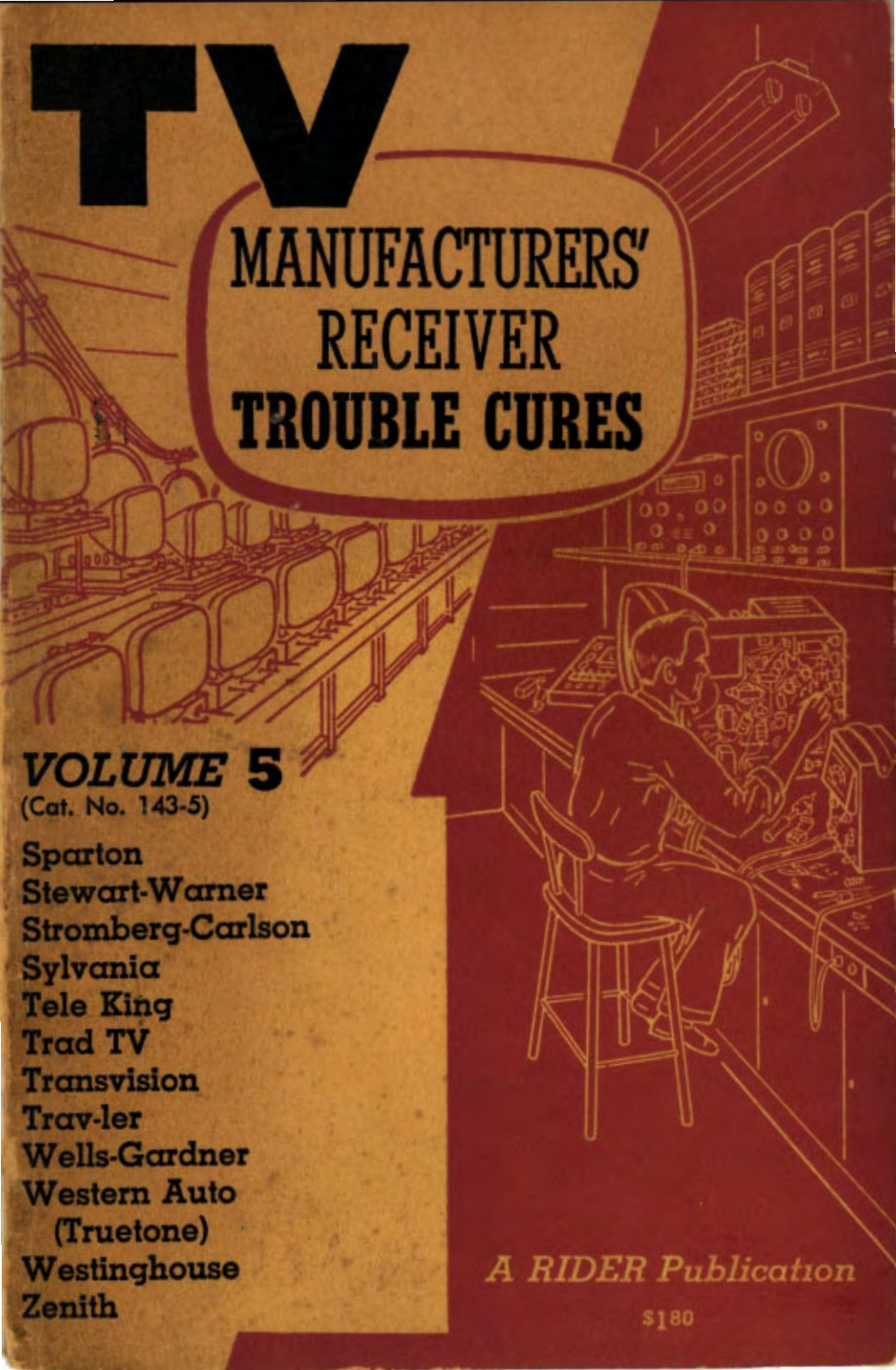
TV

MANUFACTURERS' RECEIVER TROUBLE CURES



VOLUME 5

(Cat. No. 143-5)

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TV MANUFACTURERS' RECEIVER TROUBLE CURES

VOLUME 5

Edited by
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PREFACE

This is the fifth in a series of volumes which deals with specific tv receiver troubles and their cures. These trouble cures are the tv manufacturers' own 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 of 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 this volume.

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 this volume contains 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 effecting the cure. In all cases where components are identified, the manufacturer's own circuit symbol number 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.

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.

SPARTON	TRANSVISION
STEWART-WARNER	TRAV-LER TV
STROMBERG-CARLSON	WELLS-GARDNER
SYLVANIA	WESTERN AUTO (TRUETONE)
TELE KING	WESTINGHOUSE
TRAD TV	ZENITH

March, 1954

Milton S. Snitzer

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SPARTON Chassis 19TS10, 19TS10A, 19TW10, 19TW10A

Reducing hum in final audio stage (see Fig. 1).

To reduce objectionable hum introduced in the final audio stage through common coupling with the video amplifier, sync separator, and sync amplifier, a decoupling network has been devised in the +140 volt line feeding these points. A sectional schematic diagram of the video i-f circuit, showing *V7*, 6AU6 video amplifier, and its associated components is provided here showing all of the circuit revisions. The nature of the change is as follows:

The original schematic diagram issued for these models shows that *V7*, *V12*, and *V13A* plates and screens were supplied directly from the +140 volt line. The revised schematic shows that the +140 volt supply for these tubes as specified above is now fed through the new network of resistor *R43* (820 ohms) and capacitor *C69C* (10 μf at 200 volt electrolytic). Resistor *R40* (470k ohms), in series with the brightness control *R41*, should be hooked into the +140 volt line at a point ahead of *R43* as shown on the sectional schematic.

Note: The cathode of *V9* remains connected to pin 6 of *V7* through

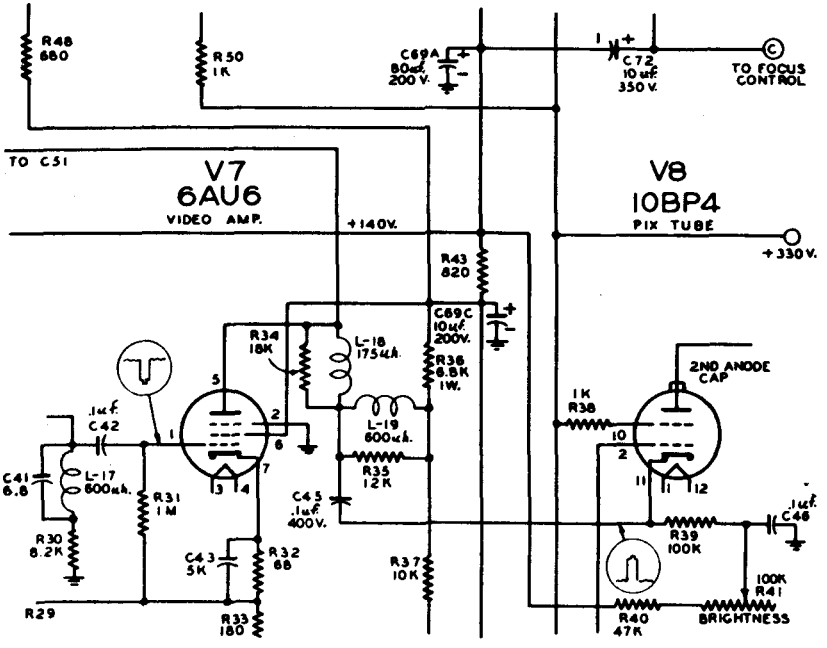


Fig. 1 — Sparton

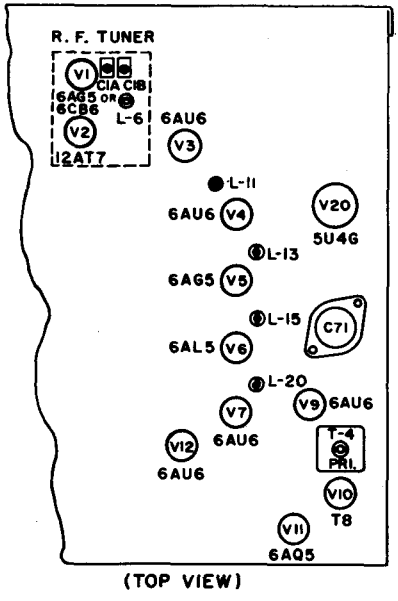


Fig. 2 — Sparton

R48. When this change is made, the 4-point terminal strip on the receiver chassis should be replaced with a 5-point strip to provide the additional tie point needed. *C69C*, the 10-μf, 200-v capacitor, is an additional section in the original *C69A* and *C69B* filter.

To effect the change follow this procedure:

1. Disconnect and remove the 4-point terminal strip already in the set.
2. Add the new 5-point terminal strip, part No. PB40200-36.
3. Add *R43* (820 ohms, ½ w), part No. BR12S-821.
4. Disconnect and remove the old *C69* filter (two section).
5. Add a new *C69* filter (three section), part No. PA4307-15.

SPARTON Chassis 19TS10, 19TS10A, 19TW10, 19TW10A

Picture i-f instability (see Fig. 2).

If the picture i-f strip is badly out of alignment, it may become unstable and fall into oscillation. When this condition occurs, a comparatively large voltage is developed across the picture detector load resistor. This voltage is independent of i-f signal input at the converter grid.

It is usually possible to stop i-f oscillation due to misalignment by adjusting the iron cores in the various picture i-f coils and traps according to the information given below:

L6 slug in (maximum inductance)
L11 slug out
L13 slug in
L15 slug out

The actual physical location of the various coils and traps is shown in the figure. As soon as the oscillation has been stopped, continue with the alignment as outlined in the service notes.

SPARTON Chassis 23TC10, 23TD10

Additional sync amplification (see Fig. 3).

Additional sync amplification and improved receiver performance can be provided for all models using the above chassis by following the step-by-step procedure outlined below. The sectional schematic diagram shown incorporates all circuit changes. These modifications can be affected in approximately 15 minutes after the chassis has been placed on the service bench.

On the sync amplifier V11 (12AU7):

1. Disconnect *R53* (100 k), *R52* (1 meg), and *C47* (.05 μf) from pin 8.

2. Connect the 1N34 crystal diode (cathode end) to *R52*, *R53*, and *C47*.

3. Move ground from pin 7 to pin 8.

4. Move *C48* (22 μμf) from pin 6 to pin 7.

5. Remove *R54* (47 k) from pin 6.

6. Use new *R83* (4.7 k) from pin 7 to ground.

7. Connect anode end of 1N34 crystal diode to pin 7.

8. Replace *R48* (1 meg) from pin 6 to +135 volt line with new *R48* (4.7 k).

9. Move *R115* (22 k) from pin 1 to pin 3.

On the horizontal afc rectifier V16 (6AL5):

10. Interchange *C100* and *C101* capacitor leads on pins 5 and 7.

New parts required:

1. 1N34 germanium crystal diode (part No. PA4206).

2. 4.7-k, ½-watt resistor (part No. BR12S-472).

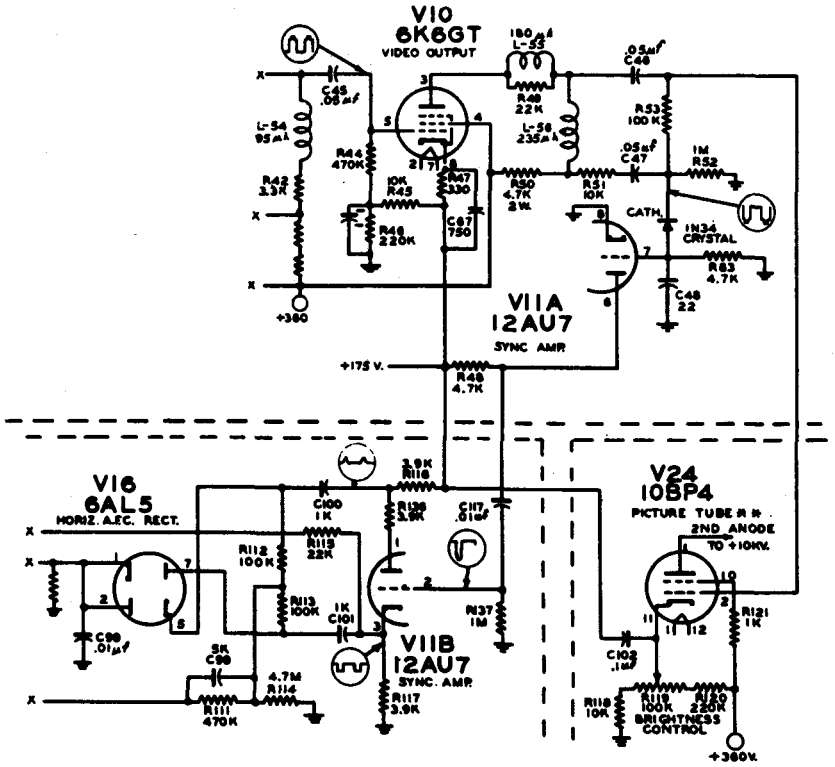


Fig. 3 — Sparton

SPARTON Chassis 24TB10, 24TM10, 24TR10

Adjustment of i-f wave trap.

The above chassis are equipped with an i-f wave trap when shipped from the factory. This unit was primarily designed to reduce or eliminate interference of the sound i-f frequencies that may be picked up by the antenna and feeders. Without the trap this interference (of a strong nature) would pass through the tuner into the sound i-f circuits resulting in garbled sound. This trap is assembled in a unit with the antenna terminal strip and is mounted on the cabinet side panel. The trap is composed of inductance *L71* and *L72* with trimmers *C27A* and *C27B* as shown in the schematic diagram.

The trimmers for this trap have been pre-adjusted to 21.75 mc at the factory and normally should not be disturbed in the field. However, on rare occasions, it may be more beneficial to readjust this trap for minimum interference after the receiver has been installed for the customer. Once disturbed, the serviceman may experience difficulty in readjusting this trap to 21.75 mc if he uses an unbalanced generator (single ended) such as he may have on the job. This adjustment is to be made by reversing the generator connections for each side of the trap. Failure to change connections will result in improper adjustment of the trimmers. The signal generator should be connected to the trap terminals (Ant. Terminals) through a resistor network simulating the impedance of the transmission line used. With a voltmeter on the sound i-f avc bus, the generator input should be sufficient to give an adequate deflection on the meter. Adjust the "high side" trimmer for minimum deflection on the meter. Reverse the generator connections and adjust the other trimmer for minimum deflection on meter.

SPARTON Chassis 24TL10

Field service on yoke coils.

Several of these chassis were shipped which had the yoke coil windings reversed internally by the vendor. Due to coil construction, it is next to impossible to identify reversed windings other than by actual operating conditions. Naturally, in order to make the yoke coil function properly while being tested in production and to prevent the picture from being inverted on the tube face, the yoke coil feeder connections in the receiver chassis had to be reversed to compensate for this error. This does not in any way affect the receiver performance and, unless one of these sets should develop yoke coil defects, this cross hookup will go unnoticed.

The following code was set up and yoke coils were marked while on test to establish their identity. In all cases where internal coil hookups have deviated from the standard, a suffix letter has been added to the part number PC70003, which is stamped on the outer shell of each coil.

When part number PC70003 is followed by suffix letters A, B, or C the designation is as follows:

PC70003 Windings conform to print and schematic hookup.

PC70003A Both vertical and horizontal windings reversed internally.

PC70003B Horizontal winding only reversed internally.

PC70003C Vertical winding only reversed internally.

When a yoke coil is stamped with part No. PC70003 only (no suffix letter), the application should conform with the schematic diagram for these models.

When a yoke coil is stamped with part No. PC70003A, the vertical and horizontal windings are reversed internally and, in using this coil for service replacement, must be connected as follows:

Horizontal Winding

1. The yellow lead wire from the yoke coil must be connected to *L52*, feed choke coil.

2. The brown lead wire from the yoke coil must be connected to *C84*, .06-μf capacitor.

3. Capacitor *C83*, 68-$\mu\mu$f unit on the coil, must be connected between terminals 2 and 3 on the yoke coil.

Vertical Windings

1. The green lead wire from the yoke coil must be connected with the yellow lead wire of the vertical output transformer (to ground).

2. The white lead wire from the yoke coil must be connected to the green lead of the vertical output transformer with *C92*, 1-μf capacitor.

When the coil is stamped with part No. PC70003B, the horizontal winding only is reversed internally. In using this coil for service replacement, it must be connected as follows:

1. The yellow lead wire from the yoke coil must be connected to *L52*, feed choke coil.

2. The brown lead wire from the yoke coil must be connected to *C84*, .06-μf capacitor.

3. Capacitor *C83*, 68-$\mu\mu$f unit on yoke coil, must be connected between terminals 2 and 3 on the yoke.

4. Hookup the vertical winding as per schematic diagram.

When a yoke coil is stamped with part No. PC70003C, the vertical winding only is reversed internally and must be hooked up as follows:

1. The green lead wire from the yoke coil must be connected with the yellow lead wire of the vertical output transformer (to ground).

2. The white lead wire from the yoke coil must be connected to the green lead wire of the vertical output transformer with *C92*, .1-μf capacitor.

3. Hookup horizontal windings as per schematic diagram.

Note: Should the serviceman encounter yoke trouble in the above chassis, he should refer to the part number stamped on the replacement yoke coil and the service application or hookup as described above.

SPARTON All chassis

Replacement of safety glass.

The safety glass in all receivers is specifically designed to withstand picture tube implosion and passes all of the requirements of the Underwriters Laboratories. Glass specifications may vary with picture tube size and its laminated construction may be twice as heavy as ordinary safety glass used in automobiles. Broken safety glass must be replaced with glass as supplied and approved by the manufacturer of the receiver.

SPARTON All chassis

Construction of interference trap.

An interference trap may be constructed of a piece of 300-ohm transmission line, shorted on one end to serve as a half-wave length shorting stub. Cut a piece of line slightly longer than given in the following table, and connect the two leads at one end to the receiver antenna terminals.

Channel Number Shorted	*Half-Wave Shorted Channel Trap*
2	84″
3	78″
4	70″
5	61″
6	53″
7	25″
8	24″
9	24″
10	23″
11	22″
12	22″
13	21″

Using diagonal cutters or a razor blade, "short"across the transmission line at a place slightly longer than the calculated length. Care should be taken when shorting the line to cut through the plastic covering only; do not cut the conductors. If the interference is not trapped out, short the line in ⅛-inch intervals (working toward the terminals) until the critical point is reached. Cut the transmission line and place a carbon resistor across the line. The resistor should be approximately 60 ohms. For strong interference, it may be necessary to drop the resistance to 20 ohms, and for weak interference it may be possible to use a 150-ohm resistor. Do not use any lower value resistor than necessary to minimize the interference.

If the interference frequency is not that of a television station, the line may be cut and the leads shorted together without using the resistor. Generally, this will completely eliminate the interference frequency.

If the interference frequency being eliminated or trapped-out is that of some other television station operating in the vicinity, the interfering frequency will also be eliminated or attenuated on its own channel. If the interference frequency is so strong that it cannot be attenuated enough using a resistor across the line, it will be necessary to install a double-pole, single-throw switch on one of the trap leads, so that the channel trap can be opened when the receiver is switched to this channel.

If the interference frequency is known, the transmission line can be cut by using the following formula:

Half-wave shorting stub in inches $= \frac{4841}{\text{freq. (mc)}}$

STEWART-WARNER

Models 9120-,9121-9122-series

Improved horizontal linearity.

On certain 26-tube chassis, it was sometimes difficult to obtain correct horizontal linearity through the adjustment of the horizontal linearity, horizontal drive, and width controls.

When such cases are encountered, it is suggested that *C280* in the re-

turn lead of the horizontal output transformer be changed from .1μf to .25 μf.

STEWART-WARNER

9120-, 9121-, 9125-series

Improving sync stability.

This change, already included in Series D of the above models, is made to improve vertical and horizontal sync stability.

1. Resistor *R351* (1,800 ohms) is added in plate circuit of *V17B* (12AU7) phase splitter. The junction of resistor *R246* (1,800 ohms) and capacitor *C247* (1,000 $\mu\mu$f) was formerly connected directly to pin 6 of this tube.

2. Resistor *R258* in plate circuit of *V19* (6SN7GT) horizontal scanning multivibrator stage, is changed from 5,600 ohms to 3,900 ohms.

3. Fuse *F343* (1 amp, 250 volt) is added between red and yellow lead of power transformer *T291* and chassis ground.

STEWART-WARNER

Models 9120-,9121-, 9125-series

Reducing tube noise level and improving picture quality.

This change, already included in Series E of the above models, is made to decrease tube noise level and improve picture quality.

1. Resistor *R161* in the cathode circuit of *V7* (1st i-f amplifier) is changed from 82 ohms to 270 ohms.

2. Resistor *R176* in grid circuit of *V9* (6AU6), 3rd i-f amplifier stage, is changed from 4,700 ohms to 8,200 ohms.

3. Resistor *R183* in plate circuit of *V9* (6AU6), 3rd i-f amplifier stage, is changed from 8,200 ohms to 6,800 ohms.

4. Resistor *R196* in plate circuit of *V11A* (6AL5), detector stage, is changed from 6,800 ohms to 4,700 ohms.

In addition, the alignment frequency of the converter plate coil and 2nd i-f coil is changed from 26.3 mc to 26.1 mc.

STEWART-WARNER

Models 9120-,9121-, 9125-series

Reducing ringing of horizontal output transformer and yoke.

In order to reduce the "ringing effect" of the horizontal sweep transformer and deflection yoke, which appears as white (or black) vertical lines on left side of picture screen, the following change, already included in Series F of these models, is undertaken.

1. Trap coil *L354* is added in series with yoke lead.

2. Capacitor *C355* (.003 μf) is placed in shunt across coil *L354*.

3. Resistor *R356* (680 ohms) is placed in shunt across coil *L354*.

STEWART-WARNER

Models 9120-,9121-, 9125-series

Limiting picture-tube beam current.

The following change, already included in Series F of this model, is made to limit picture-tube beam current. The connection to pin 10 of tube *V15* (16TP4 or 16RP4), picture tube, is changed from the 415 B+ boost voltage bus to the 340 B+ bus.

STEWART-WARNER Models 9122-series

Eliminating component resonance.

This change, already made in Series E of the above models, is incorporated to eliminate possible component resonance in the i-f frequency range and to provide a more uniform overall response curve on all channels. Capacitor *C309* in filament supply circuit of the r-f tuner is changed from 220 $\mu\mu$f to 1,000 $\mu\mu$f.

STEWART-WARNER Models 9122-series

Eliminating horizontal instability due to insufficient sync modulation.

This change, already made in Series F of the above models, is in incorporated to eliminate horizontal instability due to insufficient sync modulation (less than 20%) of the transmitted signal. Resistor *R*243 in grid circuit of tube *V17A* (½ 12AU7), sync clipper, is changed from 270,000 ohms to 560,000 ohms.

STEWART-WARNER Models 9122-series

Eliminating possibility of damper tube arcing.

This change, already made in Series G of the above models, is incorporated to eliminate the possibility of arcing between the cathode and heater of *V22* (6W4GT), horizontal damping tube. Power transformer *T291* is changed to include a separate filament winding for tube *V22* (6W4GT). Pin 7 of this tube is disconnected from the regular 6.3-volt filament string, and pin 8 is removed from ground. These heater pins are then connected to the blue filament leads of the new transformer, part No. 509679. Cathode pin 3 of *V22* (6W4GT) is also connected to one side of the filament winding.

STEWART-WARNER Models 9126-series

Improving signal-to-noise ratio in low signal areas.

This change, already made in Series C of the above models, is incorporated to improve the signal-to-noise ratio in low signal areas.

1. I-f trap coil *L160*, part No. 509056, was formerly located in the cathode circuit of tube *V7* (6AU6), 1st i-f amplifier stage. It is replaced with a new coil, part No. 520341 and relocated in the plate circuit of this tube. The physical location of the coil on the chassis remains the same.

2. Resistor *R161* in cathode circuit of tube *V7* (6AU6), 1st i-f amplifier stage, is changed from 270 ohms to 82 ohms. The end of the resistor which formerly was connected to trap coil *L*160, is now connected to chassis ground.

3. Capacitor *C162*, across trap coil *L160*, is changed from 240 $\mu\mu$f to 22 $\mu\mu$f.

4. Resistor *R370* (15,000 ohms) is added across trap coil *L160*.

5. Capacitor *C369* (2.2 μf) is added from plate pin 6 of tube *V7* (6AU6) 1st i-f amplifier to one side of trap coil *L160*, capacitor *C162*, and resistor *R370*. The other end of these latter components are connected to chassis ground.

6. Resistor *R371* (3.3 meg) is added from the agc line to the 120-volt B+ supply.

7. Resistor *R372* (3.3 meg) is added from the grid, pin 1, of tube *V16* (6AU6), keyer agc stage to the 260-volt B+ supply.

8. When replacement of trap coil *L160* is undertaken as outlined in the foregoing change, it will be necessary to realign the i-f stages of the receiver. The alignment frequency of trap coil *L*160 remains the same, 22.4 mc, but the alignment frequency of the 4th i-f coil *L*192, changes from 24.75 mc to 24.9 mc.

STEWART-WARNER Models 9127-series

Picture centering without neck shadow.

If it is impossible to center the picture on the above series receiver without producing neck shadow, apply the following circuit modifications. This change is already incorporated in 9127 models which include the letter "C" in the series coding.

1. Disconnect the yellow lead of focus coil socket from 340-v B+ supply and reconnect it to the red lead coming from pin 7 of the deflection yoke socket.

2. Disconnect 12,000-ohm, 2-watt resistor, *R363*, in screen circuit of horizontal output tube from 340-v B+ supply and reconnect it to red lead coming from pin 7 of the deflection yoke.

STEWART-WARNER Models 9200, 9202, 9203, 9204, 9209, 9210, 9211

Improved video response.

It is possible to improve the picture quality further on the above models by utilizing the peaking coils listed below. Whenever it becomes necessary to replace a peaking coil on any one of these receivers it is suggested that the latest type be incorporated. Model 9202 receivers which contain the letter "N" in the "Series" coding, Model 9210 receivers which contain the letter "G" in the "Series" coding, and Model 9211 receivers which contain the letter "E" in the "Series" coding, already utilize these particular coils.

CIRCUIT NO.	PART NO.
L121	520620
L122	520985
L129	520689
L132	509342

STEWART-WARNER Models 9200-, 9202-series

Horizontal multivibrator squeal.

During the warm-up period immediately after the receiver was turned on, certain receivers emitted a high pitched squeal. This condition can be overcome by incorporating the following circuit changes:

1. Change capacitor *C174* in plate circuit of 6SN7GT, horizontal scanning multivibrator, from 470 $\mu\mu$f to 390 $\mu\mu$f.

2. Change resistor *R177* in plate circuit of 6SN7GT, horizontal scanning multivibrator, 330,000 ohms to 680,000 ohms.

3. Change resistor *R235* in plate circuit of 6SN7GT, horizontal scanning multivibrator, from 3,900 ohms to 3,300 ohms.

4. Add 270,000 ohm, 10%, ½-watt resistor from pin 5 of 6SN7GT,

horizontal scanning multivibrator, to 315 volt B+ supply.

STEWART-WARNER Models 9200-, 9202-series

H-v transformer fuse blowout.

Under certain conditions, cumulative effects developed in the horizontal scanning multivibrator stage caused a momentary surge current in the plate circuit of the 6BQ6GT output tube which would blow the protective fuse *F191*. This condition was only existent during the warm-up period of the receiver and can be corrected by applying those four changes indicated under "Horizontal multivibrator squeal" for this model.

STEWART-WARNER Models 9200-series

Improved vertical hold.

In weak signal areas, or in locations adversely affected by external electrical interference, it is possible to improve the vertical sync stability on the above series receivers by making the following modifications:

1. Change resistor *R160* in plate circuit of phase splitter tube 12AU7 from 3,300 ohms to 6,800 ohms.
2. Change resistor *R219* in plate circuit of phase splitter tube 12AU7 from 56,000 ohms to 27,000 ohms.

STEWART-WARNER Models 9200-series

Centering range of horizontal hold control.

The following change, already made in Series A of the above receivers, is incorporated to allow the horizontal hold coil to operate in the center of its range. Capacitor *C174* in horizontal multivibrator circuit (tube *V14*) is changed from 330 $\mu\mu$f to 470 $\mu\mu$f.

STEWART-WARNER Models 9200-series

Increasing vertical scanning output.

The following changes, already included in Series B of the above receivers, are incorporated to increase vertical scanning output:

1. *V19* tube is changed from a 6SN7GT to a 6BL7GT. These tubes are directly interchangeable.
2. The moveable arm of the vertical linearity potentiometer is disconnected from ground, and resistor *R246* (680 ohms) is added from this point to ground.

STEWART-WARNER Models 9200-series

Improved interlace and vertical linearity.

The following changes, already made in Series A of the above models, are incorporated to improve interlace and vertical linearity.

1. Resistor *R219* in grid circuit of tube *V19A* (vertical blocking oscillator) is changed from 22,000 ohms to 56,000 ohms. Its connection point is changed from the junction of resistors *R160* and *R161* to pin 6 of tube *V12* (phase splitter).
2. Resistor *R223* in grid circuit of tube *V19A* (vertical blocking oscillator) is changed from 1.5 meg to 1.8 meg.
3. Resistor *R226* in grid circuit of tube *V19A* (vertical blocking oscillator) is changed from 6.8 meg to 4.7 meg. This resistor is disconnect-

ed from the red lead of the vertical blocking oscillator transformer *T221* and reconnected to the 315-volt supply.

4. Capacitor *C241* (.25 μf) is connected across the secondary of the vertical output transformer.

STEWART-WARNER Models 9200-series

Preventing sound i-f regeneration.

In order to eliminate the possibility of regeneration in the sound i-f amplifier and to minimize the effect of intercarrier amplitude modulation, the following changes, already made in Series A of the above models, are undertaken:

1. Sound i-f transformer *T12* is relocated closer to tube *V1* (sound i-f amp.).

2. Terminal 1 of sound i-f transformer *T12* is disconnected from ground and reconnected to the junction of capacitor *C11* (2.2 μμf) and capacitor *C13* (47 μμf).

3. Terminal 4 of sound i-f transformer *T12* is disconnected from the junction of capacitor *C11* (2.2 μμf) and capacitor *C13* (47 μμf) and reconnected to pin 2 of tube *V1* (sound i-f amplifier).

4. Resistor *R238* (18,000 ohms) is placed in parallel with sound i-f transformer *T12*. One end of this resistor is connected to terminal 1 of the transformer while the other end is connected directly to pin 2 of tube *V1* (sound i-f amplifier).

5. Capacitor *C242* (5,000 μμf) is placed in parallel with resistor *R15* (82 ohms). One end of the capacitor is connected to pin 7 of tube *V1* (sound i-f amplifier), while the other end is connected to pin 2 of the same tube.

6. Resistor *R243* (680 ohms) is added between pin 2 of tube *V1* (sound i-f amplifier) and 140-volt supply.

7. Resistor *R19* in plate circuit of tube *V1* (sound i-f amplifier) is changed from 1,000 ohms to 4,700 ohms.

8. Capacitor *C21* in tv sound discriminator circuit is changed from 220 μμf to 1,500 μμf.

9. Resistor *R244* (220 ohms) is added between terminal 6 of tv sound discriminator transformer *T20* and junction of capacitor *C21* (1,500 μμf) and resistor *R22* (22,000 ohms).

10. Resistor *R245* (220 ohms) is added between pin 1 of tube *V2* (sound discriminator, sound amplifier) and terminal 3 of tv sound discriminator transformer *T20*.

STEWART-WARNER Models 9202-, 9203-series

Improved sensitivity and sync stability (see Fig. 4).

It is possible to improve sensitivity and sync stability on the above receivers by incorporating the changes listed below. Model 9202 receivers coded "Series E" and model 9203 receivers coded "Series C" already contain this modification. The circuit diagram of Fig. 4 includes these changes:

1. Replace all 6AU6 i-f amplifier tubes with 6CB6 tubes.

2. Connect socket pin 7 to ground for each of the three i-f tubes. (This is the suppressor pin on the 6CB6 tube.)

3. Remove 2.2-μμf capacitor *C239* from grid circuit of 1st i-f stage.

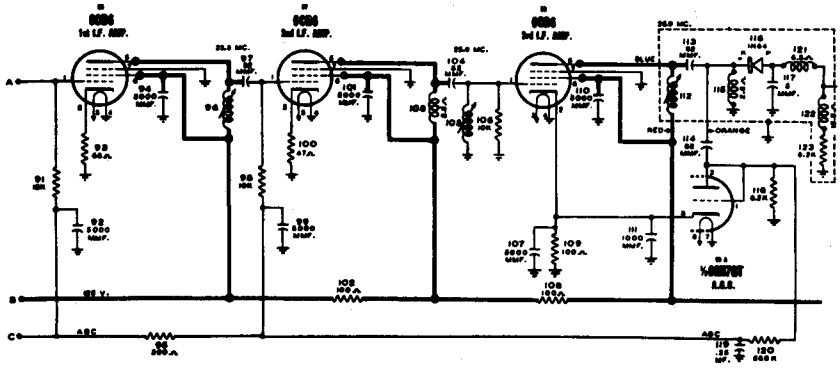


Fig. 4 — Stewart-Warner

4. Change 1st i-f grid resistor *R91* from 8,200 ohms to 12,000 ohms.

5. Change 1st i-f cathode resistor *R93* from 47 ohms to 68 ohms; connect it from pin 2 to ground.

6. Change 2nd i-f grid resistor *R98* from 8,200 ohms to 10,000 ohms.

7. Change 2nd i-f cathode resistor *R100* from 82 ohms to 47 ohms. Connect it from pin 2 to ground.

8. Change 3rd i-f grid resistor *R106* from 12,000 ohms to 10,000 ohms.

9. Change agc load resistor *R118* from 47,000 ohms to 8,200 ohms.

10. All components previously connected to pin 7 of the 3rd i-f tube should now be connected to pin 2.

11. Realign all i-f stages to new frequencies:

Converter plate	23.5 mc
1st i-f	23.5 mc
2nd i-f	25.9 mc
3rd i-f	25.9 mc

STEWART-WARNER Models 9132, 9210-series

Replacement of mask.

During the course of production on the above models, the design of the mask was altered to reduce the electrostatic discharge from the face of the picture tube to the glass window. The depth of the mask was increased, which resulted in the picture tube being placed further back on the chassis. Therefore, it is exceedingly important to determine the type of mask used on these receivers before replacement is attempted.

1. Model 21T-9210A receivers, coded "Series B" and Model 9132-A receivers coded "Series A" incorporate the deeper mask, part No. 520834-A. If the chassis coding does not include the letters indicated above, the shallow mask, part No. 520475-B is used.

2. Model 21C-9210C receivers coded "Series B" utilize the deeper mask, part No. 520833-A. If the chassis coding does not include the letter indicated above, the shallow mask, part No. 520495-B, is used.

STEWART-WARNER

1951 19-tube and 26-tube Models

Vertical drift.

In some cases, it has been found that the picture will start to roll vertically shortly after the receiver has been placed in operation. Although this condition can be corrected by adjustment of the vertical hold control, vertical roll can be encountered once more when the receiver is again initially turned on. This has been found to be due to a change in value of certain resistors in the vertical circuit. Once the faulty resistor or resistors have been isolated, they should be replaced with correct value and tolerance resistors as indicated in the applicable parts list. Use Allen-Bradley or I.R.C. resistors as replacements.

Indicated below are those resistors affected, as well as the part number of the resistor already in the chassis and the part number of the resistor to be used as a replacement.

STEWART-WARNER

1951, 1952 19-tube Models

Increased fringe area sync stability (see Fig. 5).

The following circuit changes should be incorporated in all 19-tube models that are being operated in extreme fringe areas. These changes will result in greatly improved sync stability under conditions of weak signal. *Do not* make those modifications on chassis located in *strong* or *moderate* signal areas.

1. Add a 10-meg, ½-watt resistor from pin 4 of the 6SN7GT sync amplifier tube to 140-volt B+. (This resistor is already included in some chassis.)
2. Disconnect pin 6 of the 6AC7 video amplifier from 140-v B+ and insert an 8,200-ohm, 1-watt resistor.
3. Add a 12,000-ohm, 1-watt resistor from pin 6 of the 6AC7 video amplifier to chassis ground.
4. Add a .25-uf, 200-volt capacitor from pin 6 of the 6AC7 video amplifier tube to ground.

ALL 19-TUBE CHASSIS

RESISTOR NO.	VALUE	PART NO.	REPLACE WITH
R223	2 meg, 5%, ½ w	510765	510769
R225	100,000 ohms, 10%, ½ w	510172	510766
R226	4.7 meg, 10%, ½ w	510759	510768
R227	1.5 meg, 5%, ½ w	510752	510767

ALL 26-TUBE CHASSIS

RESISTOR NO.	VALUE	PART NO.	REPLACE WITH
R320	1.5 meg, 5%, ½ w	510721	510767
R322	100,000 ohms, 10%, ½ w	510172	510766
R323	6.8 meg, 20%, ½ w	510196	510771
R324	1.2 meg, 10%, ½ w	510738	510770

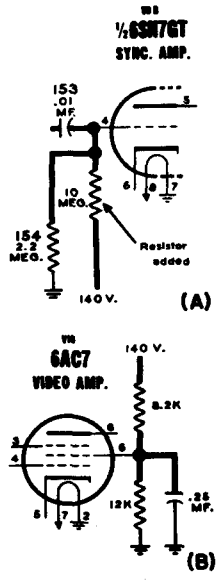


Fig. 5 — Stewart-Warner

STEWART-WARNER

1951 19-tube Models

Installation of adjacent-channel sound trap (see Fig. 6).

Adjacent-channel sound trap, part No. 520131, comprising a slug tuned coil and fixed ceramic capacitor, was designed to minimize interference caused by the sound carrier of the lower frequency adjacent channel.

When required, the adjacent-channel sound trap is to be added to the screen circuit of tube *V6* (6AU6), 1st i-f amplifier; this can be accomplished by following the procedure outlined below:

1. Mount the trap coil in the hole located adjacent and to the left of tube *V6* (6AU6), 1st i-f amplifier. The coil must be inserted from the underside of the chassis and pushed through the hole until the mounting clip snaps into position.

2. Disconnect resistor *R102* (100 ohms) from pin 6 of tube *V6* (6AU6), 1st i-f amplifier.

3. Carefully remove capacitor *C94* (5,000 $\mu\mu$f) from pin 6 of tube *V6* (6AU6), 1st i-f amplifier, as well as chassis ground connection.

4. Disconnect the B+ terminal of 1st i-f coil *L96* from pin 6 of tube *V6* (6AU6), 1st i-f amplifier.

5. Connect one terminal of the trap coil directly to pin 6 of tube *V6* (6AU6), 1st i-f amplifirr.

6. Connect other terminal of trap coil to the terminal of 1st i-f coil *L96*, which was disconnected in step 4.

7. Connect open end of resistor *R102* (100 ohms) to the junction of 1st i-f coil *L96* and trap coil.

8. Connect capacitor *C94* (5,000 $\mu\mu$f) removed in Step 3, by wiring one end to the junction of 1st i-f coil *L96* and resistor *R174*. The other end of this capacitor should be grounded at a point close to the 1st i-f coil.

The circuit diagram shows this sound trap wired into the receiver circuit.

After installing the adjacent-channel sound trap in the proper manner, it will be necessary to make the following adjustments:

1. Rotate the slug counter clockwise until stem of slug is out as far as possible.

2. Properly tune receiver for a normal picture by using fine tuning control on front panel of receiver. Do not touch this control during the rest of the adjustment procedure.

3. Connect a standard signal generator through a 330-$\mu\mu$f capacitor to

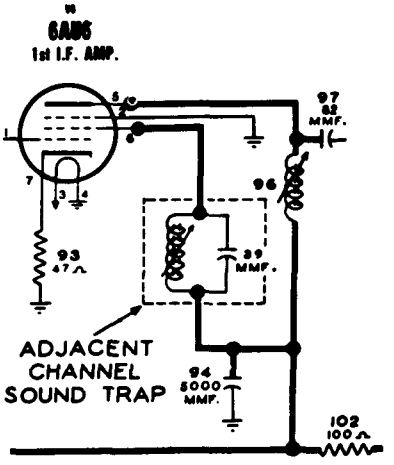


Fig. 6 — Stewart-Warner

point *Q* on the r-f tuner and a vtvm to the green lead coming from the crystal detector shield can.

4. Set the signal generator accurately to 28.25 mc.

5. Adjust adjacent channel sound trap slug for *minimum* reading on the vtvm.

6. With a normal picture and a properly tuned receiver, a slight readjustment of the adjacent-channel sound-trap coil slug may be necessary in weak signal areas to further minimize sound interference as viewed on the screen.

STEWART-WARNER

1951 26-tube Models

Improved sensitivity and sync stability (see Fig. 7).

Sensitivity and sync stability on the 1951 26-tube chassis can be improved by incorporating the changes indicated below. This modification is already incorporated in Model 9126 receivers coded "Series C."

1. Remove sound-trap coil *L160* and 240-$\mu\mu$f capacitor *C162* from cathode circuit of 1st i-f amplifier tube, 6AU6.

2. Change resistor *R161* in cathode circuit of 1st i-f amplifier tube, 6AU6, from 270 ohms to 82 ohms and connect it to ground.

3. Connect new trap coil assembly, part No. 520220, into plate circuit of 1st i-f amplifier tube, 6AU6, as shown in circuit. Insert the new trap coil in the hole previously occupied by the old coil.

4. Connect 3.3-meg, ½-watt resistor from pin 1 to pin 6 of keyer agc tube, 6AU6 (6AG5 on chassis coded "Series A").

5. Connect 3.3-meg, ½-watt resistor between agc line and 120 volt B+ supply.

6. The new trap coil should be aligned to the old trap frequency of 22.4 mc.

7. After completing this conversion, the 4th i-f stage should be changed in frequency from 24.75 mc to 24.9 mc.

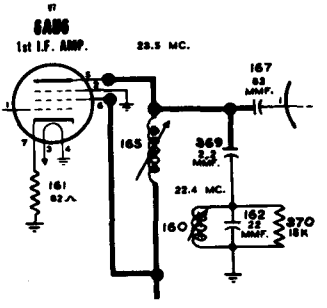


Fig. 7 — Stewart-Warner

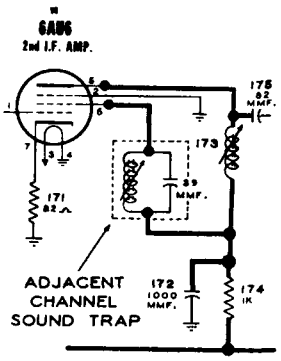


Fig.8 — Stewart-Warner

STEWART-WARNER

1951 26-tube Models

Installation of adjacent-channel sound trap (see Fig. 8).

Adjacent-channel sound trap, part No. 520131, comprising a slug-tuned coil and fixed ceramic capacitor, was designed to minimize interference caused by the sound carrier of the lower frequency adjacent channel.

When required, the adjacent-channel sound trap is to be added in the screen circuit of tube *V8* (6AU6), 2nd i-f amplifier. This can be accomplished by following the procedure outlined below:

1. Mount the trap coil in the hole located directly in front of tube *V9* (6AU6), 3rd i-f amplifier. The coil must be inserted from the underside of the chassis and pushed through the hole until the mounting clip snaps into position.

2. Disconnect resistor R*174* (1,000 ohms) from pin 6 of tube *V8* (6AU6), 2nd i-f amplifier.

3. Carefully disconnect capacitor *C172* (1,000 $\mu\mu$f) from pin 6 of tube *V*8 (6AU6), 2nd i-f amplifier, and from chassis ground.

4. Disconnect the 2nd i-f coil *L173* from pin 6 of tube *V8* (6AU6), 2nd i-f amplifier.

5. Connect one terminal of the trap coil directly to pin 6 of tube *V8* (6AU6), 2nd i-f amplifier.

6. Connect other terminal of the trap coil to the terminal of 2nd i-f coil *L173* which was disconnected in Step 4.

7. Connect open end of resistor *R174* (1,000 ohms) to the junction of 2nd i-f coil *L173* and trap coil.

8. Connect capacitor *C*172 (1,000 $\mu\mu$f) removed in step 3, by wiring one end to the junction of 2nd i-f coil *L173* and resistor *R174.* The other end of the capacitor should be grounded at a point close to the 2nd i-f coil.

The circuit diagram shows this sound trap wired into the receiver circuit.

After installing the adjacent-channel sound trap in the proper manner, it will be necessary to make the following adjustments:

1. Rotate the slug until stem of slug is out as far as possible.

2. Properly tune receiver for a normal picture by using fine tuning control on front panel. Do not touch this control during the rest of the adjustment procedure.

3. Connect a standard signal generator through a 330-$\mu\mu$f capacitor to point *Q* on the r-f tuner and connect a vtvm across the diode load resistor *R196.*

4. Set the signal generator accurately to 28.25 mc.

5. Adjust adjacent-channel sound trap slug for *minimum* reading on the vtvm.

6. With a normal picture and a properly tuned receiver, a slight re-

adjustment of adjacent-channel sound-trap slug may be necessary in weak signal areas to further minimize sound interference as viewed on the screen.

Note: To incorporate this modification into 9103, 9104, 9105, 9106, and 9108 series receivers, it will be necessary to drill the 5/16-inch trap coil mounting hole in the chassis pan.

STEWART-WARNER

1952 26-tube Models

Critical horizontal hold.

Many cases of critical horizontal hold have been found to be due to an increase in the value of the 3,900-ohm resistor *R258* in the plate circuit of the 6SN7GT horizontal multivibrator tube. This is a ½-watt, 10% tolerance resistor and, in the event that its ohmic value should increase considerably, the horizontal hold action of the receiver will be critical. The 270-k resistor *R263*, in the plate circuit of the other triode section of the 6SN7GT horizontal multivibrator will also contribute to this condition if its value should increase. Check both these resistors when this fault is encountered.

STEWART-WARNER

19-tube Models with 6CB6 i-f tubes

Installation of adjacent-channel sound trap (see Fig. 9).

Adjacent-channel sound trap, part No. 520638, comprising a slug tuned coil and two fixed capacitors was designed to minimize interference caused by the sound carrier of the lower frequency adjacent channel.

When required, the adjacent-channel sound trap is to be added to the plate circuit of tube *V7* (6CB6), 2nd i-f amplifier; this can be accomplished by following the procedure outlined below:

1. Mount the trap coil in the hole located directly in front of tube *V8* (6CB6), 3rd i-f amplifier. The coil must be inserted from the under side of the chassis and pushed through the hole until the mounting clip snaps into position.

2. Connect open end of 2.2-$\mu\mu$f capacitor to pin 5 of tube *V7* (6CB6), 2nd i-f amplifier.

3. Connect the junction of the 22-$\mu\mu$f capacitor and the coil to chassis ground.

The circuit diagram printed here shows the sound trap wired into the receiver circuit.

After installing the adjacent-channel sound trap in the proper manner, it will be necessary to make the following adjustments:

1. Rotate the slug counterclockwise until stem of slug is out as far as possible.

2. Properly tune receiver for a normal picture by using fine tuning control on front panel of receiver. Do not touch this control during the rest of the adjustment procedure.

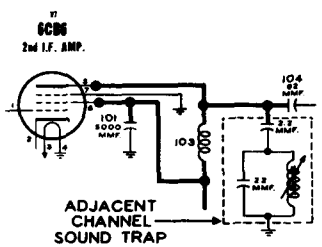


Fig. 9 — Stewart-Warner

3. Solder a pigtail to the tube shield of *V5* (mixer-oscillator). Lift this shield so that it is not grounded to chassis, but do not remove it from tube.

4. Connect a standard signal generator to the pigtail and a vtvm to the green lead coming from the crystal detector shield can.

5. Set the signal generator accurately to 27.4 mc.

6. Adjust adjacent-channel sound trap slug for *minimum* reading on the vtvm.

7. With a normal picture and a properly tuned receiver, a slight readjustment of adjacent-channel sound trap coil slug may be necessary in weak signal areas to further minimize sound interference as viewed on the screen.

STEWART-WARNER

21-inch Models

Dark spot at center of picture tube.

On certain of the 21-inch receivers, a round dark spot, approximately 4-inches in diameter, appears on the center of the picture tube screen. This has sometimes been erroneously analyzed as being an ion burn. Actually, this dark spot is due to the fact that the picture tube is too close to the safety glass. An electrostatic discharge to the glass reduces the high voltage on the picture tube in a small area, and the dark spot results.

To remedy this situation, loosen the chassis mounting bolts and slide the chassis back as far as it will go. If there is any question in your mind that this spot might be an ion burn, remove the chassis from the cabinet and note whether or not the dark spot appears.

STEWART-WARNER All models

Reduction of intercarrier buzz (see Fig. 10).

If a prominent humming or buzzing sound is noted in the sound reception of a television broadcast, it may be due to a fault in transmission from the station, or incorrect adjustment of the discriminator transformer (tuning of secondary circuit) in the receiver.

This type of disturbance, which is only present when receiving a station signal, is known as "intercarrier buzz" and should not be confused with power supply hum that would occur upon failure of a filter condenser.

When intercarrier buzz is objectionable, first be sure that the receiver has been properly tuned to

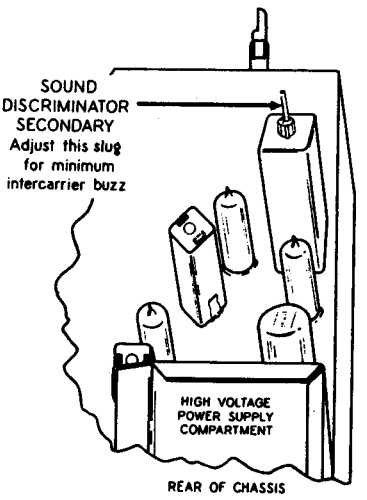


Fig. 10 — Stewart-Warner

the station. If intercarrier buzz is still too prominent, then it is advisable to check the adjustment of the sound discriminator secondary slug. This slug is accessible from the top of the chassis (see figure for slug location in a typical model).

As the slug is rotated approximately one-half turn in either direction, a "dip" point in the buzzing sound will be noted. At this position program sound will be clear and free from distortion, and buzz should be at an acceptable minimum if station transmission is not at fault.

STEWART-WARNER All models
Corona and arcing.

Corona or arc-over can best be detected by observing the operation of the power supply in a dark room. Several conditions may cause these phenomena.

Arcing or corona may be due to poorly soldered connections (rosin joints or sharp points), or defective tube socket connections. If the leads or connectors to the high-voltage filter capacitor do not grasp this component securely, arcing will also result.

Inspect solder connections and resolder these points which are unsatisfactory. Make sure tubes are firmly positioned in tube sockets and that high-voltage filter capacitor is held securely in place.

Arcing or corona may occur when h-v components or leads are placed too close together. Make sure there is sufficient spacing between all parts and wiring. If necessary, the insulation between two elements of the circuit may be improved by coating both objects with a quick-drying liquid polystyrene or polyethylene.

The socket assembly for the rectifier tube may include a corona ring, which prevents corona from the tube socket connections. The surface of this ring should be smooth and free of scratches or sharp protrusions.

STROMBERG-CARLSON
Models 16-,17-,116-series
Improved vertical hold control.

The action of the vertical hold control can be "stiffened" by inserting a 10,000-ohm, ½-watt resistor across the secondary (plate winding) of *T2*, blocking oscillator transformer. This resistor dampens out ringing which might interfere with proper synchronization. Later receiver models were modified accordingly.

STROMBERG-CARLSON
Models 16-,116-,119-series
Replacement of r-f amplifier tubes.

The tube used in the r-f amplifier position in the low-band section of the tuner in some cases, may be a 6CB6 type (part No. 162092) and in other cases be a 6BH6 type (part No. 162073), and yet the tube label on the receiver may specify the opposite type. Disregard tube labels and service notes when replacing these r-f amplifier tubes and make the replacement with an identical type to the one removed.

The performance of tuners aligned with one tube type in this r-f position would be affected by direct substitution of the other type because of different interelectrode capacitance of these two tube types.

STROMBERG-CARLSON

Models 16-,116-series

Increased frequency stability of the horizontal oscillator.

The *R59* resistor in series with the B+ supply lead to pin 5 of the 6SN7GT (*V2*) horizontal sweep oscillator tube is increased from 2,200 ohms, 1 watt to 8,200 ohms, 1 watt (part No. 37200). This increased value lowers the voltage on pin 5 about 50—75 volts with increased stability of this oscillator section. Also, 8,200-ohm, 2-watt resistors (part No. 149054) or 10,000-ohm, 2-watt resistors (part No. 149276) are permissible substitutions in this position. This change has already been made in later production runs.

STROMBERG-CARLSON

Models 16-series

Preventing breakdown of h-v resistors.

The 116-series receivers employ four special 680,000-ohm resistors in series in the voltage doubler section of the h-v supply. These resistors are located on a terminal board between the 1X2 tubes. The 16-series receivers only employed three of these resistors in series and some field failures have been reported where corona has burned and discolored the body of the top resistor and increased the actual resistance value to a point where the brightness control causes excessive picture blooming.

When servicing 16-series receivers for this reason, it is recommended that four instead of three of these special 680,000-ohm, 2,000-volt type BTAV resistors (part No. 149368) be used to reduce the stress on each resistor and to minimize possible recurrence of this failure.

STROMBERG-CARLSON

Models 17-,116-,119-series

Smoothing the tuning dial action.

Jumpy or sticky operation of the tuning dial is often traceable to roughness in the slotted tracks of the upright portions of the tuner unit, and to greater tension than necessary on the two flat springs in this same location. This condition has been corrected in factory production; field cases can be remedied by inserting a flat instrument under the flat springs and bending them outward to relieve the spring tension and binding action. The use of *Lubriplate 105* as a lubricant between these springs and the bearing surfaces of the upright brackets will also smooth the tuning action.

STROMBERG-CARLSON

Models 17-,116-series

Picture blooming.

To reduce picture blooming when the brightness control is advanced, a 100,000-ohm, ½-watt resistor can be inserted in series with the picture tube cathode lead, at the tap arm of the brightness potentiometer *R19B*. This modification

was made in later production of these receivers and *R72*, 18,000-ohm resistor is being removed so that the end of the potentiometer connects directly to ground.

STROMBERG-CARLSON

Models 17-series

Vertical output tube replacement.

Early production of this model employed a 12AU7 tube type in the vertical sweep output position (*V1*) which was later replaced by a 6SN7 octal based tube because of procurement reasons. More recently, the 6SN7 has been replaced by a 6BL7 type which achieves better vertical picture linearity.

On those receivers where the tube label on the chassis indicates "6SN7 or 6BL7" tubes in this position, either tube may be substituted for the other, but if the tube label expressly indicated "6BL7," only this type should be used in this position.

STROMBERG-CARLSON

Models 17-series

Buzz or whistle in h-v supply.

Advice from the field indicates that cases of buzz or whistle in the high-voltage power supplies on these models often can be traced to vibration of the bakelite terminal board on the horizontal output transformer when part No. 161040 is used. These cases can usually be cured by tightening the long brass screw which clamps the assembly together. Apparently, with age, the rubber washers used in assembly change resilience and allow the terminal board to become resonant at about 7 kc.

STROMBERG-CARLSON

Models 17-series

Improving interlace.

Under some operating conditions it may be difficult to obtain and maintain good interlace by adjustment of the vertical hold control. When this condition is encountered, improvement can be obtained by shorting out *R48*, 10,000-ohm resistor in the vertical sweep circuit, permitting *C33*, .033-μf capacitor to return directly to ground.

STROMBERG-CARLSON

Models 17-series

Loss of stability in horizontal oscillator.

If the frequency of the 6SN7 horizontal oscillator appears unstable with a tendency to lock-in at half-frequency where two complete pictures are displayed side-by-side with a black blanking bar running vertically between them, or at least with the oscillator running at an audibly lower frequency accompanied by a narrow raster with fewer than normal raster lines, the trouble is usually traceable to *R58*, 270,000-ohm resistor in the No. 2 plate circuit of the 6SN7 tube. Resistors of a certain manufacture have a tendency to increase their value up to 1-meg in this position, causing this condition. Use of this brand of resistors was discontinued in later production and this resistor should be replaced when this condition occurs in the field.

STROMBERG-CARLSON

Models 17-series

Brightness control cannot reduce brightness sufficiently.

When it is impossible to diminish the screen illumination with the brightness control, the cause is often the failure of *R70*, 220,000-ohm, ½-watt resistor connected in series with the brightness potentiometer. In such cases, replacing the resistor corrects the condition.

STROMBERG-CARLSON

Models 17-series

Excessive vertical picture size.

To permit the vertical size to be reduced sufficiently within the range of the vertical size control, the supply voltage to the vertical oscillator is no longer taken from the boosted dc but is taken in later production from the 410-volt, B+ line.

Circuitwise, the *R131*, 2.2-meg resistor, is disconnected from the boosted dc and reconnected to the 410-volt, B+. It is recommended that this revision be made in the field if the vertical size cannot be reduced sufficiently with the size control.

STROMBERG-CARLSON

Models 24-,119-series

Centering range of vertical hold control.

To properly center the holding action of the vertical hold control, resistor *R204* in series with *R205A*, hold potentiometer, is increased from 1.5 meg at ½ watt to 1.8 meg at ½ watt (part No. 28194).

STROMBERG-CARLSON

Models 24-,119-series

Improper brightness control action.

Improper brightness control action, with an apparent reversed action, can often be traced to an open 2.2-meg resistor (*R291*) in the picture tube grid return position.

STROMBERG-CARLSON

Models 24-,119-series

Increased range of contrast control.

To increase the contrast availability of these receivers, *R154*, 220-ohm resistor in the cathode circuit of the 6AR5 video amplifier, can be shorted out. This permits greater action of the contrast control .

STROMBERG-CARLSON

Models 24-,119-series

Horizontal picture pulling.

To reduce horizontal picture pulling in 24-series receivers and improve the sync, *R75*, 100,000-ohm agc return resistor, is increased in value to 220,000 ohms (part No. 149115).

On Model 119-series receivers, this condition can be corrected by increasing the 47,000-ohm resistor in this *R75* position to the 200,000-ohm value.

STROMBERG-CARLSON

Models 24-,119-series

T V interference to a-m radio.

Some cases of background noise in the a-m radio section of combination models have been traced to faulty grounding through the range switch of *C229*, .1-μf capacitor con-

nected to the cathode of the 6SN7 horizontal oscillator. In these cases, the horizontal oscillator continues to run with the range switch in "Radio" position, thus creating interference.

Receivers in later production have been modified to eliminate noise radiation from the video amplifier section. This modification consists of rerouting the 4th video i-f stage screen supply through the range switch. Thus, this stage is disabled during non-television operation, eliminating the interference.

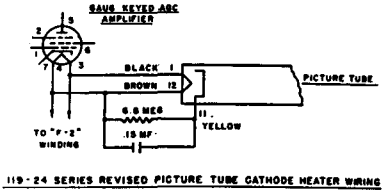
Cases of this latter condition in the field can usually be corrected by connecting a .1-μf, 600-volt capacitor across the electrolytic capacitor section *C171C* which appears circuitwise from the 6CB6, 1st sync clipper, cathode to ground. Addition of this .1-μf capacitor removes most of this interference by keeping the noise off the B-supply wiring.

STROMBERG-CARLSON

Models 24-,119-series

Cathode-to-heater shorts in picture tubes (see Fig. 11).

Field reports and picture tube returns indicate that a great many picture tubes are being replaced in the subject receivers because cathode-to-heater shorts develop within these tubes during operation. To avoid the nuisance and expense of having to replace picture tubes when this tube failure occurs, the cathode and heater circuits, in receivers date-coded 51-09 and later, have been modified to permit the receiver to operate normally when this tube failure occurs. Now, with these circuit revisions, when an internal cathode-to-heater short develops, it will not have any effect on the receiver operation or on the picture because the cathode of the tube is purposely connected externally to the heater. Thus, it will not be necessary to replace picture tubes for this reason in the future.



119-24 SERIES REVISED PICTURE TUBE CATHODE HEATER WIRING

Fig. 11 — Stromberg-Carlson

These circuit revisions are as follows, and can be made in the field if desired:

1. The black and brown picture tube heater leads are disconnected from ground and the present supply point, and reconnected to heater terminals No. 3 and No. 4 of the 6AU6 keyed agc amplifier. Thus, the picture tube heaters are now supplied from the *F2* transformer winding.

2. On the 6AU6, keyed agc amplifier socket, the cathode and suppressor are disconnected from the heater by disconnecting socket terminal No. 2 from No. 3.

3. The picture tube cathode now connects to the picture tube heater through a 6.8-meg resistor (part No. 149124). This resistor connects from the yellow cathode lead to either the brown or black heater lead.

4. A .15-μf capacitor (part No. 110767) is added directly across the 6.8-meg resistor. (Other capacitors of similar value should also be satisfactory in this position.)

Note: It is important that the B+ be removed from the *F2* heater supply winding as outlined in step 2 by disconnecting the cathode from the heater at the 6AU6 keyed agc amplifier socket. It may be noted that even with the 6.8-meg resistor in place, some voltage potential will exist between the picture cathode and heater because of tube leakage.

STROMBERG-CARLSON

Models 24, -119-series

Preventing h-v breakdowns.

To prevent breakdown between the 6BG6 plate leads and chassis, rubber grommets are inserted in the chassis holes where these plate leads feed through, and additional sleeving is added over the lead itself.

STROMBERG-CARLSON

Models 24-series

Reducing illumination at low brightness setting.

To permit the brightness control to reduce the picture tube illumination properly, resistor *R294*, in series with the feed side of the brightness potentiometer, is decreased from 150,000 ohms to 100,000 ohms (part No. 149385).

STROMBERG-CARLSON

Models 24-series

Improving horizontal phasing and linearity.

To improve the horizontal picture phasing, with respect to the sync bar, and to improve the horizontal linearity, the following changes, made in all chassis date-coded 5104 and later, are made.

1. The .22-μf capacitor (*C316*), connecting the tap of the horizontal linearity coil (*T15*) to the 6BG6 screen grids, is removed.

2. A .1-μf, 400-volt capacitor (new *C316*, part No. 110724 or 110546) is added from the tap of the horizontal linearity coil (*T15*) to the bottom side of the horizontal size coil (*T5*).

3. A .1-μf, 600-volt capacitor (*C317*, part No. 110743 or 110561) is added from the tap of the horizontal linearity coil (*T15*) to ground.

4. A 120-$\mu\mu$f, 3 kv ceramic capicitor is added in series with the present *C311*, 120-$\mu\mu$f capacitor appearing across terminals No. 4 and No. 6 of the horizontal output transformer.

5. A choke coil (*L31*, part No. 114113) is added in series with the B+ lead to the bottom side of the horizontal size coil (*T5*).

6. The 10-k, ½-watt resistor (*R228*), in the second half plate circuit of the 6SN7 horizontal oscillator, is removed and *C226*, 330-$\mu\mu$f capacitor in this same circuit is connected directly to ground.

In addition to improving the phasing and linearity, this arrangement now permits the use of lower limit 6BG6 tubes in this receiver, whereas picture folding was previously encountered with these low-limit tubes.

STROMBERG-CARLSON

Models 116, -119-series

Replacement of tuner components.

It will be noted that the ground connections in the tuners used in these models are spot-welded to the tuner chassis to assure positive grounding. When replacing compo-

nents with leads grounded in this manner, enough lead length should be left from the spot-weld connection so that the replacement part lead can be spliced on with a soldering operation.

STROMBERG-CARLSON

Models 119-series

Increasing noise immunity.

C76, .22-μf, capacitor from the agc line to ground is removed and a 2-μf, 50-volt (*C65*, part No. 110675) capacitor is added circuitwise in the same position. This increases the noise immunity of these receivers.

STROMBERG-CARLSON

Models 119-series

Permitting brightness control to reduce picture illumination.

With the picture tube screen voltage being supplied from the boosted dc instead of B+ in later receivers, *R294*, 150,000-ohm resistor in series with the brightness potentiometer, is reduced in value to 100,000 ohms, ½-watt (part No. 149385). This permits the brightness control to reduce the picture illumination properly.

STROMBERG-CARLSON

Models 119-series

Improved video response.

The above models which are date-coded 5048 and later have the following circuit changes incorporated in the video section to improve the video response:

1. Peaking coil No. 114708 (wound on a 39,000- or 47,000-ohm resistor) has replaced No. 114637 in the 1st video amplifier (6AU6) plate circuit (*L4* position).

2. Peaking coil No. 114709 (coded with green dot) has replaced No. 114669 in the 1st video amplifier (6AU6) plate circuit (*L5* position).

3. Peaking coil No. 114710 (wound on a 33,000- or 27,000-ohm resistor) has replaced No. 114640 in the 2nd video amplifier (6AR5) plate circuit (*L6* position).

4. Peaking coil No. 114711 (coded with yellow dot) has replaced No. 114638 in the 2nd video amplifier (6AR5) plate circuit (*L7* position).

5. Peaking coil No. 114716 (coded with red and yellow dot) has replaced No. 114639 in the video detector (6AL5) load circuit (*L2* position).

6. Pin No. 1 (grid) of the 6AU6, 1st video amplifier, no longer connects directly to the junction of *L2* and *R91* (2,700 ohms), the video detector load. Instead, the 6AU6 grid now connects to one end of new peaking coil No. 114717 (wound on a 15,000-ohm resistor) with the other end of the peaking coil connecting to the No. 2 pin of the 6AL5 video detector.

7. An unshielded lead now runs to the contrast control potentiometer from 2nd video amplifier section.

STROMBERG-CARLSON

Models 119-series

Increasing high voltage.

Receivers date-coded 51-03 and later have the following circuit revisions to increase the high voltage:

1. *C254*, 3,900-$\mu\mu$f capacitor appearing across terminals No. 1 and No. 2 of the flyback transformer is removed, if used.

2. The .068-μf capacitor in the *C235* position (connected between terminal No. 3 of transformer and ground) is removed and substituted in the *C234* position (connected between terminal No. 3 of transformer and afc pulse transformer) in place of the .22-μf capacitor.

3. The .22-μf capacitor removed from the *C234* position now is connected from the No. 3 flyback terminal (boosted dc) to the No. 5 pin of *V24*, 6W4 damper tube.

4. *R236*, 33-ohm, 2-watt resistor across afc pulse transformer primary, is removed.

5. The .047-μf capacitor bridging *R236* is also removed, if used.

6. From the yoke side of *C234*, a .001-μf capacitor (*C236*, part No. 110731) is connected, which in turn connects to a 2,200-ohm, 2-watt resistor (R236, part No. 149103), which then connects to ground.

7. The afc take-off (pin No. 1 and No. 2 of *V19*, 6AL5) is now connected to the junction of the .001-μf capacitor and the 2,200-ohm resistor.

8. A 100-$\mu\mu$f capacitor (*C184*, part No. 110451) now bypasses the grid (No. 7 pin) of *V18B*, 12AU7, sync splitter tube to ground.

9. All connections to the No. 6 terminal of the flyback transformer are removed and reconnected to the No. 4 pin of the flyback transformer.

The voltage increase obtained with these revisions is of the order of 1.5 kv.

STROMBERG-CARLSON

Models 317-series

Picture bending.

First samples of these receivers used an 18,000-ohm resistor in the *R152* position in the 12AU7 noise reference and blanking amplifier section. The value of this resistor was reduced in later production to 10,000 ohms (part No. 28170) to reduce bending of vertical picture lines in a horizontal direction.

STROMBERG-CARLSON

Models 317-series

Loss of horizontal size at maximum brightness.

Loss of horizontal picture size as the brightness control is advanced to maximum, is corrected in these receivers by increasing the value of *R110* from 150,000 ohms to 270,000 ohms (new part No. 28184). This resistor connects the picture tube cathode to the tap arm of the brightness potentiometer.

STROMBERG-CARLSON

Models 317-series

Centering range of vertical hold control.

The value of resistor *R184*, in series with the vertical hold potentiometer, is reduced in value from 1 to 680,000 ohms (part No. 149118). This reduced value permits the hold range to be better centered within the control.

STROMBERG-CARLSON

Models 317-series

Yoke ringing.

To correct excessive ringing, observable on some of the above receivers as several vertical white bars at the left side of the raster, it is

necessary to use a new higher impedance deflection yoke (part No. 114724). This new yoke replaces previous part No. 114706, and the higher impedance achieves better match to the horizontal output transformer, thereby correcting the ringing. All connections are the same as before, except the heavy insulated red lead from the No. 3 yoke terminal now connects to No. 7 terminal of the horizontal output transformer instead of to No. 5. Receivers date-coded 51-18-3 and later already employ the newer yoke.

STROMBERG-CARLSON

Models 317-series

Tuner vernier action.

The length of the red, yellow, and blue leads from the tuner assembly to the chassis have been shortened in production to prevent them from obstructing the vernier actiton of the tuner. Also, the fiber nut and the brass bushing in the vernier assembly section are being more freely lubricated to smooth the vernier action. Tuners should not require more than 15 inch-ounces of torque to operate the vernier.

Extreme care must be exercised in the field in returning this fiber nut to its original position, if for any reason the vernier section has been disassembled. If care is not used the tuner will have to be recalibrated, but if the vernier has been turned to its maximum clockwise position before disassembling and left in that position, no trouble should be encountered.

The vernier action of these tuners on later production consists of two full turns. The vernier action for each channel can be centered by adjusting the cam screw which is accessible from the front through the open hole in the tuner front disc plate. One extra hole in this disc plate has been taped over to prevent its being used for setting up these channel cam screws.

Later production employs an aluminum bushing in place of a fiber bushing in the vernier section to minimize wear failures. Service replacements of this part from the factory will be of the aluminum type.

STROMBERG-CARLSON

Models 317-series

Mask breakage.

Excessive breakage of the plastic mask during early shipments was reported from the field on the subject receiver series. To correct this condition, receivers of later production use a more pliable plastic mask that is capable of withstanding severe shock treatment. This newer mask looks the same as the former type except that the rear surface of the mask is now black instead of being brown colored overall. To date, this stronger brown mask with the black rear surface has proven a satisfactory solution to the mask breakage problem.

STROMBERG-CARLSON

Models 317-series

Reducing white noise spot size caused by video amplifier overshoot.

The following changes have been made in receivers dated code 51-18-3 and later to reduce the size of the white noise spots appearing in the picture in fringe areas caused by video amplifier overshoot:

1. In the *L12* position, the video detector load, peaking coil part No. 114641 replaces previous part No. 114716.

2. In the *L25* position, the video amplifier grid, peaking coil part No. 114725 replaces previous part No. 114715.

3. In the *L14* position, the video amplifier plate, peaking coil part No. 114691 replaces previous part No. 114714.

4. In the *L13* position, the picture tube cathode, peaking coil part No. 114726 replaces previous part No. 114713.

5. Capacitor *C101*, in the contrast circuit becomes 1,000 $\mu\mu$f (part No. 110599), in place of the previous 750-$\mu\mu$f value.

6. Capacitor *C153*, 33-$\mu\mu$f value, in the noise reference-blanking amplifier section, is removed. This capacitor is connected to one side of the 1N65 crystal.

7. Capacitor *C151*, in the same section, changes from a .1-μf value to a .047-μf value (part No. 110722).

8. Resistor *R150*, in the same general section, changes from a 680-k value to a 1-meg value (part No. 149119).

9. Resistor *R152*, in the same section, changes from a 10-k value to an 18-k value (part No. 28173).

10. Resistor *R160*, in the keyed agc section, changes from an 18-k value to a 22-k value (part No. 149109). This resistor is connected to the grid of the agc tube.

STROMBERG-CARLSON

Models 317-series

Improved fringe area performance.

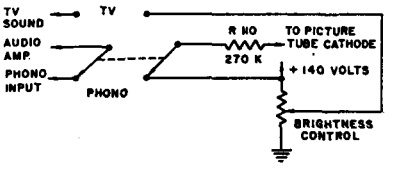


Fig. 12 — Stromberg-Carlson

The r-f tube in the tuner unit is specified as either a 6AG5 type or a 6BC5 type. Either type can be used in this position because they are interchangeable, but the 6BC5 type has higher gain. Where the 6AG5 type has been used in this position, and higher gain is desired such as in fringe areas, the 6BC5 type can be used and the higher gain achieved.

STROMBERG-CARLSON

Model 317-T

Extinguishing picture tube during phono operation (see Fig. 12).

To insure complete darkening of the picture tube during phono operation, the wiring to the phono switch is rewired as shown below. This circuit revision applies a fixed bias of approximately 140 volts to the cathode of the tube with the switch in "phono" position, cutting the beam off.

STROMBERG-CARLSON

Models 321-series

Avoiding arcing in h-v supply.

To avoid arcing, certain precautions must be observed in dressing the lead wires in the high-voltage

power supplies when servicing these sections of the subject receivers. These precautions are as follows:

1. The insulated lead from the flyback transformer to the 1B3 rectifier plate cap must be dressed clear of the 6W4 damper tube envelope by running it midway between the 6W4 and 6AU5 tubes. If there is any excessive length, the 1B3 plate cap can be turned slightly so that the lead falls to the rear of the 6W4 toward the 1B3 supporting board.

2. The white and red leads, from terminals 5 and 6 of the 6W4 socket to the fuse, must also be dressed clear of the 6W4 envelope.

It is important that these precautions be observed when replacing 1B3 tubes on 6W4 tubes in the field. It will be observed that the glass envelope on 6W4 tubes varies in length and that there is less possibility of arcing if the shorter envelope 6W4 tubes are used in these receivers. Destruction of the 6W4 tube will occur if sustained arcing is permitted between the 1B3 plate lead and the 6W4 envelope.

STROMBERG-CARLSON

Models TC-10, TC-125 series

Increased rating of R59.

Resistor *R59*, plate dropping resistor between horizontal oscillator and boosted B supply is changed from 22,000 ohms, ½ watt in TC-10 and from 22,000 ohms, 1 watt in TC-125, to 22,000 ohms at 2 watts. The required dissipation of about 1 watt is too great for the half-watt value.

STROMBERG-CARLSON

Models TC-10, TC-125 series

Preventing extraneous audio pickup.

A bent metal shield is added to cover the underside of the first audio amplifier tube socket to prevent extraneous audio pickup. This shield is designated part No. 151104, and mounts with the P-K screw which is already in use at that point.

STROMBERG-CARLSON

Models TC-10, TC-125 series

Removing light vertical fold lines.

Light vertical fold lines in the picture can usually be corrected by slight readjustment of the horizontal size control trimmer capacitor. This capacitor is located in the grid circuit of the 6BG6 horizontal sweep output tubes and bears the symbol of *C40*. The adjustment is accessible from the underside of the chassis.

STROMBERG-CARLSON

Models TC-10 series

Horizontal flashing at high brightness settings.

The *R68*, 1-meg, ½-watt resistor, in series with the high voltage, is changed in later production to a 680,000-ohm, 1-watt value (part No. 149202). If flashing horizontal streaks or lines are observed in the picture when the brightness control is advanced, the receiver may have a defective 1-meg resistor in the *R68* position which should be changed to the 680,000-ohm value, even though the resistor appears outwardly to be good. This resistor will be

found on the 1B3 socket terminal in the high-voltage cage.

STROMBERG-CARLSON

Models TS-16, TS-125 series

Dark vertical lines at left side of picture.

Vertical dark lines at the left side of the picture area caused by Barkhausen oscillations, can usually be eliminated by adjustment of the horizontal drive control. If the lines persist, changing 6BG6 tubes in the horizontal output stage should be tried. Often the lines are present on the raster, but disappear when the picture is present, so be sure to check under picture conditions.

STROMBERG-CARLSON

Models TS-16, TS-125 series

Increasing range of vertical hold control.

When tolerances accumulate, the 1.5-meg resistor *R403* in the grid circuit of the vertical blocking oscillator is sometimes too large in value to permit full control range adjustment. In these cases a 10-meg resistor may be shunted across *R403*.

STROMBERG-CARLSON Models

Models TS-16, TS-125, TC-16

Preventing picture pulling (see Fig. 13).

The above receivers are sometimes subject to picture pulling as the picture control (contrast) is advanced for proper contrast. When this condition is encountered, particularly in strong signal areas, the following suggestions which have been received from the field will improve this condition by reducing the gain of the 1st sync amplifier stage. This gain reduction is accomplished by revising the circuit of this stage as shown by decreasing the plate load, changing the method of supplying screen voltage, and removing the cathode resistor and capacitor.

STROMBERG-CARLSON

Model TC-19, 16 and 116 series

Replacement of pulse coils.

Failures of the *T5* agc pulse transformer (part No. 114078) in TC-19 receivers, and the *T13* afc sawtooth coil (part No. 114090) in

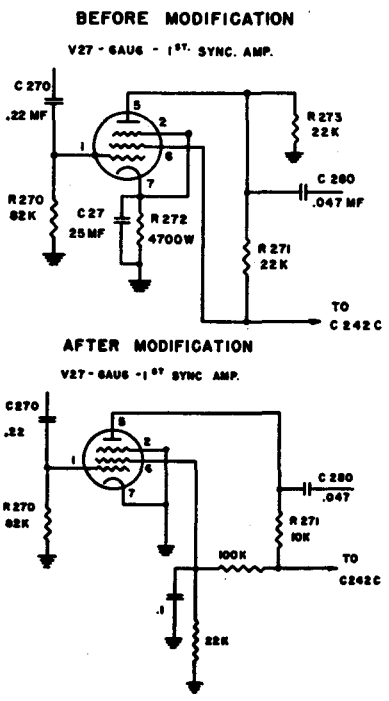


Fig. 13 — Stromberg-Carlson

16 and 116 series receivers, have been experienced when the cellulose-acetate insulation between windings breaks down under high ambient temperature and humidity conditions. Revised coil and transformer designs are used in later production with better insulation properties. Replacement units for these parts bear the same part numbers, but the revised designs are identifiable by a daub of green paint on the adjusting screw portion of these units.

STROMBERG-CARLSON

Model TC-19

Horizontal instability.

In some areas, horizontal jitter and picture pulling have been observed when the incoming signal has lower than normal sync pulse levels. Receivers in these areas may be modified to improve this situation by increasing the value of resistor *R267* from 270,000 ohms to 470,000 ohms. This resistor connects between pins 2 and 3 of *V26B*, 12AU7, sync clipper and d-c restorer tube.

STROMBERG-CARLSON

Model TC-19

Critical horizontal hold control.

Many cases of critical horizontal hold in the above receivers have been traced to a change in value of *R108*, 15,000-ohm resistor from the screen of the 6AU6, 1st video amplifier, to ground. It is recommended that this half-watt resistor be replaced with a one-watt value if the condition is traced to this resistor.

STROMBERG-CARLSON

Model TC-19

Obtaining greater in-focus picture area.

A greater in-focus picture area can be obtained if the focus coil assembly is separated by approximately three-quarters of an inch from the deflection yoke on the picture-tube neck. The separation distance is best determined by observing the picture while adjusting the focus coil position.

STROMBERG-CARLSON

Model TC-19

Loss of high voltage to picture tube.

Loss of the anode high voltage to the picture tube often occurs because of poor contact at the junction of the male-female high-voltage connectors. These connectors should be firmly pressed together to assure positive contact. In addition, this connector lead should be dressed away from any miniature tubes to prevent heat deterioration of the connector lead insulation, which could result in shorting of the high voltage. This high-voltage connector lead should be dressed on the side of the multilead cable away from the 12AU7 tubes. (This multilead cable is the one that plugs into the top of the main chassis.)

Early production of these receivers were subject to failures of *C231* and *C232* (500-$\mu\mu$f, 15,000-volt, part No. 110595) capacitors in the high-voltage supply, and short circuiting in the *L3* deflection coil assembly

(part No. 114672) when internally developed heat deteriorated the insulation between windings. The subject capacitors have been replaced in production by a new type capacitor with smooth sides, that is a 500-$\mu\mu$f, 20,000-volt unit (part No. 110680). When replacing capacitors in the field, this new part is recommended.

Also, a new deflection coil assembly (yoke) was used with better insulation properties as well as an open-type casing for better ventilation. The new yokes bear the same part number, but are recognizable by the well-ventilated yoke body. When replacing yokes in the field, this ventilated yoke is recommended. In addition, it is recommended that the protective plastic funnel sleeve between the yoke and cathode-ray tube neck be removed entirely for better ventilation.

STROMBERG-CARLSON

Model TC-19

Increasing current capacity of primary winding.

The following change, already made in later production, is in incorporated in the above model to increase the current capacity of the primary circuit. The No. 22 conductor used in wiring the primary circuit is changed to No. 16 and the lead length is shortened.

STROMBERG-CARLSON

Models TC-125 series

Obtaining sufficient vertical size with low line voltage.

To obtain sufficient vertical size under low line voltage conditions, the value of *R52*, (vertical oscillator charging resistor) may be changed from 1.8 meg and 2.2 meg to 1.5 meg. This applies to the above receivers not having the "opera glass' feature.

STROMBERG-CARLSON

Models TC-125 series

Improving picture resolution.

The following modifications are made to improve the apparent resolution of these instruments:

1. Resistor *R14* (connected to plate of agc diode) is changed from 56,000 ohms to 680,000 ohms (part No. 149118).

2. Resistor *R73*, 22,000 ohms (part No. 27407) is added across the secondary of the video detector transformer.

3. Capacitor *C36* (connected to pin 4 of horizontal oscillator) is changed from 0.01 μf to 0.047 μf (part No. 110544).

STROMBERG-CARLSON

Models TC-125 series

Horizontal instability or jitter.

Cases of horizontal instability or jitter in the picture have been encountered where *L4*, horizontal oscillator coil (part No. 114069), has developed short-circuited turns. This condition lowers the Q of the coil, in turn lowering the stability of the horizontal oscillator. This situation is best remedied by replacement of the coil.

STROMBERG-CARLSON

Models TC-125 series

Improved audio signal-to-noise ratio.

To improve the signal-to-noise level at the ratio detector stage for

clearer audio reproduction, capacitor *C56* (shunting the detector load) is increased from 1 μf to 5 μf, 50 volts (part No. 111030).

STROMBERG-CARLSON

Models with 5,000-ohm vertical linearity controls

Preventing burnout of vertical linearity controls.

Most receiver models specify a 5,000-ohm potentiometer (part No. 145079) in the vertical linearity position. When potentiometers of Mallory manufacture are used in this position, it has been necessary to so connect them that maximum size is obtainable in the full counter-clockwise direction. This is reversed from normal operation, but is necessary to prevent the dissipation from exceeding the rating under some adjustment settings. It is essential that this method be observed when replacing these potentiometers in the field. Potentiometers of Mallory manufacture can be identified by referring to the RMA date coding which will begin with the digits "235 . . ."

STROMBERG-CARLSON

All Models

Handling focus assemblies.

Both the EM-PM and PM type focus assemblies used on receivers can easily be damaged if proper care is not exercised in handling them both within the receiver and in parts stock.

A slight jar or striking with a metallic tool may cause the assembly to lose its magnetism, thereby affecting its focusing ability. When working on the receiver chassis, extreme care should be used to prevent damage to the focus assembly. In making any adjustments of this assembly, it is advisable to use a brass or nonmetallic screw driver.

When storing these assemblies in parts stock, they should not be left in contact with each other or permitted to rest on metal shelves, nor should they be subjected to serious jars or vibration.

STROMBERG-CARLSON

All Models

Bias supply pack for alignment purposes (see Fig. 14).

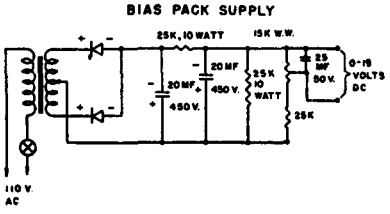


Fig. 14 — Stromberg-Carlson

The following circuit diagram is taken from the bias packs used in the factory for alignment purposes. This bias supply can also be made up in the field for this purpose, eliminating the necessity of using dry-cell batteries. Factory built bias packs used *Voltomyst* transformers for a supply source, but any similar small, low voltage transformer is suitable. Component substitutions can also be made as long as good d-c output is maintained with negligible a-c ripple content.

SYLVANIA Chassis 1-108, -139, -168, -186, -227, -231

Low or erratic high voltage.

If high voltage is low or erratic on any of the above chassis using a 6Y6G as h-v oscillator, check the following:

1. Replace the high-voltage oscillator tube with a coated type 6Y6G (Part No. 622-0006G). If high voltage is still low, try several tubes.

2. The high-voltage oscillator transformer may also be a cause of low voltage. The transformer may still be operative but is operating inefficiently due to reduced Q of the coils caused by shorted turns, damaged insulation, humidity, etc.

3. If the high voltage is erratic, the cause may be a shorted choke in the —125 volt line in the high-voltage oscillator circuit.

SYLVANIA Chassis 1-108, -139, -186

Replacement of selenium rectifiers.

When replacement of selenium rectifiers in the above chassis are required, it is recommended that they be replaced with part No. 517-0003 instead of 517-0001; however, 517-0001 may be used if desired.

SYLVANIA Chassis 1-168

Poor focus or dark picture.

When poor focus or a very dark picture is observed on the above chassis, it may be due to little or no voltage being supplied to the screen grid (pin 10) of the picture tube. Additional symptoms of this condition are that the ion trap magnet adjusts to a position far out of normal, and the brightness and contrast controls must be turned full on. Check particularly *C22*, .00015-μf, 1,000-volt mica capacitor (part No. 169-0011) and *V29*, 6X4, picture tube screen supply rectifier tube.

SYLVANIA Chassis 1-231

Insufficient horizontal scan.

If insufficient horizontal scan is encountered in the above chassis:

1. Check high-voltage setting; it may be too high.

2. Change resistor *R203* to 27,000 ohms at 1 watt (part No. 182-0273). This lowers the effective total screen grid resistor of the 6BQ6 horizontal output tube from 15,000 ohms to 12,000 ohms.

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -329, -356, -357, -366, -381

Reducing microphonics in vertical oscillator and output tube.

To reduce microphonism in the 6BL7GT tube, later production used a shock mounted socket for the 6BL7GT vertical oscillator and vertical output tube. Service parts for this socket are as follows:

Part No.	*Description*
558-0003	Spacer — Shock socket mounting
412-0018	Socket — Shock mounted assembly

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -329, -356, -357, -366, -381

Replacement of brightness control.

When replacing the brightness and volume control on the above chassis, do not bend the lug for the grounded side of the brightness control back and solder directly to chassis. Instead, use a short piece of wire and connect to one of the ground straps on either side of this control.

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -329, -356, -357, -366, -381

Increased dissipation of R232.

Resistor *R232*, in series with the horizontal deflection coils, may overheat. This may be caused by a maladjustment of the horizontal linearity control, which is not obvious as poor horizontal linearity. In such cases replacement is authorized with a 1,000-ohm, 2-watt resistor (part No. 183-0102).

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -356, -357, -366, -381, -387, -437, -441, -442

Calibration of tuners.

On all the above chassis except 1-387 and 1-441, the pointer assembly of the tuner consists of two plastic pieces held together with screws. To change calibration, loosen these screws; the cutout portion of the pointer may then be rotated about the hub until the correct channel number appears in the cutout. When correctly set, tighten screws securely.

On chassis 1-441, the position of the dial may be changed by loosening the two Allen head set screws on the capacitor drive gear assembly and slipping these gears until the correct channel indication is obtained.

On chassis 1-387, the correct position for channel 2 may be obtained by turning the channel knob to the fully clockwise position and backing off 90 degrees. The correct position for channel 13 may be obtained by turning the channel knob to the fully counterclockwise position and backing off 45 degrees. The dial position may then be changed by removing the retaining ring from in front of the dial drive shaft, pulling the shaft slightly forward to disengage the gears, rotating until the correct channel number appears, and returning the dial drive shaft into gear engagement and replacing the retaining ring.

SYLVANIA Chassis 1-260, -261, -271, -290, -274, -356, -357, -366, -381, -387, -437, -441, -442

Noise interference.

Where there is noise interference it may be reduced by adding a .008-μf capacitor from the plate of the audio output tube to ground. This should be done only where necessary as it is effectively a fixed tone control cutting some of the high-frequency response.

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -356, -357, -366, -381, -387, -437, -441, -442

Replacement of audio coupling capacitor.

When replacing *C113* (audio coupling capacitor), use part No. 162-0611 (.01-μf, 600-volt paper) instead of part No. 168-0002N .01-μf, 500-volt ceramic). This latter com-

ponent has shown some tendency for leakage in this application.

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -356, -357, -366, -381, -387, -437, -442

Elimination of 4.5-mc harmonic interference.

This appears as light and dark interference bands with a pattern similar to the graining in plywood, which move about on the picture (similar to f-m interference). It will appear only on certain channels and is due to harmonics of the 4.5-mc sound i.f. in the receiver beating with picture signal. To reduce this type of interference, return the following two capacitors to ground instead of B—:

1. *C112* (.0001 μf), plate bypass of first audio amplifier section of 6T8.

2. *C115* or *C116* (.005 μf), plate bypass of audio output tube.

In addition to the above, add capacitor *C118* (*C119* in 1-381 only), a .005-μf unit, part No. 166-5000D, between volume control lead shields and ground on the terminal strip near the brightness and volume control.

For combination chassis 1-274 and 1-357, proceed as follows: At the chassis end of the volume control leads, one shield is tied to a terminal strip. It should be moved to connect to the same point as the other shield, at pins 6 and 7 of the 6T8.

SYLVANIA Chassis 1-260, -261, -271, -274, -290, -356, -357, -366, -381, -387, -437, -442

Varying contrast and horizontal instability.

Varying contrast coupled with a tendency of the picture to pull out horizontally (though vertical stability is good) may be due to defective *C168*, electrolytic capacitor, 10 μf at 25 volts in plate of agc amplifier tube.

SYLVANIA Chassis 1-260, -261, -271, -356, -357, -366, -437, -441, -442

Replacement of grounding spring.

In some cases, the grounding spring on the above chassis will be installed with a self-tapping screw. To replace in case of breakage, remove self-tapping screw and broken spring sections, and replace with new grounding spring part No. 496-0049 by sliding spring into slot on high-voltage and scan box in normal manner.

SYLVANIA Chassis 1-260, -261, -329, -366, -381, -441

Reducing noise and eliminating split sound and picture.

The sound take-off trap (*L56*) should be tuned on a received station signal for maximum sound. Electrically this is maximum voltage across R104, 47,000-ohm limiter grid resistor. Use a 10,000-ohm isolating resistor in series with a vacuum-tube voltmeter d-c probe to read this voltage.

If a 4.5-mc signal is used to align the trap, feed to pin 1 cathode of 6AL5 video detector through a .005-μf capacitor instead of pin 7 diode plate. In many cases this has eliminated split sound and picture on these chassis. Proper adjustment will also usually reduce noise.

SYLVANIA Chassis 1-260, -356, -357, -366, -387, -437, -442, -502-3, -507-1

Increasing range of vertical hold control.

The following change, already made in later production, is incorporated to increase the range of the vertical hold control. This control is changed from a 1-meg unit to a 1.5-meg unit (part No. 153-0014).

SYLVANIA Chassis 1-271, -274, -290, -356, -357, -387

Improvement in fringe area sound reception (see Fig. 15).

If it is desired to modify any of the above chassis to improve sound

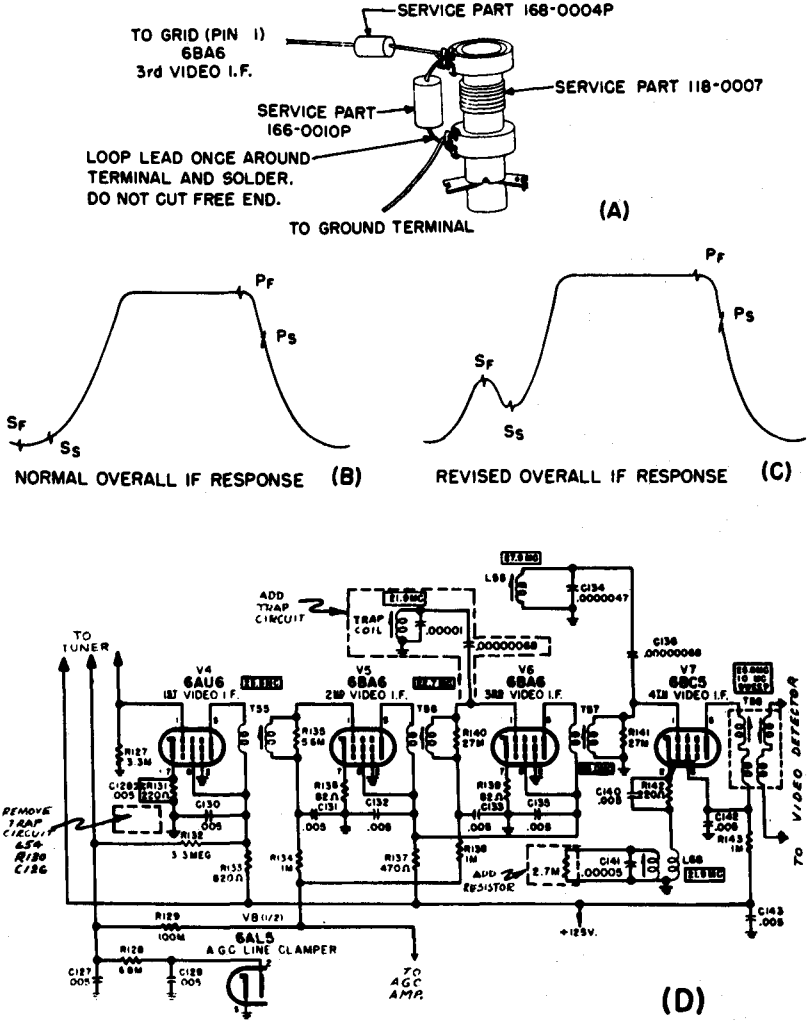


Fig. 15 — Sylvania

reception in fringe areas, the following procedure is recommended:

1. Necessary new parts:
   Coil i-f trap, part No. 118-0007.
   Capacitor, ceramic, 10 $\mu\mu$f at 500 volts, part No. 166-0010P.
   Capacitor, ceramic, 68 $\mu\mu$f at 500 volts, part No. 168-0004P.
   Resistor, 2,700 ohms, ½ watt, .68 $\mu\mu$f, part No. 181-0272.
   (Note: Use 3,900-ohm resistor for chassis 1-387.)
2. Make up an assembly as noted in part (A) of the figure.
3. Remove the following items from the circuit:
   L54, trap in 1st i-f cathode circuit.
   R130, 33,000 ohms, ½ watt (same location).
   C126, 50 $\mu\mu$f, ceramic capacitor (same location).

This may be readily accomplished by disconnecting *R131*, 220 ohms at ½ watt and *C128*, .005 μf, ceramic disc capacitor from top of trap coil and returning these two items to ground. The other ends of *R131* and *C128* are connected to the cathode (pin 7) of the 6AU6 1st video i-f amplifier tube.

4. Mount the trap assembly made in step 2 above in the hole provided between the 6BA6 2nd video i-f amplifier tube and 2nd video i-f transformer *T56*.

5. Connect the free end of the .68-$\mu\mu$f capacitor to the grid (pin 1) of the 6BA6 3rd video i-f tube and the lead from the bottom end of the trap coil to the ground lance immediately above the coil.

6. Add 2,700-ohm, ½-watt resistor across the secondary of *L68*, 4th video i-f trap coil in parallel with *C141*, 50-$\mu\mu$f capacitor. (Note: Use 3,900-ohm resistor in chassis 1-387.)

7. Realign the i-f system in accordance with alignment procedure as given in service notes covering the particular chassis concerned. Note that the adjustment of *L54* is no longer needed and the adjustment of the new coil is substituted in its place. The new trap coil is adjusted for minimum output at 21.9 mc.

8. Realign the sound system in accordance with service notes for chassis concerned. The adjustment of the two cores in the sound discriminator secondary *T53* is critical and must be adjusted very carefully for correct alignment.

After making these changes, 4.5-mc interference may become noticeable on strong signals since cosound rejection is not as great as with the original circuit.

The effect of this revision on the overall i-f response is shown by comparing the normal i-f overall response with the revised overall i-f response as shown in parts (B) and (C) of the figure, where *Ps* is picture marker for strong signal, *Pf* is picture marker for weak fringe signal, *Ss* is sound marker for strong signal, and *Sf* is sound marker for weak fringe signal. Part (B) shows a normal overall i-f response curve with markers for strong and fringe signals as shown when receiver is tuned for best picture. As can be seen, when a fringe signal is tuned for best picture (*Ps* moves to *Pf*), the sound carrier moves from *Ss* to *Sf* and becomes weak and separated. By making these revisions to the i-f circuit, a "kickback" is added to the sound side of the overall i-f response as shown in part (C). Now when a

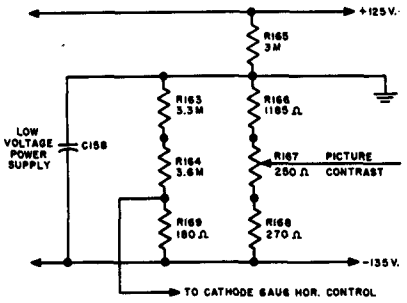


Fig. 16 — Sylvania

fringe signal is tuned for best picture (*Ps* moves to *Pf*), the sound is moved from *Ss* to *Sf* and is picked up by the "kickback." This provides greater amplification for the sound.

If this modification is made, it is suggested that the old trap assembly be left in place and a tag attached to the receiver indicating that this fringe modification has been made. This will make the change back to the normal i-f system simpler should the receiver be moved to a non-fringe location and the 4.5-mc interference mentioned above is encountered.

SYLVANIA Chassis 1-274, -290, -357, -366

Improving action of horizontal sync circuit (see Fig. 16).

To improve the action of the horizontal sync circuit in chassis 1-274, -290, and -357, the following changes are made in later production (coded *CO2*):

1. *R169* (cathode circuit of horizontal control tube) is changed from 47 ohms to 180 ohms (part No. 181-0181) and relocated as shown in the partial schematic.

2. *C147* (video amplifier cathode bypass)is changed from .05 μf to .005 μf (part No. 166-5000D).

3. *C146* (video amplifier screen bypass) is changed from .1 μf to .005 μf (part No. 166-5000D) and returned to ground instead of B—.

4. Cathode of video amplifier 6BF5 returns to high side of *R146* (100 ohms) instead of B—.

To improve the action of the horizontal sync circuit in chassis 1-366, the following changes are made in later production (coded *CO3*):

1. *R169* (cathode circuit of horizontal control tube) is changed from 47 ohms to 180 ohms (part No. 181-01815) and relocated as shown in the partial schematic.

2. *C144* (video amplifier screen bypass) is changed from .1 μf to .005 μf (part No. 166-5000D) and returned to ground instead of B—.

3. Cathode of video amplifier 6BF5 returns to high side of *R146* (100 ohms) instead of B—.

SYLVANIA Chassis 1-274, -357

Patch plugs for servicing without radio chassis (see Fig. 17).

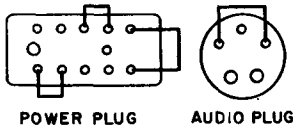


Fig. 17 — Sylvania

Patch plugs are required to operate the above tv combination chassis on the test bench without the a-m/f-m tuner chassis. Two plugs are

necessary to do this: part No. 415-0003 (14-prong plug) and part No. 415-0001 (4-prong plug). Wire jumpers into these sockets as shown here and plug into the power and audio sockets respectively.

SYLVANIA Chassis 1-329, -381

Improving agc action in strong signal areas.

The agc control setting on the above chassis is extremely critical due to the high gain and sharp cut-off characteristic of the video i-f tubes. To improve the agc action in strong signal areas, remove *R132*, 6.8-meg, ½-watt resistor connected between tuner agc bus and the screen of the 1st video i-f tube, by clipping it out of the circuit. Do not replace or bypass with a jumper. This effectively removes delayed agc action from the tuner. It may be done only for strong signals as it will increase the noise factor in weak signal areas.

SYLVANIA Chassis 1-329

Breakdown of 1,000-volt mica capacitor.

Capacitor *C211* (connected to one side of horizontal size control) is changed from mica capacitor, .00047 μf at 1000 volts to paper capacitor, .00075 μf at 1,600 volts, part No. 162-16375, to increase capacitor voltage rating. This may be valuable as a field repair where there is frequent breakdown of the 1,000-volt mica capacitor.

SYLVANIA Chassis 1-356, -357

Reducing 4.5-mc interference.

The following change, already incorporated in the above chassis coded *CO5*, is made to reduce 4.5-mc harmonic interference:

1. Change *C105*, .005-μf bypass capacitor from cold end of volume control to ground, to .0001 μf (part No. 163-0100).

2. Add *R121*, 10,000 ohms at ½ watt (part No. 181-0103) between the tap on the volume control and pin 2 of the audio socket.

3. Add r-f chokes *L69* and *L70* (part No. 147-0014) between pin 4 of audio socket and the .01-μf capacitor which normally connects to this pin, and between the —135 volt bus and pin 1 of the audio socket.

SYLVANIA Chassis 1-356, -366, -387, -441, -462

Vertical retrace suppression (see Fig. 18).

In order to suppress vertical retrace lines, the following changes, already made in later production of the above chassis, are incorporated. The modified circuit is as shown in the figure.

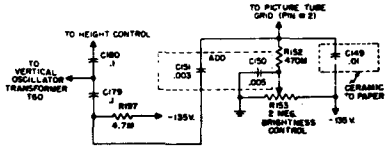


Fig. 18 — Sylvania

Schematic No.	*Part No.*	*Description*
	Remove the following:	
C149 or *C146*	168-0002N	Capacitor, ceramic, .01 μf at 400 volts
	Add the following:	
C149 or *C146*	162-0611	Capacitor, paper, .01 μf at 600 volts
C150	166-5000D	Capacitor, ceramic, .005 μf at 450 volts
C151	162-0623	Capacitor, paper, .003 μf at 600 volts

SYLVANIA Chassis 1-356, -437, -442

Eliminating 4.5-mc interference.

To eliminate 4.5-mc harmonic interference, the following change already made in later production, is incorporated:

1. A .005-μf, 400-volt capacitor (part No. 166-5000D), is added between the low side of the volume control and ground.

2. *C112* (.0001-μf capacitor connected to the triode plate of the 6T8) and *C115* or *C116* (.005-μf capacitor connected to the high side of the primary of the audio output transformer) are both returned directly to ground.

SYLVANIA Chassis 1-366, -387-1, -437

Replacement of h-v capacitors.

If replacement of *C211* or *C215*, .00075-μf capacitors in horizontal deflection coil circuit, becomes necessary, it is recommended that replacement be made with a mica capacitor of the same value, part No. 174-0750A. Similarly, for replacement of *C216*, .0012-μf capacitor on chassis with a horizontal size switch (1-387-1), a mica capacitor, part No. 174-1200A is recommended.

SYLVANIA Chassis 1-366, -387-1, -437

Replacement of horizontal output tube screen bypass.

When replacing *C205*, the screen grid bypass of the horizontal output tube, use only a .047-μf, 400-volt molded paper unit, part No. 160-04147. This capacitor is being incorporated in later production.

SYLVANIA Chassis 1-387-1, -502-1

Improved focus (see Fig. 19).

To improve focus, the plate voltage connection of the vertical output section of *V15* is modified as shown in the figure. This change is already made in later production.

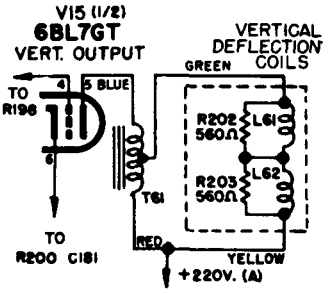


Fig. 19 — Sylvania

SYLVANIA Chassis 1-387-1, -502-1

"Sparkhausen" interference (vertical line of black and white dots).

A type of tuneable interference known at the factory as "Sparkhausen" consists of one or more vertical lines of black and white dots (salt and pepper) on the left side of the screen. This interference may be introduced, increased, or decreased by changing the setting of the brightness control.

The factory fix for this interference is the addition of a 10,000-ohm, ½-watt resistor, part No. 181-0103, in series with the high-voltage anode lead of the picture tube. This resistor is located in the high-voltage scan box inside the hole through which the high-voltage anode lead passes. Stubborn cases of this interference may require the use of a shielded 300-ohm lead from the antenna terminal board to the tuner.

SYLVANIA Chassis 1-387-1, -502-1

Intermittent vertical foldover.

Intermittent foldover on the bottom of the picture is corrected by the removal of the heater of the 6BL7GT vertical oscillator and output tube from the filament winding of the power transformer which is connected to —135 volts, and transferring it to the grounded filament winding. This is a factory change. The heater connections for the 6BL-7GT are as follows: pin 7 is connected directly to ground and pin 8 is connected to the 6.3-volt heater bus.

SYLVANIA Chassis 1-387-1, -437-3, -502-3, -507-1

Improving control of vertical size.

To improve control of vertical size, *R199* (in series with vertical size control) is reduced in value from 1.0 meg to 680,000 ohms. This change is already made in later production.

SYLVANIA Chassis 1-387-1, -437-3, -502-3

Improving operation of brightness control (see Fig. 20).

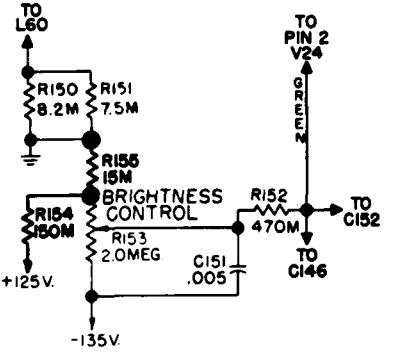


Fig. 20 — Sylvania

To improve operation of the brightness control, two new resistors are added in later production. These are identified as *R154* and *R155* with values of 150,000 and 15,000 ohms respectively. See figure for connection. In some chassis, these resistors are identified as *R155* and *R156* or as *R156* and *R157*.

SYLVANIA Chassis 1-387-1, -437-3, -502-3

Improving horizontal phasing.

To improve horizontal phasing, *C191*, a .1-μf, 200-volt capacitor is added in later production between the cathode of the 6AU6 horizontal control tube and ground.

SYLVANIA Chassis 1-387-1, -502-3, -507-1

Greater horizontal stability (see Fig. 21).

The following change, already made in later production, results in greater horizontal stability. *V16*, 6AU6 horizontal control tube, is changed to a type 6CB6, and *R214*, 220-ohm, ½-watt resistor, is inserted in the cathode circuit of *V16*. This change is illustrated by the partial schematic. In the chassis 1-387-1, the tube referred to above is *V17*.

SYLVANIA Chassis 1-387-1,

Reducing spike in video response.

To reduce spike in the video response, *R140* is reduced in value from 22,000 ohms to 18,000 ohms. This resistor shunts the grid winding of the 2nd video i-f transformer.

SYLVANIA Chassis 1-387-1,

Improving cathode trap rejection.

To improve the cathode trap rejection ratio of *V6*, the 4th video i-f amplifier, *R154*, 5,600-ohm, ½-watt resistor shunting the trap, is increased to a 22,000-ohm unit. This change is already made in chassis coded *CO7*.

SYLVANIA Chassis 1-387, -437

Improved video i-f response and reduced ringing.

The response of the video i-f amplifier in the above chassis is improved under code *CO1* by changing *R137* (shunted across grid winding in 3rd video i-f amplifier) from 27,000 ohms to 22,000 ohms.

In addition *R144* (shunted across video detector winding of 4th i-f transformer) is changed from 6,800 ohms to 8,200 ohms to reduce ringing.

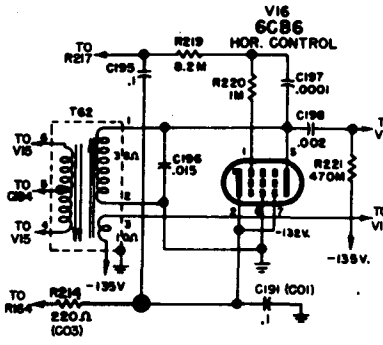


Fig. 21 — Sylvania

SYLVANIA Chassis 1-387

Eliminating 4.5-mc interference.

To eliminate 4.5-mc harmonic interference, the following changes,

already included in chassis coded *CO1*, are made:

1. Remove *R104*, 120-ohm resistor in cathode of *V11*, the sound i-f amplifier. The cathode of this tube is now connected directly to ground.

2. Add *C119*, .001-μf, 600-volt capacitor, between the B+ end of the primary winding of *T52*, discriminator transformer and ground. This capacitor should be grounded directly to the cathode (pin 7) of the sound i-f limiter.

3. Lift from chassis ground *R102* (47k) and *C102* (50 $\mu\mu$f), both in grid circuit of the sound i-f limiter. These components are to be connected directly to pin 7 (cathode) of the sound i-f limiter.

SYLVANIA Chassis 1-437-3

Reducing 4.5-mc sound interference in picture (see Fig. 22).

To reduce 4.5-mc sound interference in picture, add *C153*, 4.7-$\mu\mu$f capacitor, and L71, 4.5-mc trap coil, in series between the plate of *V8*, 68F5 video amplifier, and ground. The alignment procedure for *L71* is as follows:

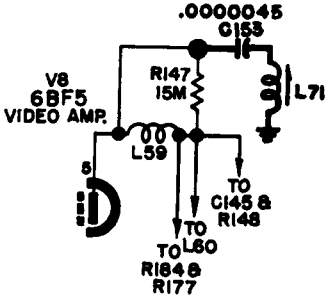


Fig. 22 — Sylvania

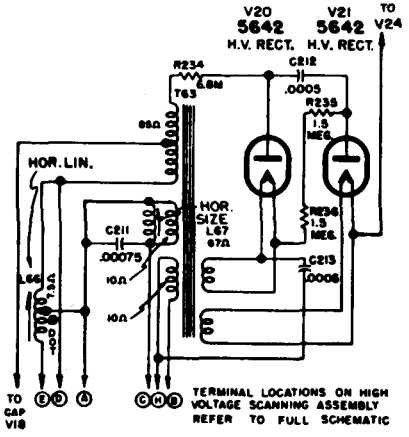


Fig. 23 — Sylvania

1. Ground the grid (pin 1) of *V6*, the 6CB6 4th video i-f amplifier to chassis.

2. Connect signal generator through .001 μf to .005-μf blocking capacitor to the grid (pin 1) of *V8*, the 6BF5 video amplifier.

3. With vtvm set for r-f readings, connect r-f probe to junction of *R148*, 180 k, and *R149*, 1.2 meg.

4. Set signal generator for approximately .5 volt output at 4.5 mc.

5. Adjust core of *L71* for minimum reading on vtvm.

6. Unground grid of 4th video i-f amplifier and remove test equipment from circuit.

Note: The above trap is already added in chassis coded *CO3*.

SYLVANIA Chassis 1-502

Increasing stability of h-v output (see Fig. 23).

To increase the stability of the high-voltage output, the connection of *C213*, .0005-μf, 10,000-volt capacitor, is changed as shown in the

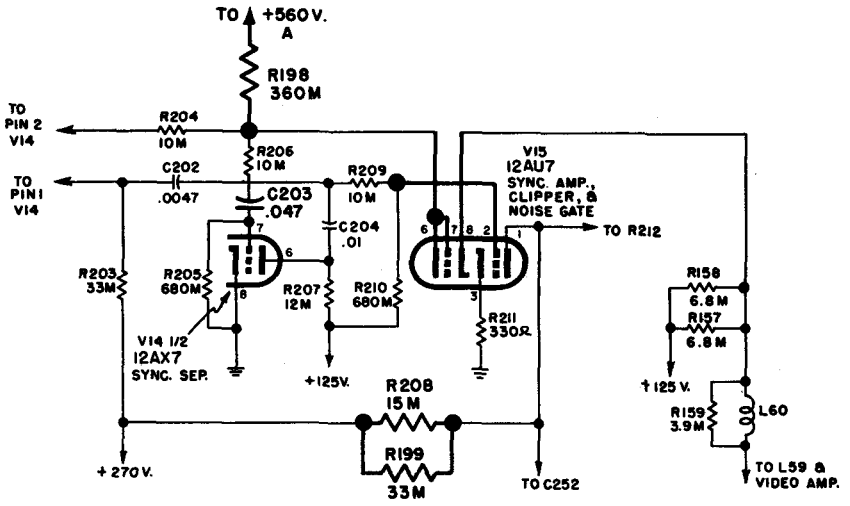


Fig. 24 — Sylvania

figure. This modification is already included in chassis coded *CO2*.

SYLVANIA Chassis 1-508-1, -2
Stabilizing sync and agc under interference conditions (see Fig. 24).

Later production on the above chassis revises the circuits of *V14*, 12AX7 sync separator and agc rectifier, and *V15*, 12AU7 sync amplifier and clipper. The change, in effect, adds a "noise gate" action between the sync take-off circuit and the sync separator circuit, and functions to stabilize vertical and horizontal sync and agc operation under interference conditions. Component changes are as follows:

1. *C203*, .047-μf capacitor, is changed from a 200-volt to a 400-volt capacitor.

2. *R208*, 10k-ohm resistor is changed to a 15k-ohm resistor.

3. *R199*, 33k-ohm resistor is added and connected in parallel with *R208*.

4. *R198*, 360k-ohm resistor is added and connected between +560 volts and *V14* and *V15*, as shown in the partial schematic.

SYLVANIA Chassis 1-510-1
Improving sync stability.

Later production on the above chassis changes the values of the following components in the sync separator circuit to improve sync stability:

1. *C200*, 470-$\mu\mu$f capacitor connected to the grid (pin 7) of the sync separator, is changed to a 220-$\mu\mu$f capacitor.

2. *C201*, .047-μf coupling capacitor between video amplifier and sync separator, is replaced by a .01-μf capacitor.

3. *R200*, 2.2-meg resistor connected between junction of *C200* and

C201 and ground, is replaced by a 470-k resistor.

4. *R201*, 220-k resistor shunted across *C200*, is changed to a 470-k resistor.

SYLVANIA All chassis with capacitors built into sound discriminator transformer ***Intercarrier buzz.***

Cases have been reported where intercarrier buzz was caused by a cracked capacitor in the base of the sound discriminator transformer. These capacitors are built in as a part of this transformer and correction of the condition necessitates replacement of the entire discriminator transformer.

SYLVANIA All 17-inch chassis ***Installation of dust seals for picture tube (see Fig. 25).***

Mask and gasket assembly, part No. 491-0014, may be installed on 17-inch tv models with the chassis either in or out of the cabinet. The methods for each type of installation are given as follows:

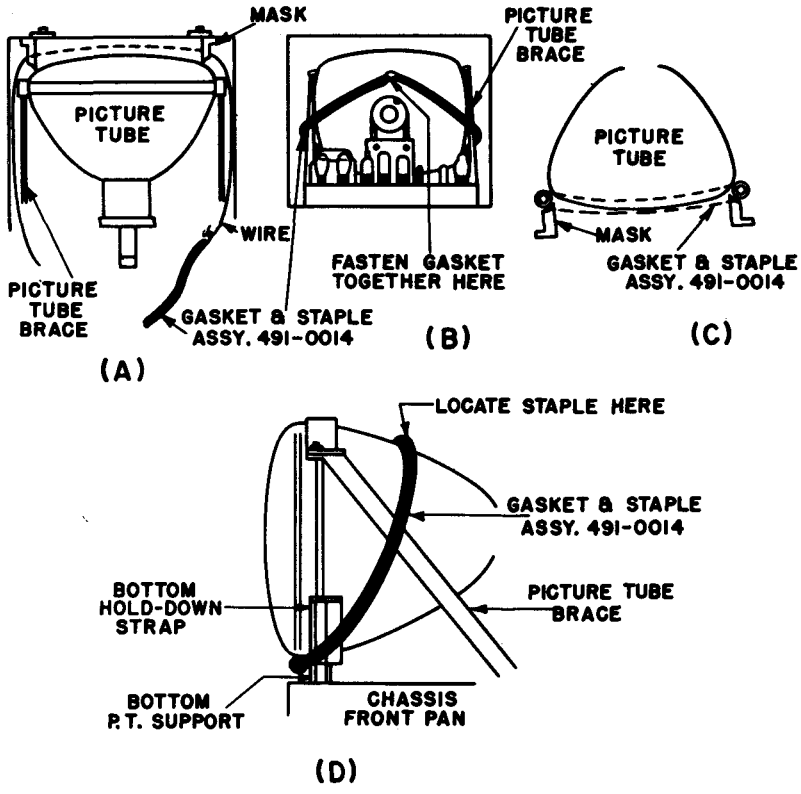


Fig. 25 — Sylvania

Installation with tv chassis in cabinet:

1. Thread a piece of moderately flexible were approximately 3-feet long around the inside of the cabinet in front of the picture tube bottom supports, making sure that it passes above both control shafts (see (A)).

3. Attach one end of wire to stapled end of gasket.

4. Pull free end of wire through until it is possible to grasp both ends of gasket at sides of chassis.

5. Hook ends of gasket together with staple as shown in figure (B), making sure that gasket passes outside picture tube braces.

6. Press gasket forward on picture tube until it falls evenly into groove between mask and picture tube as in figure (C).

Installation with chassis out of cabinet:

1. Stretch gasket over face of picture tube with staple at top as in figure (D), making sure that the gasket lies between bottom hold-down strap and chassis front pan.

2. Slide chassis into cabinet and secure chassis mounting bolts.

3. Push gasket forward on picture tube until it falls into gap between picture tube and mask. Be sure that the gasket fits snugly.

SYLVANIA All chassis with horizontal scanning transformer assembly part Nos. 241-0003 or 241-0005.

Mounting horizontal scanning transformer.

A certain number of these horizontal scanning transformers with undersize cores have been released for production. The production solution is to use an additional clip. This clip is available to the field as part No. 487-0016. There are two possible field problems:

1. Replacement transformer core undersize and no additional clip available. It may be possible to increase the bend in the "ears" on the clip to take up the variation or to add a nonmagnetic shim between the core and plastic case on the opposite side of the clip.

2. Replacement transformer core correct size but original core undersize. Remove one clip.

Caution: Do not force transformer in with two clips as plastic case may crack. (Note: There is now available, as part No. 898-0013, a tool to facilitate removal of the horizontal scanning transformer assemblies 241-0003 and 241-0005.)

SYLVANIA All chassis with h-v transformer 241-0005

Arcing and corona in h-v transformer retaining clip (see Fig. 26).

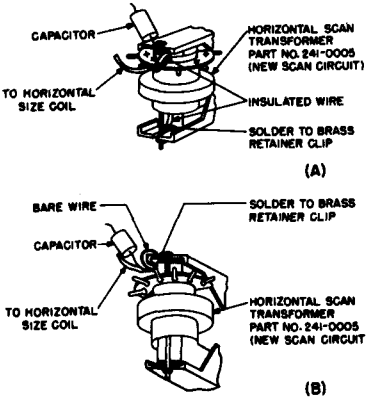


Fig. 26 — Sylvania

Arcing and corona in h-v transformer retaining clip may be corrected by connecting an insulated wire from the clip to the center transformer terminal as shown in sketch (A).

The factory is correcting this condition by connecting a bare wire from the clip (which has been moved to the top) to the center transformer terminal as shown in sketch (B).

SYLVANIA All chassis with 5642 tubes

Replacement of 5642 tubes.

When replacing 5642 tubes, special care should be taken to center the tube between the terminal lugs so that the lead length between the tube and lug is equal for all three leads. This will decrease the risk of soldering too close to the glass, which may otherwise cause a defective tube. All solder joints on the tube leads or anywhere in the h-v section should be formed with a well rounded ball of solder. Sharp points and edges will cause corona and must be removed.

SYLVANIA All chassis with 5642 tubes

Testing 5642 h-v rectifier tubes (see Fig. 27).

The 5642 is designed to be soldered in place and therefore is difficult to test without danger of accidental shorts. One way to test these tubes is to make an adapter as shown. Bolt two Fahnestock clips on an octal tube base and connect to the proper pins as required for the particular tube tester used. Bolt a lead with an alligator clip fastened to it to the other side of the base.

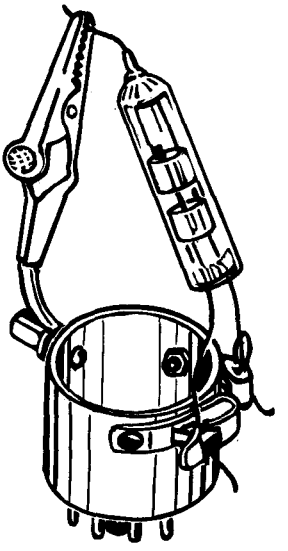


Fig. 27 — Sylvania

This lead does not connect to the base pins, but solder a tube top cap to the bolt so connection may be made with the tester's regular top cap connection, if required.

SYLVANIA All chassis with 6AG5

Replacement of 6AG5.

The 6AG5 tube has been superseded by the 6BC5 tube having improved operating characteristics. These two tubes are directly interchangeable except for minor operating characteristics. The 6BC5, part No. 623-0011, should be used as replacement for all applications where the 6AG5 was formerly used.

SYLVANIA All chassis with 6BQ6 or 6CD6 tubes

Low h-v output due to corroded plate caps.

Corrosion inside the plate caps of the 6BQ6 or the 6CD6 causing poor contact can result in low h.v. Thorough cleaning to a bright surface is recommended to insure proper contact.

SYLVANIA All chassis with 6CB6 in tuner.

Vertical hold control critical.

If critical vertical hold is encountered, check r-f tubes in tuner for heater-cathode leakage. Cases have been reported on the 6CB6 where this leakage supplies sufficient hum modulation to trip the vertical sync circuits.

SYLVANIA All chassis

Intercarrier buzz or distorted sound.

If intercarrier buzz or distorted sound is encountered, recheck alignment of the sound discriminator transformer, particularly the secondary which is somewhat critical.

SYLVANIA All chassis

Failure to obtain i-f bandpass response.

Failure to obtain the i-f bandpass response curve shown in service notes may be due to signal generators or sweep generators having too low a signal output level. For a satisfactory response curve, the d-c voltage across the diode load resistor should measure approximately 1 volt. The sweep generator must have a flat frequency response over the desired 10-mc range as specified in the service notes.

SYLVANIA All chassis

Reducing 4.5-mc harmonic interference.

4.5-mc harmonic interference may be reduced by redressing the speaker leads so that they are as far away from the antenna leads as possible. The antenna should also be kept away from the speaker frame.

SYLVANIA All chassis

Arcing and corona at anode button.

Dirt accumulation around the anode button may lead to the belief that the picture tube is defective. This is particularly true on sets using a rubber anode cap. The rubber anode cap may be removed and discarded, and the insulated area around the button thoroughly cleaned with scouring powder and water and then polished dry. This procedure will in no way affect the operation of the set and will eliminate the possibility of needless picture tube replacement.

SYLVANIA All chassis

Power transformer lamination buzz.

Many of the transformers having the above fault may be effectively treated by inserting a wooden wedge between the coil and center leg of the core. This may be done without disconnecting the transformer by removing the transformer bolts and lifting the cover. Be sure to retighten the bolts evenly and securely.

TELE KING Chassis TVG, TVJ

Vertical slipping on strong signals.

For vertical slipping on strong signals in the above chassis, apply the following:

1. On TVG chassis place a 50-μh coil, *LC11*, in parallel with *R100*, 8.2k-ohm grid resistor in the first i-f stage.

2. On TVJ chassis remove *R100*, 100k-ohm grid resistor in the first i-f stage, and put a 50-μh coil, *LC11*, in its place.

TELE KING Chassis TVJ

White flashes in picture.

Effective in later production *C125* (d-c restorer coupling capacitor) is changed from a .05-μf, 600-volt paper capacitor to a 47-$\mu\mu$f ceramic capacitor. This change helps to eliminate charging on noise pulses which results in white flashes appearing in the picture.

TELE KING Chassis TVJ

Improving retrace blanking.

To improve the retrace blanking of the receiver, the following components forming the coupling circuit from the vertical deflection coils to the grid of the picture tube are modified in later production as follows:

1. *C309* is changed from a .05-μf, 600-volt capacitor to a .01-μf, 600-volt unit.

2. *R219* is changed from a 330-k, ½-watt resistor to a 22-k, ½-watt resistor.

TELE KING Chassis TVJ

Increasing picture width and high voltage.

The following changes, made in later production, provide additional width and increased second anode voltage:

1. *R231*, a 22-ohm, ½-watt resistor in the cathode circuit of the horizontal output tube, is changed to a 10-ohm, ½-watt resistor.

2. The width coil is wired from taps 4 and 5 instead of taps 5 and 8 of the horizontal output transformer.

TELE KING Chassis TVJ

Reducing drive bars.

The following changes, made in later production, are effective in reducing drive bars:

1. *R321*, cathode resistor in horizontal output stage, is changed back to its original value of 22 ohms at ½ watt if the 10-ohm resistor suggested under "Increasing picture width and high voltage" produces drive bars.

2. *R316*, 18-k, 1-watt resistor connected to terminal 1 of the horizontal output transformer, is changed to 22 k at 1 watt.

TRAD TV Models T-20, A, B, C

Improved focus.

Any one of the following changes may be made in later production runs of the above models to improve focus:

1. Replace *R182*, *R183*, and *R184* (all in the B+ lead and shunting

the focus coil) with a 1,000-ohm, 5-watt resistor.

2. Replace *R181*, focus control, which formerly was a 2,250-ohm unit, with a 5,000-ohm unit.

3. Short out *R182*, 130-ohm, 5-watt resistor connected to one side of the focus control, and obtain plate voltage for 6V6, audio output tube, from 320-volt bus instead of from 370-volt bus.

TRAD TV Models T-20, A, B, C

Improved sync.

The following changes, already included in some later runs of the above models, improve the sync action of the receiver:

1. *C137*, horizontal sync coupling capacitor, is increased from 150 $\mu\mu$f to 270 $\mu\mu$f.

2. *R148*, grid resistor connected to pin 4 of the sync separator, is changed from 3.9 meg to 5.6 meg.

TRANSVISION 10-, 12-, 15-inch models

Preventing h-v shield from causing filament short.

If the self-tapping screw which holds the high-voltage shield down to the chassis is omitted alongside tube socket *X6* (for 5U4 rectifier), there is always a danger of the flange sliding under the base of the tube and causing a short circuit in the filament line.

TRANSVISION 10-, 12-, 15-inch models

Horizontal pulling.

Due to phase differences between station and set located in different power areas, occasionally a wavering similar to a flag weaving vertically may be noticed. To minimize this, put a 1,000-μf capacitor across the 10-ohm resistor *R69* which goes from lug 1 of *CF-2* to lug 1 of of terminal strip *0*.

Horizontal tearing is sometimes due to breakdown of the resistor in series with the anode cap lead.

TRANSVISION 10-, 12-, 15-inch models

No brightness control.

In some sets having interchangeable cathode-ray tube saddles, it has been found that the machine screw holding this saddle on the side opposite the tuner sometimes may short on terminal strip *A* on lug 3. This would result in the brightness potentiometer having no control.

TRANSVISION 10-, 12-, 15-inch models

No high-voltage output.

If no high voltage can be obtained in a newly wired set and the plates of the 6BG6 get red slowly, check to see if the vertical hold and horizontal hold potentiometers are reversed (vertical in horizontal and horizontal in vertical). Also, if loss of horizontal scanning cannot be corrected by changing tubes, change resistor *R66* (connected to pin 2 of socket *X6*).

TRANSVISION 10-, 12-, 15-inch models

Overloading causing video tearing.

In areas of excessive signal strength, tube *X11* may become overloaded causing video tearing even when contrast is reduced to a minimum. The following revision should correct this condition:

1. Remove the wire that connects lug 1 of terminal strip *P* to lug 5 of terminal strip *P*.
2. Ground lug 5 of terminal strip *P*.
3. On socket *X13*, remove resistor *R7* (150 ohms) that connects pin 5 with pin 3.
4. Put a 100-ohm resistor from pin 5 of socket *X13* to lug 1 of terminal strip *P* (using an added piece of wire).
5. Remove resistor *R3* from socket *X11*.
6. Put 150-ohm resistor from pin 5 of *X11* to ground.

Note: This revision may affect the sound when using the f-m radio (if used). It may then be necessary to turn up the contrast control.

TRANSVISION 10-, 12-, 15-inch models

Increased gain on high channels.

In some cases, it has been found that a 1,000-$\mu\mu$f capacitor across the antenna input gives considerable additional gain on channels 7 through 13.

TRANSVISION 10-, 12-, 15-inch models

Arcing and corona near picture tube.

In many cases, the second anode connector for the picture tube does not make a positive mechanical connection with the tube. Instead, the rubber cover holds to the glass by vacuum. This sometimes results in an air gap between male and female connections with a resulting arc disturbing the picture.

A hissing or cracking noise is sometimes due to arcing between the focus coil and ion trap. A short wire connected between the trap and focus coil will prevent this.

TRANSVISION 10-, 12-, 15-inch models

Increasing horizontal scanning.

In some cases it has been found that a 200-$\mu\mu$f capacitor soldered across lugs 2 and 3 of terminal strip *H* increases the horizontal scanning.

TRANSVISION 10-, 12-, 15-inch models

Insufficient width on right.

In some cases where difficulty is encountered in obtaining sufficient right-hand width (flat pattern on right side), the addition of a .1-μf capacitor in parallel with capacitor *VV* (also a .1-μf unit) should produce an improvement. Capacitor VV goes from pin 3 of *X4* to pin 2 of *X6*.

TRANSVISION 10-, 12-, 15-inch models

Parasitic oscillations.

In rare cases radiation of approximately 175 mc has been found to originate in the horizontal flyback circuit. This condition may be corrected by placing a 50-ohm, ½-watt resistor in the 6BG6 plate lead as a parasitic suppressor.

TRANSVISION 10-, 12-, 15-inch models

Arcing on h-v rectifier support.

It is advisable, with the summer months and high humidity, to dust off and clean with carbon tetrachloride, part No. 345. This is the insulated platform which supports the 1B3 tube. Several breakdowns have occurred where accumulated dust, becoming moist, provided a leakage path.

TRANSVISION 10-, 12-, 15-inch models

Reduction in brightness.

In some cases the brightness drops when the set has been placed in the cabinet. This may be due to the cup on the cabinet either becoming magnetized or distorting the magnetic field of the ion trap. Try to center the cup with reference to the axis of the tube neck or replace cup with one of non-magnetic material.

Poor high-voltage regulation is evident when varying the brightness control causes the screen to become very dim or extinguished. Replace the 1B3 tube under these conditions.

TRANSVISION 10-, 12-, 15-inch models with afc kit

Improved operation of horizontal hold and focus controls.

In some cases, after the installation of the afc circuit, the horizontal hold control may operate toward one end. This may be corrected by adding approximately 50 $\mu\mu$f to the value of capacitor *AH*. Also, if focusing is not satisfactory after installing the afc circuit, the value of resistor *R68* should be reduced to approximately half its value. This can be done by wiring another 47-k resistor in parallel with *R68*. Changing the positions of the long leads to the contrast and brightness controls may also be necessary if picture distortion occurs.

TRANSVISION Models 10BL

Proper location of ion trap.

The black strap (or dot) on the ion trap should be towards the rear of the tube (towards the base). This black strap (the rear strap) on the ion trap should be located approximately over the pole pieces (two projecting pieces on the gun inside the picture tube). The side of the ion trap having the two screws should be located approximately on the side of the tube where the anode lead is connected. This is the rough location of the trap.

Now the ion trap should be adjusted for the brightest picture by very carefully sliding it straight back and forth on the neck of the tube and then rotating slightly until the best point is obtained. When answering inquiries regarding no raster on this type of picture tube, it should be remembered that improper location of the ion trap can completely eliminate any trace of a raster.

TRANSVISION Models with 7EP4 picture tube

Substitution of picture tube.

When changing a 7EP4 socket to a 7JP4, note the extra thin orange lead coming from the latter socket. This is merely connected to the yellow filament lead in the set which is lug 1 of terminal strip *Z*. On the 7EP4, this connection was made internally in the socket.

In cases where a 7EP4 tube has been replaced by a 7JP4, several instances have been noticed where the yellow lead of the new socket has been placed on the wrong side of the filament, thus giving a highlight to half of the screen (either upper or lower half). Merely connect this lead to the opposite side of the filament.

TRANSVISION Models with 12JP4 picture tube

Cathode-to-grid leakage in picture tube.

In cases where cathode-to-grid leakage is encountered in 12JP4 tubes (as evidenced by inability to get picture to sync), sparking between pins 2 and 11 of the cathode-ray tube socket will usually eliminate this difficulty. This sparking can be done by utilizing the 9,000-volt anode potential from the chassis. The second-anode lead that is usually connected to the side of the picture tube should be connected to pin 2. A lead should be clipped to pin 11 and grounded to the chassis for a fraction of a second.

TRANSVISION Models with CT-1 and TT-2 tuners

Interference beats in picture.

Some difficulty has been noted in using the above tuners, in that interference beats are present in the picture when the sound i.f. is properly tuned. In most cases, this can be removed by adjusting the position of the antenna lead with respect to the sound i-f components. At least a 3-inch clearance is necessary to remove this effect.

In sets utilizing the CT-1 tuner, high channel beats may be traced to lead location. The filament lead (black) to the tuner should be close to the chassis adjacent to the skirt bypassed by a 1,000-$\mu\mu$f capacitor to ground. This is the lead to pin 7 of *X16*. The B+ lead (red) should be placed in the clear section in front of and away from the i-f section.

TRANSVISION Models with horizontal oscillator transformer No. 307

Improved horizontal sync.

In cases where difficulty is encountered in the horizontal sync (slight cases merely show wavy effect in vertical wedges), a 50-$\mu\mu$f capacitor across the blue and green leads of the horizontal oscillator transformer (part No. 307) usually corrects the condition. However, in some cases the circuit constants are such that the addition of the capacitor shows no effect. In which case, it may be necessary to try another horizontal oscillator transformer.

TRANSVISION Remote-control models

Weak signal symptoms.

If a remote-control installation should result in weak signal symptoms, we suggest that the following check be made: Shunt the coax cable and feed the signal directly to the input of the tuner with a separate lead. It has been found that careless soldering of the coax fittings may result in a partial short at these points with symptoms that direct suspicion to the tuner.

TRAV-LER TV Model 217-32A, 220-35A

Replacement of h-v rectifier.

Replacements for the TV-X-109 high-voltage assembly are being supplied with the 1AX2 high-voltage rectifier tube and the customary 3.3-ohm filament limiting resistor removed. This raster can be eliminated due to the self-regulating characteristics of the 1AX2 filament. All television receivers of model 220-35A with a serial number greater than 2120300 and all of model 217-32A after 2079400 will not have the series resistor and will be equipped with the 1AX2 tube.

The 1AX2 is interchangeable with the 1X2A if the current limiting resistor is removed. Therefore, replacement in the field will necessitate the removal of the 3.3-ohm resistor when substituting the 1AX2 for the 1X2A.

TRAV-LER TV Chassis 34A2

Adequate separation of sound and picture carriers.

Recent tests of the above television chassis circuitry have indicated a slight frequency shift in the i-f passband with an increase in signal strength. In order to maintain at least a 20-db separation between the sound and picture carrier in the i-f response curve, the cathode resistor of the first and second i-f stages are increased to 82 ohms each. Chassis already including this change will be stamped 34B2.

TRAV-LER TV Chassis 36A2

Improving tracking in fringe areas (see Fig. 28).

To improve tracking of picture and sound in fringe areas, later production television receivers using the above chassis have incorporated a new i-f coil TV-L-142 in the second and third i-f stages. These are *L42B* and *L42C* respectively.

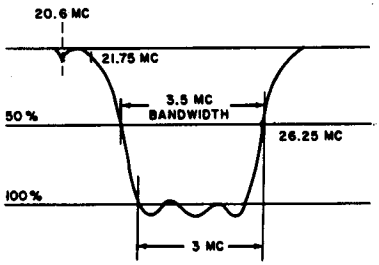


Fig. 28 — Trav-ler TV

The new coil is approximately 2 inches in length and mounts in the original i-f coil chassis hole. There are two separate windings on each coil form. The winding nearer the chassis is the i-f winding and contains the same number of turns as the TV-L-13 previously used. Mutually coupled and approximately 3/16-inch from the edge of the i-f winding is the audio trap winding with a 47-$\mu\mu$f ceramic capacitor in parallel. Both windings have separate tuning slugs and are adjusted individually.

I-f alignment procedure remains unchanged and is covered in the service notes. Each trap is tuned to 20.6 mc. The resultant i-f response is shown in the illustration.

TRAV-LER TV Chassis with TV-TA-3 and TV-TA-4 tuners

Intermittent tuners.

Laboratory examination of certain of the above tuners which have been returned for replacement labeled "intermittent" has shown them to be defective due only to mishandled rotor plates. If these rotor plates are bent in any way, rotation of the channel selector shaft will cause the plate to come in contact with the printed coil. These coils are at B+ potential, whereas the rotor plates are at chassis ground. Thus, a short or severe arcing is introduced between the coil and the plate. This condition can be corrected in the field by carefully adjusting the bent plate to provide adequate spacing between the plate and the coil.

TRAV-LER TV 1952 chassis

Intercarrier buzz.

Excessive buzz can be reduced or eliminated by simple methods of realignment of the audio circuit. In many cases, a touch-up of the secondary (top) of the ratio detector transformer *L17* may be all that is necessary. This does not require a removal of the chassis from the cabinet. Remove rear cabinet cover. Since this disconnects the power to the chassis, a substitute line cord must be provided. Turn receiver on and tune for normal picture and sound. Insert a small bladed screwdriver through the top opening of *L17* until it engages the tuning slug. Adjust for best sound with a minimum buzz level. Caution: The slug requires a slight rotation only; excessive pressure on the adjustment slug may damage the slot in the slug and will require replacing the transformer.

A simple method for adjusting the sound circuits can be used with a high-resistance voltmeter and a signal generator, the frequency of which is set to 4.5 mc unmodulated. If no signal generator is available, the television transmitting signal may be used. This method requires the removal of the chassis from the cabinet. Turn the receiver on and set the picture control fully clockwise. Connect the high-resistance voltmeter between test point *C* and chassis. Connect the signal generator between test point *A* and chassis. Adjust the sound trap coil *L16A* and primary of the ratio detector (bottom adjustment *L17*) for a maximum reading on the voltmeter. After making these adjustments, connect the voltmeter between test point *E* and chassis. Adjust the secondary of the ratio detector (top adjustment *L17*) for zero reading on the voltmeter.

WELLS-GARDNER Chassis GS-31, MS-31, -36, -39

Elimination of drive bar.

Effective in later production, the capacitance of the coupling capacitor between the horizontal oscillator and output tube is changed to 200 $\mu\mu$f. This lower value capacitor allows the horizontal drive control to be set at the center of its operating range. The new part number of this capacitor is RCM20A201K and is indicated as *C69* on the schematic diagram in the service notes.

This change is made to eliminate the drive bar which results from variations in characteristics of 6SN7GTA and 6BQ6GT tubes.

WELLS-GARDNER Chassis GS-34, MS-31, -36, -39

Horizontal jitter.

In new television areas, particularly where final transmitter adjustments have not yet been made, an unstable picture, in the form of horizontal jitters, may be received. In most cases this is caused by phase shift in the timing circuits of the television transmitter.

The above condition can be corrected by removing the long time-constant filter network, *C63* (.22 μf) and *R85* (33,000 ohms) from pin 4 of the 6SN7GTA horizontal oscillator tube in the television chassis. Since this network is used to minimize bending at the top of the picture, its removal will increase this tendency to some extent, depending upon the individual chassis.

It would be helpful to call the "phase-shift condition" to the attention of the transmitter engineer, since he may not be aware of it.

WELLS-GARDNER Chassis GS-34, MS-31, -34

Reduction of horizontal sweep interference in broadcast sets.

Interference caused by radiation from the horizontal output circuit into the a-c line can be reduced by using a 6AX4 tube in place of the 6W4. This change was made in later production runs.

The following circuit changes are necessary to use a 6AX4 tube: The lead from terminal 3 of the horizontal output transformer to the heater terminal of the 6W4 damper socket should be removed, and the damper heater grounded to the chassis at the socket. Be sure to change the tube layout label whenever this change is made, so a 6W4 tube is not inserted at a later date. Immediate breakdown will result if the 6W4 is used in place of a 6AX4 after the circuit changes have been made.

WELLS-GARDNER Chassis GS-40, MS-39

Replacement of uhf local oscillator tube.

In some uhf converters, a 6T4 is used in place of the 6AF4 oscillator tube. The two tubes are not interchangeable. If replacement is necessary, always use the same type, which is plainly marked on the tube layout labels.

WELLS-GARDNER Chassis MS-31C

Unstable vertical hold.

Due to the unstable characteristics of a large percentage of 6BL7 tubes, all chassis of the date code of 2434 and later are changed to use the 6SN7GTA. This date code appears at the center rear of the chassis.

The following changes are made to accommodate the 6SN7GTA tube in the vertical deflection circuit. Reference is made to the components listed in the service notes.

1. *R59*, vertical output B+, 15 k, 2 watt, 10%, changed to 6.8 k, 2 watt, 10%.
2. *R48*, vertical output cathode, 1,500 ohms, ½ watt, 10%, changed to 820 ohms, ½ watt, 10%.
3. *R57*, vertical output grid, 1 meg, ½ watt, 10%, changed to 2.2 meg, ½ watt, 10%.

Some early production chassis used a 53X159 vertical output transformer with a 3.3 k at *R59*, instead of a 15 k and a 53X156 vertical output transformer. To use a 6SN7GTA in place of a 6BL7 with early production chassis, it is necessary to use a 53X156 transformer in place of the 53X159.

If the vertical hold control locks the picture at the extreme clockwise setting of the control, *R50* should be changed from 1.5 meg to 1.8 meg.

It is not necessary to make the above-mentioned changes unless vertical instability is encountered which cannot be rectified by replacement of the 6BL7 tube, or original circuit components.

WELLS-GARDNER Chassis MS-31C
Agc threshold control.

To allow for variation of cutoff characteristics of 6CB6 tubes, an agc control is added to later production of the above chassis. This control, in series with a fixed resistor, takes the place of the 3.9-meg resistor, *R31*, that is connected between the agc and B+ 150-volt line. The agc control has a value of 2.5 meg, part No. 40X364, and is in series with a 2.7-meg resistor, part No. B84275. Adjustment is as follows:

Tune the receiver to the strongest station in the area in which the receiver will be used. While observing the picture and listening to the sound, turn the control clockwise until signs of overloading (buzz in sound, washed-out picture) appear. Then turn the control a few degrees counterclockwise from the point at which overloading occurs. (The stronger the signal input, the more counterclockwise this setting will be). In areas where the strongest signal does not exceed 10,000 μv, the setting will usually be maximum clockwise. With the control set correctly, the agc will automatically adjust the bias on the r-f and i-f amplifiers so that the best possible signal-to-noise ratio (minimum snow) will be obtained for any signal input to the receiver.

WELLS-GARDNER Chassis MS-31C
Checking h-v capacitor for leakage.

Service personnel are cautioned against shorting directly across the 500-$\mu\mu$f h-v filter capacitor as a check to see if voltage exists. Shorting in this manner puts an extremely high voltage surge across it, thereby causing it to develop electrical leakage and eventual breakdown. All checks for high voltage should be made after the 1-meg filter resistor, with the proper type high-voltage measuring equipment.

WELLS-GARDNER Chassis MS-31C
Improved focusing on 21MP4 picture tube.

Due to variations in electron gun structures, improved focusing can be obtained by positioning the magnet of the ion trap on the side where the electron gun is nearest the glass neck of the picture tube. In most cases, this will be on the left side of the electron gun when viewing the picture tube from the rear.

WELLS-GARDNER Chassis MS-31C
Arcing in 1B3 wafer socket assembly.

During its first few weeks of operation, an electrostatic picture

tube frequently has a tendency to arc internally due to dust particles being present around the gun structure. While this condition almost always clears up automatically without damage, there are instances where the 47X560 high-voltage filter capacitor and the 1B3 wafer socket are weakened. When continued arcing is noticed in the 1B3 high-voltage rectifer wafer socket, it should always be suspected that the 47X560 high-voltage capacitor is leaking.

Should the wafer socket be carbonized by the arcing to the point where replacement is needed, the filter capacitor should be replaced, after it has been determined whether it is damaged.

These high-voltage components should be replaced only when arcing is noticed in the assembly.

WELLS-GARDNER Chassis MS-39 with uhf tuner

Adjustment of fine tuning control shaft (see Fig. 29).

Fig. 29 — Wells-Gardner

Models using a general coverage Mallory uhf tuner have the uhf tuner driven by a string drive from the fine tuning shaft of the Standard Coil vhf tuner. Since this fine tuning shaft does not have a stop, it is difficult to find the correct position for proper adjustment of the oscillator slug.

The illustration shows the positions of maximum and minimum capacitance with reference to the flat on the fine tuning shaft. The vhf channel oscillator slug should be adjusted so that sound ripples are just noticeable in the picture with the fine tuning shaft at minimum capacitance. Note: The above mentioned adjustment may vary according to signal strength.

WESTERN AUTO (TRUETONE) Model 2D2044, 2D2047

Increasing horizontal size.

To increase horizontal size, capacitor *C117* (h-v filter) is returned to ground instead of to terminal 1 of the horizontal output transformer. This change is already included in later production.

WESTERN AUTO (TRUETONE) Model 2D2044, 2D2047

Providing better centering of picture.

1. Resistor *R103* (2,700 ohms, 2 watts) in the plate circuit of the audio output tube is replaced with a 5,600-ohm, 2-watt resistor.

2. A 5,600-ohm, 2-watt resistor is added from electrolytic *C61-D* (blank), 30-μf, 400-volt filter capacitor connected in plate circuit of audio output stage, to electrolytic *C118-A* (square dot lug), 60-μf, 450-volt filter capacitor connected to one side of filter choke.

Note: These changes are already included in later production.

WESTERN AUTO (TRUETONE) Models 2D2044, 2D2047

Increasing range of vertical hold control.

To increase the range of the vertical hold control, the following changes, already included in later production, are made:

1. Resistor *R76* (1-meg resistor connected to high side of vertical hold control) is replaced with a 560k-ohm unit.

2. Resistor *R73* (68k-ohm resistor connected to low side of control) is replaced with a 18k-ohm unit.

WESTERN AUTO (TRUETONE)
Models 2D2044, 2D2047

Preventing overload of brightness control.

To prevent overloading of brightness control and to squeeze brightness levels between stations, the following changes, included in later production, are made:

1. Resistor *R47* (6,800-ohm unit connected to low side of brightness control) is removed.

2. Terminal 3 of the brightness control is connected to ground.

3. The orange lead from the brightness control is removed.

4. The connection of the yellow lead and the .1-μf capacitor (*C67*) is removed from the brightness control center tap and connected to the audio terminal strip, lug 7 (lug 1 is closest to the side of the chassis).

5. A 100k-ohm resistor is added from the audio terminal strip lug 7 to the center tap of the brightness control. This puts this resistor between the tap on the control and the cathode of the picture tube.

6. A 68k-ohm resistor is connected from terminal 1 (ungrounded terminal) of the brightness control to 250-volt B+ (lug 1 on the terminal strip under the horizontal size coil).

WESTERN AUTO (TRUETONE)
Models 2D2044, 2D2047

Preventing oscillation failure on channel 13.

To eliminate cases of oscillation failure on channel 13, the following change, already made in later production, is included. A 7-$\mu\mu$f capacitor is added across the choke coil *L10* in the video i-f strip. This coil is in the +155 volt lead to the plate of the converter tube.

WESTERN AUTO (TRUETONE)
Models 2D2044, 2D2047

Replacement of horizontal output transformer.

The horizontal output transformer C-12M-18285 was used in all chassis up to and including code 10. When replacement is necessary the C-12M-18285 transformer should be used. The C-12M-18689 transformer can be used if the agc leads are removed from lugs 5 and 6 and a 1-meg, 1-watt resistor is added from lug 5 to the blue 6BQ6 plate lead terminal.

In code 11 and 12, the C-201-18530 transformers were used. These transformers are not available for replacement. When replacement is necessary, the following transformers can be used:

1. The C-12M-18285 transformer can be used if resistor *R107* (3,900-ohm, 2-watt unit between the damper cathode and the end of the size coil not connected to the transformer) is removed.

2. The C-201-18562 transformer can be used if the agc leads are removed from lugs 6 and 7 and a 1-meg, 1-watt resistor is added between lugs 6 and 7. A jumper is then added from the blue 6BQ6 plate lead terminal to lug 7. The lead that went

to lug 5 on C-201-18530 goes to lug 6 on the C-201-18562.

3. The C-12M-18689 transformer can be used if the agc leads are removed from lugs 5 and 6 and a 1-meg, 1-watt resistor is added from lug 5 to the blue 6BQ6 plate lead terminal.

After code 12 both the C-12M-18689 and C-201-18562 transformers were used. When the C-12M-18689 transformers were used, the 3,900-ohm, 2-watt (*R107*) resistor was not incorporated. Either transformer can be used for replacement in chassis after code 12. If replacing the C-12M-18689 transformer with a C-201-18562, the 3,900-ohm, 2-watt (*R107*) resistor must be added.

WESTERN AUTO (TRUETONE)
Models 2D2044, 2D2047

Preventing contrast control shaft connector from breaking (see Fig. 30).

Since the contrast control is located on the video i-f strip assembly, an extension shaft and shaft connector are used to operate the contrast control. The extension shaft can be rotated a full 360 degrees while the contrast control will reach its stop after approximately 280 degrees. If the extension shaft is rotated clockwise after the contrast reaches its stop, the fibre shaft connector will be broken. To prevent the shaft connector from breaking, simply follow the instructions below:

1. Remove the chassis from the cabinet.
2. Remove the lower screw and lockwasher holding the contrast shaft bracket to the front of the chassis.

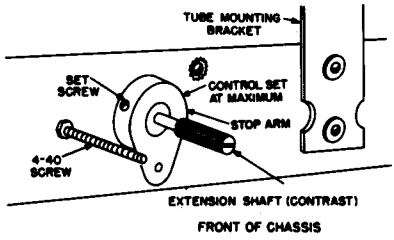


Fig. 30 — Western Auto

3. Insert the small 4-40 screw through the hole in the contrast shaft bracket so the screw head is inside the chassis. Tighten to the chassis with the lockwasher and nut provided.
4. Place the stop-arm assembly over the contrast control extension shaft so the stop-arm is away from the chassis.
5. Set the contrast control to maximum (clockwise).
6. Rotate the stop-arm clockwise until it reaches its stop (the 4-40 screw).
7. Tighten the two stop-arm assembly set screws.
8. Replace the chassis in the cabinet.

WESTERN AUTO (TRUETONE)
Models 2D2044, 2D2047

Handling permanent magnet focus assembly.

The permanent magnet focus assembly used in the 10-, 12-, and 16-inch receivers are essentially magnets within an assembly so designed as to provide a flexible means for adjusting focus and centering on the face of the picture tube.

Do not use a steel screwdriver to adjust the focus and centering con-

trols. A nonmagnetic material should be used, as a magnetic material will increase the flux density of the assembly and a correct adjustment cannot be obtained. A focus and centering adjustment tool can easily be made by flattening out a copper or brass ¼-inch tube to act as a screwdriver.

Care should be taken so as not to demagnetize the assembly. The assembly may prove troublesome if the following precautions are not followed:

1. Handle with care.
2. Keep away from metal tables.
3. Do not bump or drop.
4. Keep steel screwdriver or iron metal away.

Note: The B-55P-18445 focus magnet assembly used in the 12- and 16-inch receivers has a focus adjusting screw missing. The adjusting screw was deleted to allow proper focus and centering. The 12-inch focus magnet assemblies are coded with a splash of red paint either on the assembly or on the threads. The 16-inch assemblies are not coded.

WESTERN AUTO (TRUETONE)

Models 2D2044, 2D2047

Severe horizontal shift and squegging (see Fig. 31)

Improper neutralization of the sync amplifier in Code 13 and up receivers or chassis with "group numbers" may result in a severe horizontal shift of the entire picture with contrast control adjustments and may also start hunt oscillation ("squegging") of the horizontal afc circuit. "Squegging," evidenced by white lines or streaks running diagonally across the picture, ringing from the speaker, or singing from the horizontal deflection transformer, may cause damage to the 6BQ6, 6W4, 1X2, or the horizontal deflection transformer.

If this condition is noticed, it will be necessary to adjust the neutralization of the sync amplifier as shown below:

1. Disconnect the antenna.
2. Remove an i-f tube (6AU6).
3. Rotate the contrast control to its normal operating position.
4. Connect a vtvm (plus or minus 10-volt range) across capacitor *C106* (.25-μf unit near pin 4 of horizontal multivibrator 6SN7).
5. Short pin 5 of 6SL7 to ground.
6. Turn the set on.
7. Notice vtvm reading. This should be within plus or minus ½ volt of zero volts. If not, check capacitors *C99*, *C100*, *C101*, *C102*, and resistors *R82* and *R87*. The capacitors are 220-μμf and 680-μμf units connected to pins 1 and 5 of the afc discriminator; the resistors are 1-meg and 1.5-megs respectively which are connected through *C99* to pin 1 (cathode) and through *C102* to pin 5 (cathode) of afc discriminator.
8. Remove the short at pin 5 of 6SL7 from ground and note

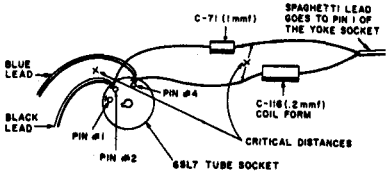


Fig. 31 — Western Auto

vtvm reading. If the voltage goes positive, move the two neutralizing capacitors *C71* and *C116* (see diagram) closer together to reduce the voltage to zero. Should this adjustment be insufficient spread the black and blue leads (see diagram) connected to pins 2 and 4 of the 6SL7. If the voltage is negative, do the opposite of above.

9. When the vtvm reading is zero, the receiver is properly neutralized.

Note: A similar picture shift may also be caused by:

1. Defective agc.
2. Video overloading.
3. Poor sync separation .
4. Defective picture tube with grid leakage to anode or cathode.

WESTERN AUTO (TRUETONE)
Model 2D2044

Hum in picture.

Hum in picture, evidenced by snake-like wavering, or a horizontal displacement of a portion of the picture or raster in the above model, can easily be cured after first determining the cause. To determine the cause, follow the procedure below:

1. Momentarily short pins 1 and 2 (horizontal winding) of the deflection yoke socket and quickly notice the white vertical line on the face of the picture tube.

2. If the line wavers or is displaced horizontally, remove the power transformer mounting bolts and replace the insulated washers with metal lock washers.

3. If the vertical line did not waver in the above check, then short the grid of the horizontal multivibrator (pin 4 of tube *V16*) to ground, manually sync the horizontal hold control and notice if hum continues to exist.

4. If in step 3 the hum does not displace the picture horizontally, the cause may be a cathode-to-filament leakage in tube *V15* or tubes *V1* through *V9*, or improper 155- or 250-volt B+ filtering.

5. If in step 3 the hum does displace the picture or raster horizontally, the cause may be one of the following:

a. Shorted resistor *R103* (2,700-ohm resistor in plate circuit of audio output tube).

b. Improper 350-volt filtering due to faulty input or output filter capacitors (*C118A* or *C118B*), shorted choke *L25*, or bad 5U4 tube.

c. Faulty power transformer. Secondary winding may be connected incorrectly making the windings in phase giving half-wave rectification. This condition can be identified by placing a voltmeter between pins 4 and 6 of the 5U4 tube and obtaining a zero reading instead of 700 volts ac. In other cases, the secondary windings may be different or a shorted portion will give different voltages at pins 4 and 6 of the 5U4 to ground. This condition can be checked by measuring the voltages or checking the ripple content with a scope (60 cycles).

WESTERN AUTO (TRUETONE)
Model 2D2044

Removing audio buzz.

To remove audio buzz, the following changes, already included in code 13 of the above model, are made:

1. Ground the pick-off coil (*T8*) at the junction of *C72* (5,000-$\mu\mu$f), *R54* (470 k), and *R55* (220 k).

2. Resistor *R54* and capacitor *C72* are removed.

WESTERN AUTO (TRUETONE)
Model 2D2044

Improving agc action.

The following changes, already made in later production coded 13, are included to improve agc action:

1. Resistor *R87* is changed to 680k ohms. This resistor is connected between the damper plate and the afc circuit.

2. Capacitor *C98* is changed to 82 $\mu\mu$f. This capacitor is connected to the plates of the afc discriminator.

3. Resistor *R82* is changed to 220k ohms and reconnected to pin 2 of tube *V9* (agc amplifier) instead of terminal 5 of *T6*. This resistor had been connected between the afc circuit and terminal 5 of the horizontal output transformer.

4. Pin 1 of tube *V9* (agc amplifier) removed from ground.

5. A 47k-ohm resistor is added from pin 6 of tube *V8* (video amplifier) to pin 1 of tube *V9*.

6. A 1-$\mu\mu$f capacitor is added from pin 1 of tube *V9* to pin 1 of yoke socket.

7. Resistor *R44* (3.3 meg) is removed from cathode (pin 3) of *V9*.

8. The connection of capacitor *C116* (.2 $\mu\mu$f, coil form) is removed from pin 3 of *V9* and reconnected to pin 4 of tube *V9*.

9. Resistor *R34* (47k ohm) is removed from pin 3 of *V9*.

10. Pin 3 of tube *V9* is connected to 155-volt B+ bus.

11. Resistor *R50* is changed to 2,200 ohms. This resistor was a 47-k unit connected to pin 2 of *V9*.

12. Capacitor *C70* is changed to .25 μf. This capacitor, originally .1 μf, is connected to tuner agc bus.

13. Resistor *R53* (560k ohms) and capacitor *C71* (1,000 $\mu\mu$f) are removed. This is a series circuit between pin 2 of *V9* and terminal 5 of the horizontal output transformer.

14. The connection from pin 2 of tube *V9* to the junction of *R50* and *R51* is removed. These resistors were originally 47-k and 220-k units.

15. The horizontal deflection transformer (*T6*) is replaced with a new transformer (C-201-18562). The new transformer has the agc winding, but resistor *R99* (1 meg) and terminal 5 are not incorporated.

16. The new transformer is reconnected to the same terminals.

17. The agc lead (terminal 7 of transformer terminal board) connects to the junction of *R50* and *R51*.

18. A .1-μf capacitor is added from the junction of *R50* and *R51* to ground.

19. The other agc lead (terminal 6) is connected to pin 2 of tube *V9*.

WESTERN AUTO (TRUETONE)
Model 2D2044

Making horizontal drive independent of phasing.

To make the horizontal drive independent of phasing, the following changes, already made in later production coded 13, are included:

1. Resistor *R95* (4,700 ohms) and capacitor *C110* (220 $\mu\mu$f) are removed. These components are both

connected to the pin 2 plate of the horizontal multivibrator.

2. Capacitor *C111* is changed to 820 $\mu\mu$f. This capacitor parallels the drive trimmer.

3. A 22-$\mu\mu$f capacitor is added from the junction of *R96* (220 ohms), *R97* (470 k) and *C112* (1,000 $\mu\mu$f) to pin 5 of tube *V18* (damper). These three components are in the grid circuit of the 6BQ6.

WESTERN AUTO (TRUETONE)
Model 2D2044

Removing gears and producing better sync and noise clipping.

The following changes, included in later production of the above model coded 13, are made to remove the shaft and gear arrangement on the volume-contrast control and to provide better sync and noise clipping:

1. A dual volume-contrast control with a double section switch replaces the contrast and volume control with shafts and gears. The volume control is wired as before.

2. The grounded end of *R36* is removed and reconnected to one end terminal (terminal 3) of the contrast control. This resistor is a 2.2-meg unit connected to pin 2 of the video amplifier.

3. The center tap of the contrast control is connected to ground.

4. Resistor *R40* (560 ohms) is removed from the cathode (pin 3) of the video amplifier.

5. Capacitor *C63* is changed to 22 $\mu\mu$f. This capacitor is also tied to pin 3 of the video amplifier.

6. A 100-ohm resistor is added from pin 3 of the contrast control to pin 3 of tube *V8* (video amplifier).

7. Resistor *R34* (47k ohms) and capacitor *C56* (22 $\mu\mu$f) are removed. These parts are tied to the high side of the original contrast control.

8. A connection is added from pin 7 of tube *V8* to coil *L16* (detector peaking).

9. An 8,200-ohm resistor is added from pin 7 of tube *V8* to ground.

10. Resistor *R38* is changed to 3,300 ohms, 1 watt. This resistor is between +155 volt bus and peaking coil of 1st video amplifier.

11. Resistor *R37* (1,000 ohms) is removed. This resistor shunts the peaking coil just referred to.

12. A 10k-ohm resistor and an 82-$\mu\mu$f capacitor are added in parallel from pin 6 of tube *V8* to the junction of *L20* (same peaking coil referred to in step 10) and *C62* (.02-μf coupling capacitor).

WESTERN AUTO (TRUETONE)
Model 2D2044

Removal of picture tube spot.

The following change, already included in code 13 of the above model, is made to remove the picture tube spot: One section of the dual on-off switch is connected between the 250-volt B+ bus and *R47*, 68-k resistor connected to high side of brightness control.

WESTERN AUTO (TRUETONE)
Model 2D2044

Preventing squegging caused by agc.

To prevent squegging caused by the agc, a 10k-ohm resistor is connected between terminal 7 of *T6*

(horizontal output transformer) and the junction of *R50* (2,200 ohms), *R51* (220 k), and *C70* (.1 μf). These components are agc bus filter components in the plate circuit of the agc amplifier.

WESTERN AUTO (TRUETONE)
Model 2D2044

Preventing audio i-f overloading and increasing output.

To prevent audio i-f overloading and to give increased audio output, *R56*, 68-ohm cathode resistor of the sound i-f amplifier, is increased to 120 ohms. This change has already been made in those models coded 15.

WESTERN AUTO (TRUETONE)
All models

Lead dress in h-v supply.

Life tests have indicated need for closer attention to dressing within the high-voltage power supply on all models. In the process of inspection, repairs, changing of tubes, or for any other reason where it is necessary to work within the high-voltage power supplies, the following should be closely observed:

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

2. Corona ring must be dressed in such a way as to make its presence useful; that is, properly centered and about ⅛-inch below 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 chassis.

4. On the race track type transformer assembly, leads must be dressed away from the coil and race track.

5. The tube cap clip ends must face away from the sides of shield can. The above is of extreme importance in minimizing breakdowns in the field.

WESTINGHOUSE Models H-196, H-207, H-217

Setting sensitivity control.

There has been considerable confusion in the past as to the correct method of setting the sensitivity control. The correct methods are as follows: If the chassis is on the bench, set the control for 0.6 volt on the picture i-f agc line with no signal input. If the set is in the customer's home, set the channel selector to a "dead" channel, turn the contrast to maximum, and turn the sensitivity control fully counterclockwise, for maximum sensitivity. The screen should then be well filled with snow. The sensitivity control should then be turned clockwise very slowly until the amount of snow just begins to decrease. The screen should still be saturated with snow and the control should be locked at this position.

The slot in the control will be approximately horizontal. If the control is set below the correct point, the full sensitivity of the set will not be realized in weak signal areas. If the control is set above the correct point, the receiver will overload in strong signal areas.

WESTINGHOUSE Models H-196, H-207, H-217

Fuse failure.

The ¼-ampere fuse (V-6171-3) should never be replaced by a jumper of heavy wire. This fuse protects the horizontal output transformer (V-5934). If the fuse is not in place and the 6BG6G tube becomes defective, the transformer is apt to be damaged. A blown fuse is usually indicative of a gassy 6BG6G, and unless the cause is located elsewhere, the 6BG6G should be replaced.

WESTINGHOUSE Models H-196, H-207, H-217

Insufficient range of vertical-hold control.

If insufficient range of the vertical hold control makes it difficult or impossible to lock-in the picture, the value of the fixed resistor in the grid circuit of the 12AU7 vertical oscillator (*R87* in model H-196 and *R419* in model H-217) should be checked. In original production, the resistor was 1.5 meg, and it was used in series with a 1-meg vertical hold control (*R10* in model H-196 and *R407* in model H-217). Later, the fixed resistor was changed to 1 meg, and the hold control was changed to 2 meg to provide greater hold control range. However, some sets used a 1-meg fixed resistor and a 1-meg hold control. In these sets the range of the hold control is limited, and better results may be obtained by changing the fixed resistor to 1.5 meg.

WESTINGHOUSE Models H-196, H-207, H-217

Picture foldover.

Foldover of the picture can be caused by failure of *C54* or *C53* in models H-196 and H-207 or the equivalent capacitors (*C407* and *C406*) in model H-217.

If *C54* (H-196) or *C407* (H-217) in the plate circuit of the 6AQ5 horizontal oscillator is leaky or shorted, the differentiating action will be lost, and the horizontal discharge tube will be triggered by a broad pulse rather than by a sharp spike. A foldover on the picture will result.

If *C53* (H-196) or *C406* (H-217), across the horizontal deflection coil, is defective, a decrease in picture width in addition to picture foldover will occur.

WESTINGHOUSE Models H-196, H-207, H-217

Preliminary alignment procedure.

During the preliminary adjustments to the video i-f coils and traps (using a signal generator and vtvm) a fixed bias should be applied to the agc line as explained in the service notes. However, more uniform results can be obtained in the final alignment (using a sweep generator and oscilloscope) by removing the fixed bias and proceeding as follows: Adjust the sensitivity control for 0.6 volt on the video i-f agc line (in DX models adjust to the threshold) with no signal input to the receiver. Then couple the sweep output to the converter grid and adjust the sweep output until 1.5 volts are developed on the video i-f agc line. At this setting the amplitude of the sweep voltage applied to the receiver will be optimum for visual alignment.

WESTINGHOUSE Models H-196, H-207, H-217

Horizontal oscillator drift.

Difficulty due to drifting of the horizontal oscillator has been traced to certain capacitors in the horizontal oscillator tank and discriminator secondary circuits. The capacitors under discussion are *C93* and *C94* in the V-2130 chassis, *C428* and *C429* in the V-2130-1 chassis, and *C426* and *C427* in the V-2146-1 chassis. If the set goes out of horizontal sync after it warms up, or if the discriminator was adjusted when the set was warm and the set will not stay in sync during the warm-up period, these capacitors should be checked.

WESTINGHOUSE Models H-196, H-207

Objectionable audio hum.

Hum in the audio section may be reduced by adding a 30-μf capacitor (V-6570) across *C99* which is connected between the screen of the 6AQ5 audio output tube and ground. This change has been incorporated in later production.

WESTINGHOUSE Model H-196

Prolonging tube life.

Early chassis used a 5Z4 tube as a low-voltage rectifier. In later production a 5V4G, which has a higher current rating, was used in place of the 5Z4. To prolong tube life in the early chassis, it is recommended that the 5Z4 low-voltage rectifier be replaced (direct substitution, no wiring change required) by a 5V4G. This change is not of sufficient importance to warrant a special service call, but it should be made when other service is performed on the set.

WESTINGHOUSE Model H-196

Poor vertical hold in weak signal areas.

In weak signal areas, the sync may be improved by replacing the 12AU7 sync amplifier tube (used in early chassis only) with a 12AT7. The 12AT7 is a medium-mu tube, and will provide greater sync amplitude than will the 12AU7 which is a low-mu type. This change is a direct substitution, and no wiring changes are required.

WESTINGHOUSE Models H-196,

Insufficient width at low line voltage.

Under very low line voltage conditions, the picture width may not be sufficient even though the width control is at maximum. If this is the case, check the code number of the deflection yoke. This number is located under the "V" number on the yoke. If the number is 98, 108, or 118, replace the yoke with one carrying any other code. The old yoke will perform satisfactorily with normal line voltage.

WESTINGHOUSE Model H-196DX

Setting sensitivity control.

The on the bench adjustment of the sensitivity control in model H-196DX differs from the method used for model H-196. In model H-196-DX, the control must be set to the "threshold" rather than to a fixed value. The correct procedure is to rotate the control completely clock-

wise, and then slowly rotate the control counterclockwise until the voltage indicated by a vtvm connected between the agc line and ground no longer decreases. The point at which the voltage stops decreasing is the correct setting. If the voltage does not decrease below 1 volt, all the r-f and i-f tubes that are connected to the agc line should be checked, and the tube that is causing the high contact potential should be replaced.

Since full agc is applied to DX tuners, the grey lead emerging from the back of the tuner is a convenient place to connect the vtvm during the above adjustment.

The procedure for adjusting the control in the customer's home is similar to that used for Model H-196.

WESTINGHOUSE Models H-216, -217, -223, -226, -231, -242, -251

Improved retrace blanking.

Under some transmitter conditions, a few retrace lines may not be blanked out at the top of the picture. If this condition is experienced, the 2.2-k resistor in the cathode of the vertical mutivibrator should be changed to a 1.2 k, ½ watt.

WESTINGHOUSE Models H-216, H-226

Picture pulling at high contrast.

On some of the early-run chassis of the subject models using a 1N34 crystal instead of a 12AU7 as the d-c restorer, it may be found that there is excessive picture distortion when the contrast control is set above very low contrast. This distortion takes the form of a sideway shift of the upper and middle portions of the picture.

This distortion, due to contrast control variation, may be eliminated by changing the 47k-ohm resistor, *R329*, connected between the d-c restorer and ground to 4.7k ohms, and the 10k-ohm resistor, *R458*, at the first sync amplifier plate to 4.7k ohms. These changes are incorporated in later production.

It should be noted that on strong signals at very high settings of the contrast control, where the tubes are driven to saturation, the picture will darken and twist. This is a normal condition.

WESTINGHOUSE Model H-217, H-217A, H-226

Increasing picture width.

With early production versions of the models listed, some difficulty may be experienced in obtaining sufficient picture width. If this condition occurs, check the voltage divider (*R501*, *R502*, *R503* and *R504*) in the voltage doubler circuit of the high-voltage supply. In original production, the plate of the 1B3GT doubler tube was connected to the junction of *R501* and *R502*. To increase the picture width, move the plate connection down to the junction of *R502* and *R503*. This was done in later production.

WESTINGHOUSE Model H-217

Ground connection to aquadag.

Wear or vibration may sometimes develop a poor connection between the outside coating of the cathode-ray tube and its grounding springs. The attendant arcing at that

point can result in tearing of the picture and insufficient picture width.

To insure a permanent ground contact, a piece of aluminum foil is inserted between the aquadag and the grounding springs on later production models. This foil, one side of which is coated with adhesive, is first cut to a size of 1 x 1½ inches. One edge is then folded ¼ inch over the adhesive side of the foil. Finally, the foil is placed between the aquadag and the grounding spring in such a manner that adhesive holds the foil to the aquadag, the spring bears against the uncoated side of the foil, and the uncoated side of the ¼-inch fold bears tightly against the aquadag.

The foil is stocked in rolls of 20 feet and can be ordered by part No. V-6237-2.

WESTINGHOUSE Models H-223, -226, -242, -251

Correcting picture blooming (see Fig. 32).

To correct for blooming, i.e., the picture expands in all directions excessively as the brightness control is advanced, insert a resistor in series with the brightness control as shown. The correct value for the V-2150 series chassis is 47 k, ½ watt and for the V-2130 and V-2146 chassis use a 100 k, ½-watt resistor. This change went into effect in the H-223 at chassis No. D11635, in H-242 at No. A013681, in H-251 at No. D008727, and in H-226 at No. H00847.

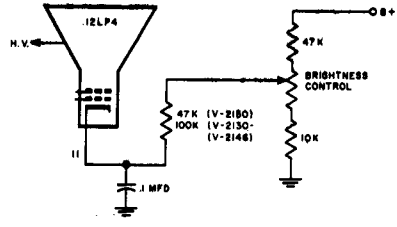


Fig. 32 — Westinghouse

WESTINGHOUSE Model H-223

Handling permanent magnet type focus coils.

Permanent magnet type focus coils were employed on some of the early production chassis. Coils of this type can be identified by the part number V-6456 stamped on the coil. Care should be exercised to avoid bringing another magnet into contact with the coil, because prolonged contact will alter the magnetization and affect the amount of current required for correct focusing. The focus control range will then be insufficient.

WESTINGHOUSE Model H-223

Random sound bars in picture.

In early production of Model H-223, one side of the audio output transformer secondary winding was connected to the chassis near the transformer, and one of the speaker socket terminals was connected to the chassis near the socket. With these connections, the audio output currents were carried through the chassis for some distance, and under certain conditions disjointed or random sound bars appeared on the picture.

The remedy is to disconnect the transformer secondary wire at the point where it connects to the chassis and connect it to the grounded terminal of the speaker socket through

an additional length of wire. This was done in later production.

WESTINGHOUSE Model H-223
Replacement of 4.5-mc audio i-f transformer.

In early production, the audio i-f transformer (V-6517) did not contain a 10-$\mu\mu$f capacitor (*C220*). Instead, the capacitor was located outside the transformer can. These transformers that do not contain *C220* are coded with a red dot.

Although the part number of the audio i-f transformer was not changed, the capacitor was built into the transformer in later production.

The transformers supplied as replacements contain the capacitor. Therefore, when replacing one of the red-dotted transformers, the external capacitor should be removed from the circuit.

WESTINGHOUSE Model H-242
Bright vertical bar prior to horizontal sync lock-in (see Fig. 33).

Differences in tube characteristics of the 12AU7 horizontal multivibrator may result in a bright vertical bar appearing on the screen just before the set is locked-in horizontal sync. If this happens, the resistors in the error voltage feedback circuit should be changed to 220 k, 1 watt each as shown in the figure. This change was effective on the chassis at No. A0152210.

WESTINGHOUSE Model H-242
Improved vertical linearity.

Some H-242's had a 4.7-k waveform correction resistor in the plate

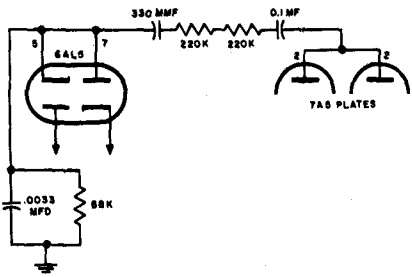


Fig. 33 — Westinghouse

circuit of the 12AU7 vertical multivibrator. Under certain transmitter conditions this may cause a wide separation of the top horizontal lines causing a "hump," which cannot be taken out with the vertical linearity control, to appear at the top of the picture. If this is the case, the 4.7-k resistor should be replaced by a 3.3-k, ½-watt resistor.

WESTINGHOUSE Model H-242
Replacement of R463 (see Fig. 34).

The physical appearance of *R463* (110 ohms, 3 watts), which is connected in series with the focus control, is different in later production chassis. The new resistor is covered with asbestos, and the assembly of resistor and asbestos is designated part No. V-8214. The electrical ratings of the old and new resistors are identical.

Only the new resistor, V-8214, is stocked for replacement purposes. Since this resistor must not be bent, the physical location of *R463* must be changed if a new resistor is used to replace the old V-6984-7 resistor. The correct location for the new resistor is shown in the figure. The

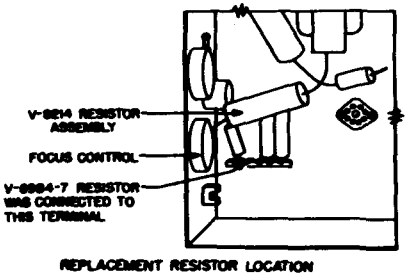


Fig. 34 — Westinghouse

red wire that runs from the tie point for the old resistor to the tie point for the new resistor should be clipped from the circuit when the new resistor is installed.

WESTINGHOUSE Model H-242
Improved picture definition (see Fig. 35).

Picture definition in the early H-242's may be improved somewhat by adding a 33-ohm, ½-watt resistor in the cathode circuit of the 6AH6. In addition, a .033-μf bypass must be added as shown. The change went into effect at chassis No. A013985.

WESTINGHOUSE Model H-242
Reduction of noise at picture tube grid.

It may be noted that the 3rd i-f amplifier screen dropping resistor (*R348*) is designated 100,000 ohms in the service notes. This is the correct value for the resistor. However, in early chassis a 47,000-ohm resistor is used. In chassis containing the 47,000-ohm resistor, it may be possible to reduce noise at the crt grid by increasing the value of *R348* to 100,000 ohms.

WESTINGHOUSE Models H-600T16, -601K12, -602K12, -603C12, -604T10, -604T10A, -605T12, -608C12, -609T10
Horizontal pulling at top of picture.

A form of picture distortion may occur under certain conditions in early production of the models listed. The affected portion of the picture extends down approximately 1 inch from the top, and the distortion is apparent as an undesired image that is horizontally displaced from the true image. The vertical lines of the undesired image converge with those of the true image and join at the lower border of the distorted area.

If these symptoms appear, the capacitor that is connected between the plate of the 12AU7 second sync amplifier and the grid of the 12AU7 phase inverter should be checked. If the value of this capacitor is 390 μμf, it should be replaced with a .05-μf capacitor. The .05-μf value is used in later production.

In addition, the resistor that is connected between the grid of the 12AU7 phase inverter and ground should be checked. In Model H-

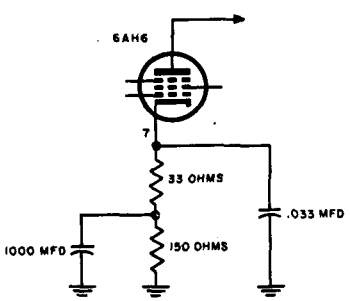


Fig. 35 — Westinghouse

609T10, this resistor should be 2.2 meg. The remainder of the above models should use a 3.9-meg resistor in this application. These values of resistance should be used to replace any 100,000-ohm resistors that are found in the 12AU7 phase inverter grid circuit. 100,000-ohm resistors were used in some early production chassis.

WESTINGHOUSE Models H-600T16, -601K12, -602K12, -603C16, -605T12, -606K12, -607K12, -608C12

Increasing video gain in weak signal areas.

A 33-ohm resistor and a .033-μf capacitor in the cathode circuit of the 6AH6 video output tube provide a sharper picture in these models. However, the sharper picture is obtained at the expense of video gain, and it may be desirable in weak signal areas to sacrifice the sharpness in favor of increased gain.

The gain of the video amplifier can be increased by connecting a wire between pin 7 of the 6AH6 video output tube and the high side of the contrast control in order to short across the resistor and capacitor described above.

A further increase in gain can be obtained at the expense of picture definition by changing the value of the plate load resistor for the 6AH6 video output tube. This resistor, which is normally 3,600 ohms, can be replaced by a 3,900-ohm, 1-watt resistor.

WESTINGHOUSE Models H-600T16, -601K12, -602K12, -604T10, -604T10A

Improving vertical hold in weak signal areas.

When these models are operated in weak signal areas, an improvement in the vertical hold characteristic may be desirable. An improvement can be obtained at the expense of increased susceptibility to noise pulses by changing the value of the resistor that is shunted across the integrating network input. This resistor is designated *R416* in the H-604T10 and H-604T10A service notes, *R419* in the H-600T16 service notes, and *R419* in the H-601K12 and H-602K12 service notes; its resistance is normally 1,000 ohms. To obtain the effects noted, the resistor should be changed to 1,800 ohms.

Note: Model H-600T16 uses either a V-2150-61 or a V-2150-61A chassis. Of these two chassis, the above information applies to the V-2150-61 chassis only. The V-2150-61A chassis utilizes keyed agc, and the input to the integrating network is taken from a different point.

WESTINGHOUSE Models H-603C12, H-608C12

Improving horizontal hold.

To improve the horizontal hold, the following changes made in later production, are included:

1. The capacitance of *C408*, which is connected from pins 5 and 7 of the 6AL5 horizontal afc tube to ground, should be changed to .002 μf.

2. Add a .1-μf capacitor from the junction of *R441* and *R433*, located in the pin 7 grid circuit of the

12AU7 horizontal multivibrator, to ground. Label the capacitor *C439*.

3. Change the resistance of *R456* in the cathode circuit of the 6BQ6 GT horizontal output tubes to 150 ohms.

4. Change the resistance of *R431*, located in the pin 6 plate circuit of the 12AU7 horizontal multivibrator, to 33 k.

WESTINGHOUSE Models H-603C12, H-608C12

Improving vertical hold.

A poor vertical hold characteristic in these models can be caused by radiation of the horizontal sweep signal into the red and orange leads that extend between the uhf adapter plug and the wafer switch. To eliminate the pickup on these leads, disconnect both the red and orange leads from the wafer switch, run the leads out over the top of the chassis and down through a hole near the wafer switch, and reconnect the wires to the wafer switch.

WESTINGHOUSE Models H-604T10, H-604T10A

Eliminating diagonal bars in picture.

A decoupling network is used in the B+ supply lead to the h-v power supply. The network consists of a 68-ohm resistor (*R505*) inserted in series with the B+ lead that connects to the junction of *R501* (68 ohms) and *R524* (10k), and .1-μf capacitor (*C508*) inserted from the junction of *R501* and *R524* to ground. These items are added in later production chassis to eliminate diagonal bars in the picture.

WESTINGHOUSE Models H-605T12, -606K12, -607K12

Improving brightness of picture tube.

The following changes, made in later production, improves the brightness on the picture tube:

1. Change the resistance of *R326* in the cathode circuit of the crt to 47 k.

2. Change the resistance of *R332* in the cathode circuit of the crt to 68 k.

WESTINGHOUSE Model H-605T12

Shadows caused by deflection yoke binding.

In some deflection yokes used in the above model, the nut for the deflection yoke adjustment wing-screw may bind with the metal channel in which it rides. The binding makes it difficult to position the yoke snugly against the bell of the crt.

If the yoke is not fitted snugly against the crt bell, shadows may appear around the edge of the crt face.

The remedy for the condition is to loosen the deflection yoke adjustment wing-screw and carefully force the deflection yoke forward as required. In extreme cases, it may be necessary to remove the deflection yoke, and pry the nut toward the rear of the yoke using a screwdriver.

WESTINGHOUSE Model H-605T12

Improving sync stability and preventing jitter.

The following changes made in later production, improve sync stability, prevents picture jitter and fold-over:

1. Add a 100-ohm resistor between pins 3 and 8 of the 12AU7 horizontal multivibrator, and make the upper end of *R424* connect to pin 3 rather than pin 8. Label the added resistor *R469*.

2. Change the resistance of *R428*, located in the pin 1 plate circuit of the 12AT7 1st sync amplifier, to 22 k.

3. Change the resistance of *R433*, located in the pin 6 plate circuit of the 12AT7 sync separator, to 22 k.

4. Change the resistance of *R439* in the 12AU7 phase inverter grid circuit to 2.2 meg.

5. Change the resistance of *R446* in the grid circuit of the 7A5 horizontal output tubes to 100 k.

6. Change the capacitance of *C430* in the 7A5 grid circuit to 270 $\mu\mu$f.

7. Change the resistance of *R419* in the pin 3 cathode circuit of the 12AU7 2nd amplifier to 330 ohms.

8. Change the capacitance of C438, which is connected between pins 1 and 7 of the 12AU7 2nd sync amplifier and phase inverter, to .05 μf.

9. Change the resistance of *R430* in the pin 1 plate supply circuit of the 12AU7 horizontal multivibrator to 33 k. This improves the stability of the horizontal sweep circuit.

WESTINGHOUSE Models H-606K12, H-607K12

Distributing voltage dissipation of R453.

Change the resistance of *R453* located in the line that connects to pin 5 of the 6AL5 horizontal afc tube to 100 k, and add a 100-k resistor in series with *R453*. Label the added resistor *R472*. This change distributes the voltage dissipation in the resistors.

WESTINGHOUSE Model H-609T10

Failure of agc.

This model incorporates a V-2150-94C chassis which uses a keyed agc system. The keying voltage for the system consists of some of the 15,750-cps horizontal sweep voltage. It is taken from the plate of the 6BQ6GT horizontal output tube through a length of 150-ohm twinlead that functions as a low value of capacitance (item 172 on the preliminary schematic).

If the length of twinlead is dressed too near the chassis, the losses in the twinlead will be too high, and insufficient keying voltage will be coupled into the agc system. The system will be inoperative under these conditions.

To cure this difficulty, unsolder one end of the twinlead, tie a single overhand knot in the twinlead, and resolder the end of the lead. The knot will support the twin lead away from the chassis.

WESTINGHOUSE Models H-610T12, H-614T12

Adding parasitic suppressor.

Add a 120-ohm resistor in series with the control grid (pin 5) of the 6Y6G audio output tube, and label the resistor *R220*. This resistor, added in later production, serves as a parasitic suppressor.

WESTINGHOUSE Models H-610T12, H-614T12

Improving sensitivity on weak signals.

Change the resistance of *R339* in the screen-grid circuit of the 6AU6 agc keying tube to 15 k. This change, made in later production, improves the sensitivity on weak signals.

WESTINGHOUSE Models H-610T12, H-614T12

Stabilizing horizontal sweep circuit.

Change the capacitance of *C430* in the 6AU5GT horizontal output grid circuit to 270 $\mu\mu$f. This stabilizes the operation of the horizontal sweep circuit. This change is already made in later production.

WESTINGHOUSE Model H-610T12, H-614T12

Increasing picture width.

Change the resistance of *R411* which is connected to the plate of the 6W4GT horizontal damper tube to 7.5 k. This corrects for insufficient width when necessary. This change is made in later production.

WESTINGHOUSE Models H-613K16

Improving contrast.

The following changes, made in later production, improve picture contrast:

1. Change the resistance of *R339* in the screen grid circuit of the 6AU6 agc keying tube to 10 k.
2. Change the resistance of *R466* located in the grid circuit of the 12AT7 1st sync amplifier to 22 k.

WESTINGHOUSE Model H-613K16

Improving signal-to-noise ratio and sensitivity.

1. Change the resistance of *R353* which is connected between the agc line and ground to 470 k. This improves the signal-to-noise ratio.
2. Change the resistance of *R217* located in the grid circuit of the 6Y6G audio output tube to 470 k. This improves the sensitivity.

WESTINGHOUSE Model H-613K16

Improving linearity.

1. Change the resistance of *R427*, which is connected to pin 6 of the 12AU7 vertical multivibrator, to 4.7 k. This improves the vertical linearity.
2. Change the resistance of *R411*, which is connected to pin 5 of the 6W4GT horizontal damper tube, to 4 k. This improves the horizontal linearity.

WESTINGHOUSE Model H-625T12

Reducing power dissipation in brightness control.

To reduce power dissipation in the brightness control, *R315* in series with the brightness control is changed to 22,000 ohms, and *R322* also in series with the control is changed to 33,000 ohms. This change is already made in later production.

WESTINGHOUSE Model H-625T12

Improving performance of height control circuit.

To improve the performance of the height control circuit, *R429* in series with the height control is changed to 470,000 ohms. In some

chassis, *R429* is 680,000 ohms, but with this higher value of resistance the time required to develop full picture height after the receiver is turned on may be excessive.

WESTINGHOUSE Model H-625T12

Correcting horizontal linearity.

C427 in the pin 6 plate circuit of the horizontal multivibrator should be 680 $\mu\mu$f as indicated on the schematic only when a V-9759 high-voltage transformer (*T502*) is in the chassis. Some earlier chassis contain different high-voltage transformers, and with these earlier chassis *C427* should be .001 μf to provide correct horizontal linearity. The .001 μf of capacitance may consist of a single capacitor (RCP10W6102K), or a 330-$\mu\mu$f capacitor (RCM20C331J) may be added in parallel with the 680-$\mu\mu$f capacitor.

WESTINGHOUSE Model H-625T12

Increasing life of filter capacitor.

To increase the life of the filter capacitor can (V-6509) that contains *C501* (input filter capacitor), *C213* (audio output decoupling), *C402* (at cathode of vertical output), and *C441* (vertical output decoupling), a change is made in later production chassis. The change consists of using a separate 30-μf, 450-volt capacitor (V-6570) for *C441*, and not using the section of the filter can marked by a triangle. By not using this section, which had been used for *C441*, heating is reduced and satisfactory operation of the filter can is obtained. Chassis that contain this change are identified by the letter "B" after the chassis number. When replacing a defective filter can (*C501*, *C213*, *C402* or *C441*), a V-9775 unit should be installed. Due to the higher ratings on the V-9775 filter can, it can be used in the normal manner and it is not necessary to use a separate capacitor for *C441*.

WESTINGHOUSE Models H-626T16, -627K16, -628K16, -629K16, -630T14

Picture blooming.

The reactor (*L403*) in the filament circuit of the 1X2A high-voltage rectifier is omitted in later production. In early production chassis which contain *L403*, blooming caused by low filament voltage at the 1X2A may be eliminated by removing the reactor.

WESTINGHOUSE Models H-626T16, -627K16, -628K16, -629K16, -630T14

Reducing power dissipation of R217.

The 5,000-ohm resistor (*R213*) in the 6AQ5 audio output circuit is connected from the output of the low-voltage power supply filter to the junction of *R212* and *C212* in the 6AQ5 cathode circuit. In some early chassis where *R213* is not connected in this manner, the power dissipation in *R217* can be reduced by changing the connections.

WESTINGHOUSE Models H-626T16, -627K16, -628K16, -629K16, -630T14

Improved horizontal stability.

In later production chassis, several changes are incorporated to stabilize the horizontal multivibrator operation. The resistor (*R436*) in

the pin 6 plate circuit of the horizontal multivibrator is changed to 270,000 ohms, a 220,000-ohm resistor (*R457*) is inserted in parallel with *R434* in the pin 7 grid circuit, and a 120-$\mu\mu$f capacitor (*C442*) is inserted in parallel with *C422* between pins 1 and 7.

In some chassis that use a 12BH7 tube as the horizontal multivibrator and do not contain the above changes, a 1.5-$\mu\mu$f capacitor (*C441*) is connected between pins 6 and 7 to improve the multivibrator performance. The effect of *C441* is negligible, however, when the above changes are made.

WESTINGHOUSE Models H-626T16, -627K16, -628K16, -630T14

Preventing raster ringing.

A 5,600-ohm resistor (*R456*) is added in parallel with the horizontal linearity control (*L402*). Some early chassis do not contain *R456*. The resistor is added in later production to eliminate vertical shaded lines on the raster by suppressing ringing in the control.

WESTINGHOUSE Models H-626T16, -627K16, -628K16, -630T14

Preventing volume control from becoming noisy.

A .005-μf capacitor (*C222*) is added between the high side of the volume control and the junction of *C207* and *R204*. In some early chassis that do not include *C222*, the tendency for the volume control to become noisy can be eliminated by adding the capacitor.

WESTINGHOUSE Models H-626T16, -630T14, -637T14

Difficulty in centering and eliminating neck shadows.

If difficulty is experienced in centering the picture or eliminating neck shadows from the face of the tube, the position of the crt neck in the hole of the focalizer mounting bracket should be checked. The neck of the crt must be centered in the hole of the mounting bracket. This can be checked by removing the focalizer from its mounting bracket. If the neck is not centered, adjust the length of the stabilizer strap which extends from the crt strap to the superstructure until true centering is obtained. Replace the focalizer and perform the adjustments outlined in the service notes.

Note: A few early production sets do not have the stabilizer strap.

WESTINGHOUSE Models H-626T16, H-630T14

Increased control of height (see Fig. 36).

Due to variations between 6K6GT vertical output tubes, it was found desirable in later production to provide increased control over the picture height. Accordingly the circuit was altered as shown. *R414* is removed from the circuit, and the height control connections are changed. In later production, *C412* is changed to .03 μf in the V-2172 chassis only.

WESTINGHOUSE Models H-626T16, H-630T14

Horizontal ringing coil adjustment.

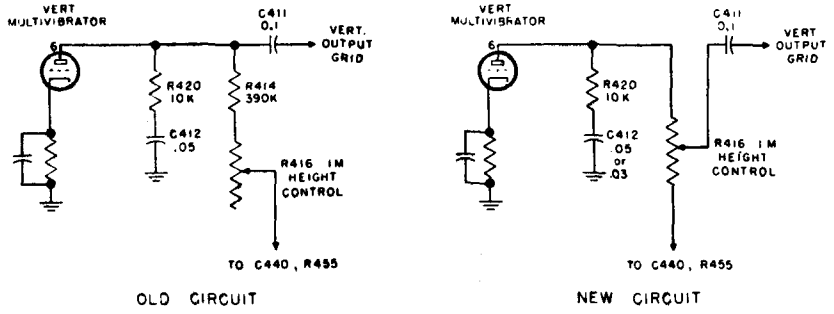


Fig. 36 — Westinghouse

The following procedures for adjusting the horizontal ringing coil should be followed in lieu of the method given in the original service notes.

Before adjusting the horizontal ringing coil (*L401*), short out the ringing coil with a short length of jumper wire. Tune in the weakest station in the area, and adjust the horizontal hold control to the center of the range over which the hold control is effective. Then remove the short from the ringing coil and adjust *L401* to the center of the range through which the picture is synchronized horizontally.

For a more critical adjustment, connect a vtvm with a zero-center scale between pin 2 of the horizontal multivibrator and the chassis so as to measure the d-c bias at this point. Tune in the weakest station in the area, and with the horizontal ringing coil shorted, adjust the horizontal hold control to the center of the hold range. Note the d-c voltage indication on the meter. Remove the short from the ringing coil and adjust *L401* for the same potential observed above.

WESTINGHOUSE Models H-626T16, H-630T14

Substitute for sound i-f alignment test point.

In some V-2170 series chassis, two 33,000-ohm resistors connected in parallel are used in place of *R205* and *R206* across pins 2 and 7 of the 6T8 ratio detector. In these chassis, alignment point *A* is not accessible. Therefore, it will be necessary to connect two 100,000-ohm resistors, the resistances of which are equal within 5 percent, in series across pins 2 and 7 to provide the midpoint *A* when aligning the sound i-f section. The two 100,000-ohm resistors should be removed after the alignment has been completed.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20, -643K16

Removal of tunable beat from picture.

When a beat pattern that can be changed by using the fine tuning control appears on the picture, it can usually be assumed that the interfering beat is developed within the

receiver itself. Interfering beat signals that develop within the receiver are sometimes called "r-f tweets."

It has been found that one type of r-f tweet is developed as a result of coupling through the heater network. To eliminate this effect, a V-4886-2 reactor should be inserted in series with the heater string immediately ahead of the 6T8 ratio detector and first audio amplifier tube so that the 6T8 and the tubes that follow in the string are isolated (at r-f) from the other tubes in the string. The reactor is included in later production chassis.

Another type of r-f tweet is produced by coupling i-f signal voltage back into the antenna circuit. This coupling can usually be eliminated by dressing the line that runs from the antenna terminals to the tuner away from the i-f chassis.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20

Improved horizontal hold stability.

To reduce the effect of temperature changes on the horizontal hold circuits, an improved low tolerance capacitor, *C422*, was used in later production for horizontal multivibrator coupling. This new capacitor is part No. RCM20C121J.

If any early production chassis requires service for horizontal oscillator drift, it is suggested the above style capacitor be installed as *C422*, multivibrator coupling.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20

Eliminating fluctuations in vertical size.

Small, rapid fluctuations in a-c line voltage can cause a corresponding vertical expansion and contraction (bounce) of the picture. This effect is more noticeable with receivers that contain a large crt.

In cases where the effect is objectionable, the time constant of the decoupling network in the vertical multivibrator plate supply can be increased to compensate for the line voltage variations. This can be accomplished by changing *C440*, located on the B+ supply line that runs to the height control, from .25 μf to 10-μf, 450-volt electrolytic.

If more picture height is required after making this change, *R455* in the same B+ supply line should be changed to 47,000 ohms, and a 1-meg resistor should be connected across the height control, *R416*.

These changes are incorporated in some later production chassis.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20

Eliminating white horizontal line.

A white horizontal line extending across the middle or lower section of the picture is sometimes caused by a spurious oscillation in the vertical output tube. This oscil-

lation appears to be at a very high frequency and is apparently generated within the tube itself. In most cases, the trouble can be eliminated by placing a tube shield, part No. V-10321-1, around the vertical output tube. It may be necessary in more stubborn cases, however, to try other tubes of the same type until one that performs satisfactorily is located.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20

Difficulty in obtaining undistorted video i-f response curve.

It may sometimes be difficult to obtain a clean undistorted response curve when aligning the video i-f system. An effect similar to that caused by instability or oscillation may be observed on the oscilloscope screen. This effect can be caused by a relatively slight circuit instability which is introduced when the oscilloscope is connected to the receiver. To eliminate the instability, the blue wire that runs from *C401* in the sweep chassis to *L306* in the i-f chassis should be removed from the clip which holds it and several other wires to the chassis partition. The blue wire should then be dressed over the corner of the power transformer, and the slack should be taken up by forming a loop in the wire and giving the loop a one-turn twist. This method of dressing the blue wire is used in later production.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -635T17, -636T17, -638K20

Eliminating deflection circuit troubles.

In deflection circuits, the accumulative effect of minor variations in the individual tube and component characteristics can cause various scanning imperfections. This may be particularly noticeable when replacing major components in the deflection system. Even though a replacement part falls within the limits of its specifications, its characteristics, when combined with the individual characteristics of other circuit components, may sometimes cause a scanning deficiency that would not exist with a part possessing slightly different characteristics.

The following sub-headings indicate the various troubles that can be caused by variations in component characteristics. Methods of eliminating these troubles are given under each of the sub-headings.

Insufficient Width and Height. — When both the width and height are insufficient, the low potential lead of the high voltage filter capacitor (*C431*) should be connected to chassis ground rather than to its normal connection at pin 7 of the horizontal output transformer. This reduces the crt second anode potential approximately 800 volts, providing increased deflection.

Insufficient Width. — To increase the picture width, change the value of *C416* in the return lead of the deflection yoke horizontal winding from .25 μf to .1 μf. This reduces the overall reactance in the horizontal

deflection circuit, allowing greater horizontal deflection current to flow.

Insufficient Height. — To increase the height of the picture, connect a 1-meg resistor in parallel with the height control, *R416*.

Excessive Width. — The width of the picture can be reduced by inserting a reactance network in series with the horizontal winding of the deflection yoke. The network consists of a V-10147-1 reactor in parallel with a 5,600-ohm resistor, and it is inserted in the line that runs between the horizontal winding of the deflection yoke and *C416*.

Another method of reducing the width is to connect a V-6984-7 resistor (110 ohms, 5 watts) across the primary of the width control, *T403*. This resistor should be mounted outside the high-voltage can. A lead extends from terminal 8 of the horizontal output transformer to the terminal board located adjacent to the high-voltage supply. The resistor should be connected between this tie-point and the B+ tie-point on the other terminal board. The effect of the resistor is to cause a greater reduction in width on the left side of the picture than on the right side.

Vertical Line on Left of Picture. — Chassis in which the horizontal linearity is such that a vertical line appears approximately three inches or more from the left side of the picture can be treated by applying cathode bias to the horizontal output tube. This is accomplished by inserting a 33-ohm resistor in parallel with a .1-μf capacitor between the cathode of the tube and ground. In some chassis, a 68-ohm resistor is used along with the same .1-μf capacitor, but this value of resistance may occasionally produce a slight compression at the extreme right of the picture.

WESTINGHOUSE Models H-627K16, -628K16, -629K16, -633C17, -634C17, -636T17, -638K20

Improving horizontal linearity and preventing foldover.

In later production chassis, a 33-ohm resistor (*R460* or *R468*) is inserted between the cathode (pin 3) of the horizontal output tube and ground, and a .1-μf capacitor (*C445* or *C456*) is connected in parallel with this resistor. This change improves the horizontal linearity and eliminates the possibility of foldover at the left of the raster.

WESTINGHOUSE Models H-627K16, H-628K16, H-629K16

Improved horizontal stability.

The resistor (*R446*) that is connected between pin 1 of the horizontal multivibrator and the ringing coil is 18,000 ohms. In some early production chassis, *R446* is 15,000 ohms. Better stability of the horizontal multivibrator may be obtained in these early chassis by changing the resistor to 18,000 ohms.

WESTINGHOUSE Models H-627K16, H-628K16, H-629K16

Improper picture width.

In some chassis, a 1.8-μh, reactor (*L406*) in parallel with a 5,600-ohm resistor (*R454*) is inserted in the line that runs between the

horizontal winding of the deflection yoke and *C416*. If sufficient picture width cannot be obtained in these chassis, the reactor and resistor should be removed from the circuit. In chassis that do not contain the reactor and resistor, *L406* and *R454* should be added if excessive picture width is experienced.

WESTINGHOUSE Models H-627K16, H-628K16

Difficulty in centering.

The decoupling resistor (*R424*) in the plate supply circuit for the vertical output tube is 470 ohms, and it returns to the junction of *C416* and the horizontal deflection coil (*Z402*). In some chassis used in early production, *R424* is connected directly to the 325-volt B+ line. If centering difficulty is experienced with these early chassis, *R424* should be changed as described above.

WESTINGHOUSE Models H-633C17, H-634C17

Increasing picture width.

In some chassis, *C416* in the return lead of the horizontal deflection coil is .1 μf (RCP10W4104M) rather than .25 μf. This allows greater deflection current to flow, thus increasing the picture width.

WESTINGHOUSE Models H-633C17, H-634C17

Correcting horizontal linearity.

In some chassis, a 12,000-ohm resistor (*R458*) is added in parallel with the horizontal discharge resistor, *R437*, located in the pin 6 plate circuit of the horizontal multivibrator. This provides correct picture linearity. In some chassis, correct linearity is obtained by making *R437* 8,200 ohms (RC20AE822K) and not using *R458*.

WESTINGHOUSE Models H-633C17, H-634C17

Reducing horizontal pulling at top of picture.

In later production chassis, a .001-μf capacitor (*C444*) is added between pin 7 of the 6C4 phase detector and ground. The additional filtering of the afc correction voltage that is provided by this capacitor, eliminates an undesirable condition wherein the top 20 lines are horizontally displaced so as to cause a straight vertical line in the picture to appear curved at the top.

WESTINGHOUSE Models H-638K20, H-642K20

Increasing picture height.

In later production, a 1-meg resistor (*R461*) is added in parallel with the total fixed resistance of the height control, *R416*, to increase the picture height.

WESTINGHOUSE Models H-640T17, -641K17, -642K20, -643K16

Removing i-f oscillation.

In some chassis, an 800-$\mu\mu$f capacitor is connected between the heater (pin 3) of the 6CB6 1st i-f amplifier tube and ground. If video i-f oscillation appears in a chassis containing this capacitor, the capacitor should be disconnected to remove the oscillation.

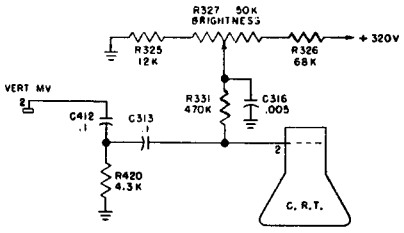


Fig. 37 — Westinghouse

WESTINGHOUSE Models H-640T17, -641K17, -642K20, -651K17

Improving horizontal stability.

The following changes, made in later production, are included to improve the stability of the horizontal multivibrator:

1. *C421* at pin 1 of the horizontal multivibrator is changed from 120 $\mu\mu$f to 47 $\mu\mu$f.
2. *C422* between pins 1 and 2 of the horizontal multivibrator is changed from 180 $\mu\mu$f to 120 $\mu\mu$f.
3. A .1-μf capacitor (*C447*) is added in parallel with the horizontal hold control.
4. *R434* in series with the horizontal hold control is changed from 150,000 ohms to 270,000 ohms.

WESTINGHOUSE Models H-640T17, -641K17, -642K20, -651K17

Retrace line suppression (see Fig. 37).

A retrace suppression circuit is included in later production by making the following changes:

1. *C313* is removed from its original position at pin 2 of the crt.
2. A 470,000-ohm resistor (*R331*) is inserted between pin 2 of the crt and the junction of *C316* and the arm of the brightness control.
3. The electrical positions of *C412* and *R420* are interchanged so that *C412* connects to pin 2 of the vertical multivibrator and *R420* connects to ground.
4. *C313* (.1 μf) is reconnected between pin 2 of the crt and the junction of *C412* and *R420*.

The revised circuit is shown in the figure.

WESTINGHOUSE Models H-640T17, -641K17, -642K20, -651K17

Improved vertical hold.

To improve the vertical hold, *R411* at the input to the integrating network is changed from 1,500 ohms to 1,800 ohms. This change is already made in later production.

WESTINGHOUSE Models H-640T17, -641K17, -642K20, -651K17

Adjacent channel sound trap.

A 47.25-mc trap is added in later production to trap out the i-f sound carrier of the lower adjacent channel. The trap consists of a slug-tuned reactor (*L308*) in parallel with a 12-$\mu\mu$f capacitor (*C321*). One end of the trap is connected to chassis ground, and the other end is connected through a 1.5-$\mu\mu$f capacitor (*C320*) to pin 1 of the 6CB6 2nd i-f amplifier.

If adjacent channel interference does not constitute a problem in the area where the receiver is to be operated, *L308* will not ordinarily require adjustment; however, the trap must not be misadjusted into the i-f response region. In areas where adjacent channel interference is not troublesome, *L308* can be set to its

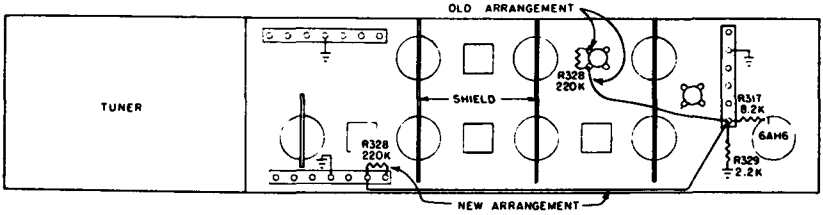


Fig. 38 — Westinghouse

highest tuneable frequency by rotating the slug completely counterclockwise, and it can be left in this position.

In areas where adjacent channel interference is evident, however, *L308* should be adjusted to 47.25 mc. This can be accomplished in either of two ways. One is to connect an amplitude modulated signal generator that has an output of .02 volt or higher to the grid of the 1st i-f amplifier, and adjust the output frequency accurately to 47.25 mc. This will produce an indication on an oscilloscope connected to the video test terminal. Adjust *L308* for minimum response on the oscilloscope. If a signal generator capable of this high output is not available, connect a good antenna to the receiver, and tune the receiver to the tv station on which the adjacent channel interference occurs, carefully adjusting the fine tuning control to its correct setting. Then, beginning with *L308* in its completely counterclockwise position, rotate *L308* clockwise until the position is found where the adjacent channel interference is eliminated. In some cases, the trap adjustment may affect the alignment of *T302*. If so, realignment of *T302* is desirable.

WESTINGHOUSE Models H-640T17, -641K17, -642K20

Increasing range of hold controls.

1. To increase the hold range of the vertical hold control, *R417* located in series with the control is changed from 220,000 ohms to 330,000 ohms.

2. To increase the hold range of the horizontal hold control, *R434* located in series with the control is changed from 150,000 ohms to 270,000 ohms.

WESTINGHOUSE Models H-640T17, -641K17, -642K20

Increasing contrast range and sound output (see Fig. 38).

To increase the contrast range, the following changes, made in later production, are incorporated:

1. The loading resistor (*R314*) across the secondary of the 3rd i-f transformer (*T304*) is changed from 8,200 ohms to 15,000 ohms.

2. *R316*, connected to the grid of the video amplifier, is changed from 10,000 ohms to 18,000 ohms.

3. The video amplifier grid resistor (*R317*) is changed from 5,600 ohms to 8,200 ohms, and its lower

end is returned to a voltage divider rather than to ground. The voltage divider consists of a 220,000-ohm resistor (*R328*) and a 2,200-ohm resistor (*R329*) connected in series and inserted so that *R328* (220 k) connects to the 130-volt bus for the i-f stages and *R329* (2.2 k) connects to chassis ground. The video amplifier grid resistor, *R317*, is connected to the junction of *R328* and *R329*.

4. It has been found that an increase on the order of 4 db can be obtained in the sound i-f gain of these chassis by changing the physical location of *R328* and the lead dress as shown in the figure. The change, which is physical in nature and involves no schematic change, is included in later production of chassis that contain the circuit described. Maximum benefit is derived from the change in weak signal areas where background noise is noticeable in the sound output.

WESTINGHOUSE Models H-640T17, H-641K17

Increasing picture height.

Some 6K6GT tubes when used as the vertical output tube do not provide sufficient picture height. In such cases the height can be increased by changing the value of *R420* in the pin 6 plate circuit of the vertical multivibrator to 5,600 ohms.

WESTINGHOUSE Models H-640T17, H-641K17

Providing test point when aligning sound i.f.

In some chassis, two 33,000-ohm resistors connected in parallel are used in place of *R205* and *R206* across pins 2 and 7 of the 6T8 ratio detector. In these chassis alignment point *A* is not accessible. Therefore, it will be necessary to connect two 100,000-ohm resistors, the resistances of which are equal within 5 percent, in series across pins 2 and 7 to provide the midpoint *A* when aligning the sound i-f section. The two 100,000-ohm resistors should be removed after alignment is completed.

WESTINGHOUSE Models H-640T17, H-641K17

Eliminating ringing.

With some deflection yokes stamped V-10045-1, a 56-$\mu\mu$f capacitor is added in series with *C415* across one section of the horizontal deflection winding. This provides a total effective capacitance of 28 $\mu\mu$f rather than 56 $\mu\mu$f. The purpose of the change is to eliminate ringing lines which are white, vertical lines on the left side of picture.

WESTINGHOUSE 1952 models

Replacing channel pilot light.

To replace the pilot light without removing the chassis:

1. Remove channel selector, fine tuning, horizontal hold, and brightness knobs.
2. Remove wire spring that holds the channel selector base in place.
3. Remove the selector base to replace the light.

To remove the chassis without damaging channel selector base:

A caution is included here because the channel light socket is clipped to the channel selector base. It should be removed before pulling the chassis for service (see procedure above).

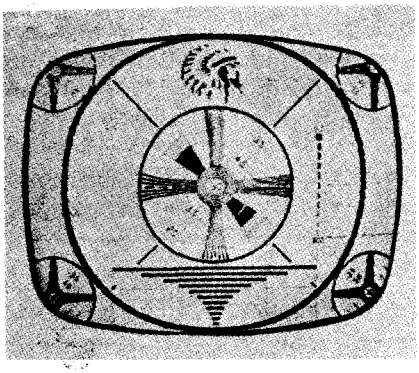


Fig. 39 — Westinghouse

WESTINGHOUSE Models with 6AU5 horizontal output tube

Ragged picture tube pattern (see Fig. 39).

A defective 6AU5GT horizontal output tube can cause the ragged picture effect illustrated. Circles on the picture appear as cog-wheels, and vertical or diagonal lines are jagged. The effect is sometimes more pronounced than shown. The remedy is, of course, to replace the 6AU5GT tube.

WESTINGHOUSE Models with 6S8 ratio detector

Checking alignment when replacing tubes.

The characteristics of some 6S8GT tubes vary from tube to tube. The characteristic variation is such that it affects the centering (secondary) adjustment of the ratio detector transformer. It is therefore essential that the secondary of the ratio detector transformer be checked for proper alignment whenever a 6S8GT tube is replaced. This can be done either by using alignment equipment as explained in the service notes, or by tuning to a tv station and adjusting the ratio detector transformer secondary for best sound with a minimum of extraneous noise. Incorrect adjustment is indicated by excessive noise on the program sound or distorted sound.

WESTINGHOUSE Models with 16AP4 picture tubes

Picture distortion due to magnetism.

If a strong magnetic field is brought near the 16AP4 cathode-ray tube, the metal cone of the tube can be magnetized sufficiently to cause objectionable distortion of the picture. The primary indication of this type of distortion is a kink in the edge of the raster.

Close contact of the tube's metal cone with any strong magnetic field must be avoided. The most likely cause of cone magnetization is contact of the metal cone with the frame of a pm speaker. Magnetized sections near the middle and small end of the cone produce the most disturbance. The magnetism is usually localized and can be detected with a pocket compass.

A magnetized cone can be demagnetized by the use of the a-c magnetic field produced by a simple coil. A suitable coil consists of approximately 1,250 turns of No. 24 insulated copper wire wound on a form that is 7 inches in diameter. Because such a coil will draw about 1 ampere at 117 volts ac, it will overheat if energized continuously; therefore, it should be used only intermittently.

To demagnetize the cone, energize the coil and move its flat side over the magnetized area. Do not de-energize the coil until after it has been moved away from the cone.

WESTINGHOUSE Models with focalizers

Changing focus range.

Proper focusing cannot be obtained within the range of the focusing slugs if the magnetic field of the focalizer is too strong or too weak. If focus is approached, but not reached, when the focusing slugs are turned all the way out, the focalizer is too weak and should be replaced. If focus is approached, but not reached, when the focusing slugs are turned all the way in, the focalizer is too strong.

The strength of the focalizer can be reduced, however, and it is not necessary to replace an excessively strong focalizer. Take a 1¼" x 1-3/16" x 1/16" piece of cold-rolled steel and curve it to match the outer circumference of the focalizer. Then place the piece of steel over any convenient sector of the focalizer's circumference so that it extends across the air gap. The magnetic attraction of the focalizer will hold the steel firmly in place. A reduction in the strength of the magnetic field will result.

WESTINGHOUSE Models with shock-mounted tuners

Noise effects caused by tuner mounting.

With shock-mounted tuner assemblies, the screws that secure the mounting bracket to the side of the chassis must not be allowed to extend through the chassis to contact the tuner shield. Mechanical vibration would affect the contact between the end of the screw and the tuner shield and produce an effect similar to that caused by noise. In cases where this occurs, the condition can be corrected by placing a washer under the head of the screw or by clipping off the end of the screw.

WESTINGHOUSE Models with ungrounded connection points for vtvm

Ratio detector alignment.

Although the television chassis and all test equipment should, in general, be bonded to a common ground, it should be noted that difficulty will be experienced during the ratio detector zero adjustment if the common terminal of the vtvm is bonded (either directly or through the instrument case) to the television chassis. Both connection points for the vtvm during this adjustment are above ground in the television chassis, and both vtvm terminals must therefore be isolated from ground.

WESTINGHOUSE All models

Jumpy or jittery pictures.

These symptoms are sometimes caused by radiation of the deflection yoke currents into the antenna circuit of the receiver. If the twinlead that runs between the antenna terminals and the r-f tuner assembly is dressed too near the deflection yoke leads, sufficient voltage may be induced in the antenna circuit to interfere seriously with the sync pulses transmitted by the station. In some

cases, the picture will be jumpy vertically, and in other cases a side to side jitter may be noted.

If the above symptoms are being caused by radiation into the antenna circuit as described, a simple remedy is to dress the twinlead away from the yoke leads.

WESTINGHOUSE All models

Elimination of interference to broadcast sets.

Under certain conditions, interference to broadcast reception can be caused by a nearby television receiver. The interference will in most cases consist of rough signals spaced at 15.750-kc intervals across the broadcast band. These interfering signals are harmonics of the horizontal sweep signal in the television receiver, and the source of the interference is the horizontal deflection circuit of the tv receiver. Receivers that employ high impedance type deflection yoke are more likely to cause interference than are receivers using a low-impedance yoke because of the greater tendency toward radiation from a high-impedance circuit. The interference can be transmitted by direct radiation from the tv receiver or by conduction through the a-c power line.

In cases where the interference is transmitted by direct radiation, corrective measures may involve a complete shielding of the tv receiver. This can be accomplished by using low-resistance metallic foil to enclose the chassis. The shield material and the chassis should be grounded. The chief source of the radiation is usually the deflection yoke leads. However, the relatively high voltages on these leads, along with the fact that too much capacitance between the leads and ground will alter the linearity, makes shielding of the leads somewhat impractical.

Cases where the interference is transmitted along the a-c power line are usually easier to cure. Most cases of this type can be cured by connecting two .01-μf, 600-volt capacitors in series across the a-c input to the receiver and grounding the center point to the chassis. The chassis should be connected to a good external ground.

WESTINGHOUSE All models

Picture tube damage due to incorrect ion trap adjustment.

It is extremely important that the ion trap magnet be correctly adjusted immediately after the set is first turned on during the installation. Improper positioning of the magnet may result in the development of circular areas of discoloration on the face of the tube. This is true even though the ions developed in the tube are being properly deflected. When the magnet is not correctly oriented, the electron beam strikes the edge of the aperture in the anode top disc instead of moving cleanly through the hole. The heat produced by the action vaporizes the metal of the disc, thus releasing gas which has a harmful effect on the tube. Some of the vaporized material may be deposited on the screen of the tube and be apparent as darkened areas on the screen.

To correctly adjust the ion trap magnet, position it over the neck of the crt with the arrow on the mag-

net (if used) pointing toward the face of the tube. Then turn on the set, and with the brightness control adjusted for a low intensity, rotate the magnet around the neck of the tube and move it forward and backward until the raster is brightest on the screen. If, in obtaining the brightest raster, it is necessary to move the magnet more than ¼ inch from the pole pieces in the tube, or if the magnet is pushed against the focus coil, the magnet may be weak and a new one should be tried. As a final check on the adjustment, the brightness should be turned up slightly above average, the focus control should be adjusted for a clear line structure, and the ion trap magnet should again be adjusted for the brightest raster.

Never move the ion trap magnet to remove a shadow from the raster if the brightness is decreased by so doing. Shadows should be removed by adjusting the focus coil.

It is essential that the brightness control be kept at a low setting until the magnet has been initially adjusted. Furthermore, the magnet must be adjusted immediately after the set is first turned on. Cathode-ray tubes have been ruined in 15 seconds by operating the brightness control too high when the ion trap magnet was incorrectly adjusted. However, in some cases it may take much longer for the darkened areas to appear on the screen, and the adjustment procedure should not be omitted merely because the set appears to be operating satisfactorily.

WESTINGHOUSE All models

Corona and arcing.

Where high-voltage sources are required, as in a television receiver, it is necessary to guard against possible corona or arcing. The following discussion should serve to assist in the isolation and suppression of corona conditions upon their occurrence.

In locations where the humidity is high, corona conditions become aggravated due to the lowered dielectric constant of the air surrounding the high-voltage source. When the air contains a high percentage of moisture, ionization takes place and corona forms at points of small surface area which are subject to a high potential much more readily than under less humid conditions. Corrective measures involve increasing the surface area at the points where corona exists. Corona can also emanate from particles of grit or dust adhering to high voltage conductors and components which provide points of high potential and small surface area and may form a path for arcing.

Arcing occurs only when the insulation resistance between two points of high potential becomes lower than the critical insulation resistance necessary for the potential involved. Arcing, therefore, is corrected by increasing the insulation resistance between the two offending points, either by spacing or introducing a high dielectric material such as polythylene sheet, etc.

Corona: A blue or violet discharge emanating from h-v sources, characterized by a hissing sound.

Arcing: Periodic or sustained breakdown between two points of different potential, characterized by a snapping and popping sound.

Locating corona: A darkened room will often prove to be of value when looking for corona, depending upon the magnitude of the corona discharge. In cases where the discharge is difficult to locate visually, it is often possible to detect the corona source by carefully probing points in question with a blunt rod of nonconducting material. When the blunt instrument contacts the corona source the hissing sound will change pitch or be interrupted. The magnitude of the corona discharge may be increased to facilitate location by using a Variac to increase the line voltage. Corona may occur at sharp solder points, around excessive rosin, sharp bends in wiring, etc.

Locating arc: An arc can usually be located by visual inspection of the high-voltage sources. A darkened room may be useful where the arc is very small. Increasing the arc by using a Variac to raise the line voltage may also be of assistance.

Correcting corona:

1. Eliminate all sharp points, such as the junction of two components, by soldering connections heavily and forming smooth rounded joints free from sharp burrs and excessive rosin.

2. If corona is emanating from insulating material, apply a coat of insulating varnish such as Westinghouse BT-2143 Tuffernell or equivalent. (It is imperative to use a varnish which will not form bubbles while drying.) Where necessary, several coats should be applied.

3. Clear all h-v areas of accumulated dust, grit, and residue. To wipe residue from connections and insulating surfaces, a cloth moistened with carbon tetrachloride is recommended.

4. When corona appears at the termination of a wire, it may be suppressed by wrapping the wire end with Scotch Acetate Woven Tape.

5. Corona about a h-v capacitor may be due to a metallic paint on the capacitor. The paint should be removed with lacquer thinner or paint remover.

6. Corona at tube pins and socket contacts (1V2, 1X2, 1X2A) can be corrected by filling tube socket contacts with Lubriplate and re-inserting tube.

Correcting arcing: Arcing can usually be corrected by proper lead dress and spacing of h-v leads and removal of dust and residue from insulators and components.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Picture shrinks horizontally.

A picture that shrinks horizontally may be caused by an increase in value of the 150-k resistor in the plate (pin 2) circuit of the 6SN7 horizontal discharge tube. Replace with a 150-k, 1-watt resistor.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Pulling at top of raster.

With certain types of transmitted signals, a definite pull can be noticed on top of the raster. To correct this

condition, replace the .01-μf coupling capacitor (*C44*) in the grid circuit of the 6BE6 sync clipper with a .0022-μf capacitor.

The above condition may also occur when a community antenna system is used where hum is introduced into the receiver input. If this hum appears in the detector output, it may cause sync instability or pulling. The remedy in this case is the same as above.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Picture flicker.

Fluctuations in line voltage often cause picture flicker. This condition can be remedied by increasing the 2nd video plate decoupling capacitor *C23* from 20 μf to 100 μf.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Airplane flutter.

It may be desirable to speed up the agc action in some areas to compensate for rapid changes in signal level caused by fading and airplane reflections. To accomplish this, replace the .47-μf agc capacitor *C18* with a .047-μf unit of the same type. In addition, change the .01-μf 6BE6 coupling capacitor *C44* to .0022 μf.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Raster ringing (see Fig. 40).

Raster ringing (vertical white stripes) can usually be corrected by readjusting the horizontal drive control, or by replacing the 6CD6 tube. In more stubborn cases, it may be necessary to dress peaking coil *L22* and the contrast and picture control leads as far from the sweep transformer cage as is practical. Also, it may be necessary to insert the network shown in series with the red-white lead of the sweep transformer.

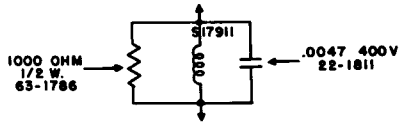


Fig. 40 — Zenith

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Low sensitivity on uhf.

Some tuners have been returned to the manufacturer because of low sensitivity on uhf. These tuners had excessive leakage in the coaxial cable which is used to inject the oscillator signal on uhf. To check the cable, switch the tuner to a vhf position, unsolder the ground end of the 22-k resistor *R7*, and check for leakage using the highest megohm scale on a vacuum-tube voltmeter. If the meter shows anything but infinite resistance, replace the cable.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Arcing between 1X2A and adjacent components (see Fig. 41).

In areas of high humidity, high-voltage breakdown may occur between the 1X2A tube and adjacent components, particularly the 6SN7 tube. To correct this condition, install an 83-2102 polystyrene corona shield around the 1X2A tube and socket assembly.

To install the corona shield, bend on broken line (see figure), and hold down one-half of the shield, slip this half under the filament leads and wrap around the 1X2A tube. Insert tongue through slot to secure shield.

ZENITH Chassis 19K20, 19K22, 19K23, 19K24, 21K20, 28K20

Spurious radiation from horizontal output tube.

Reports have been received from fringe areas of a floating visible disturbance in various shapes and forms which appears on the right side of the picture tube screen. This condition is caused by 15.75-kc harmonics radiated by the horizontal output tube, and it usually appears when the receiver is switched to an unused channel and disappears when a station is tuned in. If the condition does not disappear when a station is tuned in, readjust the horizontal drive control or replace the horizontal output tube.

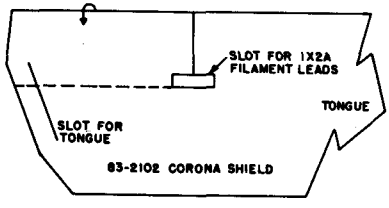


Fig. 41 — Zenith

ZENITH Chassis 19K20, 19K23, 21K20, 28K20

Servicing tuners.

In making the oscillator or bullseye adjustment, it is possible to screw the slug too far into the strip causing the slug to remain in a fixed position when turned. To correct this condition, remove the channel strip, lift up the spring clip which holds the adjustment screw in place, and reinstall the slug so that it moves in and out when turned.

In servicing tuners, satisfactory operation can be obtained by removing the tuner from its case and plugging in the power and i-f connectors. For further convenience, it may be desirable to use a test chassis in which these leads have been extended 10 to 20 inches.

In replacing a 22-2404 feed-through capacitor, unsolder the top and bottom leads and the center ground connection. Do not use excess heat or solder when making connections.

Some of the component parts in the tuner cannot be replaced without removing the fine tuning control and bracket assembly. This bracket can be removed as follows:

1. Unsolder the fine tuning capacitor leads.

2. Loosen the Allen head setscrew on the fine tuning shaft collar and remove the fine tuning shaft.

3. Remove the self-tapping screw from the center of the tuning capacitor mounting bracket, loosen the three remaining screws, and remove the bracket. Reverse the above procedure when the tuner is reassembled.

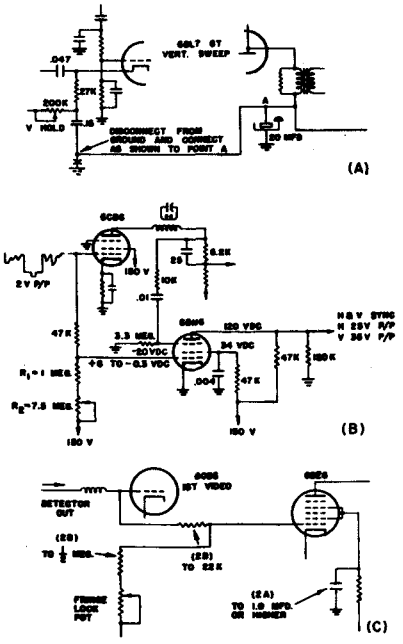


Fig. 42 — Zenith

ZENITH Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H22, 23H22, 23H22Z, 24H20

Sync Improvement in fringe areas (see Fig. 42).

The following modifications will improve the sync in fringe areas:

1. H22, H23 SERIES RECEIVERS:

(a) *Removing I-F Stages from AGC.*

This procedure consists of disconnecting the 470-ohm grid return resistor of the 3rd i-f stage from the agc string and grounding it (a grounded terminal lug will be found adjacent for convenient use). This prevents 90 percent of the agc back-off that occurs when a heavy impulse noise causes the 3rd i-f tube to draw grid current. Slight additional benefit can be obtained by taking the 2nd i-f stage off the agc string in similar fashion. Use of this modification is limited by (1) the amplitude of the strongest signal, for removal of these tubes from the agc string will cause overload to occur at lower signal levels; (2) the amount of fast fading encountered (such as caused by airplanes, for example), because removal of these tubes from the agc will cause "fluttering" to be more noticeable; and (3) the relative strength of the various signals received, because removal of these tubes from the agc may result in detector output changes, with signal level variations, thus requiring readjustment of the contrast control from channel to channel.

Usually, removal of only the 3rd i-f stage from the agc string will not result in any adverse effects, unless an extremely strong local channel is also being received. However, care should be exercised in removing the 2nd i-f stage from the agc string, especially if the turret agc has also been removed in an effort to improve sensitivity.

After any stages have been removed from the agc string, the detector output should be reset by means of the agc control to its previous level.

2. H20 SERIES RECEIVERS:

These receivers have a low impedance agc circuit, so that there is no difficulty with agc back-off and therefore removal of i-f stages from the agc string would be of very

little or no benefit. However, the following measures can be taken to improve sync performance:

(a) *Adjustment of AGC.*

In many cases, adjustment of the agc to obtain higher detector output helps the sync performance. This may also help the overall sensitivity. The detector output should be increased only to the point where sound buzz is not introduced on the strongest channel received.

(b) *Addition of Parabolic Voltage to Vertical Sync.*

This change consists of disconnecting from ground the capacitor on the 6BL7GT sweep tube input and reconnecting it to the bottom of the vertical output transformer in accordance with part (A) of the figure.

While this change does produce a noticeable improvement in vertical sync, it has one weakness. Sudden pronounced changes in line voltage will cause the picture to slip one frame, after which operation is again stable. Thus, if the set is on a power line with frequent sudden line voltage changes (caused by refrigerators, washers, water pumps, etc.) the annoyance caused by occasional slip may be greater than that previously resulting from impulse noise. Thus, the value of this change must be established at each location.

(c) *Adding the Fringe Lock Circuit to 20H20 Receivers.*

If the benefits derived from steps (a) and (b) are not sufficient (usually they are enough), the synchronizing circuits may be revised to incorporate the fringe-lock circuit, which is used in J-series receivers, however, retaining the 6BN6 sync clipper used in the H20, instead of going to a 6BE6 used in the J-series. This change requires a certain amount of reworking, consisting of rewiring the 6BN6 socket, adding the fringe-lock control (note exceptions) and further minor circuit changes. Part (B) of the figure shows the proper circuitry for the 6BN6 fringe lock. Where component values are not shown, the ones already in the circuit are retained.

The limiting resistor, *R1*, and the fringe potentiometer, *R2*, are required if strong as well as weak signals are received. Optimum sync performance under impulse noise conditions occurs with *R2* set to the best value while observing the sync on a weak signal with strong impulse noise present. If a strong signal is also being received, it may be necessary to reduce the value of *R2* until horizontal jitter or a phase split does not occur. If no strong signals are received, it is usually possible to replace both *R1* and *R2* by a single resistor with a value of about 3.3 meg.

3. J SERIES RECEIVERS:

(a) *Adjustment of AGC.*

This procedure is the same, and has the same limitations, as that described under H20-series receivers.

(b) *Addition of Parabolic Voltage to Vertical Sync.*

This procedure is the same, and has the same limitations, as that described under H20-series receivers. However, it applies only to *early* production J-series receivers.

(c) *Increasing Sync Clipper Screen Bypass.*

This change consists of increasing the screen bypass of the 6BE6 from .1 μf to 1 μf or more, as shown in

part (c) of the figure. It is very effective in improving sync stability (particularly vertical) under broad pulse conditions, but less effective when the interference pulses are of short duration.

(d) *Decreasing Sync Clipper Grid Coupling Resistor.*

This change consists of decreasing the grid coupling resistor to the 6BE6 from 47 k to 22 k, and the fringe lock series resistor from 1 meg to ½ meg, as shown in part (c) of the figure. It is noticeably effective under most types of impulse noise and is recommended whenever an early J-series chassis is on the bench.

ZENITH Chassis 20H20, 22H20Z, 22H21, 22H22, 23G22, 23G23, 23G24, 23H20, 23H22Z, 24G22, 24G23, 24G24, 24G26, 24H20, 24H21

Oscillation on channel 6.

In weak signal areas, particularly on receivers using cabinet antennas or outside antennas with unbalanced transmission lines, second harmonic radiation of the i.f. may be picked up by the antenna leads and reproduced on the receiver screen in the form of streaks.

Some of this radiation can be attributed to the fact that the cabinet escutcheon grounding spring makes contact with the chassis at a point near the i-f assembly. To correct this condition, remove the spring and connect a ground wire to a convenient point on the escutcheon on the volume control side of the chassis and ground this lead to the rear of the chassis with a self-tapping screw.

ZENITH Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Vertical instability.

After the vertical size, linearity, range, and hold adjustments have been properly made, tap the 6BL7GT tube. If the picture rolls, replace the tube. It must be remembered that improper adjustment of the agc control will cause sync compression and poor sync. The fringe lock will not operate effectively if these conditions exist in the vertical circuit.

ZENITH Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Horizontal instability.

In cases of horizontal instability, check the afc feedback circuit from pin 5 of the damper tube to the phase detector. On some receivers, an unused lug on the damper tube socket was used as a support terminal for the component parts in the afc return. On occasion, this terminal lug developed a leakage path which caused horizontal instability. To remedy this condition isolate the terminal lug by clipping it off the socket. Carefully dress the clipped components to avoid contact with socket or chassis.

ZENITH Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Picture Improvement in fringe areas.

The following modifications will improve the picture in fringe areas:

1. *Cutting the High-frequency Video Components.*

This procedure consists of connecting a capacitor of 10 to 60 $\mu\mu$f from the video grid of the picture tube (green lead) to ground. A convenient place to make this connection without removing the chassis from the cabinet may be found on the terminal strip lug located beneath a hole in the top rear of the chassis (the green lead connects to this lug). The best value must be determined experimentally, both because individual preferences vary, and receivers and series of receivers vary. This change, by cutting the video highs, smears the picture and snow so that on a very snowy picture, instead of having crisp snow, a more or less smeary haze appears. While experience has shown that many in the fringe areas prefer the crisper picture, there are some who are willing to sacrifice picture crispness to make the snow less objectionable, thus a convenient way of satisfying this group is provided. In adding the capacitor, smaller values should be tried first, and the smallest value found to be satisfactory should be used, since it results in not only smearing the snow, but also the picture. This circumstance may prohibit use of this modification whenever one or more channels at good signal levels are also being received, for the loss of picture detail is very noticeable on snow-free pictures.

2. *Retuning Converter Plate Coil and/or First I-F Coil to a Higher Frequency.*

Great care should be used in retuning these circuits, as only a slight change is permissible, for while it possibly may help the picture slightly, it may, if overdone, impair the sound considerably. This procedure should be considered only if a slight improvement in picture is felt to be worth a slight sacrifice in sound. In any case, proceed with extreme caution, keeping careful record of what you are doing, so that if this procedure is found detrimental, or of doubtful value, the slugs can be returned to their original positions. This change applies only to H20 and J-series receivers.

3. *Elimination of "White Flashes" Caused by Impulse Noise.*

(a) This change consists of increasing the value of the interstage video coupling capacitor from .047 μf to .30 μf. It will result in a very noticeable decrease in "white flashes" under severe impulse noise conditions and is applicable to H20 and early J-series sets.

(b) This modification consists of increasing the plate load resistance between the video peaking coil of the first video amplifier and B+ by 500 to 1,000 ohms. Making this change will result in a slight temporary decrease in contrast, because although the gain of the stage is increased, the diode output drops very considerably. It is therefore then necessary to readjust the agc for increased diode output. For maximum white-flash supression the diode output should be made as high as possible without introducing sound buzz, sync warping, noisy sound, or deterioration of other performance factors. After the agc is properly reset, it will be found that the available

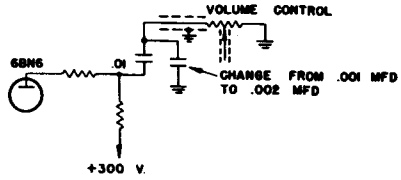


Fig. 43 — Zenith

contrast has been noticeably increased so that the contrast control should be backed off slightly from its original position. This change is applicable only to J-series receivers.

ZENITH Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Sound improvement in fringe areas (see Fig. 43).

The following modifications will improve the sound in fringe areas:

1. *Cutting the High-frequency Audio Components.*

This change consists of increasing the 1,000-$\mu\mu$f capacitance from the 6BN6 plate sound test point (which is available above the chassis) to ground to a total value of 2,000 $\mu\mu$f, either by replacing the existing capacitor or adding 1,000 $\mu\mu$f across it, as shown in the figure. While a total value of 2,000 $\mu\mu$f appears optimum, in any one case this may vary between 1,500 $\mu\mu$f and 2,500 $\mu\mu$f, depending on individual preference. By cutting the high-frequency audio components, this change not only makes the sound more "bassy" and "barrel-like," but also considerably reduces background hiss and noise. Some will probably prefer a loss in high response if there is also a reduction in hiss; indeed some prefer the highs reduced in any case. However, in the interests of good fidelity, which is important to most, receivers are produced with the 1,000-$\mu\mu$f value for use in areas where signals are strong enough so that the sound is free of noise.

2. *Sound Adjustments.*

These adjustments can be made with the chassis in the cabinet and since there are no modifications involved, are entirely free of possible ill effects. They are strongly recommended whenever there is hiss or crackle background noise in the sound. The procedure is as follows:

(a) Select a weak channel with noise background in the sound.

(b) Adjust sound take-off coil for maximum output which simultaneously will give least hiss or crackle.

(c) Adjust grid coil of 6BN6 sound tube for maximum sound output. This adjustment is relatively broad, especially on H20 and J-series receivers. Procedure outlined in this step can be eliminated in all but those cases in which the sound is unusually poor.

(d) Adjust quadrature coil for maximum sound and least noise. Any hiss detected is due to receiver noise while crackle is due to atmospheric and man-made noises. The setting which is best for one is not best for the other and depending on the relative noise conditions of the location, one or the other should be favored. These two settings are very close together and you should proceed slowly and carefully in arriving at the best setting.

(e) Adjust the buzz control for best sound, least noise, and minimum buzz while maintaining good sound level.

(f) Check adjustment of the quadrature coil and buzz control once or twice again, since there is a slight interaction between them, to make sure you have attained optimum settings.

(g) Check sound on all other channels to make sure no buzz is present in the sound (buzz is most likely to be found on the strongest channel). If necessary readjust buzz control to remove buzz, then recheck setting of quadrature coil on the weak channel.

3. *Detuning Co-channel I-F Sound Trap.*

This consists of turning the tuning slug further into the coil, thereby lowering the frequency of the trap and raising the sound carrier level. Care should be exercised not to go too far into the coil since it simultaneously introduces 4.5-mc dot-type interference into the picture. Since considerably more interference may be tolerated in snowy pictures than in clean ones before it becomes objectionable, this modification will be limited in its use by the amount of interference that can be tolerated on strong signal pictures. Where all received channels are weak, considerable benefit in sound performance is possible. If one or more received channels are strong, little or no improvement in sound on the weak signals may be possible without objectionable 4.5-mc interference appearing in the picture. The best procedure is to detune the trap slightly for a noticeable improvement on the weakest channel, then carefully examine the stronger channels for 4.5-mc beats in the picture, making sure the r-f tuning is correct on each channel. If no 4.5-mc signal is present, go back to the weak channel and detune slightly further and again check the stronger channel pictures for dots. Repeat until sound on weakest channel is helped as much as possible without 4.5-mc picture dots becoming objectionable on any channel.

ZENITH

Chassis 20H20, 20J21, 20J22, 20J23, 21J20, 21J21, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Improving overall fringe performance (see Fig. 44).

The following modifications will improve overall fringe area performance:

1. *Grounding Turret AGC.*

This procedure consists of removing the turret agc lead from the agc string and returning it to ground through a resistor of 500-k to 1-meg

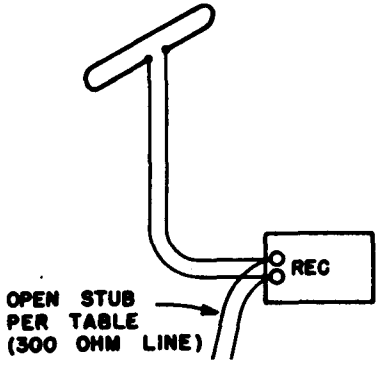


Fig. 44 — Zenith

Strong Local Channel	Stub Length (Inches)	
2	43	(Will also attenuate 7, 8)
3	39	(Will also attenuate 7, 8, 9, 10)
4	35½	(Will also attenuate 10, 11, 12, 13)
5	31	(May attenuate 13)
6	28½	
7	14	
8	13½	
9	13	
10	12½	
11	12	
12	11¾	
13	11½	

value, (about 750 k is a good value). This procedure can result in picture washout and sound buzz in reception of a strong local signal, if such is also being received. This possibility should be kept in mind. If the overload is not great and you are concerned with reception of only one strong local station, it may help to add across the receiver terminals a stub as shown, cut to the frequency of the strong channel in order to decrease the signal from it. This stub should be made from 300-ohm ribbon line, should have the length specified below, and be open at the end. Note possible bad effects on the high channels.

If the traps described previously cut down the strong channel too much, use a length slightly shorter or longer, again watching for secondary effects on the high channels if the trap is for channel 2, 3, 4, or 5.

2. *Interchanging 6CB6 Tubes in Tuner (R-F and Converter Stages).*

This procedure may be of benefit if the 6BC6 used as an r-f amplifier has an appreciably poorer noise figure than that used as the converter. However, the difference in the two tubes is as a rule not very great. Where some benefit is noted, this can be made more appreciable by realignment of the circuits affected, although this is a bench operation. This modification, where effective, will generally not result in serious deterioration of any other performance factor. Should it prove to be helpful quite often, it is suggested that a small stock of "hot" 6CB6 tubes be accumulated by periodically trying out a quantity, and selecting those which obviously are superior. One of these "hot" 6CB6 tubes can then be tried as the r-f amplifier whenever a particular set seems below par in sensitivity and the alignment is found to be correct. It is further suggested that as "hot" 6CB6 tubes are set aside for this use they be identified by some means (a dot of lacquer for example) so that in interchanging r-f tubes they do not get mixed.

3. *Modification to "Walking I.F."*

This consists of reducing the 47-ohm second i-f cathode resistor to 15 ohms. This results in Miller effect and a consequent increase in sound

carrier level with weak signals. Since i-f realignment is necessary after making this change, it can only be made on the bench. Since boosting the sound carrier makes for a better compromise of fine tuning between picture and sound, the picture is also helped slightly in an indirect manner. This change usually has no adverse effects after realignment, but is applicable only to H20 and J-series receivers.

4. *Readjustment of AGC Level.* This procedure is sometimes of benefit, but a careful check should be kept of picture snow, of sound noise, and of sync under impulse noise (on all received channels), since any one factor might be impaired while another was being helped. The best compromise must be reached under the existing conditions. An agc setting other than that specified as normal for the receiver can readily result in deterioration of performance on a local channel of moderate to strong signal level. After each readjustment of the agc, the contrast level must be reset before judging the effect on the picture.

5. *R-F Grid Trimmer Readjustment.*

Because the r-f grid trimmer setting has an effect on the amount of agc voltage developed and since at the factory the setting must be a compromise between weak and strong signal performance, it may be helpful in fringe areas to readjust this trimmer for optimum on the weakest channel. If the above modifications have been used, the r-f trimmer should be readjusted for optimum afterward.

ZENITH Chassis 20H20, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Increasing contrast range.

Satisfactory operation of the receiver in brightly lighted rooms or locations where the ambient light is high may require a greater than normal contrast range of the receiver. To increase this range, proceed as follows:

1. Remove the 3,300-ohm resistor (*R35*) from the plate circuit of the limiter-inverter *V8A*.

2. Connect a 68-k, ½-w resistor between the 360-v B+ point and the junction of *L85* and *C24AA* (10-μf electrolytic capacitor). Both these components are in the plate circuit of *V8A*.

3. Readjust the agc delay control for 3 volts peak detector output. The agc may also be adjusted by observing a test pattern on the screen and backing off the agc control from its maximum clockwise position to a point comfortably below the level of intercarrier buzz, picture distortion, improper sync, or excessive contrast.

ZENITH Chassis 20H20, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Intercarrier buzz.

1. Do not attempt to make adjustments in the sound channel unless the receiver has been bulls-eyed and the agc properly adjusted.

2. Check the 6BN6 sound limiter detector and the 12AT7 sound amplifier tubes. Do not use a 12AU7 tube as a replacement for a 12AT7.

3. The agc may not be able to work effectively under extremely strong signals and detector overload may occur. This usually results in a washed out picture with considerable intercarrier buzz. If this is so, it may be necessary to insert a 20 db or higher H-pad between the antenna and receiver to reduce the signal level to a point of normal agc action.

ZENITH Chassis 20H20, 22H20, 22H20Z, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Vertical instability.

1. Some early production receivers utilized a 1-meg resistor in the grid circuit of the 6BN6 sync clipper tube. This resistor should be replaced with an 820-k unit. In extreme fringe areas, where the signals are weak and the impulse noise is heavy, it is possible to reduce the value of this resistor further to improve vertical synchronization. Values as low as 10k ohms have been successfully used.

2. In the 24H21 chassis, vertical synchronization can be improved by increasing the grid resistor of the vertical oscillator (*R94*) from 680 ohms to 1,500 or 1,800 ohms.

3. Improper adjustment of the agc control may result in sync compression and vertical instability.

4. Check for leakage between filament and grid of the 6CB6 r-f and 6AU6 i-f tubes. When leakage between filament and grid exists, 60-cycle hum is introduced into the agc line which eventually gets into the composite video signal. (An oscilloscope connected to the video detector can be effectively used to check for presence of hum in the composite signal.) The vertical instability may not be apparent on local programs which are in synchronism with the local power source, however, this may cause the picture to roll when network programs are received. In many cases, leakage can be checked with an ohmmeter (1,000-megohm scale) by removing the tube from the socket and measuring its cold resistance between pins 1 and 3. This resistance should be infinite.

5. Check the integrator. The average resistance of an integrator is approximately 68k ohms.

6. Unstable operation of the receiver may also be caused by a "floating" octal base socket, or any ground connection which has not been securely riveted to chassis. Any socket, particularly the 6SN7GT vertical oscillator, or terminal strip which does not appear to be securely riveted should be spot soldered to the chassis in order to insure positive ground returns.

ZENITH Chassis 20H20

Preventing double picture image.

In early production of this chassis, a 2,200-$\mu\mu$f capacitor was used in the grid (pin 4) circuit of the 6SN7GT horizontal oscillator tube. Certain 6SN7GT tubes would cause this oscillator to block and produce a double image on the screen. To avoid this difficulty, replace the 2,200-$\mu\mu$f capacitor with a 1,500-$\mu\mu$f unit.

ZENITH Chassis 20H20

Preventing agc drift.

Some early production receivers using the above chassis may require

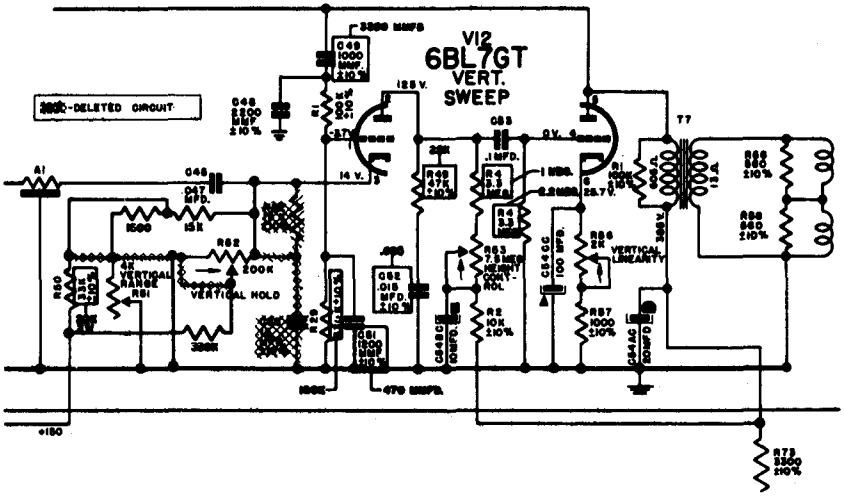


Fig. 45 — Zenith

an occasional readjustment of the agc delay control. This condition may be caused by a defective 6CB6 video amplifier or 6SN7GT agc tube. If replacing these tubes does not correct the condition, revise the circuit as follows:

1. Remove the 68-k resistor connected between the cathode (pin 6 of the 6SN7GT agc amplifier) and the +150 v line.

2. Connect a 150-k resistor between pin 6 of this tube and the +300 v line.

3. Readjust agc to a point just below the level where picture distortion and sound buzz appears.

ZENITH 20J21, 20J22, 20J23, 21J20, 21J21

Using wider latitude 6BL7's (see Fig. 45).

The circuit shown here indicates those revisions incorporated in later production J-series tv receivers. These changes were made to allow the use of 6BL7GT tubes having wide production variations. This revised circuit may be used to good advantage in those cases where difficulty is encountered in finding a replacement tube which provides optimum stability and correct linearity in receivers using the original circuit. (Note: The original components used are shown within the boxes.)

ZENITH Chassis 20J21, 20J22, 20J23, 21J20, 21J21

Lack of contrast.

1. Adjust the agc for 2¼ volts peak-to-peak output at the video detector. If a peak-to-peak reading vtvm is not available, advance the agc control to a point just below the level where picture distortion and sound buzz is encountered.

2. If sufficient contrast cannot be obtained by an adjustment of the agc delay control, replace the 470-

ohm 1st video plate load resistor (*R24*) with a 680-ohm, ½-watt resistor. Readjust the agc after making the change.

ZENITH Chassis 20J21, 20J22, 20J23, 21J20, 21J21

Fringe lock adjustment.

In fringe areas, the best adjustment will be found at or near the maximum clockwise position of the control. In normal signal areas, the control is backed down from its maximum clockwise position to a point where the horizontal jitter disappears, and where a split in the picture does not occur when the receiver is switched from channel to channel. It will be found that the correct adjustment for normal signals is near the maximum counterclockwise position of the control. If any irregularities appear in the fringe lock adjustment, replace the 6BE6 tube.

ZENITH Chassis 20J21, 20J22, 20J23, 21J20, 21J21

Minimizing sound drift.

Some cases of sound drift have occurred in the J-series tv receivers. This condition necessitated occasional readjustment of the quadrature coil, and other adjustments associated with the sound channel. The drift is due to moisture absorbed by the tape which holds the quadrature coil winding in place. To minimize the drift, remove the tape, being very careful not to break the lead which lies between the tape and the coil winding and secure the loose end of the winding with a spot of speaker cement. After the winding is secured, bulls-eye the receiver, adjust the agc delay control, and readjust the sound channel per the instructions outlined in the service notes.

All later-production J-series receivers are equipped with a new quadrature coil. This new coil is not tapped, and is longer than the original unit.

ZENITH Chassis 20J21, 20J22, 20J23, 21J20, 21J21

Insufficient picture brightness.

Some difficulty has been experienced with the magnetic shield ring sliding too close to the beam bender during shipment. This shunts the beam bender magnet and results in direct loss of picture brilliance.

The magnetic shield has negligible effect on the beam bender if spaced approximately ¾ inch from it. This spacing must be maintained when moving the beam bender back and forth to obtain maximum picture brightness or minimum glow on those picture tubes equipped wtih the green glow type indicator.

ZENITH

Chassis 20J21, 20J22

Using wider latitude picture tubes (see Fig. 46).

The figure shows a revised brightness control circuit with original components and voltages shown inside boxes. Circuit changes were made to accommodate picture tubes with widely varying focus characteristics. The revised circuit can be used to advantage in those receivers where focusing difficulties are experienced with replacement picture tubes of makes other than those originally supplied in the receiver.

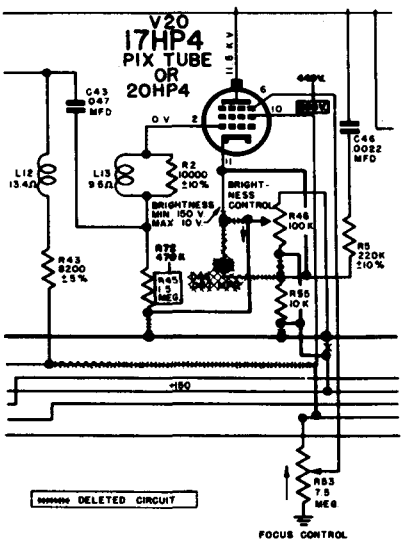


Fig. 46 — Zenith

ZENITH Chassis 22H20, 22H21, 22H22, 23H22, 23H22Z, 24H20, 24H21

Improved vertical sync in fringe areas.

Vertical synchronziation in weak signal areas may be improved by lowering the value of the resistor in the grid circuit of the sync clipper from its normal 1-meg value. Values as low as 10,000 ohms may be used. However, care must be exercised as too great a reduction of this resistance may introduce horizontal distortion into the picture on some signals.

ZENITH

Chassis 22H20, 23H22Z

Poor vertical linearity.

If poor vertical linearity cannot be corrected by adjustment of the vertical linearity and height adjustments, the fault will probably lie in a defective 6BL7GT vertical sweep tube.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26, 27F20, 28F20, 28F21, 28F22, 28F23, 28F25

Insufficient width.

Insufficient width is most prevalent in low line voltage areas and particularly on a receiver using the 12-inch screen. To increase the width range, connect a .047-μf, 600-volt capacitor across the terminals of the width control. A higher capacitance (up to .1 μf) may be required in some receivers.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Vertical nonlinearity.

Change resistor *R49* in the vertical oscillator circuit from 39 k to 33 k or increase *R22* from 68 k to 100 k. A slight foldover may occur at the top of the picture; however, it may be less objectionable than the nonlinearity.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Improving fringe area reception.

Some early production receivers used a 6BJ6 tube as the r-f amplifier. Considerable improvement in reducing snow can be made by the following modifications in the r-f amplifier stage:

1. Replace the 6BJ6 tube with a 6AK5 (no socket changes required).

2. Replace the 10-k screen resistor with a 27-k, ½-watt unit.

3. Parallel a 2.5-$\mu\mu$f ceramic capacitor (part No. 22-1891) with the plate tuning capacitor (*C11*).

4. Tune in a weak signal and adjust the plate capacitor (*C11*) for best picture and least snow.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Overheating of horizontal output tube cathode and screen resistors.

Due to variations in horizontal output tubes, overheating of the cathode and screen resistors may occur. It is recommended that *R83* (cathode resistor) be replaced with a 120-ohm, 5-w resistor, and that a 10-k, 15-w screen resistor (*R84*) be used.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Instability in sound channel.

If the sound channel breaks into oscillation when adjusted, replace the sound take-off coil *L78* with an S-16854 assembly and *C51* (10-$\mu\mu$f capacitor connected to grid of intercarrier sound amplifier) with a .01-μf, 500-volt capacitor (22-3). A 470-ohm, ½-w resistor (63-1772) must also be added between the black lead of the take-off coil and chassis.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Vertical instability.

A certain type of noise can disrupt the vertical synchronization of receivers using a 1.5-meg resistor in the grid of the 6BN6 sync separator tube. This condition may be corrected by substituting an 820-k resistor. However, care must be exercised that horizontal pulling does not occur after the change.

If the receiver syncs with the vertical hold control at the extreme clockwise or counterclockwise position, instability may result. It may be necessary to replace the control or change the value of the series resistor *R22* in order that sync occurs near the center of the control range.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Uncontrolled brilliance.

Occasionally a minute metallic substance will fall between the cathode and grid of a picture tube resulting in maximum brilliance which cannot be controlled with the brightness control. The "short" can usually be cleared by connecting the negative lead of a 20-μf filter capacitor to chassis and charging this capacitor on pin 10 of the picture tube (360v) and then discharging it through pin 11.

In extremely stubborn cases, remove the picture tube socket and apply 10 volts to the filament. Connect the positive lead of a 300- to 400-v supply to the cathode (pin 11). With the negative lead make a *momentary contact* to the grid (pin 2).

If clearing by application of voltage between tube elements does not correct the condition, try paralleling grid resistor *R2* with another 1-meg

resistor thus reducing total to ½ meg. This reduces secondary emission caused by cathode leakage.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Overheating of 25Z6 rectifier.

In the event of overheating of the 25Z6 rectifier, check *C31* (50 $\mu\mu$f) in the plate circuit of *V10A* intercarrier sound amplifier. The 22-1761 replacement capacitor should have a green durez coating. Capacitors with a brown durez coating should not be used in this circuit.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Replacement of fuse.

An occasional momentary flash in the 25BQ6GT horizontal output tubes can blow a 136-16 fuse even though the receiver is operating normally. The slow-blow fuse (136-20) has a slight delay and will not blow out unless an actual short occurs in the B+ circuit.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Replacement of one horizontal output tube.

Care must be used when replacing one of the horizontal output tubes to allow sufficient time for the other tube to cool off before the receiver is turned on. If this is not done, the load will not be evenly distributed, and the tube or tubes may be damaged.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Horizontal instability.

Horizontal instability may be caused by one of the following:

1. Open or leaky *C67*, the 100-$\mu\mu$f capacitor at the cathode of the 6AL5 phase detector. When this capacitor is defective, a positive voltage will appear at the plate (pin 7) of the 6AL5 phase detector, instead of the normal negative 8 volts.

2. Loose rivets on the Phonevision connector plug have contributed to some horizontal instability. The remedy is to solder the shorting bars to the rivets.

3. A shorted *C60* capacitor at the plate of the horizontal control tube and overheated *R75* resistors in the afc return have also contributed to some horizontal instability. These resistors are normally ½ watt; however, when replacement is made, 1-watt resistors should be used.

4. If the receiver cannot be adjusted to snap into horizontal sync when switching from channel to channel, replace the .001-μf capacitor *C57* in the agc circuit with a .047-μf unit.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Poor vertical linearity.

A defective 6SN7GT vertical oscillator tube may cause the bottom of the picture to fold, resulting in poor vertical linearity. Linearity on chassis 24G22, 24G23, and 24G24 may be improved by replacing the 68-k resistor *R22* in the cathode circuit of the damper tube with a 100-k

unit and readjusting the height and linearity controls.

ZENITH Chassis 23G22, 23G23, 23G24, 24G22, 24G23, 24G24, 24G26

Removing neck shadows.

If the shadows on the picture tube cannot be removed by normal adjustments of the beam bender and centering controls, check the deflection yoke to see that it is pushed up as far as possible toward the front of the picture tube.

ZENITH Chassis with germanium crystals

Testing germanium crystals.

If, after all normal adjustments have been made, the picture appears washed out, the cause may be low detector output due to a defective germanium crystal. The crystal may be disconnected and tested with an ohmmeter for front-to-back ratio. The resistance in one direction should be lower than 400 ohms and at least 25 times this resistance (10,000 ohms) or higher in the other direction. Any ratio less than 25 to 1 would indicate a below-standard crystal.

ZENITH Chassis with metal picture tubes

Demagnetizing metal picture tubes.

If the metal cone of a picture tube becomes magnetized through contact with some magnetic object, the picture will become distorted and proper adjustment with the size and linearity controls will be impossible.

A demagnetizer to correct this condition can easily be made by removing the frame from a 95-1109 filter choke and knocking out the I-piece with a hammer. Bring out the leads and securely tape the E-piece to reduce lamination buzz. Apply 110 volts ac to the winding and with the receiver turned off, slide the open end of the E-piece back and forth over the cone until the magnetism is neutralized. This will be evidenced by an undistorted pattern when the receiver is turned on.

ZENITH Chassis with 21-inch picture tubes

Arcing in neck of picture tube.

Arcing in the neck of 21-inch picture tubes is usually caused by loose particles inside the tube shifting into the gun structure, causing high-voltage breakdown. Arcing does not necessarily indicate that the picture tube is defective, as in many instances the "short" burns itself out.

There have been many cases where the "short" was cleared by removing the picture tube from the chassis, holding it face down, and gently tapping the bell. The picture tube should be replaced only if it has been determined that the "short" cannot be cleared in the above manner.

ZENITH Chassis with S-17268 remote control unit

Locking of manual control.

Locking of the manual control can be caused by failure of the worm drive gear to disengage. This condition can be the result of a weak solenoid armature actuating spring or misalignment of the magnet mount-

ing bracket. It will be noted that the solenoid mounting bracket has slotted mounting holes which allows for horizontal as well as vertical alignment. Improper seating of the solenoid clapper plate on the magnet core will cause excessive buzz.

ZENITH All chassis

High-voltage arcing.

1. Check for breakdown in the high-voltage filter capacitor. The arcing will increase as the brightness control is backed down.

2. Carefully check the lead dress around the horizontal output transformer. Operating the receiver in a dark room helps in locating voltage breakdown points.

ZENITH All chassis

Picture and sound cut-out.

In the event of picture and sound cut-out, check r-f shelf for rosin or loose connections in the local oscillator tank circuit. Also check oscillator tuning cam for clearance.

ZENITH All chassis

Interference from police and amateur transmitters.

Picture interference may be caused by amateur transmitters or by police transmitters operating in the 40-mc i-f band. To remedy this condition, install a sharp cut-off, high-pass filter between receiver antenna terminals and the transmission line. The filter ground strap should be connected directly to the turret tuner frame. A filter of this type should reject all interfering frequencies below 50 mc.

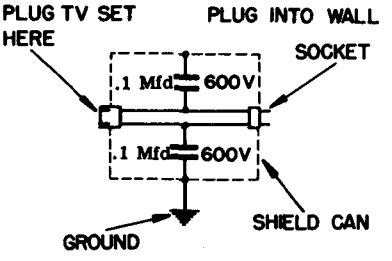


Fig. 47 — Zenith

ZENITH All chassis

TV interference to radio reception (see Fig. 47).

Radio receivers operating in the vicinity of tv receivers may be interfered with by harmonics of the 15.75-kc horizontal sweep voltage. Radiation from the tv receiver may be from the chassis, antenna, or through the power lines. If the radio receiver is more than 10 feet from the tv receiver, the interference can be reduced or completely eliminated by the addition of a simple line filter at the television receiver's a-c outlet (see figure). It is essential to use a good ground.

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