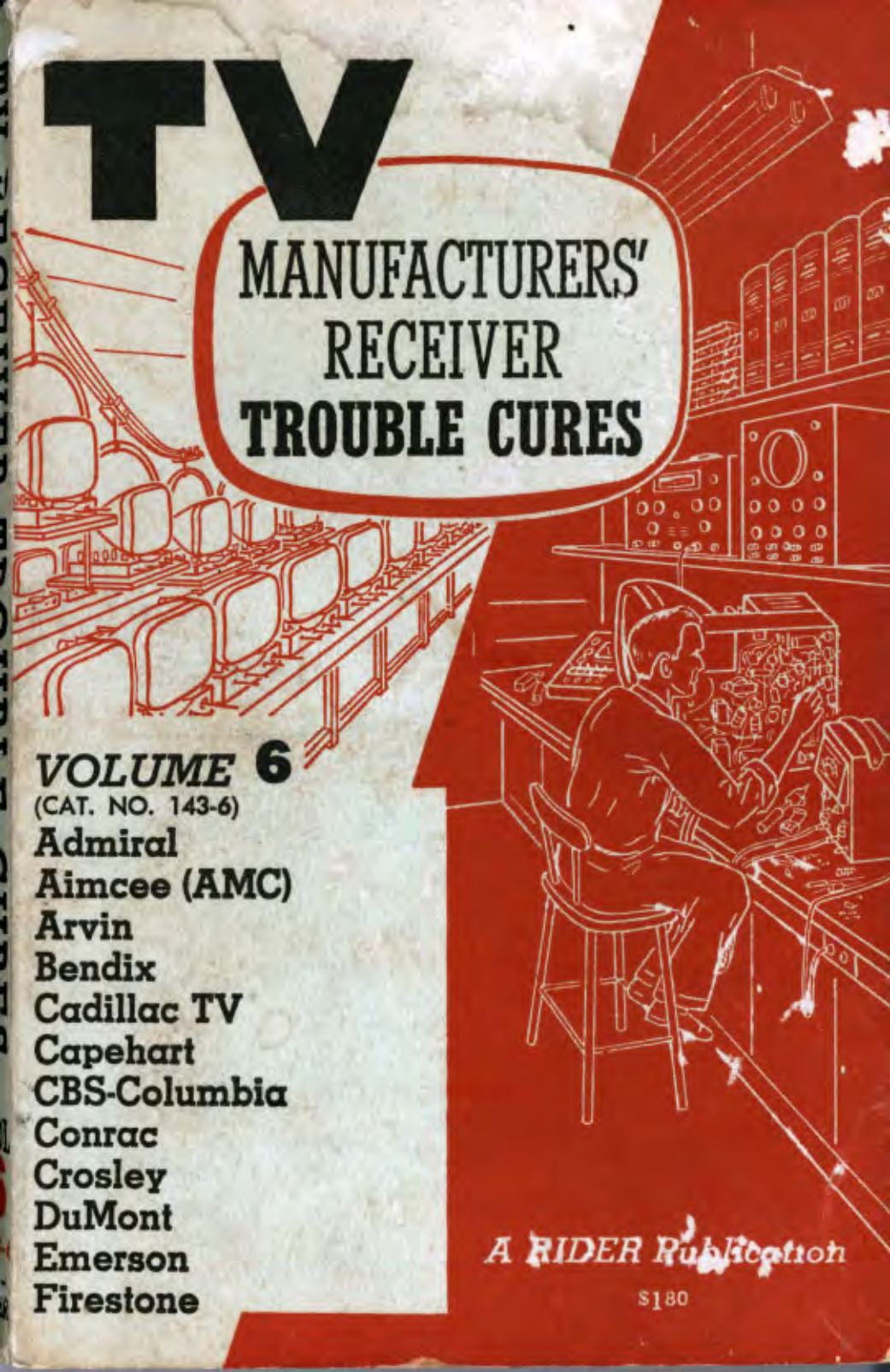
TV MANUFACTURERS' RECEIVER TROUBLE CURES



VOLUME **6**

(CAT. NO. 143-6)

Admiral
Aimcee (AMC)
Arvin
Bendix
Cadillac TV
Capehart
CBS-Columbia
Conrac
Crosley
DuMont
Emerson
Firestone

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PREFACE

This is the sixth in a series of volumes which deal 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.

The material contained in this latest volume comprises cures dealing with later model receivers than were covered previously. In addition, some new cures which have been evolved for earlier receivers are included.

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.

For your convenience, a *cumlative* Table of Contents is found at the beginning of this volume. This Table of Contents not only lists the models and chassis referred to herein, but, in addition, where cures for these and other models made by the same manufacturer appear in earlier volumes of this series, reference to such earlier volumes is also included. A complete index in which the trouble cures found in this volume 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 and/or distributors who furnished the information contained in this volume to John F. Rider Publisher, Inc.

ADMIRAL
AIMCEE (AMC)
ARVIN
BENDIX
CADILLAC TV
CAPEHART
CBS-COLUMBIA
CONRAC
CROSLEY
DUMONT
EMERSON
FIRESTONE

November, 1954

Milton S. Snitzer

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ADMIRAL 19-Series chassis, 21M1, 21N1, 21W1, 21Y1, 22A2, 22A2A, 22C2, 22E2, 22M1, 22Y1

Excessive snow in picture.

Excessive snow in the picture can be caused by faulty tubes in the receiver. Check receiver as follows:

1. Short circuit the antenna terminals and turn the picture control (Contrast) fully clockwise.

2. Connect a vacuum-tube voltmeter from test point *V* (picture detector) to chassis. Set the channel selector on an unassigned channel. If the voltmeter reading exceeds .6 volt negative, excessive receiver (tube) noise is indicated. This condition can usually be corrected by tube substitution. Substitute tubes in the following order: video detector tube *V304*, r-f oscillator tube *V102*, r-f amplifier tube *V101*, and i-f amplifier tubes *V301*, *V302* and *V303*.

Corona or arcing in the second anode supply can also cause a high noise reading at the video detector resulting in excessive snow in weak signal areas.

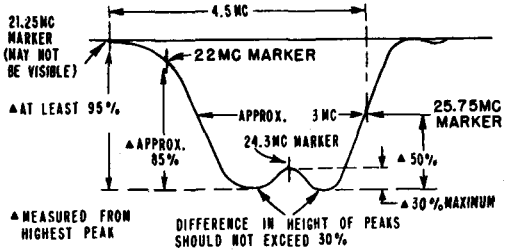
ADMIRAL 19-series chassis

Improving alignment procedure (see Fig. 1).

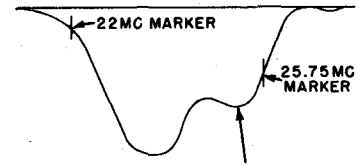
The following changes and corrections affect the alignment procedure for the 19-series chassis. The alignment changes will speed up alignment procedure and reduce difficulties such as hand capacitance, etc. Always keep the sweep generator output as low as possible to prevent overloading. If the response curve changes shape when the generator output is increased, the receiver is being overloaded. If the response curve changes shape when the scope gain is advanced, the scope is being overloaded. When using the marker generator, use just enough output of the marker so that it can be seen on the curve.

1. Instead of the original i-f response curves shown in the service notes, use the curves shown in part (A) of the figure. If it is necessary to adjust for approximate equal peaks and marker location, carefully adjust alignment slugs as instructed under the above figures. It should not be necessary to turn the slugs more than one turn in either direction. Note: Slug *A2* is the output transformer of 3rd i-f amplifier, slug *A3* is the input transformer of 2nd i-f amplifier, slug *A4* is the output transformer of 2nd i-f amplifier, and slug *A5* is the input tuned circuit of 1st i-f amplifier.

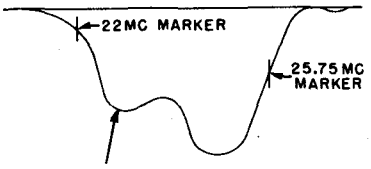
If the curve cannot be made to resemble the response curve shown, repeat all steps under "I-F Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change i-f amplifier tubes or check for a defective circuit component to



IDEAL IF RESPONSE CURVE



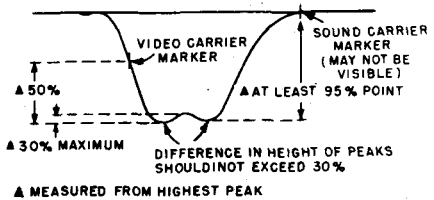
TOUCH-UP OF A2 AND A3 WILL GENERALLY INCREASE PEAK. WILL ALSO CHANGE POSITION OF 25.75MC MARKER.



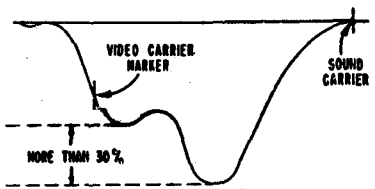
TOUCH-UP OF A4 AND A5 WILL GENERALLY INCREASE PEAK. WILL ALSO CHANGE POSITION OF 22MC MARKER.

IF RESPONSE CURVE, INCORRECT SHAPE

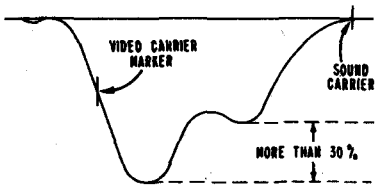
(A)



IDEAL OVERALL RESPONSE CURVE



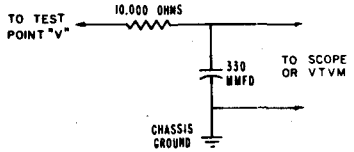
CURVE NOT WITHIN TOLERANCE. CURVE CAN GENERALLY BE CORRECTED BY INCREASING LOW SIDE WITH A2 AND A3.



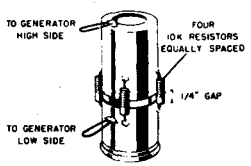
CURVE NOT WITHIN TOLERANCE. CURVE CAN GENERALLY BE CORRECTED BY INCREASING LOW SIDE WITH A4 AND A5.

OVERALL RESPONSE CURVES, INCORRECT SHAPE

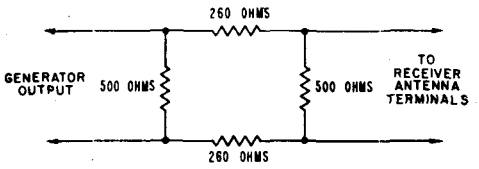
(B)



(C)



(D)



(E)

Fig. 1 — Admiral

be sure that each stage is operating properly.

2. The overall response curves shown in the service notes should be changed. To correct the three curves, the dip in the curves shown near the baseline should appear on the left side of the adjacent sound channel trap (L301). The curves when corrected should appear as shown in part (B) of the figure.

3. Due to the high sensitivity of the 19-series chassis, it is necessary to use caution when performing the i-f amplifier alignment. When adjusting *A2*, hand capacitance may cause oscillation. This condition will cause the i-f response curve to appear unstable when viewed with an oscilloscope. To minimize the effects of hand capacitance, the following suggestions should be followed:

When connecting a vtvm or an oscilloscope to test point *V* (video detector load) as given under the alignment procedure, a decoupling filter consisting of a 10,000-ohm, ½-watt resistor and a 330-$\mu\mu$f capacitor should always be used. This filter is connected in the manner shown in part (*C*) of the figure.

When connecting the sweep or marker generator or both to the chassis, a special tube shield should be used. This shield can easily be constructed from an ordinary tube shield and four resistors (approximately 10k-ohms each). The special tube shield is shown in part (D) of the figure. The top and bottom of the tube shield will then be joined by the four 10k-ohm resistors. The resistors should be as evenly spaced as possible but this is not critical. The shield is then placed over the 6J6 tube with the bottom portion to chassis ground. The generator high side is connected to the top of the shield, the low side is connected to the bottom.

When checking the overall response curve, it is very easy to overload the receiver, which results in a distorted curve. If the overall response curve changes shape when the generator attenuator is advanced, the receiver is being overloaded. Some generators have a built-in pad as part of the output cable that can be used to reduce the signal. Check the instruction book on the instrument for details. If the built-in pad is unsatisfactory, or if the generator is used without such a pad, it is recommended that a 12-db pad be made up and connected between the generator output leads and the receiver antenna. Part (E) of the figure shows such a pad. Always be sure the termination of the generator output cable is correct. Consult the instruction book of the instrument for details.

ADMIRAL 19-series chassis

Improving horizontal stability.

The horizontal stability of the 19-series chassis is improved with the use of a new vertical sync integrator Couplate, 63B6-11. The circuit of this Couplate is the same as the 63B6-2 Couplate used in chassis stamped Run 6 or lower, except that resistor *R407* (22,000 ohms) is not contained in this new Couplate. In-

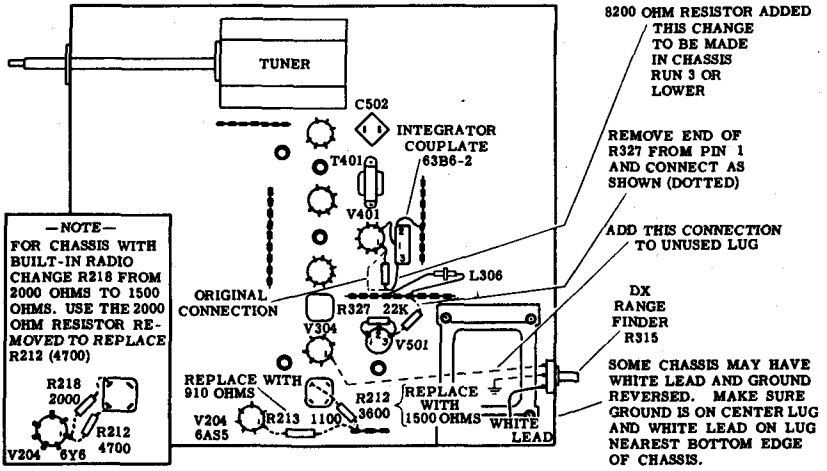


Fig. 2 — Admiral

stead, resistor *R407* is connected externally from terminal 3 of the Couplate to pin 1 of *V401B*. This change in integrator Couplates improves the horizontal sync stability by increasing the amplitude and "squaring up" the horizontal sync pulses.

This change represents a further improvement over that obtained with a Run 4 production change, which consisted of adding a 8,200-ohm resistor between terminal 3 of the Couplate and pin 1 of *V401B*.

To replace the old Couplate, 63B6-2, with the new improved Couplate, 63B6-11, omit *R443*, the 8,200-ohm resistor added at Run 4. Chassis stamped Run 3 or lower will not have this resistor. Connect *R407*, a 22,000-ohm, ½-watt resistor, 60B8-223, between terminal 3 of the new Couplate and pin 1 of *V401B*.

ADMIRAL 19-series chassis

Increasing brightness level.

The following changes, already made in later production, are incorporated in the cathode circuit of picture tube *V306* for increased brightness.

Resistor *R330* is changed from 470,000 ohms to 180,000 ohms, ½ watt (part No. 60B8-184). Capacitor *C316* is changed from .01 μf to .22 μf, 400 volts (part No. 64B9-7).

ADMIRAL 19-series chassis

Reducing bending and improving horizontal sync (see Fig. 2).

Making the following circuit changes to an early production chasssis will minimize bending of the picture at high contrast control settings in strong signal areas and improve horizontal sync in medium fringe areas.

Important: Before making changes below, check whether bending or sync trouble is due to faulty tubes, defective components, misadjustment of the DX Range Finder control, or horizontal sync adjustment.

Add changes as follows:

1. Check connections to the DX Range Finder control *R315*. Be sure that the center terminal is grounded and that the white wire goes to the terminal of the DX Range Finder nearest the bottom edge of the chassis. Connect a wire lead from pin 1 of *V304* (6AL5) to the remaining terminal of the Range Finder control. See figure.

2. In chassis using a 6AS5 sound output tube (*V204*), change resistor *R212* from 3,600 ohms to 1,500 ohms, ½ watt, 5%. In chassis using a 6Y6G sound output tube (*V204*), change resistor *R212* from 4,700 ohms to 2,000 ohms, ½ watt, 5%.

3. In chassis using a 6AS5 sound output tube (*V204*), change resistor *R213* from 1,100 ohms to 910 ohms, ½ watt, 5%. In chassis using a 6Y6G sound output tube, change resistor *R218* from 2,000 ohms to 1,500 ohms, ½ watt, 5%.

4. In some areas, it may be beneficial to increase the sync pulse level by changing the sync take-off on the video amplifier plate load. Disconnect resistor *R327* (2,700 ohms) from the junction of resistors *R325* and *R326* (2,700 ohms). Reconnect *R327* to the junction of *R325* (2,700 ohms) and peaking coil *L306*.

5. Make the Run 4 change, which consists of connecting an 8,200-ohm resistor (*R443*) in series with resistor *R407* (between terminal 3 of the vertical integrator Couplate and pin 1 of V401B).

6. Since step (1) above is effective only with the DX Range Finder set at "O", use this setting unless a higher setting gives better results.

ADMIRAL 19-series chassis

Vertical jitter and poor interlace.

Vertical jitter and poor interlace may occur in early production receivers if the red lead (terminal 3) of the deflection yoke *T403B* is dressed too close to the grid circuit of the vertical output tube *V402* (6S4). The red lead to the deflection yoke should be dressed against the chassis and as far away from the grid circuit of the vertical output tube as possible.

ADMIRAL 19-series chassis

Adding vertical retrace blanking circuit (see Fig. 3).

All 19-series chassis stamped Run 5 and higher have a vertical

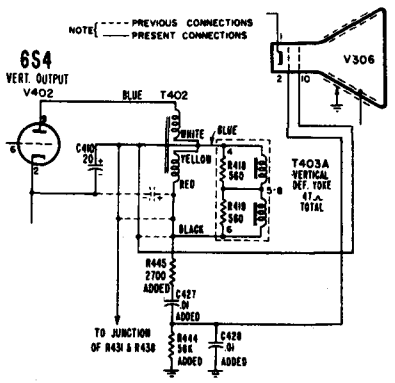


Fig. 3 — Admiral

retrace blanking circuit incorporated for eliminating retrace lines. A schematic of the retrace blanking circuit and detailed instructions for adding this change to an early production receiver, is given in the paragraphs below. The following parts are required:

Sym.	*Description*	*Part No.*
C427	.01 μf, 600 volts, capacitor	64B 9-13
C428	.01 μf, 400 volts, capacitor	64B 9-32
R445	56,000 ohms, ½ watt, resistor	60B 8-563
R444	2,700 ohms, ½ watt, resistor	60B 8-272

1. Locate the red wire between pin 10 of the picture tube and the junction of the black lead of *T403A* (vertical deflection yoke) and the red lead of *T402* (vertical output transformer).

2. Locate the bare wire between the junction of *R431* (820,000 ohms) and *R438* (1,200 ohms) and the junction of the black lead of *T403A* and the red lead of *T402*.

3. Disconnect the red wire and the bare wire from their common junction point. Reconnect both of these leads to the junction of the 7.5-ohm winding and the 100-ohm winding of *T402* (common point of the white and yellow leads). See figure.

4. Locate the red (positive) lead from *C410* (20 μf) and the junction of the black lead of *T403A* and the red lead of *T402*. Disconnect the red wire from this junction and reconnect to junction of 7.5-ohm and 100-ohm winding of *T402*.

5. Locate the green wire from pin 2 of the picture tube and disconnect from chassis ground. Connect the green wire to a .01-μf, 600 -volt capacitor. Connect the other end of this capacitor to a 2,700 -ohm, ½-watt resistor. Connect the other end of the resistor to the junction of the red lead of *T402* and the black lead of *T403A*.

6. At the junction of the .01-μf, 600-volt capacitor and the green wire from pin 2 of the picture tube (connected in step 5) connect a 56,000-ohm resistor to chassis ground. Connect a .01μf, 400-volt capacitor across the 56,000-ohm resistor.

Warning: Do not use any of the unused lugs of *V402* (6S4) tube socket for the points. These lugs are connected to the internal tube structure of the 6S4 tube.

ADMIRAL 19-series chassis

Horizontal jitter due to misadjustment.

In many cases horizontal jitter in the above television receivers is due to misadjustment of the Horizontal Lock, Horizontal Frequency, or Horizontal Lock Range trimmer.

There is one precaution to be observed in that the Horizontal Hold controls have been wired in reverse on many of the receivers leaving the factory. The 68k-ohm resistor should be connected to the top connection of the Horizontal Hold control and the lead from *K427* (usually blue) should be connected to the

lower end of the control. If the horizontal oscillator goes further out of sync (rather than pulling into sync) when performing the adjustment procedure given in the service notes, either re-wire the control or turn the control clockwise where the notes say counterclockwise. The control should be wired so that maximum voltage is measured on the horizontal oscillator control tube when the Horizontal Hold is all the way to the right. The difference in wiring makes no difference in normal operation of the receiver but is called to your attention since it may cause confusion when setting up the circuit.

The Contrast control can be advanced to the point where overload can take place in the receiver even in some fringe areas. The feature of reserve contrast is engineered into the receiver. The proper setting of the Contrast control is the point where sufficient contrast (blacks in the picture) is obtained for a normal picture.

Reports have also been received that the DX Range Finder control is advanced unnecessarily causing the set to overload even in low signal areas. The DX Range Finder should be left on "O" and advanced only in those areas where satisfactory reception cannot be had with the Contrast control full on with the Range Finder at "O". The reason for this precaution is that when the video amplifier is at the overload point, sync pulses are compressed, affecting sync stability. Therefore, the Range Finder and Contrast controls should not be advanced beyond the point where normal contrast is obtained in the picture.

ADMIRAL 19-series chassis

Insufficient height.

If adjustment of the Height and Vertical Linearity controls does not provide sufficient height, try replacing the vertical output tube *V402* (6S4). Insufficient height can also be due to a weak vertical oscillator tube *V303* (6U8).

ADMIRAL 19-series chassis

Sound bars in picture.

Sound bars noticeable at high volume levels may be caused by heavy audio currents being induced in the B+ circuits. This can be due to the location or the routing of leads to electrolytic capacitor *C215*. Capacitor *C215* is the single-section electrolytic capacitor (80 μf, 350 volts) which is mounted at the center of the chassis.

To minimize the possibility of sound bars in the picture, the mounting and routing of leads to electrolytic capacitor *C215* are changed. In later production sets, *C215* is mounted in parellel and in front of the 9-lug terminal strip near the center of the chassis. When mounted this way, the terminals of *C215* face away from the tv tuner, thus permitting the negative lead of *C215* to connect directly to the cathode of the sound output tube *V204*.

ADMIRAL 19-series chassis

Eliminating audio hum.

Strong (60-cycle) audio hum in these receivers can be due to any one of the causes listed below, which can easily be corrected.

1. Hum may be due to coupling between components in the audio input circuit and the a-c wiring. Check the 117-volt a-c leads to the On-Off switch. These leads should dress away as far as possible from the grid circuit of the sound amplifier *V203*. In models using tone control *R214*, dress the lead between the control and the plate (pin 7) of *V203* away from the a-c leads.

2. Check the position of capacitor *C209* (.01-μf input coupling capacitor) in the sound amplifier circuit (*V203*) to make certain that it is not too close to the 117-volt a-c wiring or On-Off switch. If *C209* is a tubular paper capacitor, the outside foil terminal should be connected to the junction of resistor *R207* (47,000 ohms) and capacitor *C208* (.0022 μf).

3. Check the B+ (power supply) circuits for an open or under capacitance electrolytic capacitor. Especially check filter capacitor *C501*, 60 μf, 350 volts.

4. If the receiver is a tv-only model using a 10-inch electro-magnetic speaker, it may be possible that the speaker is the cause of excessive hum. The speaker may be checked by substituting another speaker of the same type. The original electromagnetic speaker (part No. 78B75-1) can be checked by substituting a permanent magnet (pm) speaker with the filter choke attached such as part No. 78B80-1.

ADMIRAL 19-series chassis

Interchangeability of picture tubes.

Some of the 20- and 20-inch picture tubes can be used as interchangeable replacements and others cannot, as described below.

The 21EP4A picture tube used in the *19H1* chassis and the 21ZP4A picture tube used in *19K1* and *19N1* chassis are not interchangeable with other tubes because of the larger cabinet space required by these tubes.

The 21WP4 or 21WP4X picture tubes used in *19F1*, *19F1A* and *19G1* chassis and the 20DP4A picture tube used in the *19C1* and *19E1* chassis can all be used as interchangeable replacements. However, the front tube supports may have to be cut down or padded to keep the tube the same distance above chassis as the original tube. Use the measured distance between the original tube and chassis for obtaining proper alignment of the replacement tube and the picture mask. Final alignment should be checked with chassis installed in the cabinet.

The deflection yoke housing must be moved forward or backward so that the rubber neck grommet will fit tightly against the cone of the picture tube. If it cannot be moved far enough, the slots in the yoke housing may have to be elongated or new holes can be drilled in the diagonal yoke housing support brackets.

The original tube mounting strap can generally be used.

ADMIRAL 19-series chassis

Difficulty in making horizontal sync adjustments.

Changes were made to horizontal oscillator circuit (*V403*) of later production sets to minimize possible variation of horizontal oscillator performance due to parts tolerances and variation in electrical characteristics of some brands of 6SN7 tubes. By reducing the permissible tolerance of components *R422*, *R423*, *R428* and *C418*, the operation of the horizontal oscillator circuit becomes less critical.

In later production sets (stamped Run 3 and higher), tolerance of resistors *R422* (330,000 ohms), *R423* (82,000 ohms), and *R428* (150,000 ohms) were changed from 10% to 5% tolerance. Capacitor *C418* (.01 μf) was changed from 20% to 10% tolerance.

In cases where it is difficult to make satisfactory horizontal sync adjustment, the components in the horizontal oscillator circuit should be checked for correct values.

ADMIRAL Chassis 19E1, 19G1, 19N1

Preventing fuse failure (see Fig. 4).

In some of the above chassis, the 3/8-amp fuse *M401* may blow when the function switch is rotated from the Radio to the TV position. This occurs because in some 77B43

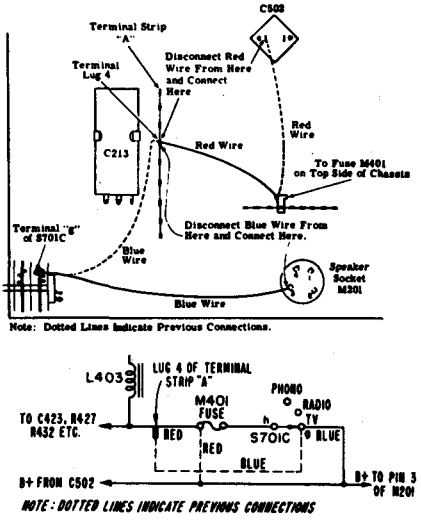


Fig. 4 — Admiral

Function Switches, the rotor contact of the switch section S701C is wide and, during rotation of the switch, there is one position where all contacts on this section may short, resulting in a surge of current that blows the fuse.

If the 3/8-amp fuse *M401* blows when rotating the function switch from the Radio to the TV position, this difficulty can be easily corrected without replacing or modifying the 77B43 switch *S701* by making a simple circuit revision consisting of changing the circuit location of the fuse, as illustrated. All 19-series chassis with built-in radios stamped Run 8 or above already have this change.

1. Disconnect blue wire from lug No. 4 of terminal strip *A*. This is the blue wire from terminal *g* of *S701C*.

2. Connect blue wire removed from lug 4 of terminal strip *A* in step 1, to pin 3 of speaker socket *M201*.

3. Disconnect the red wire that goes to fuse *M401* from the positive terminal of electrolytic capacitor *C502* (80 μf). Two red wires are connected to *C502*. Be sure to disconnect only the red wire connected to the fuse.

4. Connect the red wire removed from the positive terminal of *C502* in step 3, to lug number 4 of terminal strip *A*.

ADMIRAL 21- and 22-series chassis

Increasing sensitivity in weak signal areas.

In some tuners, capacitor *C105*, 120-$\mu\mu$f plate decoupling capacitor in 2nd r-f amplifier, was used in production instead of a 1,000-$\mu\mu$f unit. If this capacitor is replaced with a 1,000-$\mu\mu$f component, the overall receiver gain will be increased by 10 or 15 percent. If a receiver is being repaired for a fringe area, *C105* should be changed even though the difference in gain is very small (10 to 15 percent or 1.2 db).

ADMIRAL 21- and 22-series chassis

Preventing burn-out of plate decoupling resistor in tuner.

Burned out plate decoupling resistor *R104* (1,000 ohms) in 2nd r-f amplifier is usually caused by excessive plate current in some r-f amplifier tubes. This applies mostly to type 6BK7 tubes. If it is necessary to replace *R104*, use a 1-watt resistor, part No. 60B14-102. In some instances, failure of *R104* may be caused by a defective capacitor *C105* (plate decoupling capacitor in 2nd r-f amplifier). Capacitor *C105* may be shorting to the cover plate of the tuner. This capacitor should be carefully checked before reassembling the tuner.

ADMIRAL 21- and 22-series chassis

Increasing sound in fringe areas.

In some fringe areas, an increase in sound level can be obtained by detuning the 19.75-mc adjacent video channel trap *L108* (located between the plate circuit of the mixer and the grid circuit of the 1st i-f amplifier). When adjusting the fine tuning control on the re-

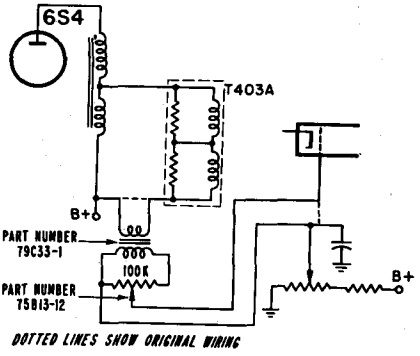


Fig. 5 — Admiral

ceiver for best picture in fringe areas, the video i-f carrier moves to a higher position on the i-f curve and the sound carrier to a lower position. This places the sound carrier very near the frequency of *L108* and causes attenuation of the sound level. Therefore, by detuning the trap (*L108*), the sound level can be increased. Turn *L108* slug in about 1 or 8 turns or until no further increase in sound is apparent.

ADMIRAL 21- and 22-series chassis

Improving vertical interlace.

Wide spacing or pairing of raster lines is an indication of improper vertical interlacing. In some instances, pairing of the raster lines may be caused by incorrect setting of the vertical hold control. Inserting a .05-μf capacitor across *R407* (8,200 or 10,000-ohm peaking resistor) in the vertical output stage grid circuit will improve vertical interlacing and add to the stability of the circuit.

In addition to the above change, a 330-$\mu\mu$f capacitor inserted from pin 1 of the vertical oscillator tube to ground should be tried. This will also improve interlacing by improving synchronization of the vertical oscillator.

ADMIRAL 21- and 22-series chassis

Picture bending due to transmission irregularities.

Picture bending with changes of contrast control setting is usually a result of improper sync separation due to variations in picture transmission. This variation can be compensated for by lowering the sync separator plate voltage. Reduce *R417* (connected to pin 1 of the sync separator) to as low as 10,000 ohms, depending on the severity of the bend.

ADMIRAL 21- and 22-series chassis

Retrace line elimination (see Fig. 5).

Retrace elimination by means of fixed values has often proved unsatisfactory mainly due to tolerances used in manufacturing and aging of tubes. The following method provides an adjustable control so that a pulse of correct amplitude may be applied to the picture tube.

1. Connect a 100,000-ohm potentiometer (part No. 75B13-12) across the primary winding of a speaker transformer (part No. 79C33-1).

2. Connect the voice coil winding of the speaker transformer in series with the vertical deflection yoke as shown in the figure.

3. Cut the green lead going to pin 2 of the picture tube. Connect the portion of the lead remaining on pin 2 to the center arm of the potentiometer, and connect the other portion of the green lead to an outer terminal of the potentiometer. Adjust the potentiometer until the retrace lines are removed. If the retrace lines do not disappear or they become brighter, change the green lead from one outside terminal of the potentiometer to the other.

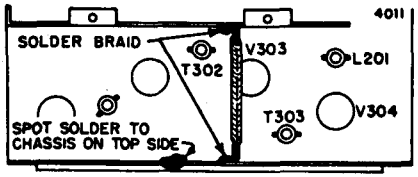


Fig. 6 — Admiral

With the contrast control set at minimum and the brightness control at maximum, the potentiometer should be adjusted to the point where the retrace lines just disappear.

ADMIRAL 21-series chassis

Changing picture width at incorrect line voltage.

In some instances, particularly where the line voltage is incorrect, it may be necessary to increase or decrease the picture width. Changing the size of *C431* (.1-μf capacitor connected to white lead of horizontal deflection winding) to .05 μf will increase the width. Increasing the value of *C431* to .5 μf will decrease the width.

ADMIRAL 21-series chassis

Preventing vertical roll and picture wash-out in weak signal areas (see Fig. 6).

Vertical roll and picture wash-out in weak signal areas can be due to any of the following causes:

1. Noise pulses.
2. I-f regeneration.
3. Defective tubes.
4. Defective germanium diode (*M301*).
5. Low line voltage.

Circuit changes were made in later production chassis (stamped Run 15 or higher) to prevent vertical roll and picture wash-out due to noise pulses and i-f regeneration. The changes made were in the i-f amplifier, video amplifier and sync circuits. If vertical roll and picture wash-out is experienced in weak signal areas, the changes given below should be made.

Adding changes to prevent vertical roll and picture wash-out.

This change should be made only in sets with a gated agc circuit, which have run numbers lower than Run 15. (Sets with gated agc use a 6AU6 for *V304*.)

1. Remove resistor *R422* (15,000 ohms). This resistor is connected to the junction of the 12k-ohm and the 2,200-ohm resistors in the cathode circuit of the 6SN7 sync inverter.
2. Connect a wire jumper across *C414* (.47 μf) in order to remove *C414* and *R425* (12,000 ohms) from the circuit. These components are also in the cathode circuit just mentioned.
3. Disconnect the two leads connected to pin 6 of *V305* (6AC7 video amplifier). Solder and tape leads together.
4. Connect a 15,000-ohm, 1-watt resistor (part No. 60B 14-153) from pin 2 of *V304* (6AU6 gated agc tube) to pin 6 of *V305* (6AC7).
5. Connect a .005-μf capacitor (part No. 65C10-1) between pins 1 and 6 of *V305* (6AC7).

6. Connect a 20-μf, 450-volt electrolytic capacitor (part No. 67A21 -1) from pin 6 of *V305* (6AC7) to chassis ground.

7. Locate junction of resistors *R418, R419* and *R420*. Note: The other end of *R422* mentioned in step (1) is connected to this junction. Disconnect *R419* (2,200 ohms) at this junction and connect it to pin 6 of *V305* (6AC7).

8. Replace resistor *R418* (47,000 ohms) with a 33,000-ohm, 1-watt resistor (part No. 60B14-333). If set is a tv-radio-phono combination model, use a 33,000-ohm, 2-watt resistor (part No. 60B20-333).

9. Replace resistor *R417*, 18,000 ohms, ½ watt, with an 18,000-ohm, 1-watt resistor (part No. 60B14 -183). This resistor is connected to pin 1 of the sync separator.

10. Connect a .005-μf capacitor (part No. 65C10-1) from pin 3 of *V302* (6AU6 2nd i-f amp.) to chassis ground.

11. Solder a 3¼-inch length of ¼-inch shield braid (part No. 95 A12-6) from the top shield on the i-f strip to the chassis; see figure. Before soldering shield braid, insulate it by slipping a 2-inch length of insulating tubing over it. Note: Some early sets may already have the wire braid shield added.

12. On the top side of the chassis, spot solder the i-f subchassis to the main chassis at the center location shown in the adjoining illustration.

Vertical roll due to faulty tubes.

Vertical roll (poor vertical sync stability) can be due to faulty tubes. The tubes listed below should be checked by replacement whenever difficulty in vertical roll is encountered.

1. Sync separator and clipper tube (*V403* 12AU7). A weak tube will provide insufficient sync input to lock in picture.

2. In tv tuner 94C18-4, r-f amplifier tube (*V101*, 6CB6, 6BC5 or 6AG5). Leakage between tube elements will cause clipping of sync pulse due to incorrect agc voltage.

3. Video amplifier tube (*V305* 6AC7). When plate current is excessive, clipping of sync pulses will occur.

Vertical roll due to faulty 1N64 germanium diode.

A faulty 1N64 germanium diode (with low output) will cause vertical roll. A rough check of the IN64 germanium diode can be made by disconnecting one side of the diode from the circuit and checking the front-to-back ratio with the ohmmeter range of a vtvm. (Diodes are easily ruined by heat. To eliminate the possibility of damage when applying a soldering iron, remove the diode from the circuit by disconnecting peaking coil *L301* or *L302* from the tie point which is connected to pin 4 of *V305*, 6AC7).

The front-to-back ratio should be on the order of 1,000 to 1,500 times. For example, if a diode measures 300 ohms in one direction, it should read 300,000 to 500,000 ohms in the other direction.

Lead dress is very important in the video detector and agc circuits in order to prevent high peak voltages from the agc circuit causing damage to the germanium diode. Be sure to:

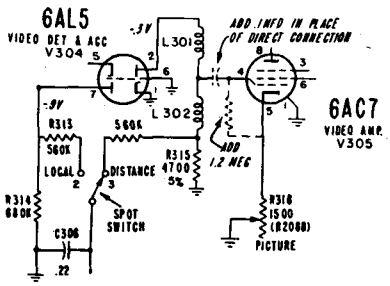


Fig. 7 — Admiral

1. Dress the germanium diode away from the white lead connected to pin 5 of agc tube (*V304* 6AU6).
2. Dress the white lead close to the chassis.
3. Dress the orange lead connected to pin 1 of agc tube (*V304* 6AU6) away from video amplifier tube (*V305*, 6AC7).

ADMIRAL 21-series chassis

Preventing picture ringing.

Resistor *R342*, 4,700 ohms, ½ watt (part No. 60B8-472) is added across peaking coil *L301* (connected to grid of video amplifier) to prevent possible "ringing" in picture. In late production sets, resistor *R342* and peaking coil *L301* are a single unit, part No. 73A5-15. Peaking coil *L301* is wound on the resistor *R342*.

ADMIRAL 21-series chassis with gated agc

Preventing picture cut-off or delay in agc action.

To prevent possible picture cut-off or momentary delay in agc action, width control *L402* is changed from a two-terminal coil (part No. 94A29-1), to a three-terminal tapped coil (part No. 94A39-1).

Use of the three-terminal width coil provides an increase (step-up) in the pulse amplitude (15.75 ko) applied to the plate (pin 5) of agc tube (*V304* 6AU6). The Three-terminal width coil can be used as a replacement for the two-terminal width coil if proper circuit connections are made. Terminal 1 of the width coil is connected to lug 7 of the horizontal output transformer, terminal 2 of the width coil is connected to lug 8 of the transformer, and lug 3 of the coil is connected to the coupling capacitor at the plate of the gated agc tube.

ADMIRAL 21-series chassis with 20-inch picture tube

Improving vertical linearity.

In sets using a 20-inch picture tube, resistor *R407* (peaking resistor in grid circuit of vertical output tube) is changed from 8,200 ohms to 10,000 ohms, ½ watt (part No. 60B8-103). This change, made in later production, is included to improve linearity (prevent packing) at the top of the picture.

ADMIRAL 21-series chassis with Local-Distant switch

Picture bending on Distant position of Local-Distant switch (see Fig. 7).

In some areas, particularly where a signal is subject to fading, the picture may bend when the Lo-

cal-Distant switch is in the Distant position. This condition may be eliminated or reduced by removing the direct coupling between the video detector (*V304* 6AL5) and the video amplifier (*V305* 6AC7). The wire connected between pin 4 of *V305* and the junction of *L301* and *L302* should be removed and replaced by a .1-μf, 400-volt capacitor (part No. 64A2-10). Connect a 1.2-megohm, ½-watt resistor (part No. 60B8-125) between pins 4 and 5 of *V305*.

Note: Do not add these changes in sets which use a gated agc circuit; these sets use a 6AU6 tube for *V304*.

ADMIRAL 21-series chassis with 6CD6 horizontal output tube

Preventing burnout of screen resistor.

In sets which use a 6CD6G tube in the horizontal output stage (*V406*), screen resistor *R442* is changed from 6,800 ohms to 3,300 ohms, 2 watt (part No. 60B20-332). Resistor *R451*, 3,300 ohms, 2 watt, (part No. 60B20-332) is added in series with *R442* to bring the total value of screen dropping resistance to 6,600 ohms. This change, already included in later production, is made to allow for the greater wattage dissipation required for 6CD6G tubes.

ADMIRAL 21B1 through 21Z1A chassis, 22-series chassis

Improving sync in fringe areas.

The following changes may be used as field expedients in very distant noisy fringe areas to improve picture synchronization. Caution: These changes are intended for use in extreme fringe areas and will result in unsatisfactory operation if used in a strong signal area.

1. Increasing the sync separator voltage in these extreme areas generally improves both vertical and horizontal sync. It is advisable in some cases to increase the size of *R417* (pin 1 of sync separator) to 4 times its original value.

2. Complaints of vertical jump in fringe areas can often be remedied by increasing the size of resistor *R423* (1,000-ohm resistor connected to cathode of sync inverter) to as high as 4,700 ohms. In other cases, changing capacitor *C315* (150-μμf unit connected to .047-μf sync input coupling capacitor) to 470 μμf will be more satisfactory.

3. Changing resistor *R331*, screen bleeder in gated agc tube, from 220k or 270k to 470k and adding an additional .5-μf capacitor across *C317*, .47-μf filter capacitor in agc bus, will generally increase contrast and improve picture stability.

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1, 22A2, 22A2A, 22M1, 22Y1

Low sensitivity caused by open C116.

Low sensitivity and an extremely broad r-f response curve can be caused by capacitor *C116* being open. *C116* is the 800-μμf minimum, ceramic disc capacitor moun-

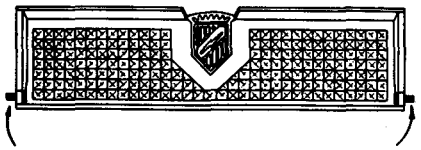


Fig. 8 — Admiral

ted to the metal plate (shield) in the tv tuner. If this capacitor is open, the r-f response curve on channel 12 will appear as a pair of horizontal lines, the curve having little or no skirt.

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1, 22A2, 22A2A, 22C2, 22E2, 22M1, 23A1

Replacement of h-v fuse.

The horizontal output of these receivers is protected by fuse *M401* (.25 amp, 250 volts). This fuse is located in the rear of the high voltage compartment.

Early production sets have a high voltage compartment with ventilation louvers. In these sets, fuse *M401* is accessible by tilting back the hinged cover.

Later production sets have a high voltage compartment without ventilation louvers. In these sets, fuse *M401* is accessible by opening the door at the rear of the high voltage compartment. In some later production sets, the door at the rear of the high voltage compartment was omitted.

If the high voltage compartment does not have a door, remove the two screws at the base and lift the cover away from the base. Some sets may have the cover soldered to the base, in which case it will be necessary to remove the top cover. Carefully remove or insert the fuse so as to avoid damage to the horizontal output transformer. If necessary, remove the chassis from the cabinet when replacing the fuse.

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1

Repairing plastic control panel doors (see Fig. 8).

The control panel doors for the chassis listed above can be repaired if only the hinge pins are broken. The repair consists of filing down the broken pin until it is flush with the side of the door, drilling a fine hole, and inserting a tubular rivet which serves as a new pin. The rivet is then heated carefully with a soldering iron until the plastic around it softens. When the iron is removed the plastic solidifies and holds the rivet securely. The entire procedure is given in the steps below.

1. File the broken portion of the hinge pin level.
2. Drill a hole with a No. 31 drill in the exact spot where the hinge pin was broken off.
3. Insert rivet, part No. 6B2-39-2.
4. Heat rivet with the tip of a soldering iron until plastic softens and holds the rivet securely.

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1

Reducing hiss in sound.

In high noise level areas, a hiss may be heard in the sound of the

receiver. The following changes, made in the audio circuits of later production receivers, are included to reduce the hiss level.

Capacitor *C207* (de-emphasis filter at output of ratio detector) changed from .001 μf to .0022 μf, 600 volts (part No. is 64B9-17). In tv-only models, capacitor *C214*, (across primary of output transformer) is changed from .005 μf to .01 μf, 600 volts (part No. 64B9-13).

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1

Reducing appearance of retrace lines.

The following changes, made in later production sets, are included to reduce the appearance of retrace lines in the picture, thereby making adjustment of the Brightness control less critical.

Resistor *R335* (shunting picture control *R316*) is changed from 470 ohms to 270 ohms, ½ watt (part No. 60B8-271). Resistor *R324* (in the cathode circuit of *V306* picture tube) is changed from 560,00 ohms to 470,000 ohms, ½ watt (part No. 60B8-474).

ADMIRAL Chassis 21M1, 21N1, 21W1, 21Y1

Improving shape of i-f response curve.

To provide more uniform peaks at the opposite sides of the i-f response curve, resistor *R301* (in the grid circuit of *V301*, 1st i-f amplifier) is changed from 10,000 ohms to 5,100 ohms, ½ watt, 5% (part No. 60B7-512). Adding this change to the i-f circuit reduces the peak at the low-frequency side (23 mc) of the i-f response curve.

ADMIRAL Chassis 21W1, 21X1, 21X2, 21Y1, 21Z1, 21Z1A, 22A2, 22A2A, 22E2, 22Y1

Servicing radio tubes and dial light.

The radio tubes can be serviced without removing the tv chassis from the cabinet. The radio tubes can be reached through the opening in the underside of the chassis shelf.

The dial light (in models with wood cabinet only) can be serviced by removing the tuning knobs, plastic knob panel and radio dial background. In models with plastic cabinet, it will be necessary to remove the tv chassis from the cabinet.

ADMIRAL Chassis 21W1, 21Y1, 21Z1, 21Z1A, 22A2, 22A2A, 22Y1

Function switch failure.

There have been reports of failure of the Function Switch used in 1952 chassis with built-in radio. Three different switches were used in these chassis: 77B39, 77B39-1 and 77B40.

Most of the failure is confined to the snap switch S703C on the 77B39 and 77B39-1 switches. This is the switch used to disable the television filament circuits when the switch is in the Radio or Phono position. Previously, this snap switch was available as a separate replacement part

for the 77B39-1 switch. In the interest of preventing call-backs caused by second failures of this switch, the manufacturer only supplies the 77B40 switch, used in later production, as a substitute for the 77B39 and 77B39-1 switches, and for the 77B39-15 assembly of S702C and S703B. The 77B40 switch replaces the snap switches used for S703C and S703B with a wafer-type switch and does not suffer from the type of breakdowns encountered with the snap switches.

The snap switch S703D used to control the phono motor is still available as a separate replacement part for both the 77B39-1 and 77B 39-1 and 40-1 switches under part No. 77B39-16.

ADMIRAL Chassis 21M1, 21Y1, 22-series chassis

Preventing horizontal jitter in strong signal areas.

To prevent horizontal jitter in strong signal areas, the following changes, already included in later production, are made.

In early sets, pin 3 of sync separator *V403* was connected to one end of picture control *R316*. In later production sets, pin 3 of *V403* is connected directly to chassis ground, and one terminal of the picture control *R316* is unused. Resistor R*418* (in the plate circuit of *V403*) is changed from 39,000 ohms to 33,000 ohms, 2 watts, part No. 60B20-333 and resistor *R331* (connected between pins 1 and 6 of *V307*) is changed from 220,000 ohms to 270,000 ohms, ½ watt, part No. 60B8-274.

ADMIRAL Chassis 21Y1

Reducing horizontal output tube current.

To reduce the cathode current of horizontal output tube *V406* (6CD6G), resistor *R437* is changed from 470,000 ohms to 1 megohm, part No. 60B8-105. This resistor is shunted across the horizontal drive control.

ADMIRAL Chassis 21Y1

Instability on radio operation.

To prevent instability on radio operation, capacitor, *C717*, 100-$\mu\mu$f ceramic, part No. 65C6-3 is added from terminal 1 of *T702* (2nd i-f transformer) to chassis ground and one lead of the secondary winding of *T202* (speaker output transformer) is connected to chassis ground. These changes, already made in later production, are made to prevent possible instability in the form of oscillation at the low end of the broadcast band.

ADMIRAL 22-series chassis

60-cycle hum.

A cathode-to-heater short in the second sound i-f tube, *V201*, will cause a loud 60-cycle hum when there is a signal being received. If hum is encountered in a 22-series chassis, disconnect the antenna and if the hum level decreases, it is like-

ly that *V201*, 6AU6, may be defective.

ADMIRAL Chassis 22A2, 22A2A, 22C2, 22E2, 22M1, 22Y1

Distorted sound due to misalignment.

Distorted sound can be caused by misalignment of the ratio detector transformer *T201*. This misalignment is sometimes due to frequency drift of the ratio detector transformer. Realignment of the ratio detector transformer may correct this trouble for a period of time, after which realignment may again be required.

A permanent remedy for this trouble is to connect a 20-$\mu\mu$f,—750 temperature coefficient, ceramic capacitor (part No. 65C6-26) in parallel with capacitor *C204* (180-$\mu\mu$f ceramic, connected across the secondary of the ratio detector transformer *T201*). Realign ratio detector after adding the 20-$\mu\mu$f capacitor.

ADMIRAL Chassis 22A2, 22A2A, 22C2, 22E2, 22M1, 22Y1

Eliminating moving horizontal ripple (see Fig. 9).

Horizontal ripple moving up or down in the picture is usually due to a power source frequency difference between the transmitter and the television receiver. It is caused by some of the 60-cycle power source voltage feeding into the horizontal oscillator. This a-c voltage can come from the B+ supply,

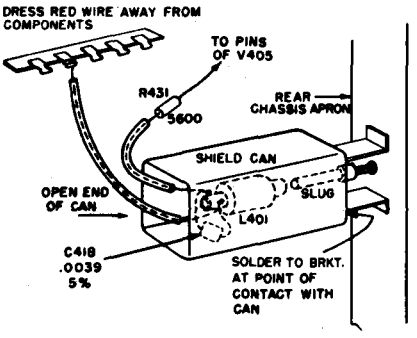


Fig. 9 — Admiral

through the horizontal sync discriminator, and thus be applied to the control grid of the oscillator, or from flux leakage around the power transformer.

The most common cause of horizontal ripple in the above chassis is flux leakage around the power transformer (even though it has a copper band) to the horizontal lock coil. To shield the horizontal lock coil from the power transformer use the following step-by-step procedure:

1. Disconnect the red lead from the lug on the horizontal lock coil (*L401*) and reroute it away from all chassis components. Reconnect the red lead to the lock coil lug. See the figure.

2. Replace the 5,600-ohm resistor which is connected between the lug of the lock coil and pin 2 of *V405* (6SN7) with a new 5,600-ohm, ½-watt resistor having longer leads or splice a wire to one lead of the existing 5,600-ohm resistor in order to lengthen it. Cover the resistor leads with spaghetti.

3. Remove the horizontal lock coil from the rear chassis apron by placing the fingers on the end of the coil form nearest the rear of the chassis and pulling the coil toward the front of the chassis. This leaves the slug and part of the assembly still attached to the chassis.

4. Procure a metal shield can, preferably an i-f can that is *not* made of aluminum. Test to see that the can will take solder before installing.

5. Slip the shield can over the slug, as shown in the drawing. The hole through the top of the can should be 7/16-inch diameter or larger.

6. Insert the lock coil through the shield can, over the slug, and back into its original assembly.

7. Solder the shield can to the mounting bracket of the assembly. Be sure to clean and tin thoroughly the surfaces to be soldered to insure a good electrical connection.

8. Check operation of the receiver and readjust the horizontal lock slug if necessary.

ADMIRAL Chassis 22C2, 22E2, 23A1

Reducing snow in intermediate fringe areas.

To reduce snow (front-end noise) in intermediate fringe areas, it is recommended that the tuner agc voltage be reduced to 1½ or 2 volts. This reduction in agc voltage can be accomplished by removing resistor *R337* (150,000-ohm tuner agc bleeder) and replacing it with a 100,000 -ohm resistor and a 47,000-ohm resistor connected in series. Connect the 47,000-ohm resistor to chassis ground and the 100,000-ohm resistor to resistor *R302*, 1,000 ohms (test point *T*). Remove the tuner agc lead (usually white) from test point *T* and connect it to the junction of the 100,000-ohm resistor and 47,000-ohm resistor. To reduce the possibility of unstable operation, it is recommended that the tuner agc lead be bypassed to chassis by a .005-μf ceramic capacitor.

Note: The above changes have already been made in some later production runs of the above chassis.

ADMIRAL Chassis 22C2, 22E2

Eliminating picture ringing.

"Ringing" in 22C2 and 22E2 chassis, consisting of at least four tunable "ghosts", about a half-inch apart, may be caused by the third i-f transformer *T303* being wired in backwards; i.e., the primary and secondary reversed, with the secondary coil winding (between terminals 2 and 3) connected in the plate circuit of *V303*, and the primary coil winding (between terminals 1 and 4) connected in the cathode circuit of *V304A*.

The numbered terminals on the bottom of the transformer should be connected as follows: terminal No. 1 to the red B+ wire going to the screen of the 3rd i-f tube, pin 6 of *V303* 6AG5; terminal No. 2 to the cathode of the video detector tube, pin 3 of *V304A* 12AT7; terminal No. 3 to chassis ground;

terminal No. 4 to the plate of the 3rd i-f tube, pin 5 of *V303* 6AG5.

ADMIRAL Chassis 22P2

Decreasing minimum brightness level.

The minimum brightness level that could be obtained in the first production 22P2 chassis was in some cases objectionably great, even with full counterclockwise rotation of the Brightness control. To decrease the minimum brightness level in the 22P2 chassis, *R324* is changed from 680k to 270k ohms and *R325* is changed from 560k ohms to 1 megohm. These resistors are both in the cathode circuit of the picture tube. This change has already been made in later production runs.

ADMIRAL Chassis 23A1

Change in fuse size to prevent burn-out.

To prevent possibility of fuse burn-out, due to momentary overload, the horizontal output fuse is changed from a ¼-ampere, 250-volt fuse to a ⅜-ampere, 250-volt fuse (part No. 84A4-3). Fuse replacement should be made only with a ⅜-ampere, 250-volt fuse. This change has already been made in later production.

ADMIRAL Chassis with 82-channel uhf tuner

Improving uhf performance (see Fig. 10.)

Poor performance of all-channel receivers on uhf may be caused by the uhf antenna lead from the uhf antenna terminals to the uhf tuner being close to or touching the metal brackets of the rear picture tube mount. This lead is purposely long and acts as a quarter-wave trap at the mean frequency of the higher vhf channels.

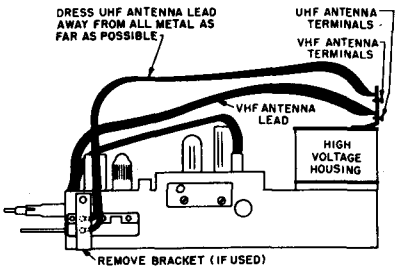


Fig. 10 — Admiral

Remove the back cover of the cabinet and check this lead to be sure it is not close to any metal and straighten it out if it is looped or doubled up. While the back is off the cabinet and after the antenna lead has been checked, check the lead from the uhf antenna terminals at the point where it is soldered to the side of the uhf tuner; see illustration. Remove the metal bracket (if used) that covers the uhf antenna connections. This bracket was used on the production line and is not required after the set is installed in the cabinet.

ADMIRAL Chassis with Roto-Scope Antenna

Corona caused by antenna contacting picture tube.

In early production sets with plastic cabinets the Roto-Scope an-

tenna may become loose and contact the picture tube. This may cause corona or arcing from the picture tube.

In order to better support the Roto-Scope antenna, a mounting clip, part No. 18A55-17, is available. This mounting clip clamps the antenna firmly to the cabinet. The new mounting clip is used in all later production sets.

ADMIRAL All chassis

Removing and cleaning picture windows.

Some wood cabinet models have picture windows which can be easily removed from the front of the cabinet for cleaning the inside of the window and the face of the picture tube.

Before attempting to remove the window, first determine whether the set has a removable molding at the top of the picture window. The molding is fastened to the cabinet (at the top of the picture window) with four screws. If the set does not have a removable molding, the picture window cannot be removed and it will be necessary to remove the chassis.

To remove the window, carefully remove the four screws and the molding. Then, carefully pull the top of the window away from the cabinet and lift it up out of the channel at the bottom of the window.

Glass picture windows and the face of the picture tubes may be washed using your favorite window cleaner. Dry carefully using a chamois or soft, lint-free cloth.

Plastic windows should be cleaned only with a dampened chamois or a soft, lint-free cloth, with as little rubbing as possible. Do not wash plastic picture windows with cleaners or solvents of any kind. Cleaners and solvents such as kerosene, carbon tetrachloride and most of the kitchen-type cleaners may damage plastics.

Wash the picture mask with mild soapy water, rinse with clear water and dry carefully. Note: If the mask is fastened in the cabinet, use cloths which are just dampened as water may cause electrical damage.

After cleaning the window and face of the picture tube, install the window by placing the bottom edge in the channel, move the top of the window in place and install the molding. Care should be taken when tightening screws to prevent stripping.

AIMCEE (AMC) Models 1C72, 1T71

Preventing fuse blow-out due to line voltage surges.

The fuse may blow on line voltage surges resulting in a small picture, foldover on both sides, and damping bars. To prevent this, proceed as follows:

Remove the fuse from its present circuit. Then remove the green lead from terminal No. 1 on TR-2293 horizontal output transformer and connect to No. 8. Connect fuse between No. 8 and No. 1. Remove yellow

wire from No. 8 and connect to No. 7. Dress fuse away from high-voltage terminals.

AIMCEE (AMC) Models 1C72, 1T71

Insufficient width.

In the event of insufficient picture width, connect a .05-μf, 600-volt capacitor across the width coil (terminal 5 and 6 of the flyback transformer). In severe cases of low line voltage, a .1-μf capacitor may be used.

AIMCEE (AMC) Models 1C72, 1T71

Removing vertical retrace lines.

To remove vertical retrace lines that are visible at a low contrast, proceed as follows: Connect a .05-μf, 600-volt capacitor from the (green lead of the vertical output transformer (*TR-2189*) to the yellow lead at pin 11 of *V13* (picture tube). These leads run to adjacent tie points on the terminal strip near the vertical output transformer.)

AIMCEE (AMC) Models 1C72, 1T71

Preventing beat interference and oscillation in the sound i-f circuits.

Beat interference, hash in the picture or sound, separation of the sound and picture in the high band, and oscillation in the sound i-f circuits are prevented as follows: Ground cathode resistor *R1* (150 ohms) directly to the center shield of the *V3* socket (1st sound i-f amplifier) instead of to the terminal strip ground. Connect a 1,500-$\mu\mu$f ceramic capacitor between pin 7 (cathode) and the socket center shield. Check alignment of sound i-f circuits, sound traps, and discriminator.

AIMCEE (AMC) Models 1C72, 1T71

Increasing vertical height.

To improve vertical height, try replacing the vertical output tube *V15*, which may be either a 6SN7GT or a 12BH7.

Due to resistor shortages, R55 and R56, 3,300 ohms each respectively in series in the plate circuit of the vertical output tube, have been replaced in some receivers by one 6,500-ohm 5-watt wire-wound resistor. To obtain increased height where *R55* and *R56* are used, short out either one of them. Where a 6,500-ohm resistor is used, shunt another 6,500-ohm, 2- to 5-watt resistor across the present one or replace it by a 3,300-ohm, 2-watt resistor.

AIMCEE (AMC) Models 1C72, 1T71

Reducing picture width.

Due to the scarcity of power transformers, part No. TR-1966, it was necessary in some cases to substitute another (part No. TR-1688) giving slightly lower B+ voltages. To secure sufficient width on all models

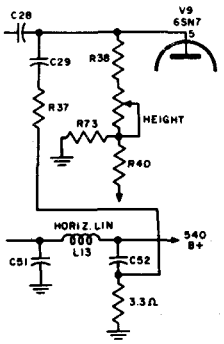


Fig. 11 — Aimcee (AMC)

where TR-1688 transformers have been substituted, the width control was removed from the circuit by connecting both width control leads to terminal 1 of the 6BQ6GT tube (*V17* socket).

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

AIMCEE (AMC) Models 1C72, 1T71

Horizontal tearing.

When tearing of the picture occurs at high or medium contrast control settings, *R36* (1000-ohm decoupling resistor in plate circuit of 2nd video amplifier) should be reduced to 700 or 800 ohms. When tearing or distortion occurs at a low contrast setting, *R36* is too low and should be increased to 1,200 ohms.

In addition to the above, if tearing occurs in fringe areas when the contrast control is advanced, check for a shorted, leaky or open .05-μf capacitor *C37* (input coupling capacitor to grid of sync amplifier and separator). Also check for low capacitance in the 220-$\mu\mu$f mica capacitor *C38* (connected between pins 2 and 4 of the sync amplifier).

AIMCEE (AMC) Models 1C72, 1T71

Reducing possibility of C18 breakdown.

Capacitor *C18* (.01-μf, 600-volt plate bypass of the 6V6 audio output stage) is returned to the 6V6 screen grid instead of to ground to reduce the possibility of voltage breakdown. This change has already been made in some of the above models.

AIMCEE (AMC) Models 1C72, 1T71

Improving range of vertical hold control.

Resistor *R50*, 6.8-meg unit going to the vertical hold control, is often eliminated for better range of the vertical hold control. This change is already made in some of the above models.

AIMCEE (AMC) Models 20C2B, 20CD2B, 20T2B, 21C2B, 21CD2B, 24C2B

Black bars on left side of screen (see Fig. 11).

On models using the cascode tuner only, black bars on the left side of the screen have appeared in a few

cases. This is caused by radiation of the high-voltage circuit which is picked up by the 1st i-f stage. By putting a small metal shield on the i-f strip just below the first 6CB6 tube socket and parallel to the 1B3 tube, the radiation effect will be decreased. This will result in eliminating the black bars.

Black bars on the left-hand side of the raster may also be removed by making the following changes. Place a 3.3-ohm resistor in series with *C52* to ground. At the junction of *C52* and the 3.3-ohm resistor, place a wire to the ground side of the 8.2k-ohm resistor, *R37*, and remove the ground from *R37*. See the figure.

AIMCEE (AMC) Models 20C2B, 20CD2B, 20T2B, 21C2B, 21CD2B, 24C2B

Overheating of the width coil.

On all models having the high-voltage transformer in a cage on top of the chassis and using the 6BQ6 horizontal-output tube, the width coil may tend to overheat. This is due to having the width coil slug all the way out. If varying the width coil so that the slug is further in the slot does not help, remove 80 turns from the width coil. This will allow the slug to be more in the center of the coil for the same width. The part number for the new coil is 10-575.

Note: On models 20C2B and 20T2B the width coil is located in the front of the set. To vary this coil for proper width, remove the On-Off Volume and Contrast knobs. There is a small hole near the control which is an entrance for adjusting the width coil.

AIMCEE (AMC) Models 20C2B, 20CD2B, 20T2B, 21C2B, 21CD2B, 24C2B

Preventing overheating of R51.

Resistor *R51*, 15k-ohm unit connected between pins 5 and 7 of the phase detector and the width coil, may overheat. In such cases replace the resistor with a 15k-ohm, 1-watt, 10% component.

ARVIN Chassis TE319, 319-1, TE330, 330-1, 330-2, 330-3, TE331-3, TE332, 332-1

Improvement of sync stability in fringe areas

A definite improvement in overall sync stability under the presence of impulse-type noise interference in

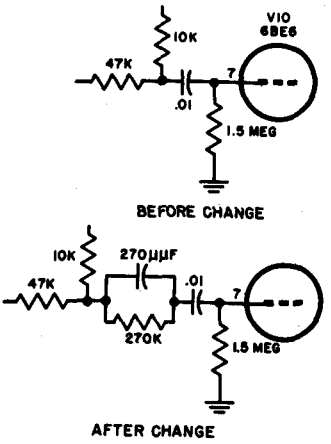


Fig. 12 — Arvin

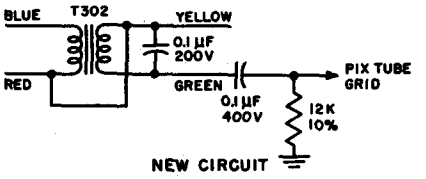


Fig. 13 — Arvin

fringe areas can be accomplished by lowering the screen voltage on the video amplifier, *V10* from 110 volts to 60 volts. Although this change may introduce a slight decrease in picture contrast, this should not prove to be detrimental on a comparison basis. The following additional parts are needed: a 4-μf, 300-volt electrolytic capacitor and a 91 k-ohm, ½-watt resistor.

1. Follow orange wire from pin 6 of *V10* to terminal strip lug (110-v supply lug).

2. Remove this wire from lug and reroute wire to blank lug of adjacent terminal strip, 1 inch away.

3. Add a 91k-ohm resistor between the old lug (110-v supply lug) and the new lug.

4. Add a 4-μf capacitor between the new lug and the chassis ground lug connected to pin 7 of *V11*.

ARVIN Chassis TE355, TE358, TE359, TE362, TE364, TE373-series

Horizontal wavering at top of picture (see Fig. 12).

Horizontal wavering in the top one-third of the picture may appear on receivers using the above chassis when the r-f signals are received from faulty distribution systems. This wavering is due to intermittent partial loss of horizontal sync pulses in the receiver sync separator. Those distribution systems that "pipe-in" r-f signals are usually community antenna systems or multiple dwelling antenna systems. The condition outlined above will not appear on a normal air signal.

To prevent this effect, add parallel R-C circuit (270 μμf and 270k ohms) in line to sync separator as shown.

ARVIN Chassis TE358, 358-1, 358-2, 358-3, TE359, 359-1, TE363, 363-1, 363-2, 363-3, TE364, 364-1

Eliminating white horizontal lines at maximum brightness and contrast (see Fig. 13).

To eliminate the white horizontal lines in the picture with contrast and brightness controls at near maximum setting, use the following procedure to make the necessary changes in the vertical blanking circuit.

1. Disconnect lead to junction of *C311* (.047μf), *R330* (8,200 ohms) and *R339* (1,200 ohms). All these components are in the grid circuit of the vertical output tube. Note: *R339* was not used in early production TE358 and 363 chassis. On these two chassis remove and discard *C316*, 4,700 μμf, and *R338*, 100k ohms, connected to the grid lead of the picture tube (green wire).

2. Connect a .1-μf, 200-v capacitor (25455-104) across the second-

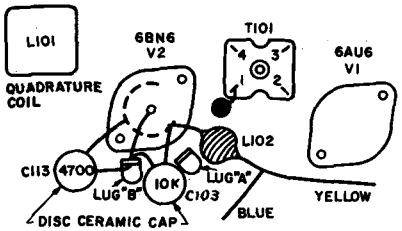


Fig. 14 — Arvin

ary (yellow to green leads) of the vertical output transformer *T302*, This capacitor may already be in this circuit in the following chassis: 358-1, 363-1, 359, 364.

3. Connect a .1-μf, 400-v capacitor (25462-104) to the junction of the 1-,μf, 200-v capacitor and the green lead of the vertical output transformer *T302*.

4. Connect a 12k-ohm, 10% resistor (22381-123) from the other end of the .1-μf, 440-v capacitor to ground. Connect the grid lead of the picture tube (green wire) to the junction of these two parts.

ARVIN Chassis TE358, 358-1, 358-2, TE359, TE363, 363-1, 363-2, TE364

Preventing interference due to 6BN6 radiation (see Fig. 14).

Under certain signal conditions, interference in the picture caused by radiation from the 6BN6 circuit may be present. To check for this type of interference, remove 6BN6 tube from set. If the interference disappears, make the following changes:

1. Remove the ground side of C103 from lug A and move it to lug B.

2. Remove blue and yellow leads from pin 1 of 6BN6 socket and add a series peaking coil *L102* (40-to 200-μh choke) between these leads and pin 1.

3. Add a 4,700-$\mu\mu$f capacitor (*C113*) from pin 4 of the 6BN6 socket to lug B.

4. Make the ground lead from pin 1 of *T101* as short as possible by soldering it directly to the chassis.

5. Add a grounded shield to the 6BN6 tube. This primarily affects uhf channels.

ARVIN Chassis TE358, TE363

Distorted sound after warm-up (see Fig. 15).

The purpose of this change was to improve the stability of the sound detector circuit by broadening the tuning of quadrature coil L101. The specific defect being corrected was the tendency of L101 to drift off re-

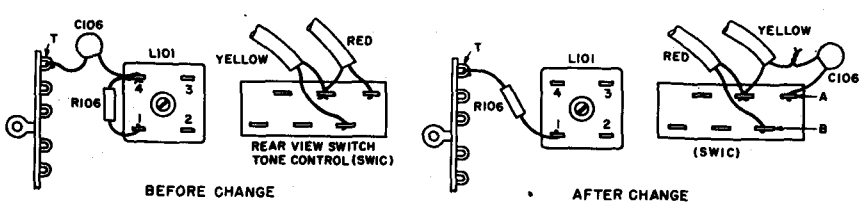


Fig. 15 — Arvin

sonance after warm-up, causing distorted sound.

1. Remove C106 from lug 4 on *L101* and T on terminal strip.
2. Move one end of *R106* from lug 4 on *L101* to T on terminal strip.
3. Remove center conductor of yellow shielded wire from *B* on *SW1C*.
4. Move center conductor of red shielded wire from *A* to *B* on *SW1C*.
5. Add *C106* from yellow wire in step (3) (connection made in space) to *A* on *SW1C*.

Note: Later production runs already include the above modification.

BENDIX Chassis T14-4, T14-6, T14-7, T14-13, T17, T17-1, T17-2, T17-4, T17-5

Insufficient height.

Complaints of vertical height deficiency can generally be corrected by changing resistor *R99* (680, ½-watt resistor connected to the low end of the height control) to a 470k-ohm, ½-watt, 10% resistor (part No. HR C23A474K). In the 17-series chassis, this resistor is *R87*. Note: Later production runs will already have this change included.

BENDIX Chassis T14

Eliminating Barkhausen Oscillation.

Barkhausen oscillation may be eliminated by the insertion of a kit (part No. 275104) that is available from the manufacturer. Installation of this kit requires only the removal of the insulated plate cap of the 6BQ6GT tube, *V22*.

The kit is then inserted between this cap and the plate cap of the tube.

BENDIX Chassis T14

Adjustment of rear controls.

Adjustment of the controls on the rear panel of the chassis can be simplified by using a standard metal-capped pencil with the eraser removed. The metal cap, if slipped over the control shafts, will provide a snug fit and the pencil then serves as a handy adjustment tool.

BENDIX Chassis T14

Replacement of tuner cover precaution.

When replacing the tuner cover on the above chassis, make sure that the 110-volt a-c leads are held aside. Failure to observe this precautionary measure may result in the tuner cover cutting the a-c leads resulting in injury to the serviceman or damage to the set.

BENDIX Chassis T14

Oscillation in r-f amplifier.

Oscillation of the 6BQ7 in the Standard Coil tuner may be caused by improper spacing of the windings on coil *L828* (plate coil of 2nd r-f amplifier). Improper winding spacing adversely affects the loading of the 6BQ7. Coil windings should be closely spaced to assure proper operation.

BENDIX Chassis T14

High frequency hash in fringe areas.

High frequency hash which may be experienced in fringe and near fringe areas is due to the wideband response of the audio system. To remedy, follow the steps outlined below.

1. Adjust front oscillator slug (*L852*), accessible by removing channel selector knob, counterclockwise for best sound. Make certain that receiver has been operating for at least 15 minutes.

2. Tune ratio detector top slug (*L11* of *T4*) for best sound.

BENDIX Chassis T14

Replacement for 6BQ7 tube.

Type 6BZ7 tube may be used as a replacement for type 6BQ7. However, type 6BK7 must *not* be used as a replacement.

BENDIX Chassis with CT-14 uhf tuner

Tuner regeneration on uhf.

On early-run all-channel receivers, both production models and those having the above uhf tuners installed in the field, tuner regeneration was experienced in uhf operation. This is best recognized by smeary or indistinct outline pictures, even in a normal signal area. This regeneration can be eliminated as follows:

1. Remove the braided ground strap connecting the uhf and vhf sections. This is located between the the top rear of the tuners.

2. Connect a 2-X 3/8-inch copper strap between the vhf and uhf tuners at locations approximately 3/4 inch from the tuner fronts. Solder ends securely for a good ground. Note: The braided strap removed in step (1) may be used in place of a copper strap.

3. The braided ground shield of the signal lead connecting to terminal 6 on the vhf section should be removed from its ground point in the top rear of the uhf section. Reconnect this lead to the rear of the vhf tuner section, directly above the numeral 6 which is die-stamped into the rear case.

All solder connections must be secure to insure positive grounds.

BENDIX Chassis T14 with uhf strips

Intermittent snow on uhf.

Incorrect installations of uhf strips may cause intermittent snow in the picture. Failure to assure proper alignment of the strip interconnecting pin is the most common cause of this condition. This results in grounding the pin to the turret.

CADILLAC TV Models 1651, 1652, 1653, 1654

Eliminating intercarrier buzz.

Where buzz is objectionable, the following procedures are recommended:

1. Check alignment of sound takeoff and ratio detector transformers.

2. Where buzz is not appreciably eliminated, one other thing can be done to improve the situation. If the ratio detector can has the number 273 stamped somewhere on the can, check the wiring of the 6T8 and ratio detector transformer. The connections should be: pin 6 of 6T8, no connection; pin 1 of 6T8, to pin F on the ratio detector transformer; and pin 3 of 6T8, to pin D on the ratio detector transformer.

Originally, when using these transformers, pins 1 and 6 on the 6T8 were connected together and to pin D on the transformer, and pin 3 on the 6T8 was connected to F. If rewiring is necessary, the sound take-off and ratio detector transformers should be realigned.

If none of the above steps help eliminate the buzz, other causes should be sought.

CAPEHART Chassis CX-36

Elimination of snow in the picture.

Variation in characteristics of 6CB6 tubes used in the 1st and 2nd i-f stages may cause a background "noise" or movement in the picture. This condition has been noticed in only certain receivers and only part of the time in these receivers.

The reason for the background noise can be seen referring to the circuit diagram and checking the agc operation. From the diagram it will be seen that the r-f and i-f bias voltages are derived from the same point. However, the r-f bias is delayed so that as the signal increases, the r-f bias will rise in value at a slower rate than the i-f bias. This difference in bias rise in the r-f and i-f sections had been designed so that an optimum signal-to-noise ratio was maintained for any given value of signal strength being received. When i-f tubes are used that differ from the design characteristics (and 6CB6 tubes will vary, even from the same manufacturer), then the r-f bias may rise too soon, decreasing the gain of the r-f stage from what it should be for signal being received. When this happens, the signal-to-noise ratio of the receiver is seriously impaired.

To allow this variation in tube characteristics to be corrected or adjusted for each chassis, the following change in the agc amplifier wiring is made:

1. Remove *R421* (3.9-meg resistor connected to plates of agc clamper) and connect a 3.3-meg and a 680k-ohm resistor in series in its place, with the 680k-ohm unit connected to pin 6 of *V401* (agc amplifier).

2. Disconnect switch *S401* (Noise Switch) from its present circuit and connect it across the 680k-ohm resistor.

Rewiring the circuit in this manner allows the value of *R421* to be changed from 3.3-meg to approximately 3.9-meg at will. This will allow the difference in the r-f and i-f bias to be set for the particular tubes that the receiver has. When setting the receiver up, it is only necessary to

place the switch in the position that reduces the background motion.

This change (with the switch known as the AGC Differential Control) is already incorporated in chassis coded D4 or higher.

CAPEHART Chassis CX-36

Setting a-m rejection control.

Variations in 6AL5 tubes and ratio detector transformers have made it difficult to adjust the ratio detector for maximum rejection of a-m signals. In later production, a new control is added to the r-f/i-f chassis to facilitate the setting of the ratio detector transformer for maximum a-m rejection. The chassis having this control bears the code number of R3 for identification purposes.

In practice, the a-m rejection control is a 200-ohm rheostat connected in parallel with *R306* (120-ohm resistor connected to lug 5 of ratio detector transformer). This control is mounted on the underneath side of the r-f/i-f chassis and is not accessible as an installation adjustment. Initial adjustment is made at the factory before shipment. If through replacement of the ratio detector transformer or tube, it becomes necessary to realign the sound i-f section, the following procedure should be used:

1. Feed a 4.5-mc signal with 400-cycle a-m modulation into pin 7 of *V205B* (6X8 1st sound i-f amplifier).

2. Connect an oscilloscope set to view the 400-cycle modulation and a vtvm with zero center to the junction of *R307* (68k ohms), *C311* (.001-μf) and *C312* (.0047-μf). These components are in the output circuit of the ratio detector.

3. Adjust the secondary (top) of *T301* (discriminator transformer) for zero on the vtvm.

4. Adjust the a-m rejection control for minimum modulation pattern on the scope. (Due to interaction of these two adjustments, they should be repeated several times to obtain the maximum amount of a-m rejection and still have the ratio detector centered on 4.5 mc.)

The balance of the sound i-f alignment is unchanged. Move the scope to the junction of *R306* (120 ohms), *R307* (68k ohms), *C310* (1,000 $\mu\mu$f) and adjust *L301* (plate coil of 1st sound i-f amplifier) and *T301* (discriminator transformer) primary for the maximum amplitude and balance of the S-curve.

CAPEHART Chassis CX-36

Channel indicator illuminating several channel numbers.

The sleeving on the pilot light behind the channel knob is adjusted at the factory for proper position but occasionally the sleeve shifts in shipment, allowing the light to illuminate two or three channel numbers.

To correct this trouble, a smaller size sleeve is used on the bulb in later production. By providing a tighter fit between the bulb and the sleeve, most cases of the sleeve shifting is eliminated.

CAPEHART Chassis CX-36

Improved noise limiting in sound.

In extreme fringe areas where reports are received of noise in sound, the following minor circuit change can be employed. Change *R305* (1,000 ohms), the plate load resistor for *V301*, the 2nd sound i-f amplifier, to 22k ohms.

This provides additional limiting action in the 2nd sound i-f amplifier. The same effect can also be obtained by adding a 47k-ohm resistor as the screen dropping resistor in the 2nd sound i-f stage (connected between terminal 3 of *T301* and pin 6 of *V301*). In this case *R305* would be left as it is and an additional bypass capacitor, (5,000 $\mu\mu$f) would be needed at the screen grid.

Cases of weak sound usually accompanied by noise in the sound will in most instances be found to be due to a weak sound i-f tube. This could also be caused by a change in value of some component in the sound i-f section or possibly misalignment of of this section. This same condition may also be caused by the 4.5-mc interstage coil (*L301*) having a few shorted turns. In cases of this kind, it is not always possible to determine the trouble by visual or other inspections. If the coil displays a rather broad peak in tuning, it should be replaced by a new one.

CAPEHART Chassis CX-36

Pie-Crust pattern at low brightness.

The effect which might be described by some as "pie-crusting" or "gear-tooth effect" has been reported as being apparent on some of the above chassis when the Shading control is adjusted to a relatively low brilliance setting. The cause of this effect has been determined to be the result of a parasitic oscillation in the horizontal output circuit. By changing *R549* (1k-ohm resistor in parallel with *C523*, .22-μf capacitor, in series with the brown yoke lead) from 1k-ohm to 470 ohms, this effect can be eliminated.

CAPEHART Chassis CX-36

Horizontal picture movement on certain signals.

Scattered reports of horizontal movement in the picture have been received by the manufacturer. This condition is not to be confused with horizontal instability or jitter which may be caused by severe noise conditions in weak signal areas. On the contrary, most cases reported have been under moderate signal conditions.

In many cases this condition has been found to be the result of variations in the afc circuit of the sync generator at the transmitter. Many transmitting stations employ sync generators which are controlled by reactance tube afc systems, similar to that employed in the above chassis. Variations that may occur in the afc circuit at the transmitter can have a direct influence on the horizontal stability of receivers using a similar afc system. The time constants employed in the reactance tube circuit of the transmitter sync generator and the receiver afc system should be approximately the same in order to provide optimum horizontal stability at the receiver. Any wide variation in

the two time constants may cause horizontal jitter. Also variations in line voltage or variations in B+ voltage in the reactance tube stage at the transmitter will cause the sync generator to be unstable, which in turn will result in horizontal instability at the receiver. Many stations will use more than one sync generator, even during the course of one particular program, therefore the condition at the receiver will probably be intermittent. You may note that this condition does not exist on network programs or possibly it is only noticed when the station is transmitting a local film program.

There is very little that a service technician can do about difficulties that stem from transmitter troubles, other than to report any suspected difficulties to the transmitter engineers. However, the technician can save himself much time if he will learn to recognize such troubles when they exist.

It has been found from trial and investigation in the field that when afc variations at the transmitter cause intermittent picture shift on the above chassis, the condition can be alleviated by removing resistor *R504* (10,000 ohms) and capacitor *C505* (.22 μf) in the afc delay network (grid circuit of reactance tube). This decreases the time constant of this circuit allowing the afc system to respond more quickly to the variations at the transmitter. Thus, the variations are not removed (since it would be impossible to do this at the receiver) but, they are speeded up to the point where they are not noticeable by the human eye.

CAPEHART Chassis CX-36

Horizontal instability (see Fig. 16).

The following information is presented as an aid to the service technician in endeavoring to service the above series chassis which shows evidence of horizontal instability. A few reports have been received by the manufacturer which indicate the possibility of drift in the horizontal oscillator frequency and phasing circuits. In these cases, a gradual change in horizontal phase of frequency may result after the set-up adjustments have been properly made. In other cases, the loss of horizontal sync has been found to be caused by a defective 12AT7 reactance tube, and in others it has been found to be due to mechanical variation of the horizontal oscillator transformer windings caused by vibration or shock. Suggestions are made in the following paragraphs which should assist in checking to determine the cause and also applying a correction.

The technician should not overlook the more common causes of horizontal instability, such as a defective sync clipper-reactance tube (12AT7), defective horizontal afc

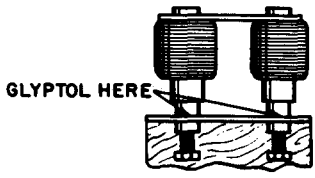


Fig. 16 — Capehart

tube (6AL5), open or leaky sync coupling capacitors, or misadjustment of set-up controls. In every case the receiver in question should be first adjusted according to the procedure outlined in the set-up instructions and then an oscilloscope should be used to trace the sync pulse through to its point of injection at the afc circuit. If this procedure is followed and horizontal instability or drift is evident, one or more of the following may be the cause:

1. *Horizontal instability due to loose coil forms (T501).* Check for play in the adjustment slugs of *T501*, the horizontal oscillator transformer. Make certain that the coil forms of this transformer are held rigidly in place by the mounting clips. If play exists, apply glyptol to secure forms to mounting bracket (*see figure*).

2. *Horizontal instability caused by defective reactance tube.* Some 12AT7 tubes have been reported as developing secondary emission in which case this would be evidenced by the grid going positive. Check the grid voltage with a vtvm at the junction of *R506* (10,000 ohms) and *R507* (1,000 ohms). It should read zero with the 6AL5 removed or with the 6AL5 in place when horizontal frequency and phasing are properly set. If the reading is positive: (a) replace the tube; (b) change *R525* (plate load for *V404 B*) from 5.6k-ohms to 18k-ohms, 2 watt (part No. 3235-183); and (c) change *R512* (plate load for *V502 A*) from 5.6k-ohms to 15k-ohms, 2 watt (part No. 3235-153).

3. *Horizontal phase shift or oscillator drift.* If the initially correct adjustments of the frequency and phasing slugs require readjustment after a period of operation: (a) remove *C510*, .0033-μf capacitor connected to terminal C of *T501*, (b) connect the parallel combination of one 1,200 $\mu\mu$f silver mica (part No. 750272A-44) and two 1,100 $\mu\mu$f, N750 (part No. 650261A-18) capacitors from terminal *C* to terminal *B* of *T501*, horizontal oscillator transformer; (c) remove *C508*, .00 47-μf capacitor between terminals *D* and *F* of *T501;* (d) connect the parallel combination of one 500-$\mu\mu$f, N1400 (part No. 650030A-20) and three 1,400 $\mu\mu$f, No. 1400 (part No. 650030A-19) capacitors from terminal *D* to terminal *F* of *T501*.

After making these changes, repeat the horizontal oscillator adjustment procedure.

Note: The total desired capacitance for replacing *C508* can also be obtained by paralleling a 1,500 $\mu\mu$f, $\pm$5% N5250 ceramic (650030 A-21) and a 3,300 $\mu\mu$f $\pm$5% silver mica (750272A-25) capacitor.

Some service technicians have found that a suitable correction to horizontal drift in these chassis can be obtained merely by replacing *C510* with a 3,300 $\mu\mu$f silver mica capacitor and *C508* with a 4,700 $\mu\mu$f silver mica capacitor. Components used in this case are part No. 750272A-25 and 2272-43472.

CAPEHART Chassis CX-36, CX-37 with uhf strips

Field alignment for uhf strips.

Since all uhf channel strips are factory aligned, it is not generally necessary that any adjustments be made to the strips other than oscillator touch-up. In many cases, the uhf stations do not go on the air with full power upon initial transmission and as a result many receivers are expected to perform satisfactorily under fringe signal conditions. Under these weak signal conditions, it is sometimes possible to improve reception by careful peaking of certain adjustments on the uhf strips. The only equipment required for this peaking is a good vtvm and a long-shaft insulated alignment tool with an approximately 1/8- inch diameter blade. The procedure for peaking uhf strips is as follows:

1. Install the strip according to suggested procedure and adjust the oscillator slug for best picture. If the best picture obtainable is not in accord with general reception in the area, proceed to step (2).

2. It is not necessary that the chassis be removed from the cabinet in most models; therefore, access to the tuner can be obtained by removing a portion of the protective screen on the cabinet bottom. After gaining access to the tuner, remove the bottom shield and the antenna coil strips for the two or three channels that are located approximately 180 degrees from the uhf strip which is to be peaked. This will provide access to the uhf strip slugs through the turret from the bottom of the chassis.

3. Connect the vtvm (on its lowest d-c range) from the r-f agc bus (terminal 2 of the r-f, i-f power plug) to chassis ground. The vtvm will serve as an indicator of signal level as the strip is peaked.

4. While observing the picture obtained on the uhf channel to be adjusted and the vtvm reading, start with the slug nearest the rear of the tuner (*C2*) and adjust with the insulated alignment tool for maximum reading on the vtvm. Proceed then to adjust the 2nd (*C3*) and 4th (*C4*) slugs also for maximum vtvm reading. Note: While adjusting for maximum vtvm reading, check also to see that picture resolution is not detrimentally affected by the adjustments. The adjustments should provide maximum reading consistent with good picture resolution.

5. After completing step (4), check the oscillator slug adjustment. If readjustment is necessary, repeat the adjustments in step (4).

CAPEHART — Chassis CX-36 coded R2-D4

Critical vertical sync.

Cases of critical vertical sync in the above chassis may be found to be due to capacitor *C530* (.0022 μf, 1000 v). This capacitor is connected to a .022-μf capacitor (*C529*) that is tied to pin 3 of the vertical output tube. It has been found that a small quantity of these capacitors have been used that did not fall within the tolerance specified for this part.

Chassis having critical vertical sync that bear the R2-D4 code num-

ber should have this capacitor checked. If it does not fall within a tolerance of 20%, it should be replaced with a good unit.

CAPEHART Chassis CX-37

Eliminating hum in horizontal deflection circuits.

Heater connections on *V403* (½ of which is used as a horizontal phase detector) are changed so that pin 9 connects to *Y* and pins 4 and and 5 connect to *Z* (these are the brown 6.3-volt leads of the power transformer). This change places the heater of this tube at a positive potential of 135 volts. The reason for the change, already made in later production, is to eliminate a 60-cycle hum in the horizontal deflection which in some cases may show up as a "snaking" of the raster.

CAPEHART Chassis CX-37

Short in width coil circuits.

Some power transformers (bearing vendor code 328), used in the above chassis are ¼ inch longer than those received from other vendors. As a result of this, a short may develop between the terminal lugs of the width coil and the transformer case when the width coil is adjusted. To eliminate this possibility, a strip of electrical tape is placed on these transformers, adjacent to the width coil.

CAPEHART Chassis CX-37

R-f beat signal during warm-up.

To eliminate an r-f beat signal which has been noted in some of the above chassis, usually during the warm-up period, make the following modification. Reroute i-f bypass capacitors *C214* and *C222* (1,000-$\mu\mu$f plate bypasses in 2nd and 3rd video i-f stages) so that they are returned to the nearest chassis ground terminal rather than to pin 7 (suppressor grid) of their respective i-f tube. This change is already made in later production.

CAPEHART Chassis CX-37

Preventing breakdown of h-v filter resistor.

R523, isolating resistor in series with the picture tube high voltage anode lead, is changed from 330k-ohms, ½ watt to 1 megohm, 1 watt. The change is to insure an additional safety factor with regard to the a-c wattage dissipation in *R523*. D-c wattage dissipation is very low, however, high voltage pulses from the horizontal scanning circuit have in some cases caused burn-out of *R523*. It is recommended that future replacements of this resistor in the field should be 1 megohm, 1 watt resistors.

To gain access to this resistor for replacement in the field, remove the rear cover of the high voltage section, remove the 1B3 tube and the screw holding the 1B3 socket to the Hi-V capacitor, and twist the socket slightly to expose the resistor.

CAPEHART Chassis CX-37

Eliminating a slight 120-cycle hum in picture.

To eliminate a slight 120-cycle hum sometimes noticed in the pic-

ture, rewire *C203* (.047 μf) to connect from terminal *C* of *T202* (i-f transformer between 1st and 2nd video i-f amplifiers) to ground. This capacitor was previously connected from pin 7 of *V202* (2nd i-f amplifier) to ground. Note: This change is already made in later production runs.

CAPEHART Chassis CX-37

Reducing hum in sound.

To reduce hum in the sound, the following changes (already made in later production) are incorporated:

1. Electrically transpose *C603A* and *C604A* (50-μf, 400-volt capacitors connected to both sides of 1 -henry power supply filter choke).

2. Substitute *C317* (.0047-μf, 600 -volt capacitor) for *C313* (.01-μf capacitor across primary of audio output transformer).

CAPEHART Chassis CX-37

Installation of beam-corrector magnets (see Fig. 17).

Beam-corrector (anti-pincushion) magnets which can be easily installed on any of the above chassis are now available from the manufacturer's distributor. These have been made available in response to requests made by service technicians in certain areas. The magnets compensate for the effect known as "pincushioning" which is noticeable particularly with the large picture tubes. An illustration of extreme pincushioning is shown in (A). Note the bending of the vertical lines near the edges of the picture. This same amount of distortion would be much less noticeable with standard picture transmission, however.

Part (B) of the illustration shows the beam-corrector magnets (part No. 650761A-1) installed on the above chassis. The magnets are fastened to the yoke support bracket (one on each side) by the small self-tapping screws which also serve to fasten the yoke to the bracket. The mounting arm of the magnet is a flexible metal which allows for adjustment by bending the magnet either toward or away from the crt. After installation, the magnets should be adjusted. Bending the magnet closer to the crt will pull the raster toward the magnet, while bending it away will have the opposite effect.

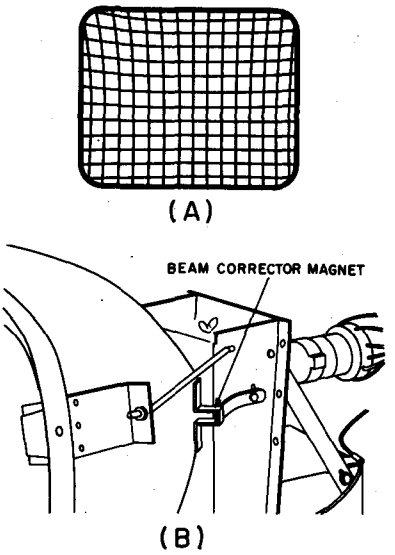


Fig. 17 — Capehart

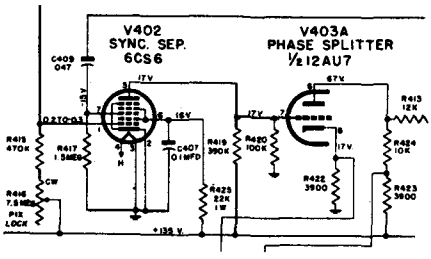


Fig. 18 — Capehart

Misadjustment of the magnet may cause an irregular bend to appear at the edge of the raster.

CAPEHART Chassis CX-37

Improving sync separation and hook at top of picture (see Fig. 18).

The following listed changes (already included in later production) improve the function of the sync separator stage and eliminate the slight hook at the top of the picture as noticed in some chassis.

1. *R421,* a 2.2-meg resistor connected to pin 7 of the phase splitter is deleted.

2. *C408,* a .047-μf coupling capacitor also connected to pin 7 is deleted and the plate (pin 5) of *V402* is connected directly to the grid (pin 7) of *V403A.*

3. *C406,* coupling capacitor is changed from .01 μf to .047 μf. (It is now designated as *C409.*)

4. *R418, V402* screen resistor is changed from 39k ohms to 22k ohms. (It is now designated as *R425.*)

5. *V402,* sync separator tube is changed from a 6BE6 to a type 6CS6.

CAPEHART Chassis CX-37

Proper h-v lead dress (see Fig. 19).

It is important that the dress of the leads in the h-v cage be checked carefully after replacement of any tubes or components in this section. In the drawing, proper dress of high potential leads within the h-v cage is illustrated by the leads which are drawn with solid lines. This is the position in which they are placed in manufacturing. Leads represented by dotted lines indicated examples of improper dress. Note that lead *A* and lead *B* must be separated from each other and looped away from the transformer winding (toward rear of chassis). The red and black leads must be dressed away from each other. The red lead can be properly dressed by rotating the 1B3 tube cap in a clockwise direction. The black lead can be properly dressed by rotating the 6BQ6 tube cap in a counterclockwise direction on a 70-

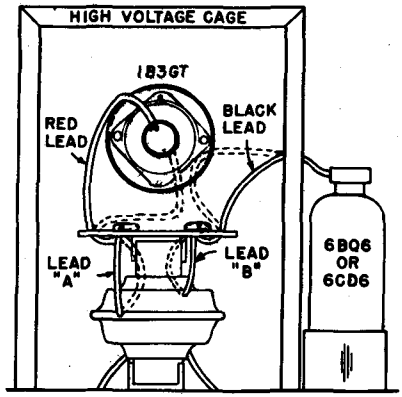


Fig. 19 — Capehart

degree chassis or on a 90-degree chassis, and by rotating the 6CD6 tube cap in a clockwise direction.

CAPEHART Chassis CX-37 in 3-way combinations

Reducing audio hum.

The above chassis, when used in 3-way combination models, is modified to reduce audio hum as follows. The audio detector plate load resistor (*R309*, 330k ohms) is replaced with a 220k-ohm (*R316*) and a 120k-ohm (*R317*) resistor in series. An additional bypass capacitor (*C318*, 1 μf at 400 volts) is connected from the junction of the two resistors to chassis ground. This change is already made in later production.

CAPEHART Chassis CX-37 with 24- and 27-inch picture tube

Noise in picture and sound.

If there is noise in the picture and sound, check for poor mechanical ground between the width tuning core screw and the coil mounting bracket. Correct by adding a 6-32 hex nut to the core screw and tighten the Tinnerman nut securely.

CAPEHART Chassis CX-37 with 24- and 27-inch picture tube

White line at top of picture.

If there is a white line at the top of the picture, add a 470k-ohm, ½-w resistor in parallel with *R564* (47k-ohms) in the vertical oscillator circuit. This change has already been made in later production.

CAPEHART Chassis CT-52, CT-57, CT-58, CTR-38, CTR-68, CX-36

Eliminating hissing in sound on weak signals (see Fig. 20).

This change is incorporated in later production to eliminate the

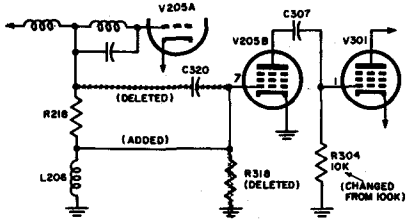


Fig. 20 — Capehart

sometimes apparent objectionable frying or hissing in the sound under extremely weak signal conditions. To make this change on early production chassis:

1. Delete *C320* (100 $\mu\mu$f) and *R318* (680k-ohms). These components are connected to pin 7 of the 1st sound i-f amplifier (*V205B*).

2. Connect pin 7 of *V205B* to the junction of *R218* and *L206* by direct connection. *R218* is the 4,700-ohm video detector load, while *L206* is the 250-μh peaking coil connected to this load.

3. Change *R304* (connected to pin 1 of the 2nd sound i-f amplifier) from 100k-ohms to 10k-ohms.

4. Delete *R317* (68 ohms) and *C318* (5,000 $\mu\mu$f) both in cathode cir-

cuit of *V301* (second sound i-f amplifier).

5. Connect pin 7 of *V301* to chassis ground.

CAPEHART CT-52, CT-57, CT-58, CTR-68, CX-36

Improved sync stability and noise clipping.

To obtain improved sync stability and noise clipping, the following modifications are made in later production runs of the above chassis.

To make this change in early production chassis:

1. Remove *R439* (10k-ohm resistor) connected between *C405* (.01 μf) and pin 7 of *V403* (sync separator).

2. Change *C405* to .047μf and connect directly to pin 7 of *V403*.

3. Remove *R438* (1-meg resistor connected to pin 1 of *V402* sync amplifier).

4. Change *R427* from 3.9 meg to 1.5 meg. This resistor is connected to pin 7 of *V403*.

5. Remove *R505* (1-meg resistor connected to terminal *E* of *T501*, horizontal oscillator transformer) and connect terminal *E* of *T501* directly to the junction of *R501* and *R502* (both 470k-ohm resistors at input of horizontal afc tube.

CAPEHART Chassis CT-52, CT-57, CTR-38, CX-36

Arcing within h-v cage.

Some arcing inside of the h-v cage may be noted on early production chassis. This was found to be due to the proximity of the IB3GT tube cap to the metal cover of the h-v cage. Naturally, the arc will be noted only with the cover in place. This may be remedied in the field as it has been in production, by placing a 2-inch wide strip of plastic insulating tape across the inside of the entire width of the h-v section cover.

CAPEHART Chassis CT-52, CT-57, CTR-38, CX-36

Arcing in picture tube gun.

Some arcing inside the picture tube gun may be noticed when these receivers are first placed in operation. This is normal with electrostatic focus tubes. If the arcing should persist beyond a reasonable breaking-in period, of course, it would not be considered normal.

CAPEHART Chassis CT-74

Preventing horizontal oscillator drift.

To prevent horizontal oscillator drift, the following modifications (already made in later production) are incorporated:

1. *C510* (connected to terminal *C* of horizontal oscillator transformer *T501*) is changed from .0033 μf to 1,200 μμf, ±5% silver mica and returned to terminal *D of T501* instead of chassis ground (new part No. 75 027A2-44).

2. *C551* and *C552* (both 1,100 μμf tubular ceramic 10% capacitors) are added in parallel across *C510*.

3. *C508* (between terminals *E* and *F* of *T501*) is changed from .0047 μf to a total capacitance of 4,700 μμf, ±5%. This capacitance is

formed by three 1,400 $\mu\mu$f, $\pm$5% tubular ceramic capacitors (new part No. 650030A-19) and one 500 $\mu\mu$f, $\pm$5% tubular ceramic capacitor.

4. *R525* (connected to terminal *B* of *T501*) is changed from 5.6k-ohms to 18k-ohms, 2 watts. (New part No. 3235-183).

5. *R512* (plate dropping resistor in horizontal oscillator circuit) is changed from 5.6k-ohms to 15k-ohms, 2 watts. (New part No. 3235-153).

CAPEHART Chassis CT-74

Increasing horizontal scan at low line voltages.

To increase the horizontal scan at low line voltages, change *C544* (68-$\mu\mu$f capacitor connected between terminals 1 and 3 of the horizontal output transformer) to 120 $\mu\mu$f, 4kv (part No. 450954A-4). Two 68-$\mu\mu$f capacitors may be used in parallel here. This modification is already made in later production of the above chassis.

CAPEHART Chassis CT-81

Preventing picture blooming.

To prevent picture blooming, the following change (already included in later production) is made. *R239* (150k-ohm resistor) is added in series with *R234* (brightness control) to chassis ground. In the early version of this chassis, *R234* was returned to +135 volts.

CBS-COLUMBIA Chassis 700-series, early 800-series

Substitution of h-v rectifier.

The above chassis employed a 1X2A high-voltage rectifier tube which uses a 2.2-ohm filament dropping resistor. Later production of the 800-series chassis uses the 1AX2 tube, which employs a 0.51-ohm filament dropping resistor.

If replacement of the high-voltage rectifier tube becomes necessary, the replacement tube should be the same type originally in the set. However, should necessity require substituting a 1AX2 for a 1X2 or 1X2A tube, it is imperative that the proper filament dropping resistor be used. In this case, the resistor must be changed from 2.2 ohms to 0.51 ohm.

CBS-COLUMBIA Chassis 700-series

Replacement of horizontal output transformer.

In cases where replacement of horizontal output transformer No. 10104, 10110 or 10135 becomes necessary in one of the above chassis, a newer transformer No. 10136, used in 800-series chassis can be substituted with good results.

In connecting the new transformer, the following instructions should be observed:

Wire	*Terminal on Old Transformer*	*Terminal on Transformer 10136*
Orange	1	2
Cap of 6BQ6	2	9
Cap of 1X2	3	3
Blue	7	4
White	4	7
Green	5	8 and 6 joined
Yellow	6	5
Width Coil	5 and 6	5 and 6

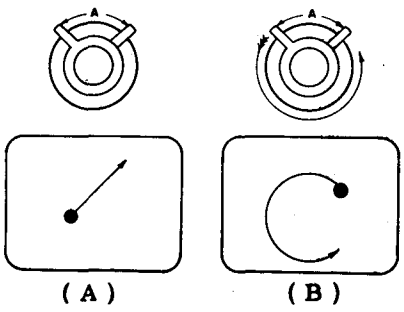


Fig. 21 — CBS-Columbia

CBS-COLUMBIA Chassis 800-series, 1000-series

Adjustment of focus control.

All the above chassis employ electrostatic focus cathode-ray tubes. A focus control, in the form of a 1-meg potentiometer is located at the rear of chassis on the 800-series, and on the top of the chassis in front of the keyed agc tube (6AU6), on the 1000-series chassis. This focus control is properly adjusted at the factory to produce the **sharpest, clearest picture.**

Operation of this control does not make the focus go in and out of range, similiar to former chassis which employed electromagnetic focused cathode-ray tubes and required a focus coil around the neck of the tube.

Adjustment of the focus control in these chassis is barely perceptible when a transmitted program is on the screen. For best focusing, the channel selector should be turned to an unused channel to produce a blank raster. Best focus control position can be obtained by watching the lines of the raster for sharpest edge to edge focus.

CBS-COLUMBIA Chassis 800-series

Increasing brightness.

Increased brightness on all the above chassis may be obtained by changing *R229*, a 270-k ohm resistor to a 100k-ohm, ½-watt resistor. *R229* is located at the centertap of the brightness control.

Later production already incorporates this circuit change.

CBS-COLUMBIA Chassis 800-series

Adjustment of magnetic centering rings (see Fig. 21).

Later production runs of the above chassis employ magnetic centering instead of electrical centering. Electrical centering was achieved by varying the d-c component in the yoke. Magnetic centering is achieved by varying the location and magnitude of an auxiliary p-m (permanent magnet) field in the neck of the crt. This magnetic centering control is effected by means of magnets mounted on the back cover of the yoke.

These magnets are in the form of circular rings with integral control tabs. When these tabs are diametrically opposite, the resultant magnetic field is zero, and rotation of the tabs will produce no effect on raster location. As the tabs are moved with respect to each other, the resultant magnetic field increases, reaching a maximum when the two tabs are together. When the tabs are other than 180-degrees apart and are rotated together, the raster will be seen to move with tab rotation. The magnitude of displacement will increase as the angle between the tabs decreases, and the direction of displacement is determined by the angular position of the combination.

Magnetic centering is effected by selecting the proper angular separation between tabs to secure the required magnetic field strength for the particular set involved and rotating the magnets together to effect displacement in the required direction.

If the picture requires centering, note the following:

1. The angle (A) between vanes moves any small area of the picture in a straight line along a radius (see part (A) of the figure).

2. Rotating the vanes simultaneously, moves the same small area along the circumference of a circle (see part (B) of the figure).

CBS-COLUMBIA Chassis 800-series

Eliminating ringing and vertical shading (see Fig. 22).

Under certain conditions, such as fringe area reception and transmitter variations, a condition may develop on the raster of some of the above series receivers known as vertical shading or crosstalk and horizontal ringing. In most cases, the shading is due to crosstalk in the deflection yoke, which can be lessened by increasing the value of ***C220*** **.01-μf, 600-volt capacitor** (connected between the high side of the vertical output transformer and ground) to .1 μf, 600 volts.

To compensate for excessive ringing in the flyback circuit, which shows on the raster as alternate light and dark vertical bars, the following network is added to the horizontal blanking circuit.

1. **Change *R227*, 2.2-meg resistor** connected to pin 10 of the picture tube to 330k ohms, 1 watt.

2. **Change *R318*, 15k-ohm, 1-watt** resistor (also connected to pin 10) **680k-ohms, 1 watt.**

3. **Change *C318*, 220-μμf, 1000-volt capacitor connected to *R318*** to 680k-ohm, 1-watt resistor.

4. Add a 10-μμf, 1500-volt capacitor to parallel 680k-ohm resistor.

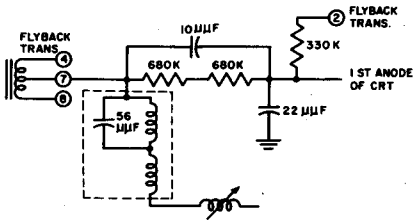


Fig. 22 — CBS-Columbia

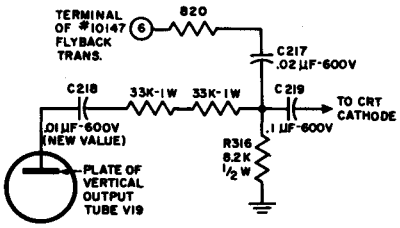


Fig. 23 — CBS-Columbia

5. Add a 22-$\mu\mu$f, 1000-volt capacitor at the junction of the 330k-ohm and 680k-ohm resistor.

The schematic for the new arrangement, already made in later production, is shown here.

CBS-COLUMBIA Chassis 800-series with uhf tuner No. 541452

Excessive snow on uhf.

On the front, top left-hand corner of this variable-capacitor tuner, there is a test point terminal which extends beyond the front. When inserting the chassis into the cabinet, a certain number of these test point terminals may have been bent down and shorted to the mounting bracket. This results in excessive snow in the picture. In order to restore the receiver to normal operation, the test point terminal should be bent away from the tuner mounting bracket.

CBS-COLUMBIA Chassis 1000-series, 1021-series

Eliminating ringing and vertical shading (see Fig. 23).

The blanking circuits in the above chassis are revised to eliminate horizontal ringing and vertical shading, by altering the means of feeding the vertical blanking signal and modifying the blanking circuits.

Briefly, this change is effected by taking the vertical blanking signal from the plate of the vertical output tube and including a damping resistor in series with the horizontal blanking pulse.

The wiring changes are effected in the following manner:

1. Remove *C218*, .1μf, 600-volt capacitor in blanking circuit coupling network to cathode of crt.

2. Change *R316* from 22k-ohms, ½ watt to 8.2k-ohms, ½ watt.

3. Connect an 820-ohm, ½-watt resistor between terminal 6 of the No. 10147 flyback transformer and *C217*, a .02 μf, 600-volt capacitor.

4. Connect the other end of *C217* to the junction of *C219*, .1-μf, 600-volt capacitor and *R316*, a 8.2k-ohm, ½-watt resistor.

5. Remove *R315*, 3.9k-ohm, ½-watt resistor in blanking circuit coupling network.

6. Connect a .01-μf, 600-volt capacitor (new value of *C218*) from plate of vertical output transformer (blue lead) to the lug formerly used for junction of *C217*, *C218* and *R315*.

7. Connect two 33k-ohm, 1-watt resistors in series, solder, and clip leads. (Two 1-watt resistors are used in series in order that the operating pulse voltages will be within safe limits. A 2-watt, 68k-ohm resistor is *not* to be used in this application because of pulse rating).

8. Connect dual 33k-ohm resistors between the junction of *C217, R316 and* .01-μf, 600-volt capacitor from the vertical output tube plate.

Note: The above changes as shown in the schematic diagram have already been included in later production.

In addition to the above, the following modifications are made only in the 1021-series chassis. A 27k-ohm, ½-watt resistor is added to attenuate the shaping pulse. By doing this, a certain amount of phase shift is noted. In order to compensate for this, a 22$\mu\mu$f, 500-volt capacitor parallels the resistor to allow a certain amount of blanking to bypass the resistor in order to prevent this phase shift.

The change is made as follows

1. Parallel a 27k-ohm, ½-watt resistor with a 22 $\mu\mu$f, 10%, 500-volt capacitor.

2. Insert this R-C network between lug 6 of the flyback transformer and *C217*, a .02 μf, 600-volt capacitor. Note that the 820-ohm resistor mentioned in step (3) above is not used.

CBS-COLUMBIA Chassis 1000-series

Increasing life of components in horizontal output circuit.

Production experience indicated that for maximum life of the components in the horizontal output circuit, the 6CD6 screen resistor should be changed from 22k ohms, 2 watt to 39k ohms, 2 watts. This change was accordingly made and should be incorporated in every receiver serviced for any reason whatsoever.

As a result of increasing the screen resistor in the 6CD6, the output of this stage is slightly reduced, and as a result, repositioning of the anti-pincushion magnets may be required. This is more likely to occur in the event that the receiver is operated at low line voltage.

CBS-COLUMBIA Chassis 1000-series

Setting up anti-pincushioning magnets.

The anti-pincushion magnets used in the above chassis are for the purpose of deflecting the electron beam to secure a rectangular raster of the proper size. An inherent characteristic of the yokes providing good focus characteristics over the face of the tube is a pincushion raster, resulting from greater deflection off the center line than on the center line. By placing permanent magnets properly polarized of suitable strength on the center line, the raster may be streched to provide a straight edge.

If these anti-pincushion magnets are improperly polarized (reversed), the pattern will be compressed along the center, due to repulsion by the permanent magnet field. If the anti-pin-cushion magnets are properly polarized and too far out from the tube, insufficient compensation will be realized. If too close to the tube, over compensation will result, and the raster will be barrel shaped.

The location of the anti-pincushion magnets along the axis

of the tube will determine their effectiveness. If the magnets are located back toward the neck of the tube, a greater range of effect may be obtained.

Proper position for the anti-pincushion magnets is achieved when straight raster sides and the desired amount of stretch (width) are obtained. Moving the raster by means of the electrical horizontal centering control is a convenient approach and permits adjusting each side of the raster independently.

CBS-COLUMBIA Chassis 1000-series

Wiring change to permit use of match-box uhf converter.

Early production chassis had pin 7 on the 6V6 tube socket grounded and pin 2 going to the 6.3-v filament bus. On all 800-series chassis and the later production chassis 1000-series, the pin 2 is grounded. On the matchbox uhf converter, pin 2 is also grounded.

Before connecting match-box converters to any chassis 1000 in the field, check the set with an a-c voltmeter to make sure that pin 7 is alive and pin 2 grounded. If this is not so, the chassis must be opened and filament connections to the 6V6 socket reversed, otherwise damage may be caused to the output coil in the uhf match-box converter.

If preferred, the brown and yellow filament leads of the uhf converter cable to the 6V6 tube can be cut and respliced, yellow to brown, brown to yellow. However, this unit can not then be used later with an 800-series or a newer 1,000-series chassis without reconnecting the cable wires back to the original way.

CBS-COLUMBIA Chassis 1021-series

Replacement of h-v rectifier.

Difficulty may be experienced in obtaining high voltage when using certain brands of 1B3 h-v rectifier tubes as replacements in the above chassis. Certain brands of this type of tube have all unused pins internally wired, as on an anti-corona shield. In tubes of this type, pin 3, which is used to connect *R414* (8.2-ohm filament dropping resistor) to pin 2, shorts out the filament, resulting in no high voltage.

Care should be taken to make sure the proper type 1B3 tube is used when replacement becomes necessary.

CBS-COLUMBIA Chassis 1021-series

Eliminating horizontal-drive line.

Field reports indicate servicemen have experienced some difficulty in eliminating a horizontal-drive line on the above chassis. This horizontal-drive line is identified as a narrow white vertical line appearing either in the center of the picture tube screen or slighly to the left of center. Normal procedure to eliminate this drive line is to turn the horizontal drive control,

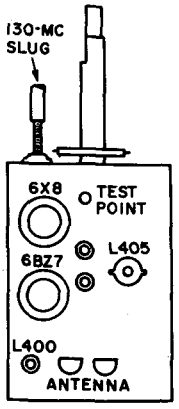


Fig. 24 — CBS-Columbia

located at the rear of the receiver, in a clockwise direction.

If the drive line still persists, it can be reduced by changing *R412*, a 330k-ohm resistor, to a 180k-ohm, ½-watt resistor. *R412* is connected from the horizontal drive control to ground.

CBS-COLUMBIA Chassis with uhf tuner

Removing "tweets" on uhf (see Fig. 24).

"Tweets" appearing in the uhf tv band are a result of the incoming signal beating against the set's local oscillator. The resulting frequencies fall in and around the video i-f frequency spectrum. When these are amplified and reproduced on the picture tube, the picture detail becomes slightly distorted with what appears to be radio-frequency lines throughout the picture.

A simple solution in the field is to readjust the 130-mc slug in the tuner. This slug is located on the front of the tuner and sticks out much further than the adjustment slugs for vhf operation. This adjustment can be made while looking at the picture. It will be noted that the slug will have to be rotated a few turns before any noticeable change in the picture is achieved.

CONRAC Models 36, 39

Removal of retrace lines (see Fig. 25).

Under conditions of misadjustment of the receiver or transmitter, retrace lines may become visible, especially during fade-outs or the transmission of dark scenes. If desired, these lines can be blanked out with the locally generated vertical scanning retrace pulse, thereby permitting the viewer to advance the brightness control beyond the normal point, and positively eliminate the retrace lines even though the received signal may have improper black level.

It is recommended that this modification be made on an individual basis when required, since it is completely unnecessary when receiving a standard tv signal and when the receiver is adjusted for correct gray scale.

1. Connect a .02-μf, 600-volt capacitor between pin 3 of *V402* (this is also the crt grid tie point) and tie point *A*.

2. Remove red wire leading from *T501* (vertical output transformer)

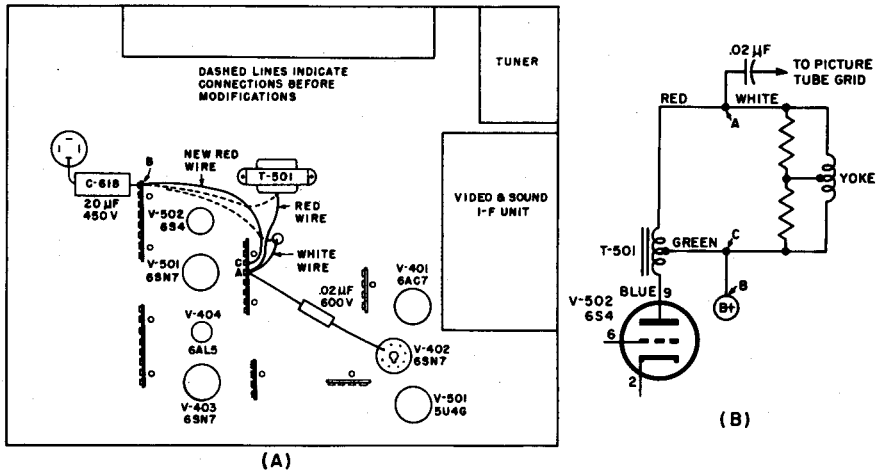


Fig. 25 — Conrac

from tie point *B* (B+ boost) and reconnect to tie point *A*.

3. Remove white wire leading from yoke terminal 4 from tie point *B* and reconnect to tie point *A*.

4. Add red jumper wire from tie point *B* to tie point *C*.

Schematic should now be as shown in part (B) of the figure.

CONRAC Models 61, 64

Improving vertical hold.

To improve vertical hold, coupling capacitor *C505*, (connected between pins 2 and 4 of the vertical oscillator) is changed to .015 μf at 600 volts. This change is already made in sets having serial numbers above 3387.

CONRAC Models 61, 64

Improving horizontal centering and eliminating foldover.

To improve horizontal centering and eliminate foldover, capacitors *C612* and *C614* (connected between a tap on the horizontal output transformer and pins 5 and 7 of the horizontal phase detector) are changed to .01 μf at 600 volts. This change is already made in later production with serial numbers above 3387.

CROSLEY Chassis 385, 386, 387, 393, 394, 396

Improving vertical sync stability (see Fig. 26).

A circuit change is made on the above chassis in order to improve vertical sync stability.

This change deletes resistor *R113*, 1.8 meg, 10%, ½ w (part No. 39374-67) and changes resistor

R120 to a 33,000-ohm, 10%, 2-w resistor (part No. 39374-219). It also adds resistor *R145*, 22,000 ohms, 10%, 1w (part No. 39374-129). Resistor *R112* 390,000 ohms, 10%, ½ w (part No. 39374-56) is removed from lug 3 of the agc switch *(SW102)* and chassis ground and rewired in series with lug 1 of the agc switch and brown lead from lug 4.

The above change is already included in chassis 385, 393, 394 and 396 that are code-lettered *B* and later; in chassis 386 that is code-lettered *E* and later; and in chassis 387 that is code-lettered *D* and later.

CROSLEY Chassis 385, 386, 387

Replacement of antenna transformer.

The antenna transformer *T1* used in the vhf tuner is available for replacement under part No. 157080. The alignment will not be affected if the leads on the replacement transformer are dressed as they were on the original transformer.

CROSLEY Chassis 385, 386, 387

Repairing damaged tuning mechanism (see Fig. 27).

The shafts and the fiber hub used in these converters have sufficient strength and flexibility to withstand normal handling and use. However, if a receiver is moved by grasping the control knobs, or if shafts are severely bumped or jarred, it is possible for the tuning mechanism to become damaged. Generally, the resulting damage will be a broken fiber hub on the control knob shaft or a loose stop on the knurled portion of the Inductuner shaft.

If a broken fiber hub or a loose stop is experienced on converters in the field, repair should be made in the following manner:

1. Remove the Inductuner cover by removing the three retaining nuts.

2. Scratch a mark on the rear of the pulley, on the fiber hub at rear

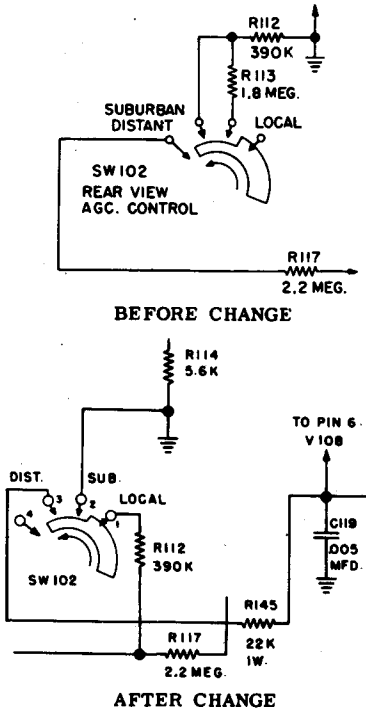


Fig. 26 — Crosley

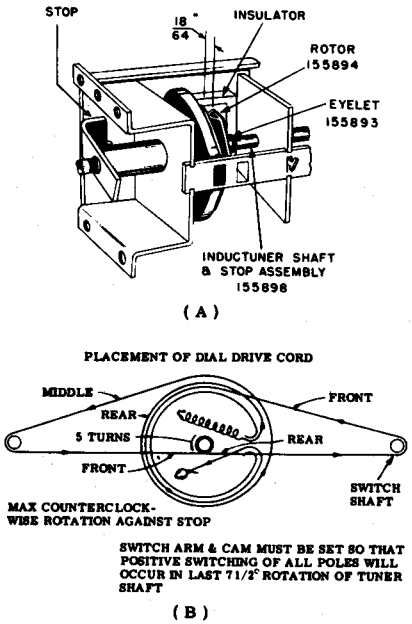


Fig. 27 — Crosley

of pulley, and on the stop, so that the position of the scratch marks coincide. These marks will be used as a reference for correct positioning of the parts when they are reassembled.

3. Secure the dial drive cord into the pulley groove with a strip of masking tape, then remove the dial cord from the groove of the idler pulley, the function switch shaft, and the control knob shaft. Note the number of turns of drive cord in the groove of the knob shaft for reference when reinstalling the drive cord. Some converters have four turns; others have five turns.

4. Remove the two screws that fasten the pulley and fiber hub to the stop. This will permit the removal of the pulley, fiber hub and control knob shaft from the stop.

5. Check position of rotors on Inductuner shaft with respect to the position of the stop on the knurled portion of the shaft as shown in part (A) of the figure, and as explained in the note below. Do not remove the stop from the Inductuner shaft unless it has been definitely determined that the stop was previously off (removed from) the shaft and is now improperly positioned. If the stop is loose (can be wobbled) on the knurled portion of the shaft, it can be tightened by carefully soldering it to the shaft. A low melting point solder (part No. 154830) is recommended. (This solder is also recommended for soldering of components and connections in all uhf converters.) Trim off all surplus solder so that the fiber hub fits properly over the end of the shaft.

Note: Before soldering the stop to the shaft, make sure that the stop is positioned correctly on the knurled portion of the shaft with relation to the position of the rotors. To do this, turn the Shaft to its extreme counterclockwise position. The correct rotor position is shown in the figure, the 18/64-inch measurement is taken from the inner surface of the insulator to the corner of the metal plate that holds the contacts on the rotor. If the rotors are not positioned as shown in the sketch, remove the stop from the knurled portion of the shaft and then replace the stop on the shaft in a position that will result in the

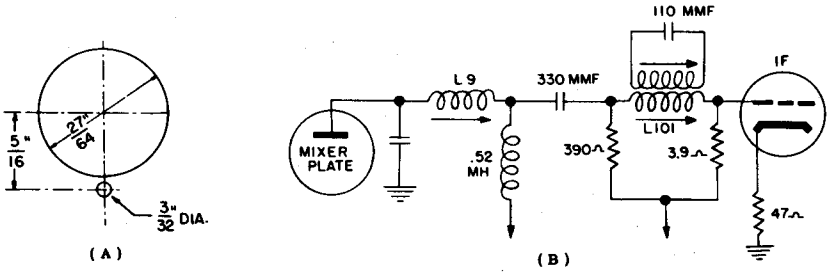


Fig. 28 — Crosley

rotors being in the position shown. The middle and rear rotor should be positioned on the shaft to coinside with the front rotor.

6. By referring to the scratch marks mentioned in step (2), assemble the fiber hub and control knob shafts and the pulley to the stop, using a new fiber hub and control knob shaft assembly (part No. 156207), if the original fiber hub is damaged.

7. Replace the drive cord on the control knob shaft, function switch shaft, and idler pulley (see part B of the figure). Then, remove the masking tape from the pulley.

CROSLEY Chassis 385, 386, 387

Replacing tuner shaft.

To replace the tuner shaft on the above models proceed as follows:

1. Remove chassis from cabinet.

2. Remove the two screws that fasten the tuner shaft support bracket to the front of the chassis. Then remove the two screws that fasten the tuner mounting bracket to the underneath side of the chassis.

3. Move tuner away from chassis, being careful not to damage the capacitors, resistors and wires at the rear of tuner, or to permit the weight of the tuner to be supported by these parts.

4. Remove cover from tuner.

5. Place a mark on tuner frame to indicate the position of the detent arm.

6. Note position of drive disc (part No. 155194) on shaft of fine tuning trimmer. Then loosen setscrew in drive disc.

7. Remove C-Washer (part No. 146507-23) from tuner shaft. This washer is located inside of the tuner.

8. Pull shaft and drive disc out from the tuner *being careful not to rotate any of the switch wafers.*

9. Place new shaft (part No. 155027) in position as indicated by mark mentioned in step (5) and position the drive disc on the fine tuning trimmer shaft as the tuner shaft is pushed into the switch wafers.

10. Insert the C-washer in the groove of the tuner shaft and tighten

the setscrew in the drive disc. Be sure the drive disc is positioned on the trimmer shaft to permit the trimmer to be rotated through its entire tuning range.

11. Replace cover on tuner, being sure that it is clipped in place on both sides. Then reinstall tuner in chassis. Make sure that no parts or connections to the tuner have been damaged.

CROSLEY Chassis 385, 386, 387

Keeping ac off antenna terminals.

To prevent the possibility of having any ac present on the antenna terminals of the above chassis, two 1-meg, 10%, ½-watt (part No. 39374-61) resistors are added. One resistor is added in parallel with capacitor *C163* and the other in parallel with capacitor *C164*. These capacitors, located on the vhf tuner, are 330-$\mu\mu$f units in series with the antenna input leads.

The above resistors are already added in later production to the following: chassis 385, code-lettered *C* and later; chassis 386, code-lettered *K* and later; and chassis *387*, code-lettered *J* and later.

CROSLEY Chassis 385, 386, 387

Minimizing adjacent sound interference by adding trap (see Fig. 28).

In areas where adjacent sound interference is prevalent, the addition of a trap will minimize such interference. To install and adjust the trap, proceed as follows:

1. Disconnect the converter i-f coil (*L101*) and remove it from the chassis.

2. Disconnect the 220-ohm resistor from terminal lug 2 on the tuner and terminal lug 2 of the terminal board on the chassis.

3. Enlarge the hole from which converter i-f coil (*L101*) was removed to a diameter of approximately 27/64 inch. Place the chassis on its side so that the tuner is at the top left corner when the chassis is viewed from its bottom, and drill a 3/32-inch hole directly below and at a distance of 5/16 inch from the center of the 27/64- inch hole. (See part A of the figure.)

4. Connect a 5-inch length of No. 24 solid copper wire from lug 4 on the tuner to lug 2 (lug from which the 220-ohm resistor was removed) of the terminal board on the chassis. Care must be taken to dress this lead as close to the chassis as possible.

5. Connect the 220-ohm resistor, which was removed in Step (2), between lugs 2 and 4 on the tuner. Keep the resistor leads as short as possible.

6. Insert the new coil (part No. 155304) into the 27/64-inch hole. The two connecting lugs on the coil form should be nearest the chassis. Connect the parts removed from the original coil in step (1) to their respective lugs on the new coil.

7. Connect a 390-ohm resistor (part No. 39374-20) on the lug of the coil that has the 330-$\mu\mu$f capaci-

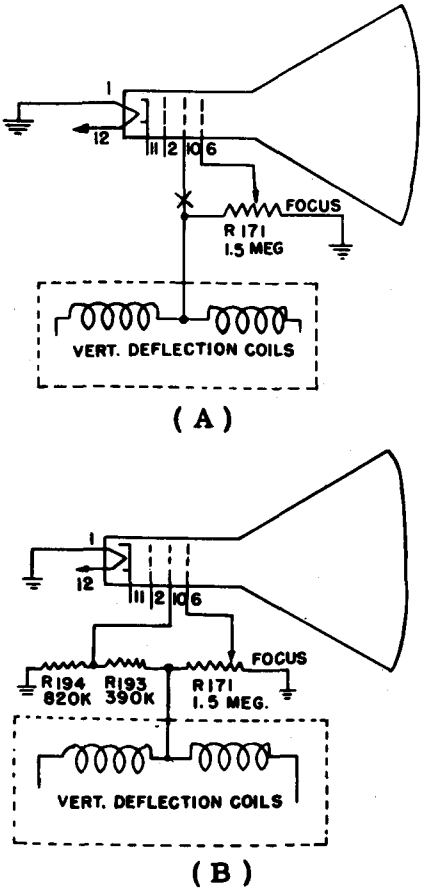


Fig. 29 — Crosley

tor connected to it; the other end of the resistor connects to the chassis at a point near the coil.

Alignment. Connect the signal generator, bias battery, and output indicator as explained in the service notes for the receiver. The alignment procedure is the same as that described in the service notes except the mixer coupling circuit should be aligned as follows:

1. Set the signal generator to 25.2 mc. Connect a 100-ohm resistor in series with a 1,000-$\mu\mu$f capacitor across *L101*. Adjust the converter output adjusting screw (*L9*) on the r-f tuner for maximum d-c meter indication. Set amplitude of signal generator to make this maximum indication approximately 2 volts dc. Remove 100-ohm resistor and 1,000-$\mu\mu$f capacitor.

2. Set signal generator to 27.9 mc and adjust bottom of *L101* for minimum dc indication. Signal generator amplitude must be suffiently high to produce a definite null. Meter must read at least 0.5 volt at null.

3. Set signal generator at 25.2 mc. Connect a 100-ohm resistor in series with a 1,000-$\mu\mu$f capacitor from test point 2 on r-f tuner to the tuner case and adjust top of *L101* for maximum d-c meter indication. Set amplitude of signal generator to make this maximum indication approximately 2 volts dc. Remove the 100-ohm resistor and the 1,000-$\mu\mu$f capacitor.

4. Repeat steps (2) and (3).

CROSLEY Chassis 385, 386, 387 with 21-inch picture tube, 402, 403, 404, 405, 406, 410, 411, 412, 414, 416

Improving picture contrast and shading (see Fig. 29).

The following circuit change is made to improve picture contrast and shading.

The change (already made in later production) lowers the voltage on grid 2 in the picture tube. It adds

two resistors, *R193* and *R194*. *R193* is a 390,000-ohm, 10%, ½-watt resistor (part No. 39374-56), and *R194* is an 820,000-ohm, 10%, ½-watt resistor (part No. 39374-60).

Schematic (A) shows the circuit before the change. To make the change the circuit is broken at point X. *R193* and *R194* are added and wired as shown in schematic (B).

Note: In 24-inch and 27-inch chassis, the 390,000-ohm resistor replaces the 220,000-ohm resistor in early production, and the 820,000-ohm resistor replaces the 1.8-meg resistor.

CROSLEY Chassis 385, 386, 387 with uhf tuner

Troubleshooting uhf tuner.

To service the uhf tuner used in the above receiver, proceed as follows:

1. Place the vhf chassis on its side (high-voltage down toward bench), with the bottom toward the serviceman. Place a block of wood between the bench and the deflection yoke bracket to prevent the chassis from falling and striking the picture tube neck.

2. Disconnect the antenna pins from the terminal board (*CO102*) which is located on the vhf tuner. Then disconnect red wire and blue wire from the other terminal board (*CO101*) which is located on the chassis near the vhf tuner.

3. Remove the four screws that mount the uhf tuner to the front of the chassis. On tuners that have the slide switch (two-tube tuners), unhook the control wire from the slide switch.

4. By inserting one of the tuner mounting screws in the small hole located near the center of the chassis front, fasten the tuner to the front of the chassis at right angles to the chassis front. In this position, both the top and bottom of the tuner are accessible.

5. Use a 6-inch jumper wire that has an alligator clip on each end, to connect the pin of the blue wire to the terminal on the terminal board (*CO101*) from which it was previously removed. Then with the same type of jumper wire, connect the pin of the red wire to its terminal on the terminal board. Connect the pins of the antenna wires to their respective terminals from which they previously were removed.

6. Turn the set on and make sure the vhf chassis is operating satisfactorily by tuning in a vhf station signal or an r-f signal from a vhf signal generator. If a vhf station is not on the air or a generator is not available, turn the contrast control full on and watch for heavy snow on the screen.

7. Check the receiver for sensitivity by setting the vhf tuning dial for uhf reception and turn the uhf dial to the channel number of the uhf station. The best method for checking the sensitivity and signal-to-noise ratio of a tuner is to have just enough signal pickup on an antenna to provide a picture with approximately 50 percent snow on a known good tuner. It is then a simple matter to compare the picture from the

tuner under test with that received on the known good tuner. If a station is not on the air, a signal can be generated by placing a known good DU-UHFP Ultratuner in operation near the tuner being checked. The generated signal can be fed to the tuner being checked by connecting a piece of 300-ohm line to its uhf antenna input terminals. The other end of the lead should be looped around the oscillator tube of the DU-UHFP Uutratuner. Do not remove shield from tube. By using the settings shown in the chart below, the uhf tuner being serviced can be checked for operation throughout its tuning range:

Ultratuner Setting	*Generated Signal*	*Channel Number of UHF Tuner on Test*
35	Fundamental	14
38	Fundamental	17
48	Fundamental	27
62	Fundamental	41
82	Fundamental	61
30	Harmonic	82

8. Generally, substituting known good tubes (one at a time) with the tubes in a receiver is the first step in servicing a receiver that is weak, noisy, intermittent or inoperative. However, since the crystal is the easiest part to change, it is suggested that a known good crystal, part No. 151871, type 1N72, be tried in the the tuner first.

9. If the crystal does not correct the trouble, then try replacing the 6BQ7 tube (two-tube tuners only); then the 6AF4 oscillator tube. Since the parts and placement of the parts underneath the oscillator tube socket are very critical, do not wiggle the tube to remove it from its socket. Pull it straight out. This precaution should also be exercised when placing a new tube in the socket. Due to variations in the capacitance between the elements in oscillator tubes, it may be necessary to try more than one tube before one is found that will oscillate through the tuning range of the tuner and will not throw the tuning range out of calibration. The tubes not usable in the tuner being serviced may be used in another tuner.

10. Check all soldered connections on top and underneath the side of the tuner. Check voltages at check points shown in the socket voltage chart. Be careful not to move position of wires, parts or metal strips. If it is necessary to replace a part, note the position of the original part and its connecting wires before removing the part. Install the new part in an identical position with the original part and dress all wires that may have been disturbed back to their original positions. Soldering of parts or connections in a uhf tuner should be made with a low melting point solder (part No. 154830) and a low temperature soldering iron, such as a 25-watt pencil-type iron with a small tip.

11. If additional sensitivity is required of the tuner for the area in which it is to be used, the sensitivity can, in some cases, be increased slightly by turning the two r-f trimmers and the r-f coupling trimmer slightly clockwise or counterclockwise while observing the results on the screen. If no improvement is no-

ticed while turning an adjusting screw, return the screw to its original position. To determine whether or not the repaired tuner is providing peak performance, it again should be compared with the known good receiver as explained in step (7).

CROSLEY Chassis 386, 387, 393, 394

Preventing arcing in focus control.

In the event that arcing in the focus control occurs on the above chassis, disconnect the lead from the center arm of the focus control. Connect this lead to one lead of a 470,000-ohm, 10%, ½-watt resistor (part No. 39374-57) and connect the other lead of the resistor to the center arm of the focus control. Be careful of lead dress so that this connection does not short to chassis or other components.

The above change is already made in the chassis that are letter-coded as follows and later: chassis 386, code letter *J;* chassis 387, code letter *H;* chassis 393, code letter *F;* and chassis 394, code letter *F.*

CROSLEY Chassis 397

Fuse replacement.

If it becomes necessary to replace the fuse located on the rear of the high-voltage power supply in model E-30COMU or E-30COBU, use a 3.2-amp Slow-blow fuse (part No. 155586).

CROSLEY Chassis 402, 403, 404, 405, 406, 410

Replacing 6BQ6 screen resistor.

When it is necessary to replace the dropping resistor in the screen circuit of the 6BQ6GT tube due to the ohmic value of the resistor becoming changed from overloads, replace the resistor as explained in step (1) or (2) below. Do not attempt to use a common type 2-watt resistor as a replacement.

1. Replace the original resistor with a special 10,000-ohm, 10%, 2-watt resistor (part No. 156911-1) which, although rated at 2 watts, is able to withstand overloads for limited periods of time.

2. Replace the original resistor with two standard resistors wired in parallel, one a 33,000-ohm, 10%, 1-watt resistor, (part No. 39374-113) and one 15,000-ohm, 10%, 2-watt resistor (part No. 39374-215).

One or the other method is incorporated into all later production chassis.

CROSLEY Chassis 402, 403, 404, 405, 406, 410

Increasing heat dissipation ability of cathode circuit of vertical output tube (see Fig. 30).

An improvement (already included in later production) is made on the television chassis listed above to increase the heat dissipation ability of the cathode circuit of the vertical output tube.

1. Remove vertical linearity control (part No. 154088); this part has

a rating of ¼ watt. Add vertical linearity control (part No. 155519) which is rated at ½ watt. Control is wired as shown in the figures.

2. In the Deluxe chassis (except chassis 403) remove the 8,700-ohm, 5%, 5-watt resistor (part No. 154 084). Add in its place two 15,000 -ohm, 10%, 2-watt resistors (part No. 39374-215), wired in parallel. See part (A) of the figure. (In chassis 403 the 6,800-ohm, 5-watt resistor is deleted.) In chassis 402-4, 402-5, 404-4, and 404-5, *R150* (4,700 ohms, 10%, ½-watt resistor) is connected to the control arm of *R152*, instead of to ground. See part (B) of the figure which shows a similiar connection in Custom chassis.

3. In the Custom chassis, remove the 6,800-ohm, 10%, 2-watt resistor (part No. 39374-211) and the 2,700 -ohm, 10%, 1-watt resistor (part No. 39374-118). Add in their places one 5,600 ohm, 10%, 2-watt resistor (part No. 156911-2) and one 3,300 ohm, 10%, 1-watt resistor, part No. 39374-119, respectively. (See part (B) of the figure.)

Note: Part No. 156911-2 is a special resistor which can withstand overload for limited periods of time. It should not be replaced with an ordinary 2-watt resistor.

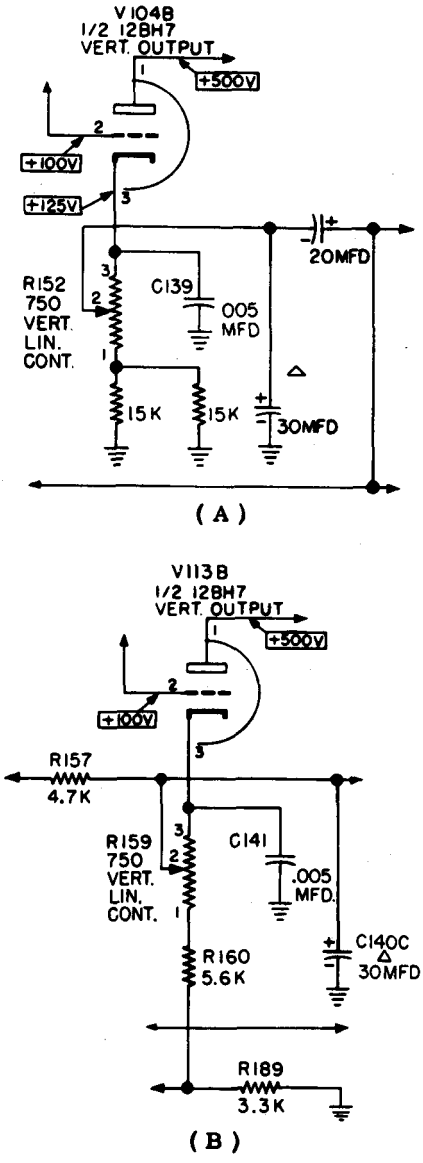


Fig. 30 — Crosley

CROSLEY Chassis 402, 403, 404, 405, 410

Improvement of horizontal linearity (see Fig. 31).

The following changes, made in later production, are incorporated to

SYMBOL NUMBER		PRIOR TO CHANGE		INCORPORATED IN CHANGE	
Deluxe Models	*Custom Models*	*Part No.*	*Description*	*Part No.*	*Description*
L113A L113B		154221-6	Deflection yoke assembly: Chassis 402, 402-1, 402-4, 402-5	157044-1	Deflection yoke assembly
	L116A L116B	154221-5	Deflection yoke assembly: Chassis 410-1	157044-1	Deflection yoke assembly
L113A L113B	L116A L116B	154221-9	Deflection yoke assembly: Chassis 403, 403-1, 404-1, 404-5, 405, 405-1	157044-2	Deflection yoke assembly
T108		155514-1	Horizontal deflection transformer assembly: Chassis 402, 402-1, 402-4, 402-5, 403, 403-1, 404-1, 404-5	157045-1	Horizontal deflection transformer assembly
	T108	156330-1	Horizontal deflection transformer assembly: Chassis 405, 405-1, 410-1	157045-1	Horizontal deflection transformer assembly
C159	C161	137499-34	Capacitor, 560 $\mu\mu$f, 10%, 500v, mica	144675-2	Capacitor, .005 μf, 500 v, disc ceramic
C162	C163	154988	Capacitor, 120$\mu\mu$f, 10%, 3kv, disc ceramic	157046-1	Capacitor, 100$\mu\mu$f, 10%, 3kv, disc ceramic
R172	R182	39374-55	Resistor, 300,000 ohms, 10%, ½ watt	39374-57	Resistor, 470,000 ohms, 10%, ½ watt
	Part of T108	156333	Coil (primary), horizontal deflection transformer assembly	157047	Coil (primary), horizontal deflection transformer assembly

improve the horizontal linearity. Part (A) of the figure shows the changes that are made to the schematic diagram of the custom chassis. The same parts are used in both the Deluxe and the Custom chassis. Although the published parts lists still apply to early production chassis, the following lists gives the new parts used in the chassis incorporating this change. The symbol numbers are given in two columns to permit quick refer-

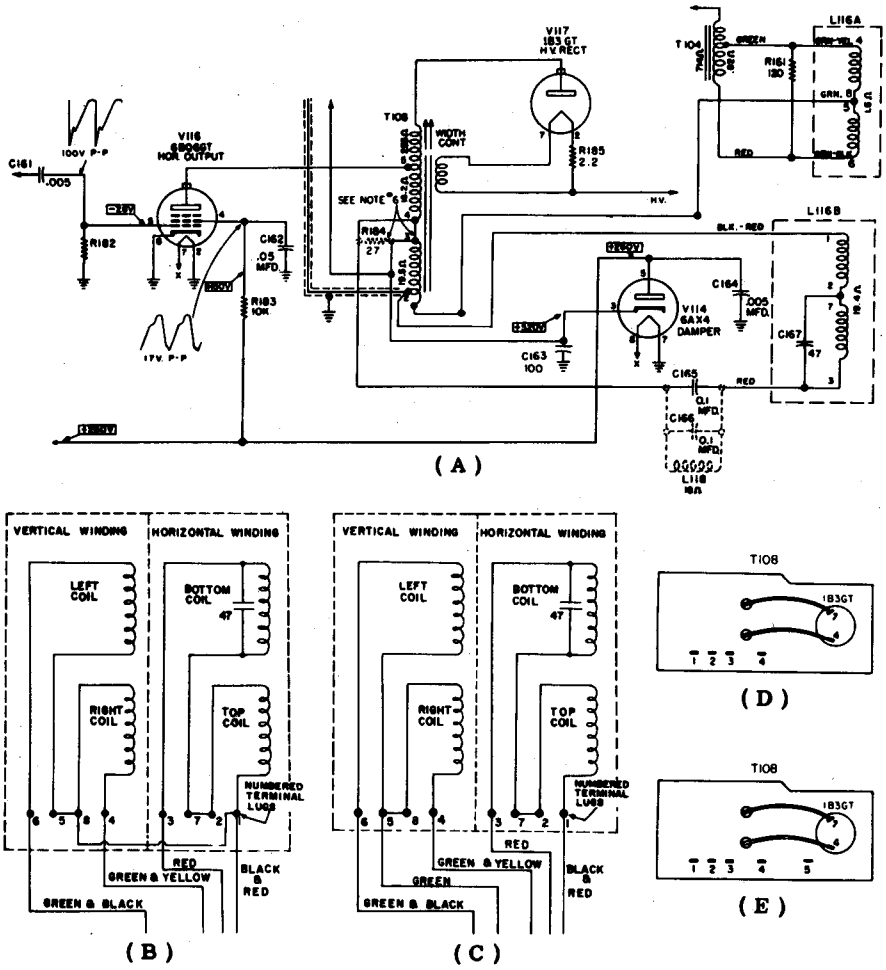


Fig. 31 — Crosley

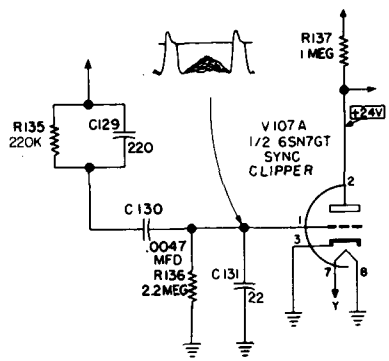


Fig. 32 — Crosley

ence to the schematic of either the Deluxe or custom models.

Deflection yokes 157044-1 (or -2) may be used in place of deflection yoke 154221-5 or -6 (or -9) if the green lead and the red-black lead are connected to the same point. If the later yoke 157044-1 (or -2) is not available, a 154221-5, -6, or -9 may be alerted to be electrically the same as the later yoke.

To make the change, the yoke cover is removed and the short wire is cut out that connects yoke lugs 8 and 1 (the lug numbers are molded on the outside surface of the yoke shell). The rest of the alteration is to connect the necessary length of green lead to lug 5 of the yoke. As described above, the original wiring may be restored if the green and red-black leads are connected to the same point.

Part (B) of the figure shows the wiring of yoke 154221-5, -6 -9; part (C) of the figure shows the wiring of yokes 157044-1 and -2. Yokes 154 221-5 and -6 and 157044-1 (for 17 inch models) are provided with beam centering adjustments mounted on the back cover. Yokes 154221-9 and 157044-2 do not have this adjustment.

The numbering of the horizontal deflection transformer assembly terminal lugs is as shown in part (D) of the figure (for part No. 155514-1) and in part (E) of the figure (for part No. 156330-1 and 157045-1).

Note: Part No. 156330-1 may be used in place of 155514-1 by skipping lug 2. In order to do this, the wires that originally were connected to lugs 2, 3 and 4 of 155514-1 must now be connected to lugs 3, 4 and 5 of 156330-1.

CROSLEY Chassis 402, 403, 404, 411

Improving vertical sync stability (see Fig. 32).

To improve the vertical sync stability, the following change (already made in later production) is incorporated in the above chassis. Replace the 470,000-ohm, 10%, ½ -watt resistor (part No. 39374-57) with a 220,000-ohm, 10%, ½-watt resistor (part No. 39374-53). The resistor is in the input circuit to the sync clipper (see the figure).

CROSLEY Chassis 402

Preventing arcing at focus control.

To minimize arcing at the focus control in the above chassis, a resistor (470,000-ohm, 10%, ½-watt, part No. 39374-57) is wired between

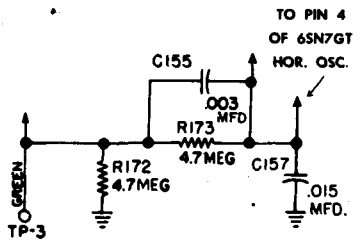


Fig. 33 — Crosley

the centertap of the focus control and pin 6 of the picture tube. The change is already made in later production.

CROSLEY Chassis 403

Providing increased vertical deflection.

To provide increased vertical deflection in the above chassis, the value of *R153* (in the cathode circuit of the vertical output tube) is reduced in one of two ways:

1. A resistor of 33,000 ohms, 10%, 1 watt, part No. 39374-131, is wired in parallel with the original 8,700-ohm, 5-watt wirewound resistor (*R153*).

2. The original 8,700-ohm resistor is replaced with a 6,800-ohm, 5%, 5-watt wirewound resistor.

One or the other of the changes described above will be found on later production chassis.

CROSLEY Chassis 411, 412, 414, 416

Reducing horizontal distortion at high brightness (see Fig. 33).

To reduce horizontal distortion at high brightness levels, a capacitor (.01 μf, 600 v, paper) is deleted from 24-inch and 27-inch chassis. It was formerly wired from *TP-3* (green lead) to ground. See the fig-

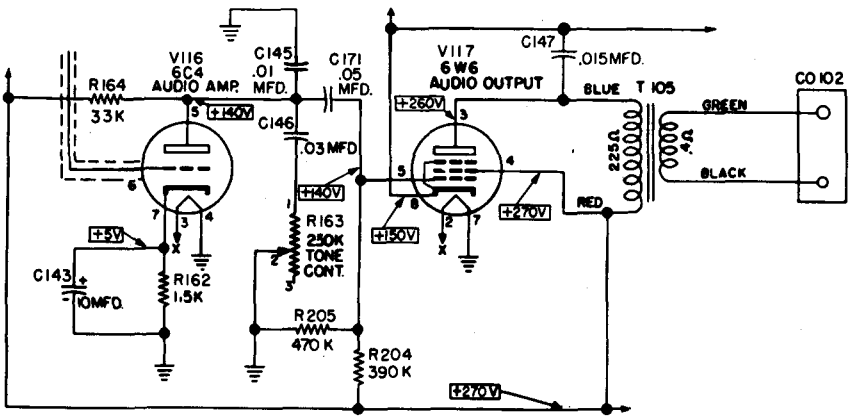


Fig. 34 — Crosley

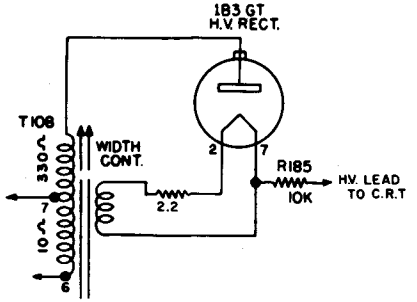


Fig. 35 — Crosley

ure and the schematic wiring diagram of the chassis involved. The change is already made in later production.

CROSLEY Chassis 411, 412, 414, 416

Preventing oscillation in audio section (see Fig. 34).

On the above chassis, an improvement is made in the audio amplifier circuit to eliminate the possibility of oscillation. The figure shows the schematic of the last two audio stages of the 412 chassis. The other chassis are the same except for reference numbers. The .02-μf, 600-v paper capacitor is removed from across the screen and plate of the 6W6 output tube. It is replaced with a .015-μf, 600-v paper capacitor (part No. 39001-14) connected from plate to cathode of the 6W6. *C145*, which was originally tied from grid to cathode, is now connected to ground.

Note: These changes are already made in later production.

CROSLEY Chassis 411, 412, 414, 416

Improving operation and prolonging life of h-v rectifier (see Fig. 35).

In 24-inch and 27-inch tv chassis, the filament of the 1B3GT tube is normally operated at or near the maximum allowable voltage. In some cases, such as high line voltage, this filament voltage has been found to exceed the rated value, causing a burnout of the tube filament.

To provide lower and better regulated voltage and to increase the life of the 1B3GT tube under these conditions, it is suggested that a 2.2-ohm, 10%, ½-watt wire wound resistor (part No. 39303-12) be inserted in series with the filament as shown in the figure. An easy way to make the change is to remove the wire from pin 2 of the tube socket and connect it to pin 4. Then connect one of the resistor leads to pin 2 and the other lead to pin 4. Resolder both connections.

Since the addition of this resistor increases the life of the tube, it is recommended that it be installed on all receivers of this series that are brought in for service.

CROSLEY Chassis 411, 412, 414, 416

Improvement in sync stability (see Fig. 36).

In the above chassis, a 4.7-megohm, 10%, ½-watt resistor (part No. 39374-77) is added to improve sync stability with the action of the agc

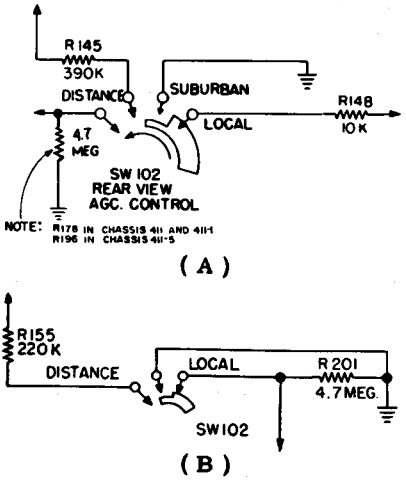


Fig. 36 — Crosley

switch. The circuit for the Deluxe chassis is given in (A) along with the correct code letters; the circuit for the Custom chassis is shown in part (B) of the figure. This change is already made in later production.

CROSLEY Chassis 411, 412, 414

Preventing excessive voltage in screen circuit of horizontal output tube.

An improvement in the screen grid circuit of the horizontal output tube of the 24-inch chassis is made by adding a 1,800-ohm, 10%, 2-watt resistor (part No. 39374-204) in series with the other screen dropping resistor or resistors. It is added to guard against excessive high voltage in the above chassis. The change is already made in later production.

CROSLEY Chassis 426

Easier adjustment of buzz control.

On later production of chassis 426 (code letter *D* or later) *R132* is a 500-ohm control, part No. 157955 -2. Chassis with earlier code letters have a 1,000-ohm control, part No. 157955-1. The change simplifies the sound alignment. When adjusting the buzz control for a null, the low value resistance makes it easier to find the null.

CROSLEY Chassis 426

Avoiding excessive height (see Fig. 37).

On later production of the above chassis (code letter *D* or later) a wiring change was made in the vertical circuit to avoid excessive height by reducing the plate voltage on *V110A* (vertical oscillator tube). However, no parts were added or deleted. The change on the schematic is shown in the figure. The figure shows also the correct color coding of the two leads of *L107A*, vertical

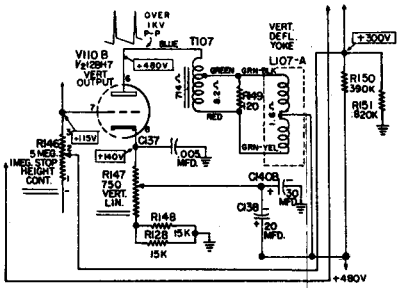


Fig. 37 — Crosley

deflection coils. The colors for these two leads as shown in the schematic in the receiver service notes are incorrect.

If it is desired to make this change on an earlier chassis, remove the red lead wire between the positive terminal of the electrolytic capacitor *C138* and lug 2 of the height control *R146*. Then connect a length of hookup wire from lug 2 of the height control to the junction of *R150* and *R151* (on the terminal board directly above the height control).

Note: On some chassis which did not incorporate the above change, a 1-megohm, 10%, ½-watt resistor (part No. 39374-61) is inserted between lug 3 of the height control *R146* and the grid (pin 7) of the *V110B*. The 1-megohm resistor compensates for the low overall resistance value of the control when that resistance approaches 4 megohms (lower limit at 20% tolerance). When installing a replacement control which has a similar low overall resistance, either of the above methods may be used to decrease the height of the picture.

CROSLEY Chassis 426

Keeping ac off picture tube support bracket.

A 33,000-ohm, 10%, 1-watt resistor (part No. 39374-131) is wired between the rear picture tube support bracket and a soldering lug under the head of one of the screws holding the bracket to the chassis. The purpose is to provide a leakage path in case the anode lead should become disconnected from the picture tube bell and come in contact with the bracket while the set is turned on. Without such a path, the high voltage could break down the insulation ability of the nylon grommets. This would leave a permanent leakage path between the chassis and bracket, thus making the bracket "hot". This change is already made in later production.

CROSLEY Chassis 426

Improving vertical interlace.

To improve vertical interlace on later production chassis, a 5,000 $\mu\mu$f, GMV, 1,000-v disc ceramic capacitor (part No. 158215-4) is connected in parallel with the 33,000-ohm resistor referred to under "Keeping ac off picture tube support bracket" for chassis 426. The capacitor bypasses stray a-c potentials on the bracket, which were found to be disturbing vertical interlace in some sets.

If it is desired to improve the interlace on earlier production sets, the capacitor may be added by connecting it in the same manner as described for the 33,000-ohm resistor above.

CROSLEY Chassis 426 with uhf converter

Replacing uhf fine tuning knob.

Delete from the cabinet replacement parts list for Models G-17TO MU, G-17TOBU, and G-17TOWU, Part No. 157754-2 (Knob, UHF Fine Tuning) and add Part No. 158359-1.

The uhf channel selector and fine tuning knobs were designed to rotate at different speeds. However, on sets with early fine tuning knob (part No. 157754-2), both knobs could be grasped and forced to turn at the same speed. The slack resulting from this improper operation caused the dial string to jump off the pulleys. The possibility of such improper use of the controls is eliminated with the use of a later fine tuning knob (part No. 158359-1), which has a wide enough flange to project over the entire rim of the channel selector knob. The channel numbers on the channel selector knob remain clearly visible through the transparent plastic flange.

CROSLEY Chassis with 10-inch e-m speaker

Reducing audio hum.

If hum is encountered in receivers using a 10-inch electromagnetic speaker with a variable resistor mounted on the speaker frame, hum may be reduced by adjusting the variable resistor with a screwdriver.

CROSLEY Chassis with 24- and 27-inch picture tubes

Installing and adjusting anti-pincushion magnets.

If the picture on 24-inch and 27-inch television receivers has excessive pincushioning, i.e., tends to curve or bow in on the top or bottom edges, this condition may be caused by the misadjustment of the anti-pincushion magnets which are mounted on the front side of the deflection yoke bracket, one above and one below the tube flare. Adjust the position of the magnets, as described below, to correct the shape of the picture.

If the receiver is not already equipped, the magnets (part No. 157 599) may be added as described below.

Mounting the magnets. The upper magnet may be mounted using the center hole in the flange at the top front of the deflection yoke bracket. The lower magnet may be mounted by soldering the end of the support strap directly to the deflection yoke bracket. It should be positioned so that the hole in the end of the strap is located on the vertical center line of the bracket and approximately 1¾ inches below the bottom edge of the large hole provided for the tube neck. An alternate method is to drill

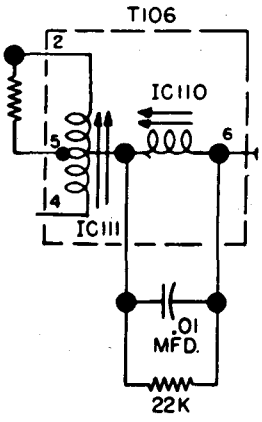


Fig. 38 — Crosley

a small hole in the deflection yoke bracket at this point and secure the magnet to the bracket using a suitable nut and bolt.

Adjusting the magnets. The magnets can be readily adjusted by bending the brass support straps. Adjust the position of the magnets relative to the picture tube until the bowing condition has been reduced to a minimum or eliminated entirely. In adjusting the magnets, care should be taken not to cause the edges of the picture to bow outward from the center, that is, to "barrel".

CROSLEY Chassis with uhf converters

Replacement of uhf crystal.

When making a crystal replacement on the uhf converter part No. 158116 for G-series models, it is best to make the replacement with the same type of crystal as the one originally used in the converter. The three crystals being used in this converter are as follows:

Part No.	*Crystal Type*
158186-21	1N82A
158186-22	1N82
158186-23	2JB2C-9

For model DU-UHFP (external converter), and for all internal converters designed for use with E- and F-series tv receivers, it is recommended that K3D crystals (part No. 157690-1) be used as replacements. If the K3D type is not immediately available, a 1N82 crystal (part No. 155459-1 or 158186-22) or 1N82A (part No. 158186-21) may be used.

Because of slight variations between crystals of the same part number, it is generally considered good practice to try several different crystals of a particular type to select the one that gives the best performance in that particular converter.

CROSLEY 1950, 1951, 1952, 1953 custom chassis

Horizontal drift due to high humidity (see Fig. 38).

If horizontal drift is experienced due to humidity, replace the .01-μf

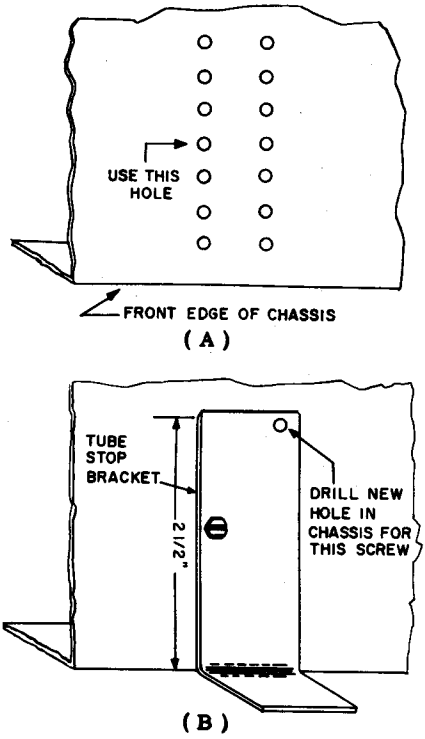


Fig. 39 — Crosley

capacitor that is connected in parallel with a 22,000-ohm resistor from lug 5 to lug 6 of the transformer *T106*. The replacement capacitor is treated with a special glazed coating and is stocked under part No. 148813-2. Replacement capacitors (part No. 1488 13-1 or 148813-2) that do not have the special glazed coating may be used in less critical circuits.

CROSLEY 1953 chassis with 21MP4 picture tube

Replacing metal picture tube with glass picture tube (see Fig. 39).

The 21MP4 metal tube can be replaced with a 21YP4 glass tube in the 1953 television receivers by using either mounting kit No. 158429-1 or mounting kit No. 158429-2 and following the instructions given below:

Using kit No. 158429-1 which contains the following parts:

Quantity	*Part No.*	*Part Name*
1	155887	Strap
2	154210-10	Bolt
1	155891	L. H. bracket
1	155892	R. H. bracket
2	149671-1	Spring
2	153424-2, -4 or -5	Cushion
1	153424-1	Cushion
1	157146-3	Anode connector

1. After removing the 21MP4 tube, remove and discard the original front support brackets.

2. Install two new front support brackets by using the mounting holes nearest the front edge of the mounting bracket and the original holes in the chassis.

3. Cement one cushion (short) to each of the front support brackets, and wrap a piece of tape around the tube stop.

4. Remove the four screws that fasten the deflection yoke mounting bracket to the chassis. Then reposition the bracket by sliding it ¼ to 5/16 inch toward the rear of the chassis, using only two of the mounting screws and the two holes nearest the rear of the chassis to secure the bracket to the chassis. The yoke mounting bracket should not extend over the rear of the chassis more than 5/16 inch.

5. Put the new picture tube in place and secure with a new tube strap and cushion.

6. Reinstall the two original springs that connect from the yoke mounting bracket to the front support brackets.

7. Replace the original anode connector with the new connector supplied with the kit.

8. Install an Aquadag grounding spring to each side of the yoke mounting bracket, being sure that the springs make good contact against the picture tube. The springs may be fastened with selfthreading screws into the holes which are already in the bracket.

9. Install the original ion trap and make all necessary setup adjustments to the yoke and ion trap as explained in the service notes.

Using kit No. 158429-2 which contains the following parts:

Quantity	*Part No.*	*Part Name*
2	149671-1	Spring
1	153422	Strap
2	153423	Rods
2	39033-15	Nuts
1	157146-3	Anode connector
1	154359	Stop
2	154358	Brackets
2	153424-2, -4 or -5	Cushion
1	153424-1	Cushion

All steps are the same as given above except when using this kit, it is necessary to install the tube stop bracket on the center front of the chassis to limit the forward position of the tube. Proceed as follows:

1. Insert a selftapping screw through the hole nearest the front of the bracket and into the center hole (in the row of seven holes) toward the left side. This will position the rear edge of the bracket approximately 2½ inches from the front edge of the chassis (see figures).

2. Drill new hole for the rear mounting screw.

CROSLEY All Chassis

Corona or arcing at picture tube anode button.

If corona or arcing is experienced at the anode button of the picture tube, it is probably due to an accumulation of dirt or to the effect of a corroded rubber suction cover. The following procedure is recommended to eliminate the trouble.

1. Disconnect the anode lead from the tube.

2. Clean the area around the anode button with carbon tetrachloride or a scouring compound such as Bon-Ami.

3. Add a protective coating. It has been found that the use of Crosley Appliance Polish (part No. 81427) after the surface has been cleaned will give this protection.

As an added precaution: If the original anode connector is without a suction cover thus permitting free accumulation of dirt, or if it has a rubber cover, which could be the source of present or future trouble, a new anode connector and lead assembly (part No. 157146-3) should be used to replace the original assembly. This new assembly is provided with a neoprene suction cover which will resist corrosion and prevent accumulation of dirt around the anode button. If the above procedure is followed, re-occurrence of problems of this kind will be held to a minimum.

CROSLEY All Chassis

Ion trap adjustment.

The proper adjustment of the ion trap magnet is not only important to obtain maximum brightness and a good quality picture, but also to the life of the picture tube. The importance of this adjustment cannot be overemphasized, because of the tube cost involved.

The ion trap should be placed on the neck of the picture tube close to the tube base and over the internal pole pieces that are mounted on the gun structure. The code dot or the arrow on the magnet should be toward the picture tube face. There are usually two possible positions of the ion trap on the neck of the tube

where maximum brightness can be obtained. Always set the ion trap in the position closest to the base of the tube. If the picture tube has just been installed or if the receiver has been moved, it is imperative that the brightness control be kept at a low setting until after the initial adjustment of the magnet and also that the adjustment of the magnet be made *immediately* after the receiver is turned on. It is important that the intensity of the beam be low when the receiver starts operating if the magnet has not yet been adjusted. Some picture tubes have been ruined in 15 seconds of operation due to the ion trap magnet being out of adjustment and the intensity being set too high. By keeping the intensity low, the beam current is low enough so that the electron beam is not likely to damage the anode top disk before the magnet is adjusted. The amount of damage that may be done to the tube is a function also of the anode voltage applied to the tube; i.e., the higher the voltage the shorter is the period of time that is required to ruin the tube.

To adjust the ion trap, set the brightness control completely counterclockwise, then advance slightly (less than ¼ turn) in a clockwise direction. Slide the trap forward or backward on the neck of the picture tube and at the same time rotate the trap clockwise or counterclockwise until maximum brightness is obtained. If no raster is obtained at this setting, advance the brightness control slightly clockwise and repeat adjustment of the trap until a raster is obtained. Readjust the brightness control until the raster is slightly above average brilliance. Adjust the focus control until the line structure of the raster is clearly visible. The final setting of the ion trap should be made with the brightness control set to the maximum position with which good line focus can be obtained. If neck shadow is encountered, or if the picture is off-center, a correction should be made with the centering adjustment. After making any centering adjustments or moving the deflection yoke or focus coil, a readjustment of the ion trap may be necessary.

Never use the ion trap to correct neck shadow, and always set the trap to the position where maximum brightness is obtained.

Note: If after making the above adjustments, a raster does not appear, turn off the receiver and check to make sure that the ion trap magnet is positioned with the code dot or arrow on the magnet toward the face of the tube. It is also advisable that another ion trap magnet be tried and the above procedure be repeated.

CROSLEY All Chassis

Connecting external record player (see Fig. 40).

The following are a few helpful suggestions for connecting an external record player to a tv chassis:

1. A switch will be necessary in order to switch the high side of the volume control from television sound detector output to record player input (TV-Phono switch, part No. 14 8260 is suitable.)

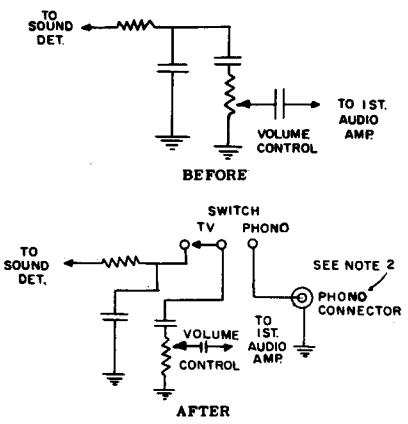


Fig. 40 — Crosley

2. A phono connector of some sort should be used so that the record player can be disconnected easily by unplugging from the television chassis. (Phono connector part No. 136 998 is suitable.)

3. Mounting a separate plate on the chassis or back of cabinet for the switch and phono connector would be a more convenient method of installation.

4. In order to prevent hum pickup, it would be advisable to use shielded wire from the sound detector and volume control to switch.

Note 1: There are differences in types of pickup cartridges used on record players, therefore it would be advisable to check with the manufacturer of the cartridge should the problem of impedance match be encountered.

Note 2: Connecting a record player to a receiver having one side of the a-c line connected to the chassis is not recommended.

DUMONT Models RA-109, RA112/113, RA-117, RA-120, RA-130, RA-133, RA-147.

Installing cascode turret tuners for weak signal areas (see Fig. 41).

In weak signal areas, the performance of the above chassis can often be improved by the installation of a turret-type cascode tuner. Later cascode tuners provide a lower noise figure which results in a reduction in snow when receiving weak signals. No improvement will be obtained if snow-free pictures are received using the original tuner.

Installation of a turret tuner in any one of the receivers mentioned above results in loss of f-m broadcast reception. In addition the dial mechanism an RA-112/113, 109, 120, 133 chassis is rendered inoperative. In view of the above, the installation of turret tuners in these receivers is worthwhile only in very weak signal areas, where the primary problem is to obtain a satisfactory picture.

Models RA-112/113 and 120

To install turret tuners in RA-112/113 and RA-120 chassis the following procedure should be used:

1. Remove the original tuner, noting all lead connections.

2. Enlarge the tuner mounting holes to ¼ inch, as shown in part (A)-1 of the figure.

3. Remove the dial mechanism from the old tuner and cut out the sections of the dial plate and brac-

ket shown in parts (A)-2 and -4 of the figure.

4. Drill three holes in the dial-plate bracket and the front of the chassis as shown in parts (A)-2 and -3 of the figure. Use a No. 18 or slightly larger drill.

5. Check the part No. of the old tuner. If it is 89 003 901, 3902 or 3911, replace the first i-f transformer (*Z204*) with part No. 20 005 351. If *L213*, a slug-tuned coil mounted next to *Z204*, is used, remove it. Rewire the circuit as shown in part (B) of the figure. It may be necessary to add an 8 to 50 $\mu\mu$f ceramic trimmer capacitor between the first i-f transformer and ground. Some chassis have this capacitor already mounted on a standoff. If not, it may be mounted by soldering one terminal to pin 3 of of *Z204*. If a 2.7k-ohm, ½-w resistor is not connected in the grid circuit of the 1st video i-f, it must be added.

6. Install the new tuner, as shown in part (C) of the figure. The lead connections are shown in (B). A 3k-ohm, 5-w and a 2.7k-ohm, 2-w resistor must be added in the tuner B+ lines. The tuner ends of each resistor should be bypassed to ground with a .005-μf ceramic disc capacitor.

7. Connect an insulated lead from the output tab of the tuner to terminal 3 of *Z204*.

Models RA-117 and RA-147

To install a cascode tuner in an RA-117 or RA-147 chassis proceed as follows:

1. Remove the crt and front crt support.

2. Remove the original tuner, noting the points in the chassis to which the tuner leads were connected.

3. Mount the new tuner in the chassis. It may be necessary to enlarge the chassis holes (see part (A) -1 of the figure) with a ¼-inch drill to obtain a fit.

4: Connect all tuner leads as shown in (B). The 3k-ohm, 5-w and 2.7k-ohm, 2-w resistors must be added. The tuner side of each resistor should be bypassed to ground with a .005-μf ceramic disc capacitor.

5. Connect an insulated lead from the tuner output tab to the junction of the 8 to 50 $\mu\mu$f trimmer and the 1st video i-f transformer.

Models RA-109, 130 and 133

To install a cascode tuner in an RA-109, 130 or 133 chassis proceed as follows:

1. Remove the original tuner and mounting bracket. Unfasten the terminal strip from the underside of the mounting bracket.

2. Make up three brackets as shown in part (D)-1 of the figure. Fasten the brackets to the new tuner, as shown in part (D)-2 of the figure.

3. Drill three holes in the chassis for the three mounting brackets. To locate the holes, place the tuner in the proper position and mark the holes. The rear of the tuner turret shaft should not project beyond the chassis cutout.

4. Mount the tuner in the chassis cutout.

5. Fasten the terminal strip mentioned in step (1) to the front of the chassis, under the tuner, using one of the holes already available. Lengthen the leads where necessary.

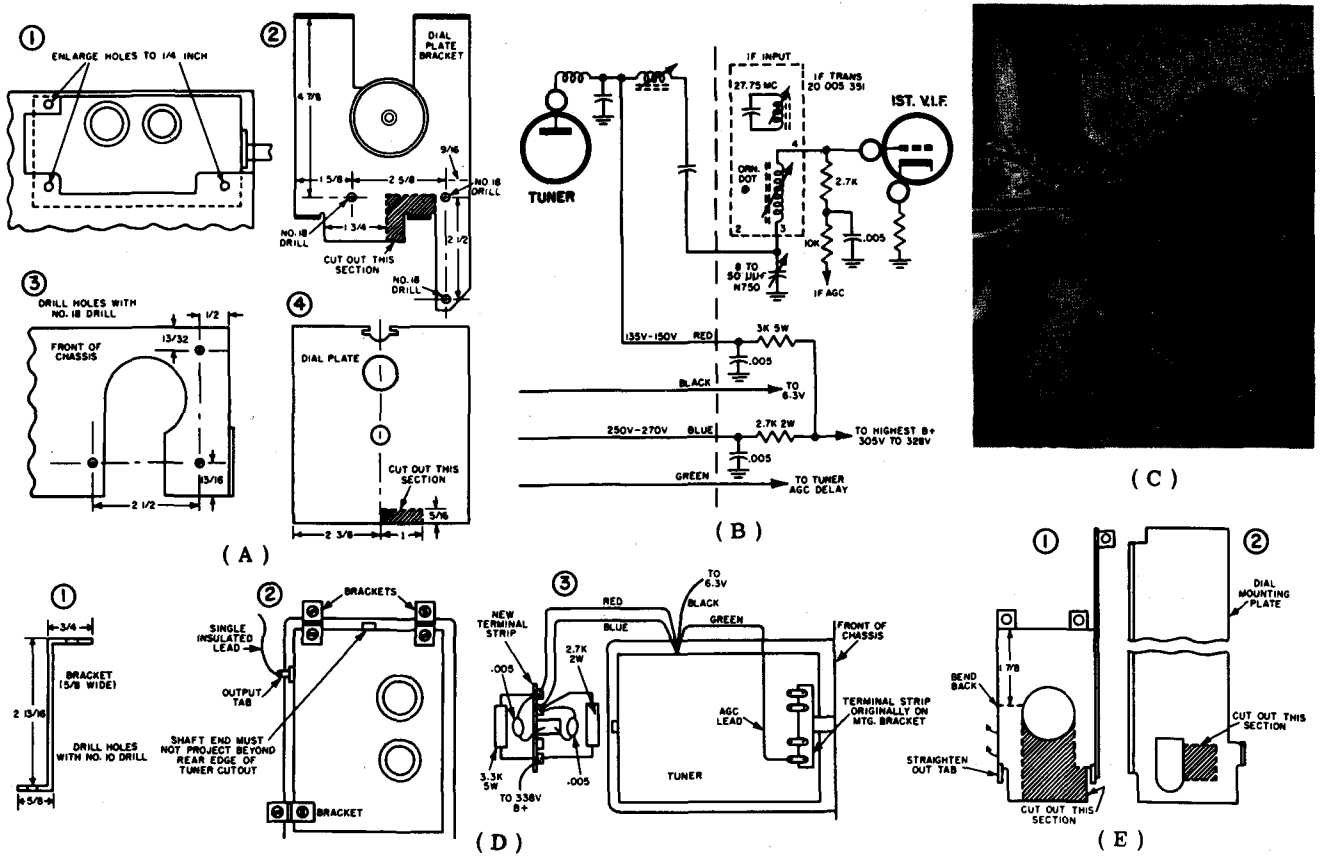
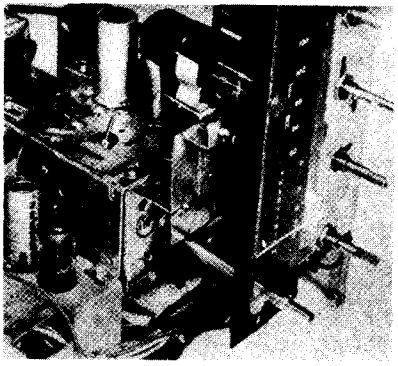
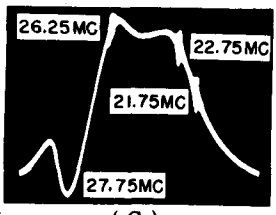


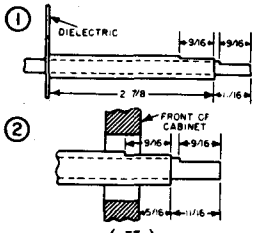
Fig. 41 (Part A-E) — Dumont



(F)



(G)



(H)

Fig. 41 (Part F-H) — Dumont

6. Mount a 4-lug terminal strip in the hole already available near the rear of the tuner cutout, as shown in part (D)-3 of the figure.

7. Connect the tuner leads, as shown in the schematic of part (B). The 3.3k-ohm, 5-w and 2.7k-ohm, 2-w resistors should be mounted on the terminal strip mentioned in step (6) (see part D-3 of the figure). By-pass the tuner end of each resistor to ground with a .005-μf ceramic disc capacitor.

8. Remove *Z205*, the 1st video i-f transformer, and replace it with part No. 20 005 351. Remove *L215*, a slug-tuned coil mounted next to *Z205*, if it is present. Connect *Z205* as shown in (B). The 8 to 50 $\mu\mu$f ceramic trimmer may be mounted by soldering one of its terminals to terminal 3 of *Z205*.

Note: Some chassis do not have the 2.7k-ohm resistor in the grid circuit of the 1st video i-f, and it must be added.

9. Cut out the sections of the dial plate and bracket shown in (E). Bend the dial bracket 90 degrees, at the point shown, and mount the dial and bracket as shown in (F).

Alignment

After installing the new tuner, the mixer output, the 1st i-f coils, and the trimmer capacitor connected between the i-f coil and ground, must be adjusted.

Follow the regular alignment procedure, injecting the signal at the grid of the mixer and connecting the scope at the plate of the 1st video i-f tube. Adjust the trimmer capacitor for proper bandwidth. The top slug of the 1st i-f can should be adjusted for minimum lower adjacent-channel

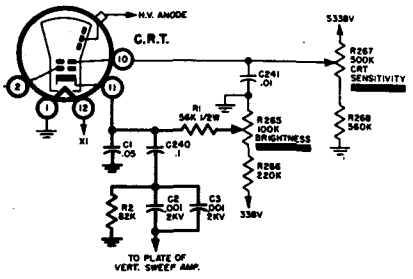


Fig. 42 — Dumont

sound carrier (27.75 mc or 27.9 mc, whichever is used in the chassis in question) response. The tuner mixer plate coil and the bottom slug of the i-f can must also be adjusted. The proper bandpass curve is shown in (G).

The tuner oscillator slugs should be adjusted to provide proper fine tuning range on each channel.

Turret Tuners

Several different Standard Coil tuners can be used. The most important requirement is a 21-mc i-f output. DuMont part No. 21 010 783 is satisfactory. Standard Coil model TV-2232 may also be used.

In most cases, it will be necessary to cut the tuner shaft to proper length. The shaft dimensions are shown in (H). Part (H)-1 shows the dimensions for RA-112, 113, 117, 120 and 147 chassis. In the case of the RA-109, 130 and 133 chassis, the shaft length should be determined by mounting the chassis in the cabinet and marking the proper length, as shown in part (H)-2.

If tuner 21 010 783 is used, new flats must be filed on the fine tuning and channel selector shafts. The proper dimensions are shown in the figure. The position of the flat on the selector shaft must be the same as the original one, otherwise the knob will not indicate the correct channel.

On RA-112, 113 and 120 chassis all the tuner strips must be moved three turret positions counterclockwise, so that the channel will be indicated at the top of the channel selector knob, since in these receivers the chassis and tuner mount on their sides.

DUMONT Models RA-109, RA-116, RA-130, RA-133

Adding retrace blanking (see Fig. 42).

The circuit changes necessary to add vertical retrace blanking to the above chassis are shown in the figure. shown in the schematic, was originally connected between the crt cathode and ground. It should be removed and connected as shown. Additional parts required are listed below.

Symbol	*Description*	*Part No.*
C1	.05 μf, 400v	03 019 640
C2, C3	.001μf, 2kv	03 122 420
R1	56k, ½w	02 031 980
R2	82k, ½w	02 032 000

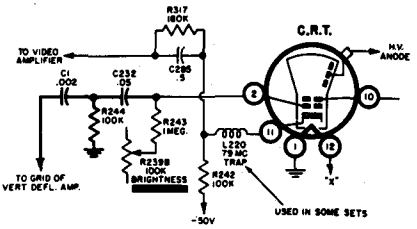


Fig. 43 — Dumont

DUMONT Models RA-111, RA-112, RA-113, RA-117, RA-120, RA-147

Adding retrace blanking (see Fig. 43).

The circuit changes necessary to add retrace blanking to the above chassis are shown in the figure.

The following procedure should be used to make the modification:

1. Remove and discard *C231*, the .05-μf, 600-volt capacitor connected between pin 2 of *V209B*, the d-c restorer, and the plate of the video amplifier, *V210*.

2. Remove and keep *R244*, the 100k-ohm, ½-watt resistor connected between pin 2 of *V209B* and the arm of the brightness control.

3. Disconnect the grounded end of *C232*, the .05-μf, 200-volt capacitor connected between pin 5 of *V209B* and ground.

4. Connect *C1*, a .002-μf, 600-volt capacitor, from pins 1 and 4 of *V221*, the vertical deflection amplifier, and the end of *C232* removed from ground in step (3).

5. Connect the 100k-ohm, ½-w resistor removed in step (2) between the junction of the two capacitors in step (4) and ground.

The only additional part required is *C1*, a .002-μf, 600-volt capacitor, part No. 03 014 430.

DUMONT Model RA-119

Adding retrace blanking (see Fig. 44).

The circuit changes necessary to add vertical retrace blanking to the above chassis are shown in the figure. The blanking pulse is obtained from the vertical output transformer. *C240*, the 0.1-μf capacitor shown in the schematic, was originally connected between the crt cathode and ground. Additional parts required are listed below.

Symbol	*Description*	*Part No.*
C1	.05 μf, 200v	03 019 640
C2	.01 μf, 1kv	03 119 630
R1	56k, ½w	02 031 980
R2	82k, ½w	02 032 000

DUMONT Models RA-160, RA-162/162B

Adding retrace blanking (see Fig. 45).

The changes necessary to add retrace blanking to this chassis described below. The original vertical output transformer secondary circuit and the modified circuit are shown in the figure.

The following procedure should be used to make the changes.

Sweep Chassis

1. Mount a pin jack, part No. 09 019 870, in the hole next to *C330* (40-μf B+ boost electrolytic capacitor near afc test jack).

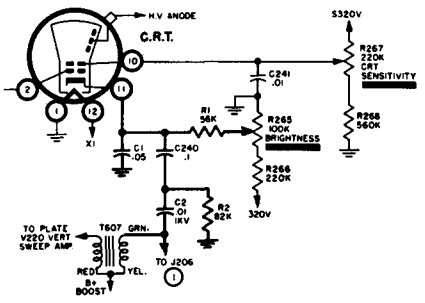


Fig. 44 — Dumont

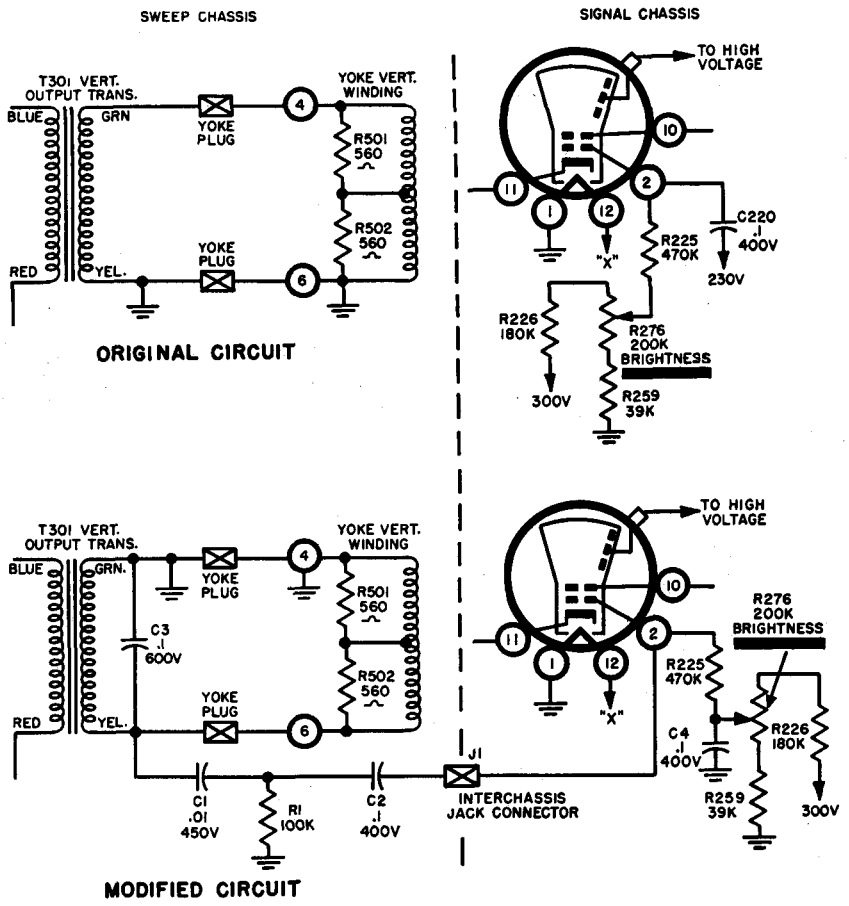


Fig. 45 — Dumont

2. Disconnect the black ground lead from the yellow vertical output transformer (*T301*) secondary lead, and connect it to the green secondary lead.

3. Connect *C1*, a .01-μf, 450-volt ceramic disc capacitor, between the yellow lead of *T301* and the nearest unused terminal strip lug.

4. Connect *R1*, a 100k-ohm, ½-watt resistor, from the lug in step (3) to ground.

5. Connect *C2*, a 0.1-μf, 400-volt capacitor, between the jack in step (1) and the nearest unused terminal strip lug.

6. Connect a lead from the terminal lug in step (5) to the junction of *C1*, the .01-μf capacitor in step

(3), and *R1*, the 100k-ohm resistor in step (4).

7. Connect *C3*, a .1-μf, 600-volt capacitor, between the yellow lead of *T301* (vertical output transformer) and ground. Note: Some receivers already have this .1-μf capacitor in the circuit and do not require the addition of *C3*.

Signal Chassis

8. Remove *C220*, the 0.1-μf, 500-volt capacitor connected between the green crt cable lead and the 230-volt line. This capacitor is located near the tuner. Remove the lead between *C220* and the green crt cable lead.

9. Connect *C4*, an 0.1-μf, 400-volt capacitor, between the arm of the brightness control and ground.

10. Connect an insulated stranded lead to the green crt cable lead. A 24-inch lead is required for the RA-160 and a 30-inch length for the RA-162. A base pin removed from a discarded octal tube should be soldered to the other end of the lead. Plug this connector pin into the pin jack on the sweep chassis (see step 1).

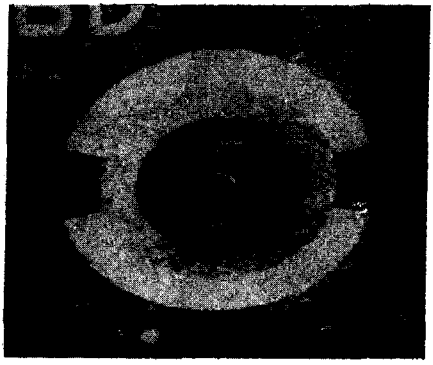


Fig. 46 — Dumont

11. Remove the ground lead from terminal 6 of the yoke and connect it to terminal 4.

Note: When servicing a chassis which has been modified, the modified defilection yoke must be available since the chassis will not work with a conventional crt bench setup.

The additional parts required to make the above changes are listed below.

Symbol	*Description*	*Part No.*
C1	.01 μf, 450v	03 015 920
C2, C4	0.1 μf, 400v	03 019 260
C3	0.1 μf, 600v	03 120 740
J1	Pin Jack	09 019 870
R1	100k, ½w	02 032 010

DUMONT Models RA-160, RA-162

Horizontal jitter at top of picture (see Fig. 46).

Horizontal jitter may occur at the top of the picture and/or random white streaks as seen when receiving moderately weak signals.

A probable fault is the internal corona in *C501*, the anti-ringing capacitor connected across part of the yoke winding. To remedy this fault, replace *C501* with a 68-μμf, 2-kv capacitor, part No. 03 112 700. This capacitor is used in later production.

DUMONT Models RA-160, RA-162

Increasing agc voltage for improved operation.

To increase the agc voltage developed and assure an agc adjustment which will result in a 3 volt

peak-to-peak video detector signal level, proceed as follows: Add *R800*, a 470k-ohm, 20%, ½-w resistor (part No. 02032580), from pin 8 of *V209B* (agc gate) to ground. This change is already included in later production models coded *RC3*.

DUMONT Models RA-160, RA-162

Preventing damage to vertical output transformer.

To prevent damage to the vertical output transformer in the event of a short in the vertical amplifier tube, proceed as follows:

Remove the red lead of the vertical output transformer, *T301*, from *C332B* (40μf) and connect it to a blank lug on a nearby terminal board. Connect a ⅛-amp pigtail fuse (part No. 11001110) between *C332B* and the blank lug. This change is already included in later production in models coded *R4*.

DUMONT Models RA-160, RA-162

Increasing range of vertical hold control.

To increase the mechanical hold range of the vertical hold control, proceed as follows:

1. Remove *R242*, a 1.8-meg, 10%, ½-w resistor connected across *R247A*, the vertical hold control.

2. Change the value of resistor *R329* (connected to yellow lead of bto transformer) from 680k-ohms, 10%, ½w to 1.2 meg, 10%, ½w.

3. Add resistor *R341*, 2.7-meg, 10%, ½w from the junction of *C326* (.02 μf), *T302* (bto transformer) yellow lead and *R329* (680k ohms) to ground. This change is already included in models coded *R5*.

DUMONT Models RA-160, RA-162

Improving sound performance in extreme fringe areas.

To improve the sound performance in extreme fringe areas, the value of the coupling capacitor of the second accompanying-channel sound trap is reduced. This results in a reduction in the amount of attenuation that can be achieved.

Remove *C257* and replace it with a .68 μμf, 20%, 500-volt capacitor (part No. 03014520). *C257* connects between *Z204*, the fifth video i-f transformer and *L213-C258*, the second accompanying sound trap.

Models coded *R5* already include the above modification.

DUMONT Models RA-160, RA-162

Eliminating parasitic oscillations in the filament supply (see Fig. 47).

To eliminate the possibility of parasitic oscillation in the filament supply wiring, the following change is made. This condition causes a series of white streaks to appear on the left-hand side of the picture when the set is tuned to channels 9, 10, or 11. It also results in a loss of horizontal sync stability.

1. Disconnect the filament lead running from pin 4 of *V213*, the sec-

Fig. 47 — Dumont

ond vertical sync clipper, to pin 8 of *V214*, the horizontal sync clipper, at pin 4 of *V213*.

2. Connect the above lead to an unused terminal on a nearby terminal board.

3. Connect a filament choke, part No. 21008972, between pin 4 of *V213* and the terminal on the terminal board.

The above change is already made in models coded *R8*.

DUMONT Models RA-160, RA-162

Sync Buzz.

In the event of sync buzz, check that the oscillator slug is properly adjusted. Also check the fine tuning range. If it is not correct, readjust the oscillator slug or slugs.

If buzz persists, check for the presence of *L215*, connected between pin 5 of *Z205* (ratio detector transformer) and one end of *R280* (270 ohms). If *L215* is present, remove it and connect *R280* directly to pin 5 of *Z205*. *L215* is not used in later production.

DUMONT Models RA-160, RA-162

Improving performance in fringe areas (see Fig. 48).

The circuit change described here will produce a worthwhile improvement in reception in the deep fringe. In such locations the background snow may appear "blobby." This effect is due to the tremendous drive available in the above chassis.

As shown in the figure, an 8.2k-ohm resistor is added to the video detector plate load, and the High-Low Signal switch, *S203*, is rewired so that the resistor is removed from the circuit in the High-Signal position. In addition the switch is rewired so that the agc voltage on the tuner is reduced in both switch positions.

The following procedure should be used to make the change:

1. If there are two leads connected to the end terminal of *TB-5* next to the terminal to which *L206* is connected, remove the leads, connect them together and insulate the joint with tape or spaghetti.

2. Disconnect the grounded end of *L206* and connect it to the end

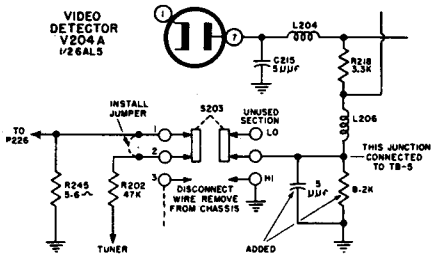


Fig. 48 — Dumont

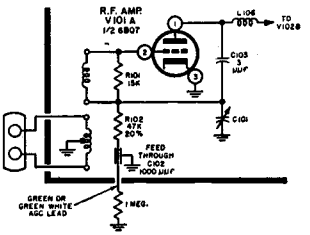


Fig. 49 — Dumont

terminal of *TB-5*, made available in step (1).

3. Connect an 8.2k-ohm, ½-watt resistor between the ground lug from which *L206* was removed and the end terminal of *TB-5* mentioned above.

4. Connect a 5-μμf, 50-volt capacitor from the above terminal of *TB-5* to the ground lug to which the 8.2k-ohm resistor was just connected.

5. Connect a lead between the terminal of *TB-5* to which the 8.2k-ohm resistor is connected, and terminal 5 of the High-Low Signal switch, *S203*, as shown in the figure. Run the lead close to the chassis, keeping it on the side of the terminal strips away from the video i-f stages. Pass it through the chassis hole between *R247* and *R285*.

6. Ground terminal 6 of the High-Low Signal switch.

7. Disconnect both ends of the lead connected to terminal 3 of the High-Low Signal switch, *S203*, and remove it from the chassis.

8. Connect a jumper between terminals 1 and 2 of *S203*.

DUMONT Model RA-160

Vertical sync drift.

Due to variations in tube manufacture, it has been found that a percentage of the 6BL7's *(V306*-vertical oscillator) will heat up to the point of becoming erratic when a shield is placed over the tube. Later production, therefore, does not include this shield.

It is recommended that the shield covering the 6BL7 *(V306)* be removed when the set is installed.

Complaints of vertical sync drift can usually be cleared up by removing the shield. If the vertical drift still persists after the tube cools, replace the 6BL7 *(V306)* and leave the shield off.

DUMONT Models RA-164, RA-165

Reducing snow in fringe areas (see Fig 49).

In fringe areas, the amount of picture snow in the above receivers can be reduced by grounding the tuner agc lead through a 1-meg resistor, as shown in the figure. Disconnect the tuner agc lead (green) from the terminal strip on the main chassis, cut it to proper length, and connect it to the unused lug on the terminal strip nearest the tuner. Connect a 1-meg resistor between this point and the nearest unused ground lug. Readjust the agc control.

This modification is recommended only in areas where all signals are weak since it eliminates the tuner agc and may result in overloading on strong signals.

DUMONT Models RA-164, RA-165

Increasing efficiency of channel 5 beat trap.

To increase the efficiency of *L209*, the channel 5 beat trap, proceed as follows:

1. Remove *L209* (connected to plate of video amplifier). Connect pin 7 of *V204*, the video amplifier to *C217*, *L207* (the 4.5-mc beat trap).

2. Disconnect *C217*, *L207*, the 4.5-mc beat trap, from the junction of *C216*, *R217* (.1 μf and 120k ohms). Connect *L209* between these two junction points.

The above change is already included in chassis coded *C2*.

DUMONT Models RA-164, RA-165

Increasing picture drive and contrast range.

To increase picture drive and contrast range, proceed as follows:

1. Remove *C219* and *R214* at cathode of *V204* (video amplifier).

2. Connect pin 1 of *V204* to the junction of *R218* (470 ohms) and *R209B* (contrast control).

3. Remove *R258* (connected to high side of brightness control) and replace it with a 1.2-meg, 10%, ½-w resistor (part No. 02032140).

4. Remove *R300* (connected to low side of brightness control) and replace it with a 390k-ohm, 10%, ½-w resistor (part No. 02032080).

Note: Steps (3) and (4) are not required unless the brightness range is inadequate after steps (1) and (2) have been completed. These modifications are already included in chassis coded *C5*.

DUMONT Models RA-164, RA-165

Improving picture quality and sync stability in weak signal areas (see Fig. 50).

To improve picture quality in weak signal areas by reducing picture noise and increasing sync stability, proceed as follows:

1. Remove the jumper between terminals 2 and 3 of *TB2* (-7.5 volt terminals on terminal board adjacent to 1st video i-f amplifier), and connect *R245*, a 27k-ohm, 10%, ½-w resistor between these terminals.

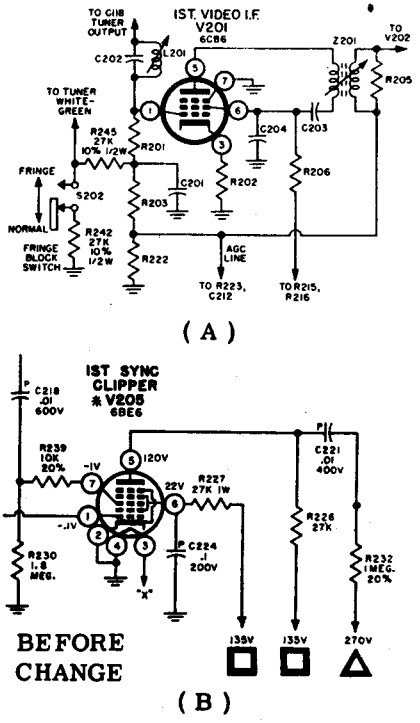


Fig. 50 — Dumont

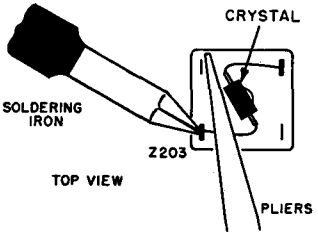


Fig. 51 — Dumont

2. Remove the blue lead from the junction of *R203, R222* and connect it to terminal 3 of *TB2.*

3. Replace *C218* with a .02-μf, 20%, 600v capacitor and *C221* with a .02-μf, 20%, 400v capacitor.

4. Replace *R230* witha 3.9-meg, 10%, ½-w resistor, *R226* with a 22k-ohm, 10%, ½-w resistor, *R227* with an 18k-ohm, 10%, 1-w resistor, and *R242* with a 27k-ohm, 10%, ½-w resistor.

R245 is placed in series with the tuner green white agc lead, but it does not affect the tuner agc voltage when the Fringe Block switch, *S202,* is open. When *S202* is closed, *R203, R242* and *R245* are shunted across *R222,* the agc bleeder resistor, reducing the source agc voltage. The tuner agc voltage is further reduced by the *R242, R245* resistor divide-down ratio.

Note: The above modifications are already included in later production chassis coded *C7.*

DUMONT Models RA-164, RA-165

Crystal detector replacement (see Fig. 51).

Crystals are often checked by measuring their front and back resistances. Unfortunately, this technique is of little use in determining whether or not a crystal will function properly as a video detector.

The only sure way to check a crystal is by substitution. When performing this check, the last i-f transformer must be realigned when the new crystal is substituted, since individual crystals have different loading effects on the transformer.

A crystal will be damaged if it is heated excessively. Grasp the crystal leads with a pair of long-nose pliers when soldering or unsoldering them. The pliers should be placed between the body of the crystal and the solder joint as shown in the figure.

Application of B+ voltage to a crystal will damage it. When working on a receiver, exercise care to prevent this from happening.

Use an exact replacement part whenever possible. The crystals used in the above models are specially selected for their performance in these receivers. Part No. 26 001 081 is the exact replacement.

If locally purchased crystals are used for replacement, several will usually have to be tried before satisfactory performance is obtained.

DUMONT Models RA-164, RA-165

Improving range of vertical linearity control.

To improve the vertical linearity adjustment range, the value of *R272* (connected to pin 2 of vertical

deflection amplifier) is decreased. Replace *R272* with a 15k-ohm resistor (part No. 02030760). Note: This change is already made in later production.

DUMONT Models RA-164, RA-165

mproving picture quality and definition (see Fig. 52).

To improve picture quality and definition, proceed as follows:

1. Replace *R201* (connected to pin 1 of 1st video i-f amplifier) and *R208* (connected to pin 1 of 3rd video i-f amplifier) with 5.1k-ohm resistors.

2. Disconnect pin of *V204*, the video amplifier, from the junction of *L202, C230, R212, R228*, and connect *L205* (video peaking coil 21006628) between these two points. Connect a 27k-ohm resistor (*R302*) in parallel with *L205*.

3. Remove *L209* and connect it between pin 7 of *V204* and the junction of *C217, L206, L207*. (Sets below serial number 656400 have *L209* located in this position.) Connect *L210* (video peaking coil 21006628) between the junction of *C217, L207* and the junction of *C216, R217*.

4. The following new i-f alignment frequencies are used. The alignment procedure and the sound i-f frequencies remain unchanged.

Coil	*New Alignment Frequencies*
L110 (mixer plate)	23.05 mc
Z201 (1st i-f transformer)	25.25 mc
Z202 (2nd i-f transformer)	23.93 mc
Z203 (3rd i-f transformer)	25.25 mc
L201 (1st i-f amplifier trap	27.25 mc
L207 (video amplifier trap)	4.5 mc

The above change is already included in chassis with serial number 6549482 and later.

DUMONT Models RA-164, RA-165

Improving adjustment range of agc control.

To improve the adjustment range of the agc control, the value of this control is increased. Replace *R303*, the agc control, with a 100k-ohm potentiometer (part No. 01053800).

This modification is already made in chassis with serial number 6555 201 and later.

DUMONT Models RA-164, RA-165

Eliminating picture hook.

To eliminate the possibility of picture hook, proceed as follows:

Remove *C225* (connected between the junction of *R223, R234*, plate circuit of 2nd sync clipper, and pin 7

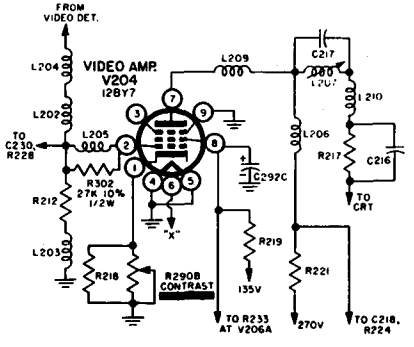


Fig. 52 — Dumont

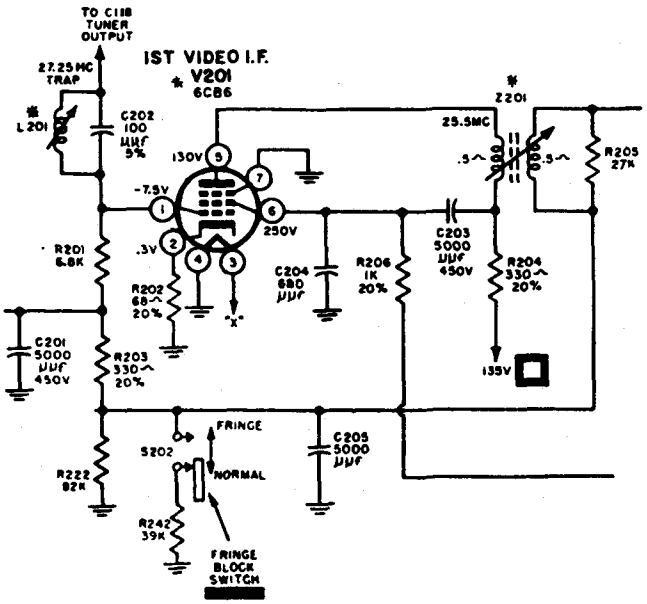


Fig. 53 — Dumont

of *V207*, horizontal phase detector) and replace it with a 1,000-μμf, 450-v ceramic capacitor (part No. 03100490).

Note: The above change is already made in later production chassis coded *C2*.

DUMONT Models RA-164, RA-165

Improving picture quality by reducing mixer noise and improving sync stability (see Fig. 53).

To improve picture quality by reducing mixer thermal noise, proceed as follows:

1. Replace *R203* (located in the agc circuit) with a 330 ohm, 20%, ½ w resistor (part No. 02032390).

2. Replace *R222* with an 82k-ohm 10%, ½-w resistor (part No. 02032000).

3. Disconnect the agc input lead from the junction of *C201*, *R201*, *R203* and the tuner green lead and connect it to the junction of *C205*, *R203*, *R222*.

The above modification is already made in chassis coded *C3*.

Note: To improve sync stability in noisy fringe areas, an agc switch is incorporated in later production coded *C4*. The switch (slide switch 05004200) is physically located behind the hidden control panel and is

called the Fringe Block switch. The switch circuit is shown in the figure. *R242* (39k ohms, ½ w, part No 02031960) is connected between one terminal and ground as shown.

DUMONT Models RA-164, RA-165

Preventing horizontal line displacement with noise.

To increase the immunity of the afc circuit to short duration noise pulses when receiving weak signals, proceed as follows: This design modification prevents horizontal displacement of individual scanning lines with noise.

1. Replace *C228* (connected between pin 1 of the horizontal oscillator and the output circuit of the 2nd sync clipper) with a .01-μf, 20%, 200-v capacitor (part No. 03119780).

2. Replace *C268* (connected between pin 1 of the horizontal oscillator and ground) with a .05-μf, 20%, 200-v capacitor (part No. 03000950).

3. Replace *R241* (connected across *C228*) with a 220k-ohm, 10%, ½-w resistor (part No. 02032050).

The above change is already included in chassis coded *C3*.

DUMONT Models RA-164, RA-165

Sync pulse buzz in audio.

To minimize the possibility of sync pulse buzz in the audio, proceed as follows:

Remove *R250* and *R251* (ratio detector load resistors) and replace them with 15k-ohm, 10%, ½-w resistors (part No. 02031910).

The above change is already made in chassis *C4*.

DUMONT Models RA-164, RA-165

Increasing vertical interlace stability (see Fig. 54).

To improve the picture quality by increasing the vertical interlace stability, proceed as follows:

1. Remove *R265* (10-meg resistor connected to pin 6 of vertical deflection amplifier).

2. Disconnect *C259* (470 μμf at 2kv) from ground. Connect the free end of *C259* to the red lead of *T202*, the vertical sweep output transformer.

3. Remove *R242* (82k-ohm in feedback circuit from plate of vertical amplifier to grid of vertical oscillator) and connect the junction of *C263*, *R243* (.01 μf and 100k ohms) to the junction of *C259*, *R271* (470 μμf and 330k ohms).

4. Replace *R243* (100k ohms) with a 68k-ohm, 10%, 1-w resistor (part No. 02034990).

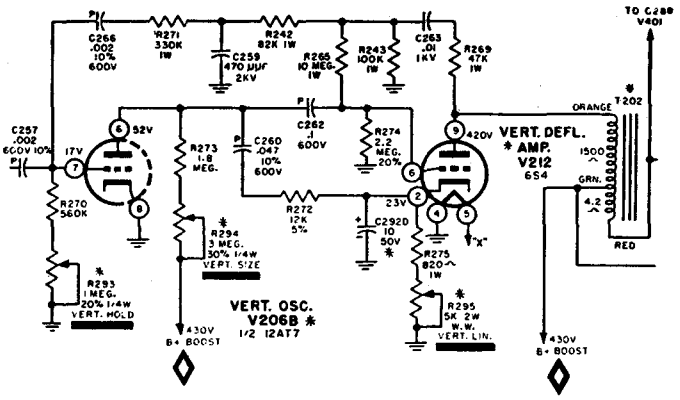
5. Replace *R270* (560k-ohm grid resistor of vertical oscillator) with an 820k-ohm, 10%, ½-w resistor (part No. 02032120).

6. Replace *R272* (12k-ohm peaking resistor) with an 18k-ohm, 5%, ½-w resistor.

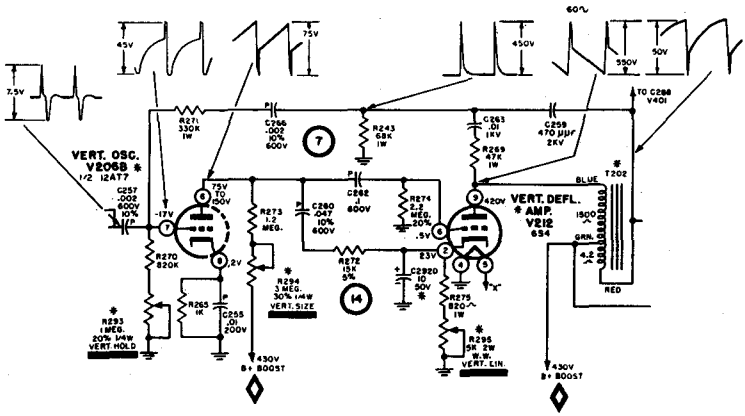
7. Replace *R273* (1.8-meg plate resistor of vertical oscillator) with a 1.2-meg, 10%, ½-w resistor.

8. Disconnect pin 8 of *V206*, the vertical sweep oscillator, from ground.

9. Connect *C255*, a .01-μf, 20%, 200-v capacitor (part No. 03119780) between pin 8 of *V206* and ground.



BEFORE CHANGE



AFTER CHANGE

Fig. 54 — Dumont

10. Connect *R265*, a 1k-ohm, 10%, ½-w resistor (part No. 02031770), between pin 8 of *V206* and ground.

Note: The above changes are already included in chassis coded *C2*.

DUMONT Models RA-164, RA-165

Preventing audio in picture and beats on channels 5, 7 and 11 (see Fig. 55).

To mimimize the possibility of audio modulation in the picture and

beats on channels 5, 7 and 11, proceed as follows:

1. Remove *R302*. Connect pin 5 of the second audio amplifier *(V211)* to the junction of *C246, R255* and *R256*.

2. Disconnect pin 3 of *V211* from pin 3 of *J202* (speaker plug).

3. Disconnect *C247* from pin 3 of *V211*. Connect the free end of *C247* to pin 6 of *V211*.

4. Connect *L219* (part No. 21010331) between pins 3 and 6 of *V211*.

5. Connect *L211* (part No. 21010331) between pin 6 of *V211* and pin 3 of *J202*.

6. Connect *C250*, a 470-$\mu\mu$f, 500-v capacitor (part No. 03016480) between pin 3 of *J202* and the nearest ground lance.

7. Disconnect pin 4 of *V211* from pin 4 of *J202*, and connect *L212* (part No. 21010331) between these two points.

8. Disconnect *R256* from pin 4 of *J202* and connect it to pin 4 of *V211*.

9. Connect *C251*, a 470-$\mu\mu$f, 500-v capacitor (part No. 03016480), between pin 4 of *J202* and ground. Use the same ground as in step (6).

Note: The above changes are already included in chassis *C2*.

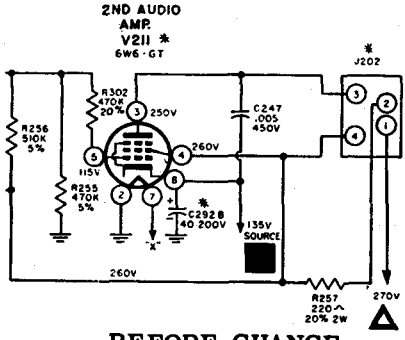
DUMONT Models RA-164, RA-165

Reducing tuner oscillator radiation.

To reduce tuner oscillator radiation, the inductance of *L110*, the mixer plate coil, is reduced. The part number of this coil is 21011561. This permits the use of a suppressor coil, *L220* (part No. 21011751), between the tuner output tab and *L201, C202*, the adjacent channel trap. Tuners which already have the new mixer-plate coil are stamped 21010783..

The procedure is to connect *L220*, covered with an adequate insulation sleeve, between the tuner (21010783) output tab and *L201, C202*, the adjacent channel trap.

Note: Tuner 21010783 must be used with *L220* or mixer plate coil *L110* will not align properly Tuners 21010781, 21010782 and 89012601



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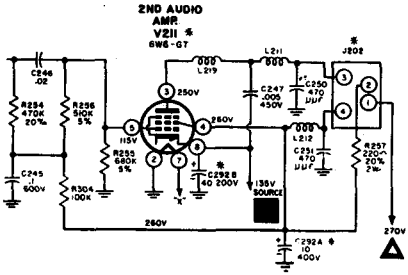


AFTER CHANGE

Fig. 55 — Dumont

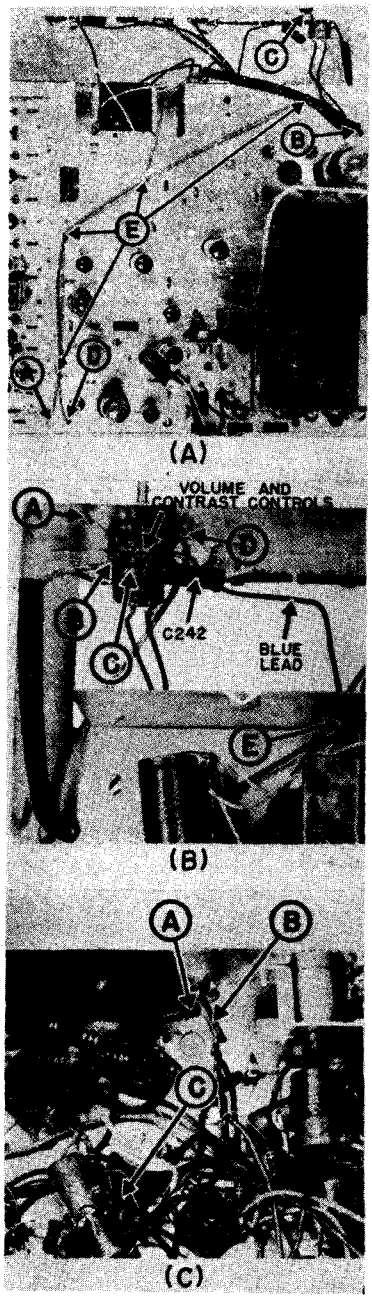


Fig. 56 — Dumont

may be used as direct replacements if *L220* is removed from the circuit.

The above change is already made in chassis with serial number 6552074 and later.

DUMONT Models RA-164, RA-165

Eliminating audio buzz, minimizing residual hum and improving sound quality (see Fig. 56).

To eliminate audio buzz, minimize residual hum and improve the sound quality, proceed as follows:

1. Remove the shielded leads running between the junction of *C241*, *R252* (de-emphasis filter at output of ratio detector) to *C242* (adjacent to the volume control, *R290A*) and from *R290A* to *C244* in the grid circuit of the first audio amplifier, *V210*. Reroute the leads as shown in part (A) of the figure. Run the lead from *C241*, *R252* through holes *A*, *B* and *C*. Run lead from *C244* through hole *D*, place a 12-inch length of spaghetti over the lead and run through hole *B*. Fasten leads to chassis at points indicated by *E*. Connect leads to volume control as shown in part (B) of the figure.

2. Run leads around edge of shield. Remove volume control ground wire connected between points *A* and *B* (do not disturb the contrast control ground). Connect shield of lead from *C244* at point *B* and center wire to point *C*. Ground shield of lead from *C241*, *R252* at point *D* and connect center wire to *C242* at terminal board. Disconnect blue lead from un-

grounded end of the contrast control *R290B*), run through hole *E*, reconnect and dress lead along front of chassis as shown in part (B) of the figure.

3. Dress *C244* close to rear of chassis as shown at *A* in part (C) of the figure. Dress lead from volume control *(R290A)* as shown at *B*. Pull all excess crt base connector leads through hole *C*. Dress excess crt connector leads away from the audio amplifier stages. Disconnect blue crt base connector lead from terminal board *TB11-2* and connect to pin 6 of *V218* (agc amplifier). Disconnect jumper wire between pin 6 of *V218* and *TB11-2*. Disconnect *R254* (470k ohms) and *R456* (510k ohms) from pin 4 of *V211* (2nd audio amplifier) and connect them to *TB11-2*. Connect *R304*, a 100k-ohm resistor between pin 4 of *V211* and *TB11-2*. Connect *C245*, a .1μf, 600-v capacitor from *TB11-2* to ground near pin 1 of *V211*. Replace *R255*, connected between pin 5 of *V211* and ground, with a 680k-ohm resistor.

4. Disconnect *R226* (22k-ohm plate resistor of 1st sync clipper at terminal board, cover with spaghetti and connect to pin 8 of *V204* (video amplifier).

The above changes are already made in chassis with serial number 6574505 and later.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Streaks in picture due to audio harmonics.

High audio frequency harmonics present on the +150 volt line may enter other stages of the receiver causing streaks in the picture.

To eliminate, connect a 5,000-$\mu\mu$f ceramic capacitor (part No. 0301 5610) from pin 8 to pin 7 of the audio output tube, *V215*.

This modification is already made in later production.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Replacement of B+ boost capacitor.

The 10-μf B+ boost filter capacitor in the above models (*C281* in RA-166-171 and *C283* in RA-164/165) is semi-polarized. During the receiver warm-up period, the B+ supply voltage is present on the negative terminal of the capacitor 10 to 15 seconds before the horizontal sweep amplifier develops the B+ boost voltage on its positive terminal. As a result the capacitor must operate for a short time at reversed polarity.

If the B+ boost filter is replaced, the replacement capacitor should be a semi-polarized unit. An ordinary electrolytic capacitor will deteriorate rapidly, resulting in early failure.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Troubleshooting intermittent horizontal sweep and h-v troubles.

Intermittent horizontal sweep and high voltage troubles that blow

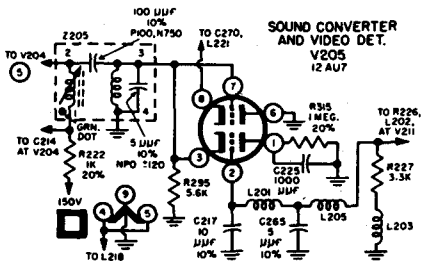


Fig. 57 — Dumont

the ¼-amp fuse are difficult to troubleshoot. Many times, a replacment fuse will allow the set to operate for several hours to a few days.

More positive results when troubleshooting an intermittent, may be obtained by removing the 6W6 audio amplifier. When this tube is removed, the sweep pulse, the B+ boost and high voltage increase. Any hidden trouble is more apt to show up when the receiver is operated in this manner.

DUMONT Models
RA-166/167, RA-168/169,
RA-170, RA-171

Preventing i-f harmonic interference in picture (see Fig. 57).

To reduce radiation of harmonics of the sound and video i-f sig,-nals, generated in the video detector and sound converter, *V205*, proceed as follows. Under some conditions these harmonic signals enter the tuner causing interference in the picture.

A dual triode is used in place of the 6AL5 dual diode. The triode sections operate as diodes with the grids acting as the diode plates. The triode plates are used as shields to reduce radiation. The sound-converter section plate is grounded directly. The video-detector section plate is grounded through a parallel R-C network. The network places the plate at ground potential to rf, while avoiding the loading effect on the video detector which would occur if the plate were grounded directly.

1. Remove the 6AL5 and its socket. Replace the socket with a 9-pin miniature socket. Rewire the circuit as shown in the figure.

2. Remove *R265*, a 1k-ohm resistor connected between the junction of *C219* (6.8-μμf coupling capacitor to sound i-f amplifier), *L221* (coil originally tied to the cathode of the sound converter) and ground. Connect *R265*, 2.7k-ohm, 10%, ½-w resistor, from the junction of *L221*, *C270* (10-μμf capacitor to ground) and pin 8 of *V205*, to ground.

Parts required are as follows:

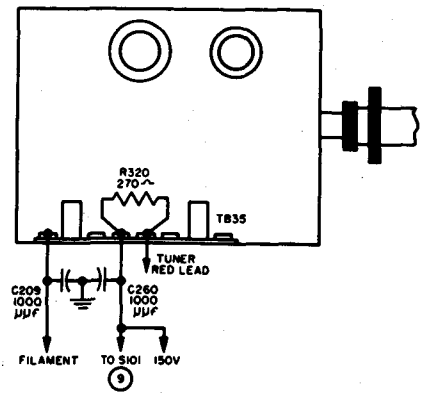


Fig. 58 — Dumont

Symbol	*Part No.*	*Description*
R265	02 031 820	Res. 2.7k, 10%, ½w
R295	02 031 860	Res. 5.6k, 10%, ½w
R315	02 032 600	Res. 1 meg, 20%, ½w
V205	25 000 130	Tube, 12AU7
	34 003 590	Socket, 9-prong
	42 009 040	Shield (for 12AU7)
	42 007 110	Base, tube shield

This modification is already made in later production of the above models.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Preventing regeneration on uhf models (see Fig. 58).

To reduce the possibility of regeneration in models equipped with a uhf tuner, an R-C decoupling network is added between the +150 volt line and the tuner red lead. Also, to eliminate r-f components on the tuner filament and +150 volt line, two r-f bypass capacitors are added. The procedure is as follows:

1. Disconnect the yellow lead, and the red lead between *S101* and *TB-35*, from terminal 3 of *TB-35*, and reconnect them to terminal 4 (see figure).

2. Connect a 270-ohm, ½-watt resistor between terminals 3 and 4 of *TB-35*, and connect a 1,000-$\mu\mu$f ceramic disc capacitor between terminal 4 of *TB-35*, and ground. The capacitor ground lead should be soldered to the tuner bracket directly below terminal 4 of *TB-35*.

3. Connect a 1,000-$\mu\mu$f ceramic capacitor between terminal 6 of *TB-35* and the ground point in step (2).

4. Connect a 1,500-$\mu\mu$f ceramic disc capacitor between terminal 1 (150-volt terminal) of *TB-16* and the nearest ground lug. Note: This terminal board is located between the phase splitter and the horizontal phase detector.

The above changes are already made in later production.

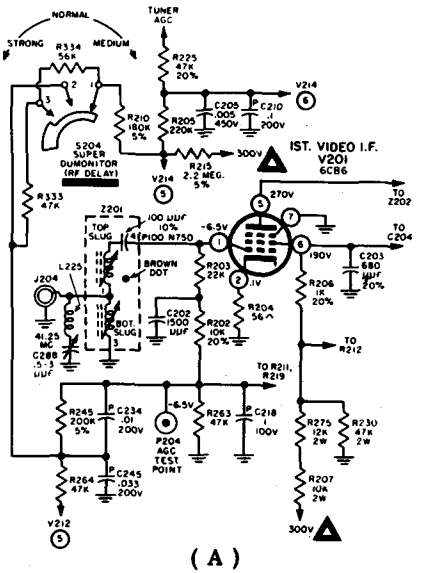
DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Providing field adjustment of r-f agc delay (see part A of Fig. 59).

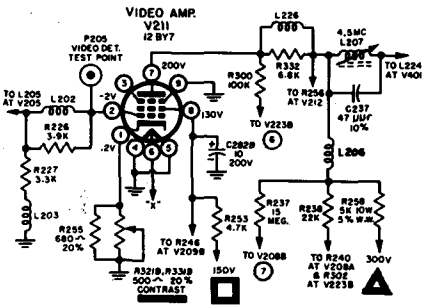
To provide a field adjustment of the r-f agc delay in order to obtain improved strong and very weak signal performance, the following modifications already included in later production are made. The new control is named the Super Dumonitor.

1. Mount *S204*, a single-pole three-position rotary switch (part No. 05008731), on rear of chassis above *L210* (horizontal stabilizing coil).

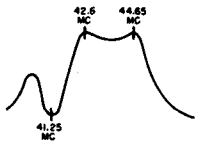
2. Remove *R210* (240k-ohm resistor in r-f agc bus). Connect a 180k-ohm, ½-watt, 5% resistor between terminal 1 of *S204* and terminal 3 of *TB18*. This is the -3 volt



(A)



(B)



(C)

Fig. 59 — Dumont

lug on the terminal board mounted between the agc amplifier and the agc control. Cover the leads of this resistor with spaghetti. The new resistor is shown as *R210* in the figure.

3. Connect *R333*, a 47k-ohm, ½-w resistor, between terminals 2 and 3 of *S204*.

4. Connect *R334*, a 56k-ohm, ½-watt resistor, between terminals 1 and 3 of *S204*.

5. Connect a lead between terminal 2 of *S204* and terminal 2 of *TB19*. This is the -40 volt lug on the 2-lug terminal board adjacent to the afc test point.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Improving horizontal lock-in range and preventing overload (see part A of Fig. 59).

To improve the horizontal lock-in range and minimize the possibility of overload in the 4th video i-f stage, the following changes (already included in later production) are made:

1. Remove *C245*, the agc filter capacitor (see figure), and replace it with a .033-μf, 20%, 200-v capacitor.

2. Remove *R221* in the cathode circuit of *V204* (4th video i-f amplifier) and replace it with a 180-ohm, 10%, ½-w resistor.

3. Remove *R222*, 1,000-ohm resistor in the plate circuit of *V204*, and replace it with a 470-ohm, 10%, 1/3-w resistor.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Increasing vertical oscillator stability.

To increase the long-term stability of the vertical oscillator, remove *C252* (feedback capacitor connected to pin 6 of the vertical oscillator) and replace it with a 2,200-$\mu\mu$f, 500-volt mica capacitor (part No. 03029480).

This change is already made in later production.

DUMONT Models RA-166/167, RA-168/169, RA-170, RA-171

Improved picture quality and weak-signal sound performance (see Fig. 59).

To provide improved picture quality and very weak signal sound performance, an accompanying-sound trap *C288, L225* is added, see part (A) of the figure. The video amplifier plate load and sync take-off circuits are changed, as shown in part (B) of the figure, and new i-f alignment frequencies are specified.

The procedure is as follows:

1. Mount *C288*, a .5- to 3-$\mu\mu$f variable ceramic capacitor (part No. 03019871) in the rectangular chassis hole located between *Z201*, the video i-f transformer and the input jack *J204*. Solder the capacitor's spring lock nut to the chassis.

Note: A few chassis do not have this hole. In this case drill a ⅛-inch hole in the chassis midway between *Z201-1* and *J204*, and file the sides to fit *C288*.

2. Connect *L225* (part No. 21012011) between *C288* and *J204*.

3. Remove the black lead connecting pin 7 of *V211*, the video amplifier, and *L207*, the 4.5-mc trap.

4. Remove the black lead connected between terminal board *TB-13-3* (junction of *R237*, 15 meg, ½ w, and *R238*, 22k-ohm, 5%, 1 w) and pin 7 of *V211*.

5. Connect *L226* (video peaking coil, part No. 21006623) between pin 7 of *V211* and *L207*. Connect *R332*, a 6.8k-ohm, 10%, ½-w resistor, in parallel with *L226*.

6. Connect a lead from *TB-12-3* (junction of *L206* and *R258*, 5k-ohm, 5%, 10-w resistor) to the junction of *TB-13-3* noted in step (4).

7. Replace *R228* (100k-ohm grid resistor) at *V206* (sound i-f tube) with a 470k-ohm, 10%, ½-w resistor.

8. Replace *R220* (3.3k-ohm grid resistor) at *V204* (4th video i-f amplifier) with a 22k-ohm, 10%, ½-w resistor.

9. Replace *R226* at *V211* with a 3.9k-ohm, 10%, ½-w resistor (see part *B* of figure). The frequencies in the alignment procedure in the service notes should be changed as follows:

Step 1—44.25 mc (*Z205*, i-f transformer between 4th and i-f amplifier and detector.

Step 2—42 mc (*Z204*, i-f transformer between 3rd and 4th i-f amplifiers).

Step 4—44.25 mc (*Z202*, i-f coil between 1st and 2nd i-f amplifiers).

Step 6—Adjust mixer plate coil *(L109)* and *Z201 (top)* for 44.65-mc marker on one peak and *Z201* marker on the other peak of wave-

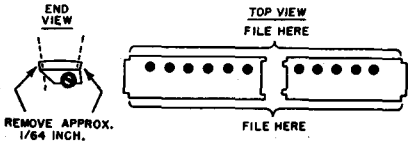


Fig. 60 — Dumont

form shown in part (C) of figure. Adjust *C288* for 41.25-mc dip.

Note: The above modification are already included in later production of the above models.

DUMONT Models RA-166/167, RA-170

Using R-coded uhf strips in 13-position tuner (see Fig. 60).

When the regular QR-coded strips for 13-position tuners are not available, it is possible to use the R-coded strips intended for 12-position 41-mc tuners as substitutes. The R-coded strips are electrically the same as the QR strips and their use will not compromise performance in any way.

R strips are wider than QR strips and their sides must be filed slightly in order to fit them into 13-position tuners. The figure shows where they should be filed. When filing, check the strips in a tuner to avoid removing more than enough material to permit a snug fit.

When the channels adjacent to the position in which the uhf strips are to be inserted are not in use, the adjacent strips can be removed to make room for R strips without filing. Filing the strips is preferable however, and is recommended whenever possible.

DUMONT Models RA-306, RA-307

Extending range of vertical hold control.

To extend the range of the vertical hold control the following procedure, already used in later production run 1, is employed. This permits the circuit to provide vertical sync lock-in with a wider variation of of vertical oscillator tube characteristics.

1. Remove *R293*, the 1-meg/50k-ohm vertical hold/horizontal hold dual control. Replace *R293* with a 1.5-meg/50k-ohm dual control. *R-293A*, the vertical hold control is changed to 1.5 meg. *R293B*, the horizontal hold control, remains unchanged.

2. Remove *R270*, the 820k-ohm resistor connected between the vertical hold control and the grid of the vertical oscillator, *V206B*. Replace *R270* with a 680k-ohm, 10%, ½-w resistor.

DUMONT Models RA-306, RA-307

Minimizing effect of component tolerances in agc circuit.

The agc delay B+ bucking voltage resistor is reduced in value to minimize the effects of component tolerances and assure proper agc delay circuit performance. The procedure, already followed in later production run 1, is:

Remove R*242*, 3.9-meg, 5%, ½-w resistor connected between the B+ 270-volt line and the agc delay control. Replace *R242* with a 3.6-meg, 5%, ½-w resistor.

DUMONT Models RA-306, RA-307

Preventing possibility of breakdown of C263.

Capacitor *C263* (.01-μf capacitor in the feedback circuit from the plate of the vertical deflection amplifier) is changed from a 1-kv to a 1,600-volt unit to minimize the possibility of breakdown. The new part No. is 03139681.

Later production, coded run 1, already has this modification.

DUMONT Models RA-306, RA-307

Preventing damage to agc amplifier when h-v fuse opens.

To eliminate the possibility of damage to the 6AU6 agc amplifier when the high-voltage fuse opens, the tube's screen voltage is changed to the fused side of the +270 volt line. The procedure for this modification, already included in later production run 1, is as follows:

1. Disconnect the screen of the 6AU6 agc amplifier from the +270 volt line.

2. Connect a wire from the screen of the agc amplifier to the high-voltage fuse at the fused side of the +270 volt line.

DUMONT Models RA-306, RA-307

Using power transformer with single 6-volt winding.

Wiring changes are made to the agc amplifier stage, *V218*, to permit the use of a power transformer with a single 6.3-volt a-c filament winding. The procedure for this modification, already included in later production run 1, is as follows:

1. Remove the filament leads (designated *Y* in the service notes) from pins 3 and 4 of the 6AU6, agc amplifier. Do not disturb the ground lead connected to pin 4.

2. Connect a lead between pin 3 of the 6AU6 agc amplifier and pin 2 of the 6W6 audio amplifier.

DUMONT Models RA-306, RA-307

Reducing tube failure of horizontal deflection amplifier.

To reduce tube failure in the horizontal deflection amplifier stage and increase the life of the 6BQ6 tube, change the screen resistor (*R281*) of this tube from 4,000 ohms, 10%, 10 watts to 5,000 ohms, 10%, 10 watts. This change is already made in later production.

DUMONT Models RA-306, RA-307

Improving sound performance.

The sound performance is increased by removing resistor *R216*, 47k, 10%, ½w, connected between pin 1 of the 6AU6 sound i-f amplifier and the ground. As *L208*, the sound i-f coil, is also wired between pin 1 of the 6AU6 sound i-f amplifier and ground, the Q of the sound i-f coil is increased when *R216* is removed.

Note: This modification is already made in later production run 1.

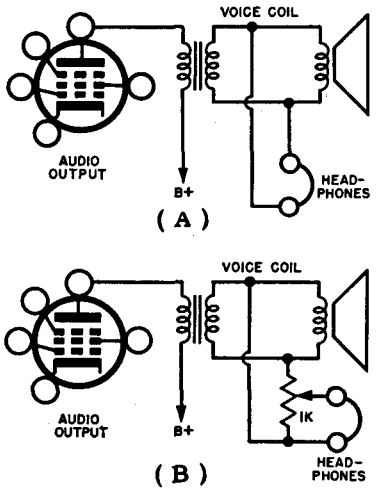


Fig. 61 — Dumont

DUMONT Models RA-306, RA-307

Providing fuse protection for agc amplifier grid circuit.

To provide fuse protection to the grid circuit of the agc amplifier, the following modifications (already made in later production run 1) are incorporated:

1. Disconnect resistors *R225* (68k-ohm, 10%, 1-w resistor connected to high side of agc control) and *R221* (7k-ohm, 10%, 10-w plate dropping resistor for video amplifier) from the +270 volt line. Resistors *R221* and *R225* are located at terminal board *TB11* (between video amplifier and horizontal phase detector).

2. Connect the free end of *R225* and *R221* to the high-voltage fuse, *F201*, at the fused side of the +270 volt line.

3. Remove *F201*, the ¼-amp high-voltage fuse, and replace it with a ⅜-amp fuse.

DUMONT Models RA-306, RA-307

Improving horizontal sync on strong signals.

The time constants of the agc delay circuit are increased to improve horizontal sync performance on strong signals, and minimize the effects of agc control adjustments which result in lower than normal video detector output. The procedure for making the modification, already included in later production run 1, is as follows:

1. Remove *R267*, 220k-ohm, 10%, ½-w resistor, connected across the agc diode plates of *V210*. Replace *R267* with a 470k-ohm, 10%, ½-w resistor.

2. Remove *R306*, 27k-ohm, 10%, ½-w resistor connected in the agc filter network. Replace *R306* with an 18k-ohm, 10%, ½-w resistor.

DUMONT All models

Connecting headphones to receiver (see Fig. 61).

Occasionally the service technician is called on to connect a set of headphones to a tv receiver for use by a person with defective hearing.

The figure shows two simple ways in which headphones can be connected. In (A) a pair of high-imped-

ance phones are connected directly across the voice-coil winding of the audio output transformer. This will usually produce satisfactory headphone volume when the volume control is adjusted for normal loudspeaker output.

To determine whether or not direct connection will be satisfactory, connect the phones as shown in part (A) of the figure. Turn the receiver on and set the volume control at minimum. While listening to the phones, advance the volume control until satisfactory headphone output is obtained, then check the loudspeaker output. If it is satisfactory, the phones can remain connected directly across the voice coil. The above test is best made with the individual who will use the headphones.

If the direct connection proves unsatisfactory the method shown in part (B) of the figure may be used. The 1,000-ohm potentiometer may be mounted on the back of the receiver, or in a small box near the phones. A phono jack can be included in the box to permit removal of the phones when they are not in use.

If the customer desires, the line for the phones can be run along the baseboard to the point where the user will sit. The box mentioned above can be mounted on the baseboard at this point. This provides a convenient and inconspicuous installation.

EMERSON Chassis 120129-B, -D,-G,-H, 120134-B,-G,-H, 120135-B,-G,-H, 120140-B,-G,-H, 120144-B,-G,-H.

Substitution of deflection yoke (see Fig. 62).

In order to use the deflection yoke No. 708150 in place of the 708 073 and 708043 yokes, it will be necessary to add a 1,500-ohm, ½-watt resistor in series with the 270-$\mu\mu$f capacitor. This resistor should be connected to the centertap of the vertical winding (lugs 5 or 8).

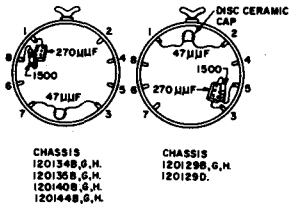


Fig. 62 — Emerson

A 47-$\mu\mu$f or a 50-$\mu\mu$f, 2,000-volt ceramic capacitor was originally used across a half of the horizontal winding in the 708073 and 708043 yokes. For best results with the 708150 yoke, a 47-$\mu\mu$f, 2,000-volt ceramic capacitor (part No. 9280 65) should be used.

To determine which lugs to connect across, refer to the schematic drawing for the chassis in question, since it varies between direct and cabinet-mounted picture tubes.

The diagrams show how this yoke is to be wired.

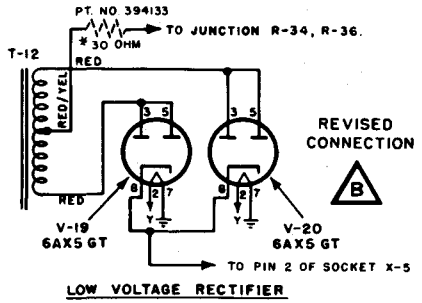


Fig. 63 — Emerson

EMERSON Chassis 120162-A

Reducing excessive horizontal size at high line voltages (see Fig. 63).

On some chassis coded Triangle-B, a 30-ohm, 10-watt resistor (part No. 394133) has been placed in series with the red and yellow lead of the power transformer *T12* as shown in the diagram. This was done to reduce the horizontal size which may become excessive under high line voltage conditions. If so desired, this change can be easily made when servicing the chassis.

EMERSON Chassis 120163-D, 120164-B

Maintaining picture crispness under poor transmission conditions.

The following changes are made to maintain picture crispness even under poor picture transmission conditions.

1. Change *L9* from a 440-μh peaking coil to a 660-μh peaking coil. This coil is located in the plate circuit of *V5*, the video amplifier.

2. Remove pigtail of *R19* (10k-ohm resistor in video-to-sync line) from junction of *R18* (15k ohms) *L7* (440μh), *C21* (.047-μf), *T5* (sound take-off) and connect to junction of *R17* (4,700 ohms) and *L7*.

3. The following alignment changes are made with the above circuit modifications:

(a) Tuner and first i-f coils *T1* and *L3* should be aligned to 45.0 mc instead of 42.0 mc.

(b) Second i-f transformer *T2* should be aligned to 42.0 mc instead of 45.3 mc.

(c) *T4*, 4th i-f transformer, is now used when required to position the 45.75-mc picture marker instead of *T2*.

Note: These changes are already included in later production chassis.

EMERSON Chassis 120163-D, 120164-B

Improving afc operation on weak signals and when switching channels.

The following changes, already included in later production, improve afc operation on weak signals and when switching channels:

1. Change *R69*, 180k-ohm, ½-watt resistor connected between horizontal hold control and ground, to a 330k-ohm, ½-watt, 10% resistor.

2. Change *R64*, 12k-ohm, ½-watt resistor from pin 2 of the horizontal sync amplifier to ground, to a 10k-ohm, ½-watt, 10% resistor.

EMERSON Chassis 120163-D, 120164-B

Reducing trailing whites due to agc loading.

The following changes, already made in later production sets, reduce the loading effect of the agc circuit, which under certain types of transmission may produce white tails:

1. Change *R37*, 10k-ohm, ½-watt screen-dropping resistor of the sound limiter, to a 6,800-ohm, ½-watt, 10% resistor.

2. Change *R35*, 15k-ohm, 1-watt resistor in 150-volt line to pin 5 of 1st audio amplifier and agc clamper, to a 22k-ohm, 1-watt, 10% resistor.

3. Replace the jumper wire of *V4* (video and agc detector) from pin 5 to pin 7 with a 100k-ohm, ½ watt, 20% resistor.

EMERSON Chassis 120163-D

4.5-mc beat in picture.

The following changes, already incorporated in sets coded Triangle-D, provide for increased protection against 4.5-mc beat in picture:

1. Add a 4.5-mc trap (part No. 708032) to chassis hole near *V5* (video amplifier). Solder clip of 4.5-mc trap to chassis.

2. Move one end of *C21*, .047-μf, 400-volt capacitor, from *V5* pin 1 to top of winding of 4.5-mc trap.

3. Add wire from bottom of winding on 4.5-mc trap to socket *V5* pin 1.

4. Yellow wire of picture tube cable is moved from chassis hole near socket *V5* to chassis hole near socket *V11*, sync amplifier and horizontal separator.

EMERSON Chassis 120166-D, 120168-D, 120171-B, 120173-D

Repeated fuse failure.

Repeated fuse failure in these chassis can be caused by momentary arcs in tubes or components which occur intermittently and soon heal themselves. These causes of fuse failure can be easily overcome by replacing the burnt out fuse with a 0.6-amp slow-blowing type fuse.

EMERSON Chassis 120166-D, 120168-D, 120171-B, 120173-D

Reducing detuning of sound take-off trap for fringe areas (see Fig. 64).

The following change, already made in later production, reduces the detuning effect on the sound take-off trap *T5* as a result of different signal levels. The advantage of this becomes apparent in fringe areas.

Remove *C26* and *R30* from pin 7 of *V6* (6AU6, 1st sound i-f) and insert a 47-ohm, ½-watt resistor from junction of *C26, R30* to pin 7 of *V6*.

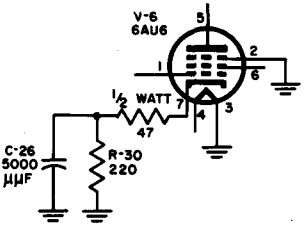


Fig. 64 — Emerson

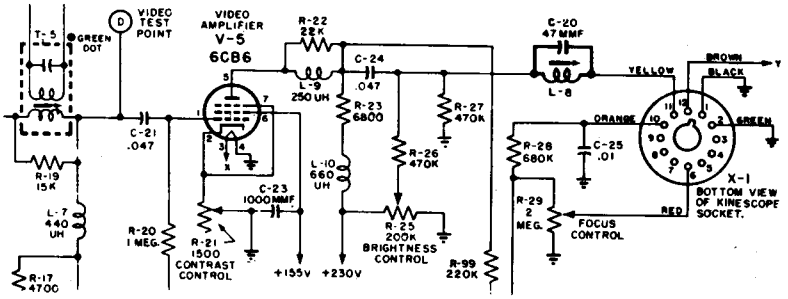


Fig. 65 — Emerson

EMERSON Chassis 120166-D, 120168-D, 120171-B

Increasing 4.5-mc rejection and increasing audio sensitivity (see Fig. 65).

Later production of the above chassis has the 4.5-mc trap (*L8*) electrically changed from the grid to the plate circuit of the video amplifier (*V5*, 6CB6) as shown on the schematic. The physical mounting of trap *L8* remains the same. This change is incorporated to increase the 4.5-mc trap rejection ratio and to increase audio sensitivity.

The procedure for aligning this trap is now different from what is indicated in the service notes. This trap should be aligned in the following manner:

1. Connect a crystal-controlled 4.5-mc signal generator through a .01-μf capacitor to the grid of the video amplifier tube (pin 1 of *V5*, 6CB6); low side to chassis.

2. Set contrast control for maximum contrast (fully clockwise).

3. Connect *vtvm* (d-c scale) through r-f probe to cathode of the picture tube (pin 11, yellow lead); low side to chassis.

4. Adjust the 4.5-mc trap (*L8*) for minimum reading on the *vtvm*.

If a crystal-controlled generator is not available, the video trap can be adjusted in the field by setting the fine tuning control for maximum 4.5 mc in picture and adjusting the 4.5-mc trap (*L8*) until this 4.5-mc beat note is reduced. Be sure that video ringing is not introduced from this adjustment. This indicates the trap is aligned at too low a frequency.

EMERSON Chassis 120166-D, 120168-D, 120171-B

Popping sound in audio during vertical roll or vertical hold adjustment (see Fig. 66).

A popping sound in the audio is eliminated by inserting a 100-ohm, ½-watt resistor between the plate and screen of the 6W6 vertical output tube as shown on the schematic. This change is already made in later production.

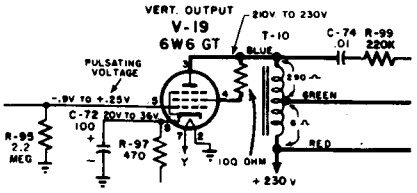


Fig. 66 — Emerson

EMERSON Chassis 120166-D, 120171-B, 120173-D

Increasing video drive at high contrast setting (see Fig. 67).

The fuse is relocated as shown to decrease the bias applied to the grid of the video amplifier. This increases video drive at high settings of the contrast control and thus provides improved fringe area operation. The change is already included in later production.

EMERSON Chassis 120166-D, 120168-D

Tube replacement in tuner.

The tuner used with this chassis may incorporate either a 6BQ7, 6BQ7A or a 6BZ7 tube. These tubes are interchangeable, but due to possible variations in interelectrode capacitances, several tubes may have to be tried for best results.

EMERSON Chassis 120166-D, 120168-D

Picture wiggle due to stray pickup.

1. If the video input lead to the picture tube is not dressed properly, picture wiggle may result due to the stray pickup of video information by the horizontal oscillator tube. This video lead should be dressed away from this tube simply by securing it to the side of the deflection yoke support bracket.

2. The white lead to the fringe compensator on-off switch should be dressed away from the horizontal phase coil and the grid of the horizontal oscillator tube (*V13*).

EMERSON Chassis 120166-D, 120168-D

Field alignment of video trap and sound circuits.

Adjustment of 4.5-mc Video Trap L8 (located next to video amplifier tube V5).

This trap, when properly adjusted, prevents the 4.5-mc intercarrier beat note, which is generated within the video detector, from interfering with the picture in the form of very fine superimposed diagonal lines (about 300).

In most instances, where necessary, this trap can be adjusted while viewing one of the stronger tv channels.

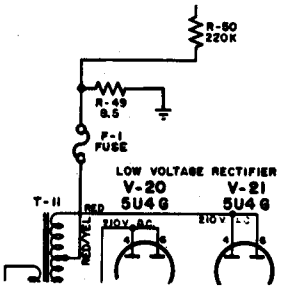


Fig. 67 — Emerson

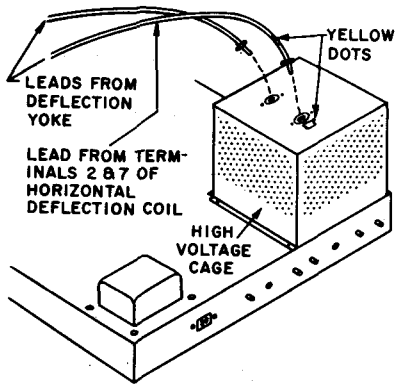


Fig. 68 — Emerson

With the fine tuning set for the maximum 4.5 mc in the picture, adjust the 4.5-mc video trap *L8* for the minimum 4.5-mc beat note in the picture.

Note: After the 4.5-mc video trap (*L8*) is adjusted, repeak the sound take-off transformer (*T5*).

Field Alignment of Sound Circuits Using an "On-the-Air" TV station.

Under certain conditions of reception or transmission, it may be advisable to touch up the alignment of the sound circuits usings an "on-the-air" tv station as the signal source instead of a generator. By doing this, it is possible to improve the audio signal to noise ratio. The following procedure is employed.

1. Tune receiver to a good "on-the-air" tv station. Connect a vtvm through a 10k-ohm resistor to the junction of *R33* (1 meg), C29 (68 $\mu\mu$f), and *R32* (47k-ohms) in the grid circuit of the sound limiter. The low side of the meter is connected to the chassis. Adjust take-off coil *T5* (top or bottom) and sound i-f transformer *T6* (top and bottom) for maximum negative reading.

2. Then move the vtvm to the output of the discriminator (junction of *R41*, 68k-ohms and *C33*, .001 μf, de-emphasis components) and proceed to tune the ratio detector transformer *T7*. First detune the secondary (top) for maximum negative reading. Then, peak the primary (bottom) for maximum negative reading. Finally, readjust the secondary toward the original setting for zero reading on the vtvm. This should be the point of best sound.

If further sound improvement is desired in the fringe areas, the 4.5-mc video trap *L8* can be shorted out by soldering a short wire directly across the coil. When this is done, the sound take-off transformer (*T5*) should be repeaked for best results.

EMERSON Chassis 120166-D, 120168-D

Proper polarity of plugs in h-v cage (see Fig. 68).

Some technicians are reversing plugs *P5* and *P7* when reinserting the chassis into the cabinet. To prevent this, the factory has painted a yellow dot next to socket *X7* and one on the corresponding plug *P7*.

Note: On some chassis the sockets may be located on the sides of the high-voltage cage; however, the corresponding yellow dot on the plug and the yellow dot on the socket should be matched when connecting.

EMERSON Chassis 120166-D

Less critical vertical hold setting.

R86 (connected to pin 4 grid of vertical oscillator) is increased in value from 100 to 150 ohms in later production chassis coded triangle-B. This tends to make the setting of the vertical hold control less critical in the fringe areas.

Note: Under certain types of noise impluse interference, the vertical hold might tend to jump. Under these conditions, the 100-ohm resistor may be more satisfactory.

EMERSON Chassis 120166-D

Minimizing effect on horizontal hold due to variations in horizontal oscillator tubes.

R68 (cathode resistor of horizontal oscillator) is reduced in value from 1,000 ohms to 820 ohms in later production chassis coded triangle-C. This change is incorporated so that variations between 6SN7 tubes when used as the horizontal oscillator (*V13*) have less effect on the stability of this circuit. This change should be made when the occasion arises to service the underside of this chassis.

EMERSON Chassis 120166-D

Reducing hiss in fringe areas.

The value of *C33* (connected between the high side of the volume control and ground) is changed from .001 μf to .002 μf. This change tends to increase the signal-to-noise ratio reducing the amount of hiss noise in the fringe areas. Chassis already incorporating this change are coded Triangle-D.

EMERSON Chassis 120168-D

Reducing hiss in fringe areas.

Sets coded Triangle-D incorporate the addition of a .001-μf capacitor connected from the plate of the 1st audio amplifier (pin 7 *V9*, 6AV6) to chassis. This change reduces the amout of hiss noise in the fringe areas.

EMERSON Chassis 120168-D

Black horizontal streaks on channels 5, 6 or 7 (see Fig. 69).

This condition is usually only apparent in the fringe areas and is caused by harmonics of the picture i.f., which are generated in the video detector, coupling to the front end and causing regeneration of certain frequencies. This condition is tunable with the fine tuning control.

If this condition exists, it can be easily eliminated by connecting a 10-μh r-f choke (part No. 705021) or a 20-μh r-f choke (705014) in series with the capacitor *C21* connected to the grid of the 6CB6 video amplifier tube. This choke should be connected and dressed as shown.

EMERSON Chassis 120168-D

Replacement of yoke balancing capacitor (see Fig. 70).

Each 708163 deflection yoke used in the above chassis not bearing any code triangle letter has been individually balanced at the factory to prevent objectionable yoke ringing (rippling of horizontal raster lines at the left third of the picture). To accomplish this, a ceramic capacitor,

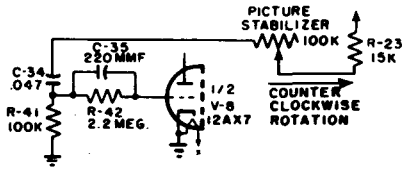


Fig. 72 — Emerson

tubes should be tried.) Those 6CB6 tubes which do not provide best video output in a given chassis are not defective and should be used for other functions.

If desired, it is possible to make the following simple modification (already included in later production) which will minimize the above effects:

1. The suppressor grid (pin 7) of the 6CB6 video amplifier (*V5*) is connected to the screen grid (pin 6) instead of to the cathode (pin 2). The tube is now operating as a tetrode tube rather than as a pentode.

2. The contrast control lead which was wired to pin 7 is now wired to pin 2 (cathode).

Note: When making this change on the above chassis, make certain that a 68-ohm, ½-watt resistor is added between the top side of the contrast control and pin 2 (cathode) of the video amplifier (*V5*, 6CB6) if one is not already there.

Similar difficulties with earliest models using the 6CB6 can be cured in the same manner.

EMERSON Chassis 120182-D, 120195-D, 120206-D, 120208-D, 120211-D

Stabilizing sync in noisy fringe areas (see Fig. 72).

A Picture Stabilizer control is added in later production runs of all of the above chassis. This addition effectively extends the range of these receivers by stabilizing the sync in electrically noisy fringe areas. This control is mounted at the rear of the chassis making it easily accessible.

Details of this change are as follows:

1. A 100k-ohm control (linear taper) is placed in the input circuit of the sync separator in series with *R23* (15k-ohms) and *C34* (.047 μf) as shown. The control is wired in such a manner that counterclockwise rotation increases the resistance placed in series with *R23* and *C34*.

2. In order to mount this control on the rear of the chassis, the following steps have been taken: (a) vertical linearity control is moved to chassis hole near the power transformer; (b) vertical size control is moved to the hole vacated by the vertical linearity control; and (c) Picture stabilizer control is added to the hole vacated by the vertical size control.

3. This control should normally be at its extreme clockwise position. If sync improvement is required in electrically noisy fringe areas, rotate the control counterclockwise for best picture stability. Note: For local signals this control should be set to its extreme clockwise position. Always adjust this control from its extreme clockwise position to the point where maximum stability is achieved.

EMERSON Chassis 120196-B, 120197-B, 120197-D, 120206-D

Increasing brightness range.

Depending on such variable factors as line voltage, picture tubes, high voltage transformers, etc., it may sometimes be desirable to increase the amout of reserve brightness on the above sets. This can easily be accomplished in the field in a matter of minutes since the chassis does not have to be removed from the cabinet.

Remove the capacitor (.0033 μf or .0068 μf) mounted between lugs 1 and 5 on the horizontal output transformer. This capacitor is electrically connected across the horizontal width coil. On some chassis, a 100-$\mu\mu$f, 4,000-volt capacitor is used in place of the above. This is connected between lugs 5 and 7 of the horizontal output transformer. This capacitor should be removed from those chassis which incorporate it.

In low line voltage areas the removal of the above capacitors may result in insufficient width even after readjustment of the horizontal width coil. If this is the case, replace the 6BQ6 horizontal output tube. Several of these tubes may have to be tried for best results. Those 6BQ6 tubes that do not afford maximum width, however, should not be considered defective.

FIRESTONE Chassis 700-series, 800-series

Replacement of h-v rectifier.

In the 21-tube 800-series chassis, a 1AX2 high-voltage rectifier tube is used, whereas in the 20-tube 700-series chassis either a 1X2 or 1X2A is used in this circuit.

If replacement of the high-voltage rectifier tube becomes necssary, the proper replacement type tube must be used, namely for 700-series chassis either a 1X2 or 1X2A, and for the 800-series chassis, a 1AX2 only.

The reason for this is that the 1A X2 tube uses a higher current filament in conjunction with a lower value (.51 ohm) dropping resistor and the insertion of a 1X2 or 1X 2A tube in this circuit will result in premature failure of the tube.

FIRESTONE Chassis 700-series

Signal weak and received on incorrect channel setting.

A complaint may be received of signals being received on wrong channel settings, such as channel 4 on 3, channel 5 on 4, channel 9 on 6. This can be caused by failure of 10-$\mu\mu$f capacitor *C410* connected between the grid (pin 6) of the 6J6 tube in the tuner and the switch wafer. To remedy, replace *C410* with the same type capacitor.

This condition has been encountered in only a few cases and these are all on sets that are approximately two years. old.

FIRESTONE Models 13-G-51,-52

Vertical drift.

The drift becomes apparent after the receiver has been in service for some time. The picture will roll

Schematic No.	*Old Part No.*	*Replace With New No.*
R223 (connected to pin 4 of vertical oscillator)	510765	510769 2 meg, ±5%, ½w
R225 (connected between vertical hold control and ground)	510172	510766 100,000 ohms, ±10%, ½w
R226 (connected to tap of vertical hold control)	510759	510768 4.7 Meg, ±10%, ½w
R227 (connected to high side of height control)	510752	510767 1.5 Meg. ±5%, ½w

vertically and is generally corrected by resetting the vertical hold control, but this must be reset again after the set is put in operation the second time. This could be caused by some unstable 6BL7GT tubes (vertical oscillator-output), and it is suggested that if this tube is needed, replacements be made by Sylvania 6BL7GT tubes identified by a star adjacent to the code date.

The above condition could also be caused by a change in value of resistors in the vertical circuit. Indicated above are those resistors that could be affected, showing the old part number and a suggested replacement resistor.

FIRESTONE Models 13-G-51,-52
Vertical bending in strong signal areas.

In moderate or strong signal areas, vertical bending may be encountered on chassis which include "F" in the series coding. On these chassis, the 27,000-ohm isolating resistor *R219* was removed from the plate circuit of the 12AU7 phase splitter tube to improve sync stability in weak signal areas. To overcome this bending action reinsert resistor *R219*.

FIRESTONE Models 13-G-51,-52
Improved sync stability in fringe areas (see Fig. 73).

The following circuit changes should be incorporated into chassis 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 this modification 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 the 140-volt B+ line. See part (A) of the figure. (This resistor is already included in some chassis.)

2. Disconnect pin 6 of the 6AC7 video amplifier from the 140-volt B+ line and insert an 8,200-ohm, 1-watt resistor as shown in part (B) of the figure.

3. Add a 12,000-ohm, 1-watt resister from pin 6 of the 6AC7 video amplifier to chassis ground.

4. Add a .25-μf, 200-volt capacitor from pin 6 of the 6AC7 video amplifier tube to ground.

FIRESTONE Models 13-G-110, -115,-116,-118,-119,-120, -126,-128,-129,-145,-146

"Mode hopping" of horizontal oscillator.

In some of the above mentioned sets, there is a tendency for the horizontal oscillator to "mode hop" or start at half frequency when the set is first turned on. This condition will show up as a singing noise from the high-voltage box and is usually accompanied by an absence of horizontal sweep and high voltage. This trouble is primarily due to the slow heating characteristics of the 6AX4 damper tube causing undue delay in the boost voltage supply.

Tube manufacturers have taken steps to improve the heating characteristics of the 6AX4 tube and in most cases it is felt that replacement of the old 6AX4 tube with one of recent manufacture will completely cure the trouble. However, in stubborn cases where replacing the 6AX4 tube does not correct the trouble, the following circuit change is suggested.

Replace the 40X331 drive control *R89* (150k ohms, linear, ¼ watt) with a 40X378 (150k ohms, linear, ½ watt). Wire as before and add an additional wire from the outside vacant lug to pin 6 of the damper tube (B+ 300 v). The drive control will now be wired as a potentiometer, with the boost voltage connected to one side and the B+ 300-v power supply voltage to the other. In addition the 430-$\mu\mu$f coupling capacitor, *C67* (connected between pins 1 and 5 of the horizontal oscillator), should be replaced with a 360-$\mu\mu$f unit, part No. 47X568, for additional stability. Check to see that the B+ 250-volt line is connected to the start of the horizontal frequency coil winding *L14*. Reversed connections to this coil would aggravate the unstable condition.

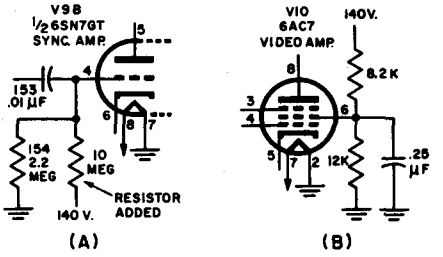


Fig. 73 — Firestone

Note: If sufficient horizontal cannot be obtained with the drive control in its maximum position, it is suggested that *C69* (coupling capacitor to pin 5 of the horizontal output tube) be increased to approximately 220 $\mu\mu$f.

FIRESTONE Models 13-G-110, -115,-116,-119,-120,-127, -128,-129,-130,-132,-135

Horizontal jitter.

In some new television areas particulary where final transmitter adjustments have not been made, an unstable picture, in the form of horizontal jitters, may be noticed. This is usually caused by phase shift in the timing circuits of the television transmitter. 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.

The above condition can be reduced substantially by removing the long time constant filter network, *C63* (.22 μf) and *R85* (33,000 ohms) from pin 4 of the 6SN7 horizontal oscillator tube. This network is used to minimize bending at the top of the picture and its removal will increase this tendency to some extent, depending on the individual chassis.

FIRESTONE Models 13-G-110, -115,-116,-119, -120,-127,-128

Elimination of drive bar.

In later production, the capacitance of the coupling capacitor between the horizontal oscillator and output tube was changed to 200 μμf. This lower value 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.

FIRESTONE Models 13-G-110, -115,-116,-119,-120

Sync control adjustment.

A sync control is provided on the rear of most of the above models. The purpose of this control is to enable the serviceman to adjust the set for maximum picture stability.

Adjust as follows: Tune the receiver to the strongest available signal. Turn sync control clockwise until bending of the picture occurs at the top, then turn slightly counterclockwise until bending just disappears.

FIRESTONE Models 13-G-110, -115,-116,-119,-120

Unstable vertical hold.

If it is necessary to set the vertical hold control at an extreme clockwise position in order to lock the picture, this condition should be corrected by changing *R50* (connected to high side of vertical hold control) from 1.5 meg to 1.8 meg.

A large percentage of 6BL7 tubes have unstable characteristics and because of this later production models have been changed to use a 6SN7GTA vertical oscillator output tube. In changing over to the 6SN7GTA tube, the following resistor changes are necessary:

1. *R59* (connected to tap of height control) is changed from 15k ohms, 2 watts, 10% to 6.8k ohms, 2 watts, 10%.
2. *R48* (connected to pin 6 of vertical oscillator-output tube) is changed from 1,500 ohms, ½ watt, 10% to 820 ohms, ½ watt, 10%.
3. *R57* (connected to pin 4 of vertical oscillator-output tube) is changed from 1 meg, ½ watt, 10% to 2.2 meg, ½ watt, 10%.

In cases where it is difficult to obtain a stable 6BL7 tube and it is considered advisable to change to the 6SN7GTA, the above resistor changes *must* be made for proper operation.

Important: Some early production chassis used a 53X159 vertical output transformer and 3.3k ohms at *R59* instead of a 53X156 transformer and 15k ohms at *R59*. The 53X159 transformer will not work with a 6SN7GTA tube; therefore, if the changeover is deemed necessary on one of these early chassis, it will also be necessary to change the output transformer to a 53X156 in addition to the resistor changes described above.

FIRESTONE Models 13-G-110, -115,-116,-119,-120

Agc threshold control.

In later production of the above models, an agc threshold control is added to minimize snow on weak signals. This control is located on the rear of the chassis and is marked AGC.

Proper setting of this control is as follows: Tune in strongest signal available and turn control clockwise until signs of overloading occur (buzz in sound or washed-out picture). Then turn the control a few degrees counterclockwise from the point of overload. (The stronger the signal, the more counterclockwise the setting will be.) In areas where signals do not exceed 10,000 microvolts, the control will usually be set at a maximum clockwise position.

This control is a 2.5-meg potentiometer, part No. 40X364, in series with a 2.7-meg, ½-watt, 10% resistor, part No. B84275, and is connected between the agc line to the tuner and B+ 150-volt line. The control and resistor combination take the place of the 3.9-meg resistor *R31* which was formerly connected between these two points.

FIRESTONE Models 13-G-110, -115,-116,-119,-120

Replacing flyback transformer.

In the event it becomes necessary to replace the flyback transformer (part No. 53X326) in the above sets, do not remove picture tube from the chassis as this repair can be effected without this unnecessary operation. In order to make this replacement, proceed as follows:

1. Remove the 6BQ6 shield compartment and tube, also the back cover plate on the transformer compartment.
2. Clip transformer leads close to terminals, and remove the four transformer mounting screws. Loosen 1B3 socket and capacitor assembly by removing nut on underside of chassis. Lift out transformer and socket assembly.
3. Unsolder filament leads from 1B3 socket. Solder filament leads of new transformer to 1B3 socket, making sure to get good rounded solder connections without sharp or jagged edges so as to avoid corona.
4. Mount new transformer in position but leave 1B3 socket assembly unmounted until all soldering is completed. Soldering will be much easier if the above procedure is followed. Be certain to dress leads on transformer exactly at the original assembly, keeping them away from 1B3 socket.
5. Remount 1B3 socket assembly, tube shield and cover plate.

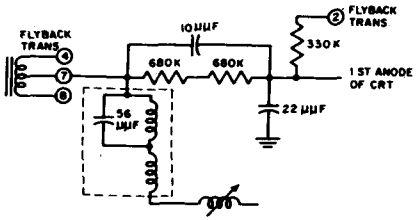


Fig. 74 — Emerson

FIRESTONE Models 13-G-110, -115,-116,-119,-120

Interference due to horizontal radiation.

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 (damper).

When this change is made, it will be necessary to remove the lead from terminal 3 of the horizontal output transformer to the heater terminal of the former 6W4 damper socket and the damper heater must now be grounded to the chassis at the socket.

The tube layout label should be changed so that at a later date, a 6W4 tube is not inserted as an immediate breakdown will result.

FIRESTONE Models 13-G-114, 114A,-117,-118,-121, -121,-122,-124,-125,-126

Vertical shading and horizontal ringing (see Fig. 74).

Under certain conditions, such as fringe area reception and transmitter variations, a condition may develop on the raster of some of the above series receivers known as vertical shading or crosstalk and horizontal ringing. In most cases, the shading is due to crosstalk in the deflection yoke, which can be lessened by increasing the value of *C220,* .01-μf, 600-volt capacitor (connected between the high side of the vertical output transformer and ground) to 1 μf, 1,600 volts.

To compensate for excessive ringing in the flyback circuit, which shows on the raster as alternate light and dark vertical bars, the following network is added to the horizontal blanking circuit.

1. Change *R227,* 2.2-meg resistor connected to pin 10 of the picture tube to 330k ohms, 1 watt.
2. Change *R318,* 15k-ohm, 1-watt resistor (also connected to pin 10) to 680k-ohms, 1 watt.
3. Change *C318,* 220-μμf, 1,000 volt capacitor connected to *R318* to 680k-ohm, 1-watt resistor.
4. Add a 10-μμf, 1500-volt capacitor to parallel the 680k-ohm resistors.
5. Add a 22-μμf, 1000-volt capacitor at the junction of the 330k-ohm and 680k-ohm resistor.

The schematic for the new arrangement, already made in later production, is shown here.

FIRESTONE Model 13-G-128

Replacement of uhf oscillator.

In some production of the uhf converters used in the above model, a 6T4 tube is used in place of a 6AF4 oscillator tube. These tubes are not interchangeable. If a replacement is necessary, always use the same type as originally used in the tuner, as plainly marked on the tube layout label.

FIRESTONE Model 13-G-141

Adjustment of single-channel uhf converter.

Field experience indicates that adjustment and tuning of this converter is critical if attempted in areas where signal is doubtful or weak. It has been found that better results can be obtained if the converter is adjusted and tuned to the uhf channel in an area where the signal strength is known to be strong and then installed on the receiver in the weak signal area.

FIRESTONE Models 13-G-151, -152,-152A

Eliminating horizontal ringing and vertical shading (see Fig. 75).

The blanking circuits in the above chassis are revised to eliminate horizontal ringing and vertical shading, by altering the means of feeding the vertical blanking signal and modifying the blanking circuits.

Briefly, this change is effected by taking the vertical blanking signal from the plate of the vertical output tube and including a damping resistor in series with the horizontal blanking pulse.

The wiring changes are effected in the following manner:

1. Remove *C218*, .1-μf, 600-volt capacitor in blanking circuit coupling network to cathode of crt.

2. Change *R316* from 22k-ohms, ½ watt to 8.2k-ohms, ½ watt.

3. Connect an 820-ohm, ½-watt resistor between terminal 6 of the No. 10147 flyback transformer and *C217*, a .02 μf, 600-volt capacitor.

4. Connect the other end of *C217* to the junction of *C219*, .1-μf, 600-volt capacitor and *R316*, a 8.2k-ohm, ½-watt resistor.

5. Remove *R315*, 3.9k-ohm, ½-watt resistor in the blanking circuit coupling network.

6. Connect a .01-μf, 600-volt capacitor (new value of *C218*) from the plate of vertical output transformer (blue lead) to the lug formerly used for junction of *C217*, *C218* and *R315*.

7. Connect two 33k-ohm, 1-watt resistors in series, solder, and clip leads. (Two 1-watt resistors are used in series in order that the operating pulse voltages will be within safe limits. A 2-watt, 68k-ohm resistor is *not* to be used in this application because of pulse rating.)

8. Connect dual 33k-ohm resistors between junction of *C217*, *R316* and .01-μf, 600-volt capacitor from vertical output tube plate.

Note: The above changes as shown in the schematic diagram have already been included in later production.

In addition to the above, the following modifications are made. A 27k-ohm, ½-watt resistor is added to

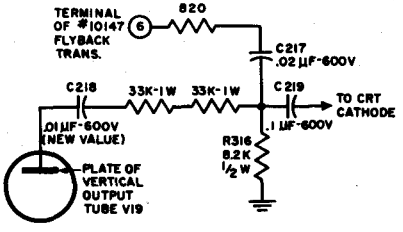


Fig. 75 — Emerson

attenuate the shaping pulse. By doing this, a certain amount of phase shift is noted. In order to compensate for this, a 22-$\mu\mu$f, 500-volt capacitor parallels the resistor to allow a certain amount of blanking to bypass the resistor in order to prevent this phase shift.

The change is made as follows:

1. Parallel a 27k-ohm, ½-watt resistor with a 22-$\mu\mu$f, 10%, 500-volt capacitor.

2. Insert this R-C network between lug 6 of the flyback transformer and *C217*, a .02 μf, 600-volt capacitor.

FIRESTONE Models with 40-mc i.f.

Eliminating television interference.

In some locations, television receivers using these higher intermediate frequencies may be subject to interference from local police transmitters or radio paging services operating on frequencies close to 40 megacycles. Interference of this type usually appears on the television screen as a crosshatching or herringbone pattern and cannot be tuned out by means of the channel selector or fine tuning control.

The recommended procedure for eliminating such interference is to augment the attenuation already built into the receiver by the addition of an external tunable i-f wave trap. The wave trap should be connected in the vhf antenna lead and mounted as close as possible to the input of the r-f tuner. Tune the trap to the frequency of the interfering station.

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