25-henry power choke *L101* is disconnected from 100,000-ohm negative-bias voltage-divider resistor *R107*, and the junction of the 50- μ f power-supply filter capacitor *C101A*, then *L101* is connected to ground.

2. *R643*, 12,000-ohm resistor in screen circuit of horizontal-output tube, is rewired from +315 volts to the junction of *C627* (.47 μ f) and pin 3 of horizontal-yoke jack *J601*.

3. *R107*, 3.3 ohm resistor in series with the secondary of *T601* (vertical-output transformer) is removed. The black lead of the transformer is grounded.

PHILCO Power chassis A1
Reducing yoke ringing.

To reduce ringing in the horizontal circuit, the following changes (already made in production run 2) are made:

1. *C626*, .0033- μ f capacitor across the anti-ringing coil in horizontal-yoke circuit, is changed to a .004- μ f capacitor (part No. 61-0179).

2. *R644*, 470-ohm resistor across the anti-ringing coil, is changed to 330 ohms (part No. 66-1335340).

PHILCO Power chassis A1
Reducing screen voltage of 6CD6.

To reduce screen-grid voltage of the 6CD6, resistor *R643*, in the screen-grid circuit, is changed from 15,000 ohms to 27,000 ohms (part No. 66-3274340). This change is already made in production run 2.

PHILCO Power chassis A1
Reducing width-coil current.

To reduce the current flowing into the width coil, the following change (made in production run 2) is made: *C627* (.47 μ f) and *R646* (390 ohms) both connected to the horizontal-yoke jack are rewired from terminal F to terminal E of *T603*, the horizontal-output transformer.

PHILCO Power chassis A1
Improving horizontal linearity.

Horizontal linearity is improved by the following changes, already made in production run 2:

1. *C624*, .082- μ f capacitor connected to terminal A of the horizontal-output transformer, is changed to .068 μ f (part No. 45-3505-46).

2. *C619*, connected to one side of drive control, is changed from 680 μ f to 270 μ f (part No. 60-1027 5407).

PHILCO Power chassis A1
Improving horizontal-oscillator stability.

An improvement in horizontal-oscillator stability is produced by the following change, already made in production run 4; *R635*, 39,000-ohm resistor connected to one side of the horizontal-hold control, is changed to 68,000 ohms (part No. 66-3684340).

PHILCO Power chassis AP1,
C1, C3, CP1

Limiting voltage between ground and chassis.

To limit voltage between earth and chassis ground, *R110*, 100,000-ohm resistor (part No. 66-4104340) is added between the input side of *S100*, power switch, and ground. This change is already made in later production.

PHILCO Power chassis C1, C2, CP1
Improving range of height control.

To improve the range of the height control, the following change (already included in later production) is made: *R618*, connected to

one side of the height control, is changed from 680,000 ohms to 1 megohm (part No. 66-5108340).

PHILCO Power chassis C1, C3, CP1
Improving sync performance.

To improve sync performance, *R111*, connected to pin 2 of the octal power socket, is changed from 22,000 ohms to 27,000 ohms at 2 watts (part No. 66-3275340). This change has already been included in later production runs.

PHILCO Power chassis C1, C3, CP1
Improved vertical linearity and interlace.

To improve vertical linearity and interlace, the following change (already included in later production) is made: *R620*, connected to the cathode of the vertical-output tube, is changed from 3,300 ohms to 6,800 ohms (part No. 66-2688340).

PHILCO Power chassis C1, CP1
Increasing picture width.

To increase picture width, the following change (already included in later production run) is made: *C636*, connected across the width coil, is changed from .001 μ f (if used at all) to .0056 μ f (part No. 45-3505-54).

PHILCO Power chassis C1, CP1
Centering range of vertical-hold control.

To center range of vertical-hold control, the following modification (already included in later production) is made: *R615*, connected to vertical-hold control, is changed from 180,000 ohms to 270,000 ohms (part No. 66-4278340).

PHILCO Power chassis C1, CP1
Channel-5 beats with built-in antenna.

To eliminate oscillation beats on channel 5 when the built-in antenna is used, add *L609*, a 10 μ h choke (part No. 32-4112-24) in series with the damper-tube plate. This choke is already used in later production of the above chassis.

PHILCO Power chassis C1, CP1
Reducing picture bounce.

To reduce picture bounce, the following changes (already included in later production run) are made:

1. *R649* (*R647* in CP1) 560,000-ohm resistor connected to one side of height control, is removed.

2. A new *R649* (*R647* in CP1) of 18,000 ohms, is connected between the cathode of the 6BY5G damper tube and the junction of the height control and *C631* (10- μ f capacitor).

3. *R635* (*R634* in CP1), connected to one side of the horizontal-hold control, is changed from 47,000 ohms to 82,000 ohms at 1 watt (part No. 66-3828340).

4. *R634* (*R635* in CP1), connected to the other side of the horizontal-hold control, is changed from 33,000 ohms to 47,000 ohms (part No. 66-3478340).

5. *R108*, 18,000-ohm bleeder across -13 volt supply, is removed. In CP1, resistor is 15,000 ohms and it is connected across -15 volt supply.

6. *R107*, 100,000-ohm resistor (part No. 66-4108340) is added between *R100*, 10,000-ohm bias-supply voltage dividers, and pin 5 of *J101* (octal power plug). In CP1, this step not required.

7. *R108*, 150,000-ohm resistor (part No. 66-4158340) is added between pin 5 of *J101* and ground. In addition, the following steps are required in the CP1 chassis only:

8. Remove *R649*, 100,000-ohm resistor connected to red lead of vertical-output transformer.

9. *C629*, .1- μ f capacitor connected to one side of height control, is changed to 10 μ f (part No. 30-2417-19).

10. *C625*, connected to one side of the linearity control is changed from .1 μ f to .22 μ f (part No. 54-3505-49).

11. *R615*, connected to white lead of vertical blocking oscillator transformer, is changed from 180,000 ohms to 270,000 ohms (part No. 66-4278340).

PHILCO Power chassis C1
Improved sweep width.

To increase sweep width, the following changes (already included in production run 3) are made:

1. *R643*, screen-grid resistor of the horizontal-output tube, is changed from 12,000 ohms to 8,200 ohms (part No. 33-1335-108).

2. Capacitor *C636*, connected across width coil, is changed from .0033 μ f (if used at all) to a value of .0047 μ f (part No. 45-3505-56).

PHILCO Power chassis C1
Reducing line-voltage fluctuations.

To reduce line-voltage fluctuations, change *C631* from .1 μ f to 10 μ f at 475 volts (part No. 30-2417-19). This capacitor, already changed in production run 6 of the above chassis, is connected to one side of the height control.

PHILCO Power chassis C1
Low vertical deflection.

Some cases have been encountered, especially in the above chassis, where low vertical deflection is the complaint. Where such a case is encountered the first step would be to substitute for 7N7 and 6S4 tubes and noting any changes which might take place. If changing these tubes does not cure the trouble, place a scope on the grid of the 6S4 with the receiver height control set to about the center of its range. A peak-to-peak voltage of 100 volts should be measured here. If the shape of the waveform is of a low amplitude or is of improper wave shape the trouble is somewhere in the vertical oscillator stage.

Some cases have been encountered where the 1-meg resistor, in series with the height control R618, increases in value, thus lowering the voltage on the vertical-oscillator plate. This results in a decrease in output from the discharge tube. If the waveform at the grid of the 6S4 is normal, the trouble must be in the vertical-output stage or vertical-deflection coil. Check the range of voltage on the plate of a 6S4. It normally should be between 420 to 500 volts. If the plate voltage is normal, and vertical deflection is still insufficient, the trouble most likely is due to either one of two causes. The vertical-output transformer, T601, may be of low sensitivity or the vertical-deflection coil may be of low sensitivity. Since the deflection coil is easier to substitute, first change the coil for one that is known to give sufficient deflection, and observe the results. If insufficient deflection is

still apparent, change the vertical-output transformer.

It has been found that a good part of the height problem is due to low sensitivity deflection yokes. These yokes lose sensitivity because the ferrite core material has cracked for some reason in several places.

This condition may be cured by first removing the deflection yoke from the housing and then removing the metal band around the yoke. Apply pressure to both sides of the ferrite metal pieces around the yoke so that the butt ends of the pieces are as close together as possible. Apply two layers of *Scotch* tape to hold pieces in this position. Replace metal band and reinsert yoke.

PHILCO Power chassis C1
Vertical foldover
(see Fig. 55).

If vertical foldover is encountered at the bottom of the screen, in most cases it is due to the 6S4 be-

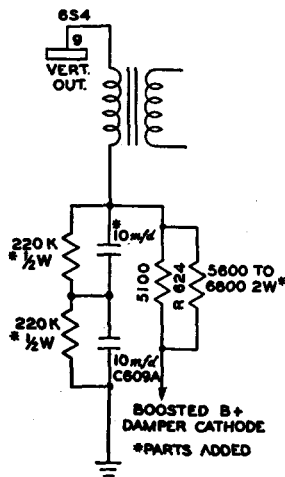


Fig. 55 — Philco

ing driven too hard so that the top portion of the input sawtooth voltage is flattened by plate saturation. A good remedy for this problem is to increase B-plus to the 6S4 by shunting the damper boost resistor *R624*, 5,100 ohms, with another resistor of from 5,600 to 6,800 ohms.

It will also be necessary to use two 10- μ f filter capacitors wired in series and to equalize the charge across them with two 220,000-ohm resistors. This is due to the fact that shunting the 5,100-ohm damper resistor increases the vertical output B-plus to very close to, or slightly above, the rated breakdown voltage of the filter capacitor (*C609A*). Putting two capacitors in series divides the voltage between them so that twice the original safety factor is effected. The resistors shunt the capacitors so as to exactly divide the B-plus voltage in half across the capacitors.

PHILCO

Power chassis C2, CP1, F2;
RF chassis 33, 35, 37, 38

Vertical-retrace suppression (see Fig. 56).

In the following discussion the procedure for installing a complete vertical-suppression circuit is discussed. It should be borne in mind very strongly that it is very desirable to incorporate these changes only when abnormal conditions make it necessary. The changes incorporate a relatively simple circuit which feeds a positive voltage in the form of a pulse from the vertical-output circuit to the picture-tube cathode (see part A of the figure). Since the pulse is positive the picture tube is cut off during the vertical-retrace

time. This makes a very effective and simple vertical-retrace circuit.

The following changes are made in power chassis C2, CP1, and F2 (see part B of the figure):

1. Connect a 3,300- μ f, 1,000-volt capacitor (part No. 30-4650-89) between unused pin 5 of the 5U4 low-voltage rectifier closest to the front of the chassis and the lug on the terminal panel (*B3-5*) which is connected to pin 9, plate of the 6S4 vertical-output tube.

2. Add a 6-inch piece of wire between pin 5 of the front 5U4, and unused pin 7 of the rear 5U4.

3. Disconnect the ground wire from pin 3 of the chassis interconnecting socket and attach the ground wire to pin 1 of the socket. If this ground wire is too short to reach pin 1 replace with wire of the proper length.

4. Add a 220,000-ohm resistor between pin 3 of the chassis interconnecting socket and pin 7 of the rear 5U4.

In addition, the following changes are made in r-f chassis 33 and 35 (see part C of the figure):

1. Disconnect yellow wire (picture-tube cathode) of the picture-tube cable from terminal strip *B8-2* and connect it to *B7-4*.

2. Place a 33,000-ohm resistor between terminal strip *B8-2* and *B7-4*.

3. Connect a 1,500- μ f, 600-volt capacitor (part No. 30-4650-53) between the terminal strip *B7-4* and ground.

4. Disconnect black wire to pin 3 of chassis interconnecting plug from terminal strip *B4-7* and connect it, adding another length of wire if necessary, to *B7-4*.

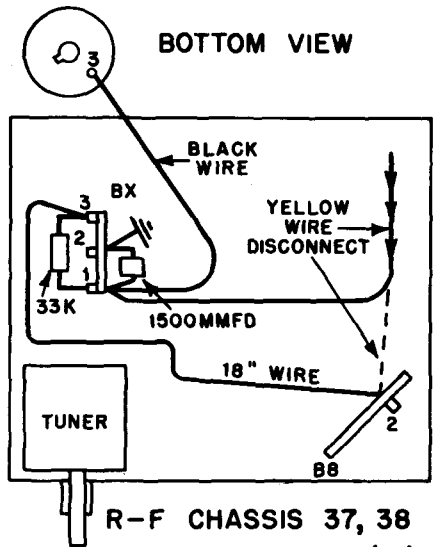
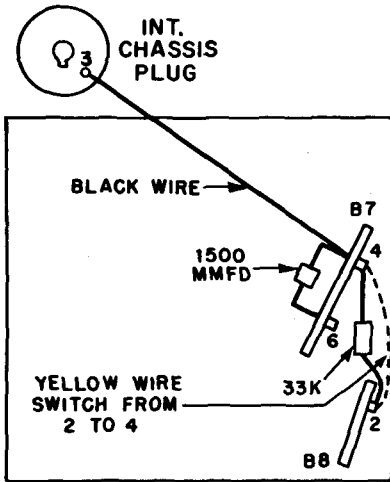
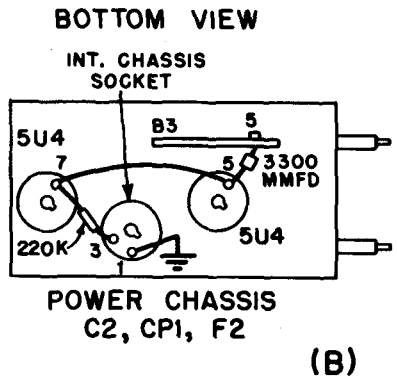
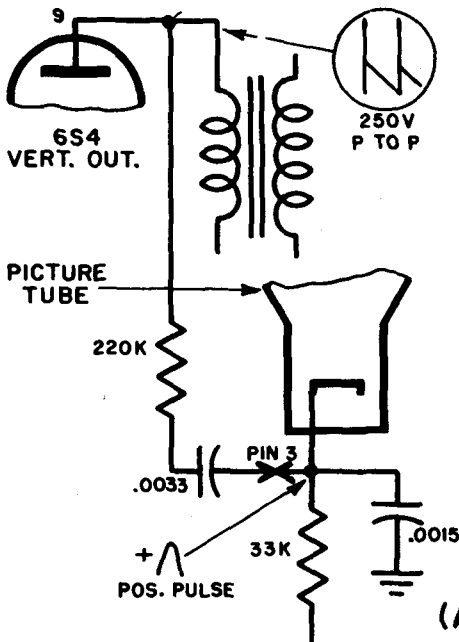


Fig. 56 — Philco

If r-f chassis 37 or 38 are used, proceed as follows (see part D of the figure):

1. Mount a 3-lug terminal panel using the existing hole behind the tuner. Locate this panel so that it is parallel to the tuner shaft. For this article the lugs are identified as *BX-1*, *BX-2*, and *BX-3* reading from front of chassis.

2. Disconnect yellow wire (picture-tube cathode) from picture-tube cable from terminal strip *B8-2* and connect to *BX-1*.

3. Attach 33,000-ohm resistor between terminal strip *BX-1* and *BX-3*.

4. Attach an 18-inch piece of wire from terminal strip *B8-2* to *BX-3*. Dress this lead around the tuner as the yellow picture-tube lead was dressed originally.

5. Connect a 1,500- μmf 600-volt capacitor (part No. 30-4650-53) between the terminal strip *BX-1* and *BX-2*. *BX-2* is the ground terminal.

6. Disconnect the black wire to pin 3 of the chassis connecting plug from terminal strip *B4-7* and connect it using an extra lead if necessary to *BX-1*.

PHILCO Power chassis C2
Improving interlace.

Interlace may be improved by making the following change, already included in production run 10 of the above chassis: *C704*, vertical-output loading capacitor connected across the secondary of the vertical-output transformer, is changed from .0033 μf to .68 μf (part No. 30-4650-46).

PHILCO Power chassis C2
Vertical foldover.

Vertical foldover may be reduced by the following: *R644*, connected to the red lead of the vertical-output transformer, is changed from 100,000 ohms to 180,000 ohms (part No. 66-4188340). This modification has already been made in production run 3.

PHILCO Power chassis D1,
D1A, D4, D4A;
RF chassis 41, 44

Vertical-retrace suppression
(see Fig. 57).

When vertical-retrace suppression is required, a positive pulse from the secondary of the vertical-output transformer may be applied to the cathode of the picture tube as shown in part (A) of the figure.

Proceed as follows in the deflection chassis (see part B of the figure):

1. Change the 3,300- μmf capacitor that is wired between pin 11 of the deflection-yoke cable socket on the high-voltage cage and ground to a .033- μmf , 400-volt capacitor (part No. 30-4650-44).

2. Attach a 17-inch wire from pin 11 of the deflection-yoke cable socket to terminal strip *B4-4* in the chassis. This panel is located near the vertical-output tube.

3. Attach a .022- μmf capacitor, part No. 30-4650-43, between terminal strip *B4-1* and *B4-4*.

4. Attach a 6 inch lead from terminal strip *B4-1* to pin 10 in chassis D1 and D1A and pin 11 in chassis D4 and D4A of the chassis interconnecting cable socket.

5. Remove 680-ohm step resistor in the vertical-charging circuit wired between terminal strip *B10-1* and *B10-2* in chassis D1 and D1A only.

Wire these two terminals together with a short lead.

6. Insert 680-ohm resistor between pin 11 of the yoke-cable socket and ground.

Note: Steps 5 and 6 of the above procedure will not be required on D1A chassis of run 8 or higher.

In addition to the above, proceed as follows in the r-f chassis (see part C of figure):

Add a wire in the interconnecting chassis cable between pin 10 (in chassis 41) or pin 11 (in chassis 44) of the plug and terminal strip B8-2 of the chassis. B8-2 is the tie point for the picture-tube cathode.

PHILCO

Power chassis C2, CP1, D1, D1A, D4, D4A, F2; RF chassis 33, 35, 37, 38, 41, 44

Vertical-retrace suppression (see Fig. 58).

In lieu of the wiring changes described under "Vertical-retrace suppression" for the above chassis, an alternate form of vertical-suppression circuit can be incorporated as follows. An external wiring assembly as shown in the figure is used. The connector provides flexibility in chassis removal.

Proceed as follows:

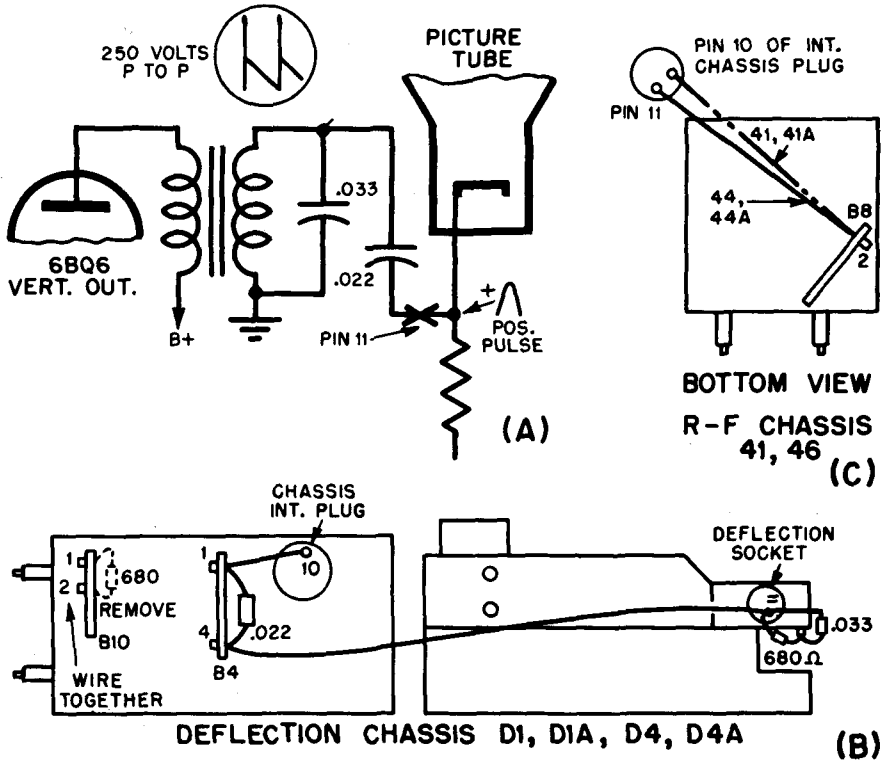


Fig. 57 — Philco

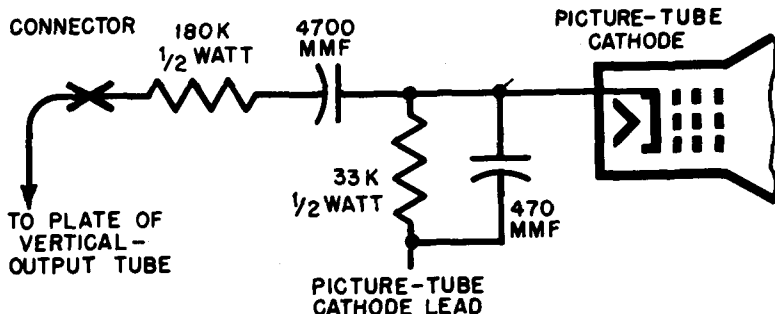
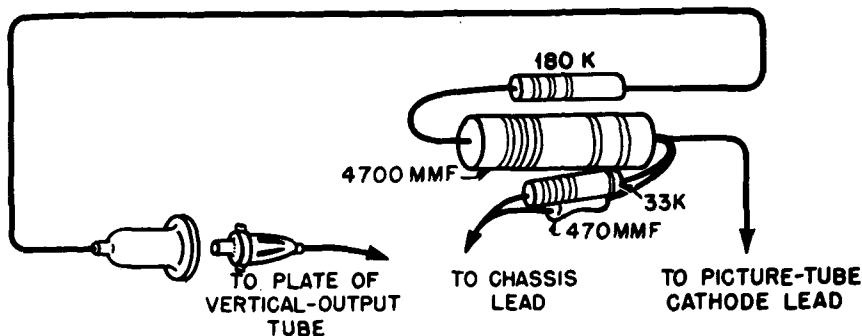


Fig. 58 — Philco

1. Cut cathode lead in picture-tube cable near socket.

2. Connect lead from large capacitor to tube end of cable.

3. Connect lead from small capacitor and resistor to set end of cable.

4. Solder red lead to plate pin of vertical-output tube. Connector (part No. 41-4060-2) permits removal of tube in chassis.

5. Dress red lead away from tubes and hot components.

PHILCO Power chassis D1, D1A, D4, D4A

Preventing parasitic oscillation.

Parasitic oscillations in the vertical-output tube are prevented by making the following change (al-

ready included in later production): a 330-ohm resistor is added in series with the grid of the vertical-output tube. The part No. is 66-1338340.

PHILCO Power chassis D1, D1A, D4, D4A

Vertical output transformer buzz (see Fig. 59).

Some cases of vertical-output transformer hum have been reported. In order to minimize the buzz in the transformer (part No. 32-8515), the peak voltage on the transformer primary and secondary can be reduced by the following expedient without any compromise in performance. This reduction in peak voltage is accomplished by removing the 680-ohm step resistor in the vertical-

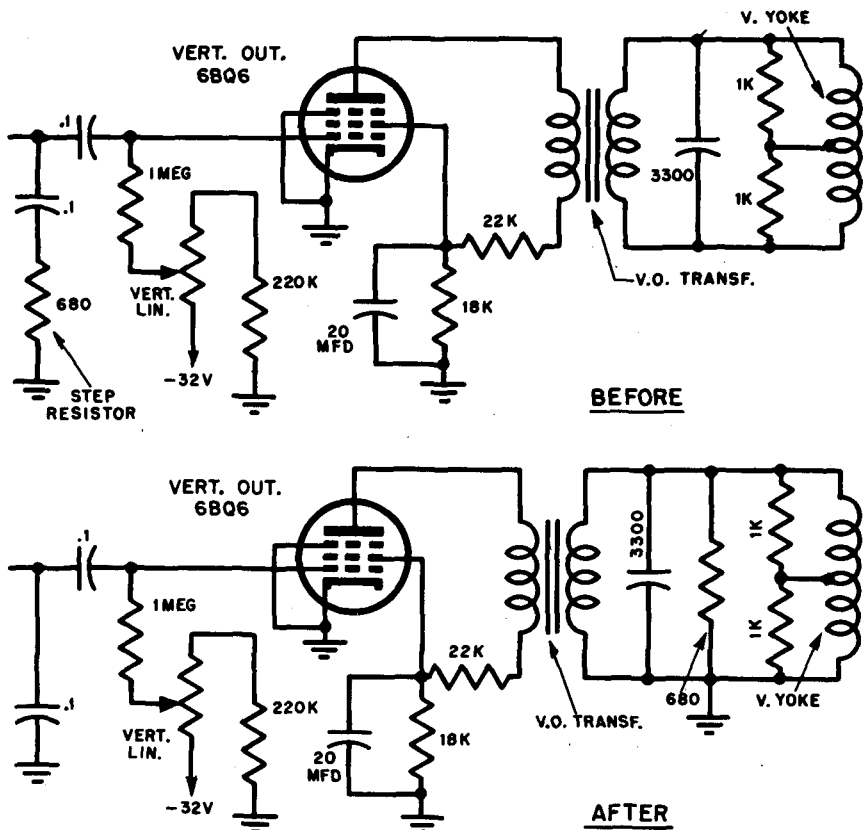


Fig. 59 — Philco

charging circuit and placing it across the vertical-output secondary. No change in vertical linearity or interlace should be noticed. However, the overall height will decrease approximately $\frac{3}{8}$ inch. This decrease may be corrected with the height control.

PHILCO

Power chassis D1, D1A

Increasing width.

Picture width may be increased by the following change, already made in production run 4; R816, horizontal-output tube screen-drop-

ping resistor, is changed from 6,500 ohms, 5 watts to 5,100 ohms, 5 watts (part No. 33-1335-18).

PHILCO Power chassis F2, FR2 Increasing picture width.

Picture width is increased by the following modification, already made in later production: C634, .0033- μ f capacitor connected across width coil, is increased to .0056 μ f (part No. 45-3505-56).

PHILCO Power chassis F2, FR2 Reducing yoke ringing.

Yoke ringing is reduced by the following changes, already made in later production:

1. *C626*, .0047- μ f capacitor across the anti-ringing coil connected to terminal D of the horizontal-output transformer, is changed to .0068 μ f (part No. 45-3505-40).

2. *L602*, 150- μ h anti-ringing coil, is changed to a 250- μ h coil (part No. 32-4480-4).

PHILCO Power chassis F2
Improving interlace.

Interlace is improved by the following modification, already made in production run 2: *R620*, 8,200-ohm resistor connected to the cathode of the vertical-output tube, is changed to 5,600 ohms (part No. 66-2568340).

PHILCO R-f chassis 3P1,
3R2, 32, 33, 34, 35
Improving picture quality.

To improve picture quality the following changes, already included in later production runs, are made:

1. *R214*, 150-ohm resistor in cathode circuit of 4th i-f stage, is changed to 180 ohms (part No. 66-1188350).

2. *R215*, 6,800-ohm resistor in plate circuit of 4th i-f stage, is changed to 5,600 ohms (part No. 66-2568343).

PHILCO R-f chassis 3P1,
3R2, 32, 33, 34, 35
Reducing oscillator beats on channel 5.

To reduce oscillator beats on channel 5, *L304*, 10- μ h choke (part No. 32-4143-18) is added in series with the 1st video grid input circuit.

This choke is inserted between the 4.5-mc trap and pin 7 of the 1st video tube. The choke is already incorporated in later production runs of the above chassis.

PHILCO R-f chassis 3P1,
3R2, 32, 33, 34, 35
Improving sync performance in strong-signal areas.

To improve sync performance in strong-signal areas, the following changes (already incorporated in later production) are made:

1. *R214*, cathode resistor of 4th i-f stage, is changed to 220 ohms (part No. 66-1224340).

2. *R606*, 240,000-ohm resistor connected to grid of the noise-gate tube, is changed to 180,000 ohms (part No. 66-4188240).

PHILCO R-f chassis 3P1
Improved tone compensation and audio quality.

To provide proper tone compensation, the following changes (already included in later production runs) are made:

1. *R408*, connected to pin 4 of volume-control socket, is changed from 15 ohms to 27 ohms (part No. 66-0273340).

2. *C411*, connected to cold side of volume control, is changed from .01 μ f to .015 μ f (part No. 45-3505-59).

To improve audio tone quality, the following changes are made:

1. *C416*, connected to hot side of volume control, is changed from .01 μ f to .0047 μ f (part No. 45-3505-56).

2. *C415*, connected across the primary of the audio-output transformer, is changed from .022 μ f to .0068 μ f (part No. 45-3505-91).

3. *C412*, coupling capacitor to the grid of the 1st audio tube, is changed from .001 μf to .0068 μf (part No. 45-3505-40).

4. *R407*, de-emphasis resistor, connected to pin 1 of the volume-control socket, is changed from 22,000 ohms to 56,000 ohms (part No. 66-3568340).

PHILCO R-f chassis 41, 44
Centering range of variable peaking coil.

The range of the variable peaking coil in the video-output plate circuit is centered by means of the following modifications, already included in later production:

1. *L302*, 1st video amplifier shunt peaking coil, is changed from 220 μh to 180 μh (part No. 32-4480-9).

2. *C308*, 1st video amplifier cathode bypass capacitor, is changed from .0047 μf to .0033 μf (part No. 30-4650-38).

PHILCO R-f chassis 41, 44
Eliminating shock hazard.

To eliminate shock hazard on the antenna, the following changes (already made in later production) are made:

1. Two 470- μmf capacitors (part No. 62-147001001) are added in series with the antenna leads of the tapered-line assembly *Z500*.

2. Two 1-megohm resistors (part No. 66-5108340) are added from the antenna leads to the chassis.

PHILCO R-f chassis 41, 44
Improving sync in fringe areas.

Synchronization can be improved in most fringe areas having a high noise level by changing the value of *R606* connected to pin 1 of

the noise-gate tube from 180,000 ohms to 240,000 ohms. Also, remove *C603* (33 μmf) from plate of noise gate to ground, and connect it in the 2nd sync separator circuit, from plate to grid return (from pin 6 of 12AU7 to junction of *R604*, 1.2 meg, and *R605*, 270k ohms).

Because of the fact that 12AV7 tubes may have slightly different plate current characteristics, changing cathode resistor *R601* from 10,000 ohms to 4,700 ohms will allow the cathode-follower circuit to function more efficiently with a greater number of 12AV7 tubes when replacement becomes necessary. Both of the above changes are already included in chassis starting with run 4.

PHILCO Models with
7F8 mixer oscillator
Motorboating.

One cause of motorboating in the models using a 7F8 tube as a mixer oscillator is low emission in one or both sections of the 7F8 tube. The trouble occurs when the receiver is first turned on. As it warms up, the motorboating increases in frequency, and finally disappears. If these symptoms are noted, first try another 7F8 tube.

It should be understood that, although low emission in the 7F8 is a common cause of motorboating, it is not the only cause.

PHILCO Models with
76-5411 tuner
Reduction of modulation hum.

Modulation hum in the reception of high-frequency channels may be reduced by adding an additional

100- μ f filament bypass capacitor (part No. 30-1224-1). This capacitor should be wired from the junction of filament chokes *L2-T* and *L4-T* to ground. Physically, the capacitor should be connected between the terminal holding the filament feed wire and the adjacent ground knockout.

With the tuner in the chassis, the parts are made accessible by simply removing about half of the snap-in coils.

PHILCO Models with 76-5411 tuner
Improving sensitivity of tuner in fringe areas (see Fig. 60).

The following modifications are limited to use under fringe-area conditions. They should not be used in moderate or strong-signal areas.

Changes can be made in the r-f amplifier section of the above tuner by increasing the Q of the grid and plate tuned circuits. This can be accomplished by removing the 3,900-ohm resistor in the grid circuit of the r-f amplifier and the 10,000-ohm resistor in the plate circuit of the r-f amplifier. See part (A) of the figure.

Recently it was found that by introducing a slight amount of regeneration in the r-f amplifier stage, additional gain of another 20 percent may be realized on the high-band channels and especially near the upper end of the high band. This regeneration can be very easily introduced by simply clipping off pin 2 of the r-f amplifier tube. Doing this introduces an impedance common to the suppressor and cathode. This common impedance is the internal cathode tie and the cathode lead. The relatively high capacitance between the plate and suppressor provides a feed-back path which causes some amount of regeneration in the r-f amplifier tube. The circuit actually takes the form of a modified Colpitts oscillator. After pin 2 is clipped off and the tube is reinserted, the tuner should be realigned to complete the modification of the r-f stage for good fringe performance. It is necessary to realign the r-f stage because introducing regeneration tends to produce a definite peak on the sound side (high-frequency side) of the response curve, therefore the r-f stage must be realigned so that the sound and video peaks are equal. It will be found that it is necessary to retune the grid and plate trimmers to give correct response. See part (B) of the figure.

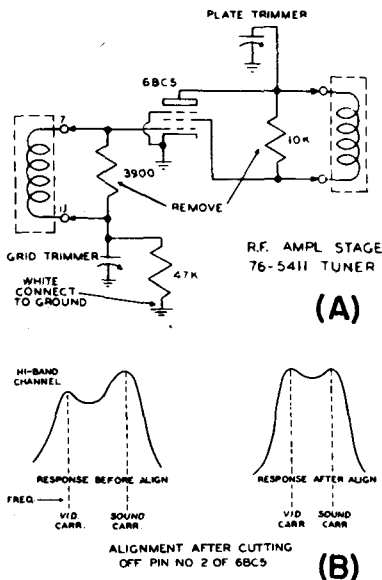


Fig. 60 — Philco

The agc system used later provides the tuner agc control voltage from the final sync separator rather than from the agc rectifier in the video circuit. The latest agc system has the advantage that it permits the receiver to operate without overloading in areas of very high signal strength. Signals of the order of .5 volt on the antenna leads will produce normal pictures without any signs of clipping or excessive contrast.

If you are servicing a receiver which suffers from either excessive snow on signals of approximately 300 microvolts or overloads on strong signals, then you will want to examine the circuit and revise the agc system to the tuner so as to correct either or both of these troubles. If the first problem is present, it is only necessary to provide the delay voltage for the tuner from the contrast control. If the second trouble is present, then it will be necessary to change the source of the tuner agc voltage as well.

The changes made on the tuner agc system are illustrated in the figures. These show the original agc circuit, the circuit with delay voltage added, and agc control voltage supplied from the final sync separator.

To make the agc changes, proceed as follows:

1. Remove 6.8-meg resistor *R604* (connected to pin 4 of octal power plug).
2. Remove wire connected from lug 2 of terminal panel *B5* to pin 6 of 12AU7 sync separator noise gate.
3. Remove connection of *R602* (15,000 ohms) at lug 2 of *B5* and

reconnect to pin 6 of 12AU7 sync separator noise gate.

4. Remove connection of wire, which feeds sync signal to sync inverter in power chassis, from lug 2 of *B5* and reconnect to pin 6 of 12AU7 sync separator noise gate.

5. Install a 1.2-meg resistor between terminals 2 and 4 of *B5*.

6. Install a 5.6-meg resistor between terminal 2 of *B5* and pin 6 of 12AU7 sync separator noise gate.

7. Remove 680-k resistor *R223* and 1.5-meg resistor *R222*. These resistors are in the agc bus and appear when the agc delay change has been incorporated (see part A of the figure). Remove wire connected from lug 3 of *B6* (3-lug terminal panel next to 4th i-f tube) and lug 8 of *B7* (8-lug terminal panel mounted next to 1st and 2nd i-f tubes).

8. Install 3.3-meg resistor between terminal 8 of *B7* and terminal 3 of the 3-lug terminal panel adjacent to tuner.

9. Install 330-k resistor between lug 4 and 8 of *B7*.

10. Install .068- μ f capacitor between lug 8 of *B7* and ground.

11. Connect agc lead (white) from tuner to lug 8 of *B7*.

12. Connect lead from lug 3 of the 3-lug terminal panel to lug 2 of *B5*.

13. Connect lead from lug 4 of *B7* to pin 6 of 6T8 tube. Install 330- μ f capacitor from pin 6 of 6T8 to a convenient ground point.

14. Replace the 470- μ f d-c blocking capacitor connected from the mixer plate coil to the 1st i-f grid, with a 100- μ f unit or add 150- μ f in series with the 470- μ f capacitor.

the B+ at this point varies in response to the agc voltage or signal level in the i-f strip, the voltage applied to the video-output tube screen grid would also vary in step with the change in B+. It has been established that this change in screen voltage actually aggravates and contributes to the "wash out" condition in areas of intermediate signal strength. At the same time that the screen voltage is changed, the control grid bias should also be increased. The control-grid bias is easily increased by changing the position of two resistors in the grid circuit. The changes are shown schematically in the figures.

"Wash out" is in many cases very similar to overload of the audio system which can be brought about simply by turning the volume control full on. In other words, "wash out" in some cases indicates that the contrast control is being advanced too far. It should therefore be kept in mind that although the changes prescribed above extends the contrast range before overload occurs, there must necessarily be some signal level at which overload will be inevitable.

In some chassis employing the above tuner it is possible that with very strong signals applied to the antenna, "wash out" will occur when the contrast control is only about $\frac{3}{4}$ toward its maximum clockwise position. In these cases you may wish to modify the agc control system to the tuner so that the signal delivered to the video-output stage is maintained more nearly constant. In areas of extremely high signal level it is also necessary to reduce the

time constant in the grid of the first common i-f stage. This is done by reducing the value of the 470- $\mu\mu\text{f}$ capacitor from the plate of the mixer to the grid of the first i-f amplifier down to 100 $\mu\mu\text{f}$ and connecting a 40- μh choke across the grid resistor of the first i-f stage.

Proceed as follows:

1. Shunt the 5,600-ohm resistor in the plate circuit of the 1st video stage with a 12k-ohm, 1-watt carbon resistor.

2. Remove connection from pin 6 (screen) of 6AQ5 socket. Connect the two wires together, solder, and insulate with spaghetti tubing or insulating tape.

3. Connect new length of wire from capacitor lug C303A to pin 6 of 6AQ5 socket.

4. Interchange resistors R306 and R307; that is, the 1.8-meg resistor will now connect from pin 7 to lug 1 of terminal panel B2 and the 1.2-meg resistor will connect from pin 1 to lug 4 of terminal panel B2.

PHILCO

All 10-, 12-,
16-inch models

Extension cables.

To greatly facilitate service-bench work, picture-tube and deflection-yoke extension cables may be prefabricated from the following accessory parts:

1. Deflection plug and cable assembly, part No. 41-3860-6. Octal socket and cable, part No. 41-3777.

2. Picture-tube cable and socket assembly, part No. 41-3772. Picture-tube plug, part No. 54-4571-1.

This cable is approximately 28 inches long.

PHILCO

1950 models
with built-in antenna

Reducing harmonic beat
(see Fig. 63).

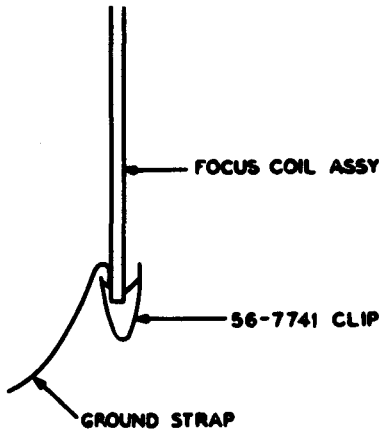


Fig. 63 — Philco

To reduce harmonic beat in models having a built-in antenna, it is important that the picture-tube mounting-frame assembly be grounded to the chassis. This grounding is accomplished by means of a flat metal strap.

In case this strap is broken, it may be repaired by the use of a clip, part No. 56-7741, as shown in the accompanying diagram. When it is necessary to replace the entire strap, the following strap assemblies are available: 3 $\frac{3}{4}$ -inch strap, part No. 76-5472 and 6-inch strap, part No. 76-5472-1.

PHILCO

1951 models

Variable agc and noise-gate
voltages for fringe areas
(see Fig. 64).

Tests have shown that manual control of the agc voltage will have

beneficial effects in some fringe-area work. The control consists of a 500,000-ohm potentiometer connected from the agc test point on the align test jack to ground. Rotating this control varies the agc voltage applied to the i-f and r-f system. This increases the gain of the entire system and gives a blacker picture; it also helps in clipping noise in the i-f system.

The practical limits for reducing the agc voltage in the i-f strip is at the point where sync clipping starts to occur. Part (A) of the figure shows a simplified circuit of the manual agc control.

The variable control has an advantage over the regular Fringe-Normal kit 45-1732 in locations where signal level and noise conditions vary over relatively short periods of time.

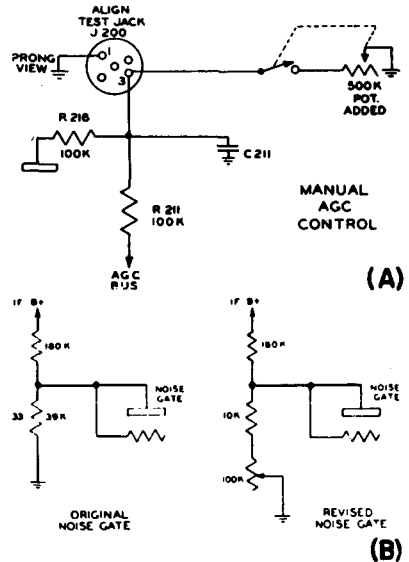


Fig. 64 — Philco

Under conditions of heavy noise, as would be experienced in some fringe areas, it is advantageous to be able to manually control the bias on the noise-gate diode, thus controlling the clipping level of the tube. A circuit to accomplish this is shown in part (B) of the figure. The 39,000-ohm resistor is replaced by a 10,000-ohm resistor in series with a 100,000-ohm potentiometer.

The supreme effort to get useful television reception in noisy, low-signal areas, after taking all other steps, would be the use of manual controls of both the agc and noise-gate clipping voltage.

In order to simplify mounting and usage of the potentiometers, a dual unit may be used. It is part No. 33-5563-5 which contains a 1-meg section and a 100-k section. While these values are not those specified above they will do the job satisfactorily. The 1-meg section is used in place of the 500-k value shown in part (A) and the 100-k section as shown in part (B).

The dual control does not contain a switch, however, in most fringe areas there is no practical use for a switch since the 1-meg resistance is sufficiently high to cause very little loading of the agc line. The dual control arrangement will also prove valuable for troubleshooting some receivers having sync-clipping problems, since the control affords a manual means of adjusting the agc bias and also the clipping level of the noise-gate tube.

PHILCO 1951 models
Snow reduction in fringe areas.

One of the major complaints in fringe-area reception is the annoying

effect of snow. The changes listed below are intended to reduce the effective amount of snow content. They should only be used in areas where the received signal is of such a constant low level that it produces a picture in which the picture content is barely discernible.

1. Decrease of video - amplifier bandwidth.

- a. Increase the resistance value of the 1st video plate-load resistor (*R303*, 2,700 ohms) to 4,700 ohms.
- b. Increase the resistance value of the video-output plate-load resistor (*R311*, 1,800 or 2,200 ohms) to 2,900 ohms.

These changes increase the amount of video gain (effective receiver sensitivity), and cause the snow to smear, because of reduced high-frequency response.

2. Elimination of interlace.

Introduction of a portion of the horizontal component into the vertical-sweep system causes poor interlace. In this case, the horizontal scanning lines are apparently farther apart. Thus there is less tendency for the "snow flakes" to overlap in adjacent lines. Snow in adjacent lines tends to coincide, and the viewer apparently sees fewer snow particles.

Poor interlace (pairing) can be obtained by feeding voltage from the horizontal-drive padder through a 47- μmf coupling capacitor to the control grid of the vertical-oscillator tube. In some models, because of tube and component tolerance, it may be necessary to connect a 500,000-ohm resistor in series with

the vertical-hold control, in order to set this control properly to its correct range.

Note: The above changes should be made only in areas where the received signal is very weak and the picture content is so heavily masked with snow that it is barely distinguishable. In areas where the signal is good enough to produce a picture with some details, the above changes are not advisable. Also, in areas where television reception includes several stations with varying degrees of signal strength, the changes are not advisable. In fringe areas where the signal on one particular channel may vary considerably, due to weather, time of day, season of year, etc., the changes are not advisable.

PHILCO 1952 models
Increasing range of brightness control.

It has been reported that there are some objections to the above chassis concerning the inability to cut off the picture-tube beam current at minimum brightness settings. In some cases the brightness circuit range is not sufficient to completely remove the picture at the minimum brightness position of the control.

In order to increase the brightness control range the 82-k resistor, *R313* (voltage-divider resistor in the picture-tube cathode), is reduced to a 68-k resistor, part No. 66-3684346. When this resistor is decreased in value a slight decrease in light output at maximum brilliance is noted. To regain this loss, the 120-k resistor, *R314*, in the picture-tube cathode is reduced to 100-k, part No. 66-4108346.

The above change increases the brightness-control range to provide no light loss at maximum setting and yet cut off the picture-tube current in the minimum setting.

PHILCO All models
Intermittent receivers.

In many cases, when an intermittent receiver is removed from the cabinet the receiver will work normally for an indefinite period because it operates at lower temperature outside the cabinet.

The temperature encountered in the cabinet may be duplicated by placing a 250-watt heat lamp near the underside of the chassis.

PHILCO All models
Vertical white line in picture.

A vertical white line may appear on the left half of the picture. This line usually appears on one channel and is not apparent on the others. It is very often present on programs relayed by cable and disappears on local programs. This type of white line can be differentiated from the lines caused by ringing in the damper circuit, because the vertical white line can be made to move by turning the horizontal-hold control. The line has a jagged appearance, due to modulation by noise. In addition, the white line is apparent only when one particular channel is being received.

This effect has been traced to overshoot in the sync pulses sent out by the transmitter. During retrace, the sharp overshoot spike causes the picture tube to unblank at the point corresponding to the position of the white line.

Since the sharp spike represents a very high-frequency component, the effects of this spike (the vertical white line) will be noticed only in receivers having a relatively good high-frequency response, and for that reason, cannot be seen on most test oscilloscopes. Since this trouble originates in the transmitter, the effect will be seen on the monitor at the station. This trouble should be corrected at the station if at all possible.

At the receiver, the effects of the overshoot can be minimized by degrading the video high-frequency response. This can be accomplished by connecting a small capacitor between the picture-tube grid and ground. The smallest value of capacitance that will do the job should be used, since too large a value will produce objectionable smear.

PHILCO All models
Elimination of shadow
(see Fig. 65).

Listed below is a compilation of things to check for elimination of shadow:

1. Proper adjustment of the beam bender. The following are the types of beam benders encountered and their mechanical preset positions.

a. Type A has two ring magnets and is placed on the neck of the picture tube with the smallest ring magnet toward the face of the tube. The arrow appearing on frame of the assembly must point to the anode connector.

b. Type B has two bar magnets and is placed on the neck of the picture tube with the brac-

ket colored blue toward the face of the tube. The magnets will locate either adjacent to or opposite to the anode connector, depending on which is found to give maximum brilliance.

c. Type C has a single bar magnet and is placed on the neck of the picture tube with the part number toward the tube base and the magnet on the side of tube opposite the anode connector.

d. Type D has a single bar magnet and is placed on the neck of the picture tube with the arrow located on the frame of the assembly pointing to the anode connector.

e. Type E has a single bar magnet and is placed on the neck of the picture tube adjacent to the anode connector. The arrow appearing on the magnet support bracket must point to the anode connector.

f. Type F has a bar magnet and a ring magnet and is placed on the neck of the picture tube with the ring magnet toward the face of the tube. The bar magnet must appear on the side of the tube opposite the anode connector.

Note: On picture tubes using metal shells and having no anode connector, the location between pins 3 and 4 on the tube base is the equivalent reference point.

2. Examine the deflection yoke to make sure it is concentric with the neck of the tube and pushed as close to the bell of the picture tube as

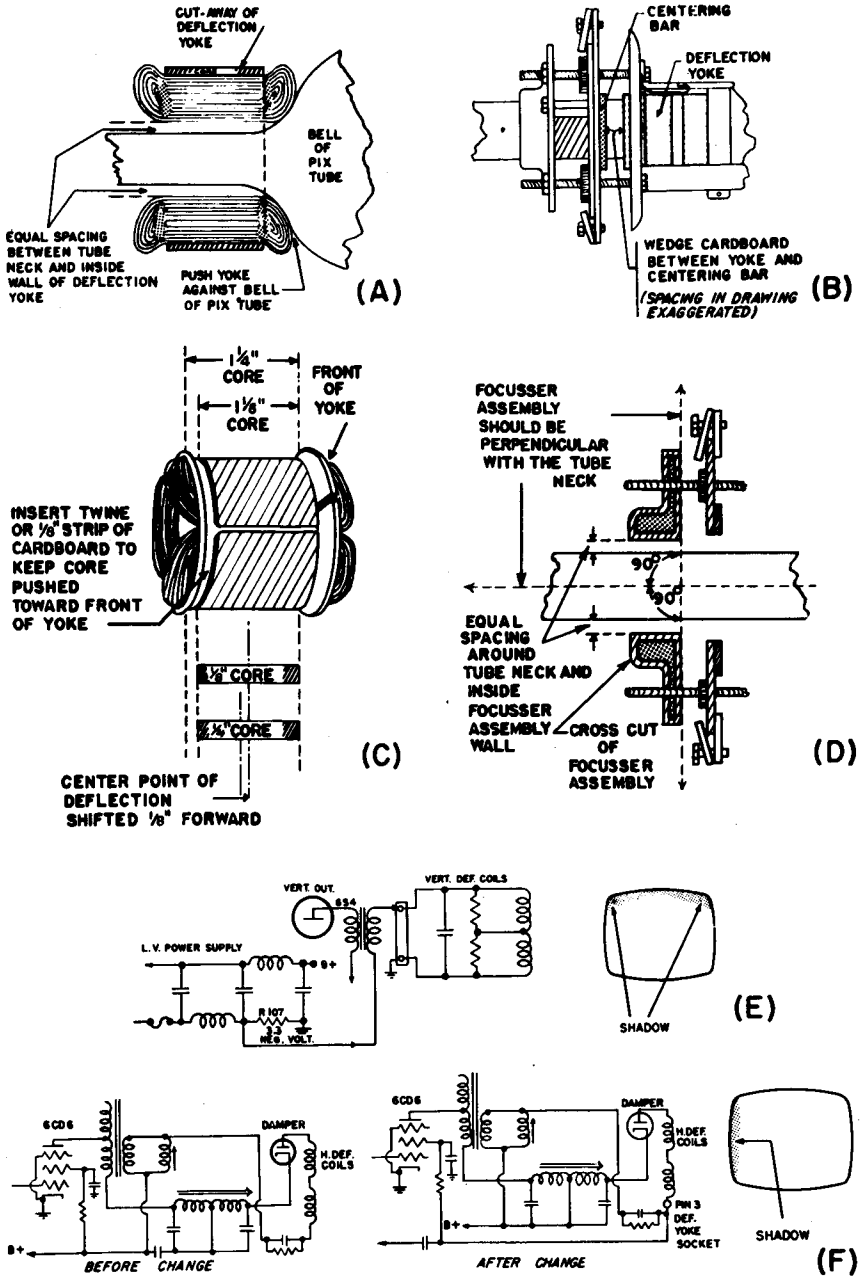


Fig. 65 — Philco

possible. See part (A) of the figure. Inserting cardboard wedges between the back of the deflection yoke and centering bar will prevent any tendency for the yoke to spring back away from the bell. It may even be necessary to remove the rubber bumpers to allow the yoke to move closer to the bell of the picture tube. See part (B) of the figure.

3. In deflection yokes that use a $1\frac{1}{4}$ -inch length core around the windings, replacing it with a $1\frac{1}{8}$ -inch core and placing a spacer between the back of the core and fiber collar will move the center of deflection and decrease the possibility of the beam striking the sides of the tube neck. See part (C) of the figure.

4. Examine the focus assembly to see that it is concentric and adjusted to 90 degrees with the axis of the tube neck. See part (D) of figure.

5. If shadow appears in pair of upper or lower corners, it may be possible to correct shadow by introducing a small amount of current in the vertical-deflection coil. As shown in part (E) of the drawing, a slight negative voltage appearing across *R107* is placed in series with the secondary winding of the vertical transformer.

6. If shadow appears on the left-hand side of picture, the raster can be shifted to the left by removing the bottom end of the 6CD6 screen resistor from B-plus and connecting it to the bottom end of the horizontal deflection coil (pin 3). In certain models, this change has been made in production. Therefore, if the raster needs shifting to the right, the bottom end of the screen resistor is removed from pin 3 of the horizontal-deflection yoke and tied directly to B-plus. The change in the circuit is given in part (F) of the figure.



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