

TV field service MANUAL

with TUBE LOCATIONS

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TV field service MANUAL

with TUBE LOCATIONS

VOL. 3

Edited by
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PREFACE

Since the public is reluctant to part with its television receivers for any length of time, more and more servicing must be done in the home. Therefore, there is a need for information that will help the technician to quickly locate and eliminate any troubles he may find when working on equipment in the field. The purpose of this manual is to help him accomplish this work with a minimum expenditure of time, thus increasing his overall efficiency and enabling him to complete more service calls each day. The question immediately arises, how can this be done? The technician's assistant, the TV FIELD SERVICE MANUAL, will tell him what to do before he even opens up the back of the receiver, just by turning to the right page.

For every receiver model and chassis of the manufacturers covered, there is an individual listing of trouble symptoms (audio and video), as well as directions for their cure, in the form of a Troubleshooting Chart. In the front of this manual, troubles are described and shown pictorially in the form of sample test patterns under the heading, *Symptoms and Causes of Faulty Operation*. Under the section heading, *Adjustments*, there is provided the necessary information on how to make the horizontal oscillator, tuner oscillator, picture tube, and age adjustments correctly. Only those procedures are given which can be done in the home.

Tube Lists are found in the main part of the manual in order to identify the function and correct type of each tube in the receiver. The Top View layout, located near the Tube List shows the exact location of all the tubes. An additional feature of the Top View indicates the location of the sound i-f and detector alignment points, thus eliminating trial-and-error methods of finding them. Front and Rear Control Views identify all receiver controls. The Key Voltages, under the Tube Lists provide a means of isolating the fault to a given section of the receiver. The heading *Adjustments*, located under Key Voltages, tells which of the numbered tuner and horizontal oscillator adjustments to look for in the front of the manual. Dial stringing arrangements are shown where necessary. The numbers following the trouble headings in the Troubleshooting Charts refer to the particular paragraph and the accompanying picture tube pattern under the Symptoms and Causes of Faulty Operation section in the front of the manual.

After a receiver has been identified, the Table of Contents should be used to find the corresponding pages on which the service information appears. Try to match the receiver trouble as you see and hear it, with one of the headings in the particular Troubleshooting Chart, and follow the instructions that are provided. When tube numbers are given, locate them with the help of the Top View Chart and replace and check the tubes in question. When controls or alignment points are given, check the adjustments. Frequently, components are also listed to indicate possible failures which may cause the trouble symptom.

The editor wishes to express his appreciation to the tv manufacturers listed on the cover of this manual who furnished the service information used to produce this volume to John F. Rider Publisher, Inc.

December, 1954
New York, N. Y.

H.A.

TABLE OF CONTENTS

MODEL OR CHASSIS	PAGE	MODEL OR CHASSIS	PAGE
EMERSON		EMERSON	
86B, Ch.	26-27	667B, 668B, Ch. 120134-B, 120134-G	70-71
87B, Ch.	28-29	669B, Ch. 120129-B	64-65
571, Ch. 86B	26-27	673B, Ch. 120133-B	54-55
571, Ch. 86B	28-29	674B, Ch. 120334-G	70-71
585, Ch. 120025B, 120088B	34-35	675B, Ch. 120129-B	64-65
606, Ch. 66B	26-27	676B, Ch. 120140-B, 120140-G, 120140-H	60-61
606, Ch. 86B	26-27	676D, Ch. 120144-B, 120144-G, 120144-H	74-75
608, Ch. 120089B	30-31	677B, 678B, Ch. 120134-B	70-71
609, Ch. 120084-B	68-69	680B, Ch. 120144-B, 120144-G, 120144-H	74-75
611, Ch. 87B	28-29	680D, 681B, Ch. 120140-B, 120140-G, 120140-H	60-61
614, Ch. 120110B, 120110C	40-41	681D, Ch. 120144-B, 120144-G, 120144-H	74-75
614D, Ch. 120095-B	50-51	681F, Ch. 120143-B, 120143-H	72-73
618, Ch. 120090B, 120090D	32-33	683B, Ch. 120141-B	70-71
621, Ch. 120098B, 622, Ch. 120098P	36-37	684B, 685B, Ch. 120134-B	70-71
626, Ch. 120104B, 120104BJ	24-25	686B, Ch. 120144-B, 120144-G, 120144-H	74-75
628, Ch. 120098B	36-37	686D, Ch. 120140-B, 120140-G, 120140-H	60-61
629, Ch. 120114B	44-45	686F, Ch. 120143-B, 120143-H	72-73
629B, Ch. 120120	46-47	686L, Ch. 120142-B	72-73
629B, 629C, Ch. 120120-B	46-47	687B, Ch. 120144-B, 120144-G, 120144-H	74-75
629C, Ch. 120109C	44-45	687F, Ch. 120143-B, 120143-H	72-73
629C, Ch. 120120	46-47	687L, Ch. 120142-B	72-73
629D, Ch. 120124B	48-49	688B, 689B, 690B, Ch. 120129-B	64-65
630, Ch. 120099B	36-37	696F, Ch. 120143-B, 120143-H	72-73
631, Ch. 120109B	44-45	696L, Ch. 120142-B	72-73
632, Ch. 120096B	42-43	699B, Ch. 120148-B	76-77
633, Ch. 120114B	44-45	699D, Ch. 120160-B	82-83
637, Ch. 120110B, 120110C	40-41	700B, Ch. 120153-B	78-79
637A, Ch. 120095-B	50-51	700D, Ch. 120158-B	80-81
644, 647, Ch. 120113B, 120113C	38-39	700L, Ch. 120153-O	78-79
648B, Ch. 120110-E	40-41	701B, Ch. 120153-B	78-79
650, Ch. 120113B, 120113C	38-39	701D, Ch. 120158-B	80-81
650B, Ch. 120118B	58-59	709A, Ch. 120162-A	84-85
650D, Ch. 120123-B	56-57	711B, Ch. 120164-B	88-89
650F, Ch. 120138-B	52-53	712B, Ch. 120164-B	88-89
651B, Ch. 120120	46-47	714B, Ch. 120153-B	78-79
651B, Ch. 120120-B	46-47	714D, 715D, Ch. 120153-D	78-79
651C, Ch. 120109C	44-45	716D, Ch. 120163-D	86-87
651C, Ch. 120124B	48-49	716F, Ch. 120168-D	92-93
651D, Ch. 120124B	48-49	717D, Ch. 120163-D	86-87
654B, Ch. 120118B	58-59	717F, Ch. 120168-D	92-93
654D, Ch. 120123-B	56-57	719D, Ch. 120163-D	86-87
654F, Ch. 120138-B	52-53	719F, Ch. 120168-D	92-93
655B, Ch. 120123-B	56-57		
655F, Ch. 120138-B	52-53		
658B, 658C, Ch. 120124B	48-49		
659B, Ch. 120124	48-49		
660B, Ch. 120133-B	54-55		
661B, Ch. 120134-B, 120134-G	70-71		
662, 663B, Ch. 120127-B, 120128-B	66-67		
664B, Ch. 120133-B	54-55		
665B, Ch. 120131-B	62-63		
666B, Ch. 120135-B	70-71		

ADJUSTMENTS

Horizontal Oscillator Adjustment No. 1 (HOR. OSC. ADJ.-1)

Permit the receiver to warm up for several minutes. Tune in a television station and adjust contrast (picture) control for normal contrast setting. Rotate the horizontal hold control (usually located on the front panel) to the approximate center of its range. If the picture is not in sync, turn the horizontal lock (frequency) control (usually located on the rear panel) to the left or the right as required until the picture falls into sync. Continue turning this control to the point where the picture goes out of sync again. Then turn the horizontal lock (frequency) control back until it is adjusted to the approximate mid position of the range over which a stable picture occurs. The horizontal hold adjustment should now be satisfactory. However, to check the adjustment, turn the horizontal hold control very slowly, first to the right and then to the left. The picture should stay in sync over most of the range of this control. Next, reset the horizontal hold control to the approximate center of its range and interrupt the signal by switching the channel selector to another channel and then back to the channel on which the original check and adjustment was performed. The picture should fall into sync. If this is not the case, repeat the above procedure.

Horizontal Oscillator Adjustment No. 2 (HOR. OSC. ADJ.-2)

Allow the receiver to warm up for a few minutes. Tune in a television station and adjust the contrast (picture) control for normal contrast setting. If the picture cannot be brought into sync with the horizontal hold control, (usually located on the front panel) turn this control to the approximate center of its range. Then operate the hori-

zontal frequency and lock adjustments, (both located at the rear of the set on the horizontal oscillator transformer) until the picture is brought into sync.

If a test pattern is available, examine picture width and linearity. If necessary, make any correcting adjustments of width, linearity and drive controls before proceeding with the horizontal oscillator adjustment.

Now turn the horizontal hold control fully counter-clockwise. Momentarily interrupt the signal by switching the channel selector off channel and then back again. The picture may remain in sync. If so, adjust the horizontal frequency control (on the rear panel) until the picture goes out of sync and several diagonal bars sloping down to the left are visible. Turn the horizontal hold control clockwise very slowly and note the least number of diagonal bars obtained just before the picture goes into sync. If more than three diagonal bars are visible just before the picture pulls into sync, adjust the horizontal-lock-range trimmer slightly counter-clockwise. Momentarily interrupt the signal and recheck the number of diagonal bars present just before the picture goes into sync. Repeat the last steps of this procedure until only three bars are present.

Shift the picture to the right so that the blanking bar at the left side of the picture is visible. The shift of the picture can be done by movement of the focus coil or magnets, or the centering controls or magnets, depending on the particular receiver control combinations.

While observing the left side of the picture, slowly rotate the horizontal frequency control (in either direction) in such a way as to move the picture to the right until the blanking bar at the left of the picture just begins to jitter or wobble. Then slowly turn the horizontal frequency control in the opposite direction until the blanking bar moves to the left and the picture just becomes stable. Recenter the picture and check the horizontal hold on all active channels. If properly adjusted, a synchronized picture should appear on all of these positions. If this is not the case, repeat the above procedure.

Horizontal Oscillator Adjustment No. 3 (HOR. OSC. ADJ.-3)

Permit the receiver to warm up for several minutes. Tune in a television station and adjust the fine tuning control for best sound quality. Turn the horizontal hold control to its mid position and adjust the horizontal frequency control (rear panel) until the picture is synchronized. Adjust the contrast (picture) control so that the pic-

ture is a little below average contrast level. Turn the phase adjustment screw (on the side opposite the horizontal frequency control on the horizontal oscillator transformer) until the blanking bar, which may appear in the picture, moves to the right and off the raster. The range of this adjustment is such that it is possible to approach an unstable condition. The length of the stud beyond the bushing is usually about one-half inch in its correct position.

Turn the horizontal hold control to the extreme counter-clockwise position. Next, turn the horizontal frequency adjustment (usually clockwise) until the picture falls out of sync. Then turn it slowly back to the point where the picture falls into sync again. Readjust the horizontal phase adjustment so that the left side of the picture is close to the left side of the raster, but does not begin to fold over.

Finally, turn the horizontal hold control to its extreme clockwise position. The right side of the picture should be close to the right side of the raster, but should not begin to fold over. If it does not fill this requirement, readjust the horizontal phase control.

To check the action of the horizontal oscillator, momentarily remove the signal by switching off the active channel. When you switch back to the station, the picture should fall into sync. If it does not, turn the horizontal frequency control until the picture falls into sync. Then turn the horizontal hold control to the extreme counter-clockwise position and remove the signal momentarily. Upon restoring the signal the picture should fall into sync. If the picture does not go into sync after momentary removal of signals in both extreme positions of the horizontal hold control, the pull-in range may be inadequate, although a pull-in through three-quarters of the horizontal hold control range is satisfactory.

Tuner Oscillator Adjustment No. 1 (TUNER OSC. ADJ.-1)

High-channel adjustment *A*, and low-channel adjustment *B* of the tuner oscillator are accessible from the front of the receiver when the channel tuning knobs are removed. These two adjustments are shown on the tuner unit front view shown in Fig 1. In this tuner type, the high-channel adjustment *A* has to be done before the *B* adjustment. The adjustments are optimized on channel 13 and channel 6 respectively. The procedure below gives the adjustment for any available stations.

High Channels. Set the channel selector switch to the highest available station between channels 7 and 13. Set the fine tuning control to

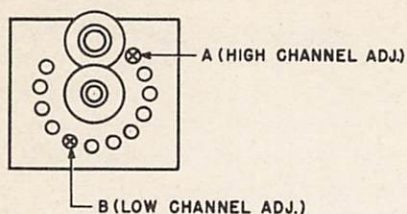


Fig. 1—Tuner oscillator adjustment No. 1.

its mechanical mid position. Remove channel selector and fine tuning knobs. Adjust *A* for best picture definition and maximum sound volume along with minimum distortion. The remaining high-channel stations should then be within the range of the fine tuning control.

Low Channels. Set the channel selector switch to the highest available station between channels 2 and 6. Set the fine tuning control to its mechanical mid position. Adjust *B* for best picture definition and maximum sound volume along with minimum distortion. The remaining low-channel stations should then be within the range of the fine tuning control.

Tuner Oscillator Adjustment No. 2 (TUNER OSC. ADJ.-2)

In this tuner type, the oscillator frequency of each channel can be adjusted individually. This adjustment becomes accessible only for the particular channel to which the tuner is switched. The channel tuning knobs have to be removed to make it possible to insert a tuner alignment tool into the fine tuning adjustment screw shown in Fig. 2. The alignment procedure is given below.

Set the channel selector knob for a station in operation. Adjust all other controls for normal picture and sound. Set the fine tuning control to approximately the mechanical mid position of its full rotation. Remove channel selector and fine tuning knobs. Insert a $\frac{1}{8}$ -inch

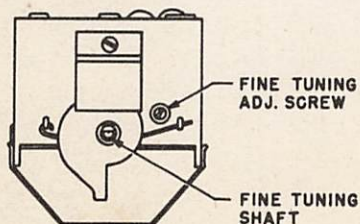


Fig. 2—Tuner oscillator adjustment No. 2.

blade, non-metallic screw driver (tuner alignment tool) in the $\frac{1}{4}$ -inch hole adjacent to the channel fine tuning shaft. Carefully adjust the fine tuning adjustment screw (tuner slug) for best picture with clear detail for each channel in operation. Be sure that the fine tuning control is set at the center of its range before adjusting each channel slug. Only slight rotation of the slugs will be required; turning the slug in too far will cause it to fall into the coil.

In the event that the slug falls into the coil, the chassis usually has to be removed from the cabinet to remove the particular coil strip from the tuner.

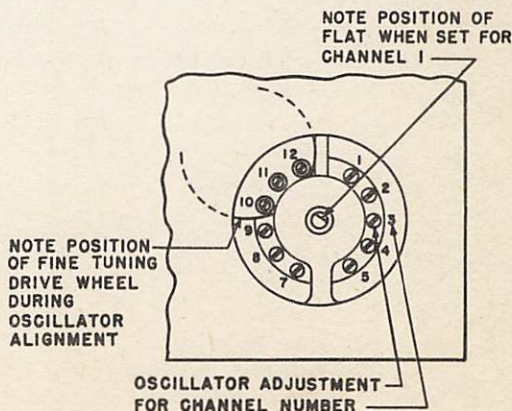
With the correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the fine tuning control. This may not necessarily be maximum sound output.

Tuner Oscillator Adjustment No. 3 (TUNER OSC. ADJ.-3)

When an oscillator adjustment is necessary in this type tuner, it should be remembered that all individual channel adjustments effect the other remaining channels. Therefore, the following procedure must be followed in its correct sequence.

Turn the channel selector knob to the highest frequency active channel. Set all operating controls to receive best picture and sound. Turn the fine tuning oscillator adjustment to its mechanical mid range position. Remove the tuner knobs. Remove escutcheon by sliding spring clip to the left. Readjust fine tuning oscillator adjustment to its mechanical mid position. Locate the oscillator tuning slug which corresponds with the highest active channel (see Fig. 3). Use a non-metallic align-

Fig. 3—Tuner oscillator adjustment No. 3.



ment tool or screwdriver to touch-up this individual oscillator channel adjustment for best picture and sound. Switch the channel selector to the next lower active channel and repeat the oscillator tuning touch-up adjustment.

Follow the same procedure in adjusting all other active channels, always working down from the higher to the lower channels. After all these oscillator tuning adjustments have been made, it is usually necessary to check all channels for their proper tuning again and to make a final fine adjustment on each of these channels.

The individual tuner oscillator adjustments for channels 13 and 6 are not accessible from the front of the receiver. Should either of these two channels need adjustment, the receiver chassis has to be removed and a complete tuner alignment must be performed using the factory-authorized alignment procedure.

Tuner Oscillator Adjustment No. 4 (TUNER OSC. ADJ.-4)

Oscillator adjustments in this tuner are made in sequence from channel 13 down through channel 2. The alignment procedure is as follows:

The fine tuning control is first set to the middle of its adjustment range. Set the channel selector switch to channel 13. Adjust the oscillator slug for this channel (see Fig. 4) until the best picture and sound are received. Next, repeat this procedure for channel 12, then channel 11 and so on down the line.

There is no oscillator adjustment for channel 7. Alignment of the oscillator on channel 8 automatically assures proper alignment on channel 7. After the high-frequency channels are aligned (13 through 7), each low-frequency channel can be aligned individually although the oscillator slug for channel 6 can be used to shift the complete low-frequency band if desired.

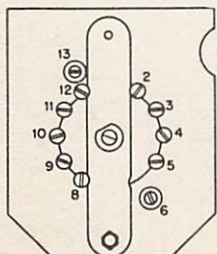


Fig. 4—Tuner oscillator adjustment No. 4.

AGC Control

To adjust the agc control, tune the receiver to a very strong station signal and sync the picture. Turn the agc control until the picture bends or overloads slightly. Then turn the control back just to the point where the bend disappears.

The above method may not always work because it may not be possible to get the picture to bend. This is an indication that the picture signal is not strong enough to cause the i-f system to overload. In this case, turn the agc control until the snow in the picture becomes more pronounced or the picture becomes washed out. Then turn the control in the opposite direction until the best signal-to-noise ratio is obtained.

After the adjustment, check the receiver on all channels. The receiver should not overload on any station, or show a bend in the picture. If there is an overload, the agc control must be readjusted on the particular channel involved. If the channel selector is turned from one active channel to another, the picture should appear immediately. If it does not appear as soon as the channel selector is changed, the agc control must be readjusted.

Picture Tube Adjustments

The mounting of the yoke and its position on the neck of the picture tube effects the resulting picture on the screen of the picture tube. Always push the deflection yoke as far as possible towards the face of the picture tube. Rotate the yoke until the picture is in the correct horizontal position (minimum tilt) and is properly centered. Tighten all screws, nuts and bolts holding the deflection yoke and its mounting.

The adjustment of the focus coil or magnet should preferably be done when the receiver is tuned to a channel transmitting a test pattern. Always be careful not to move the focus coil or magnet closer than about $\frac{3}{8}$ inch from the deflection yoke. The metal case of the focus unit never should touch the neck of the tube. Loosen the focus coil or magnet mounting screws only enough to allow the unit to be tilted up and down and be rotated. Tilting and rotation of the focus coil or magnet positions the picture on the face of the picture tube. Neck shadows in the corners of the picture can be eliminated by manipulation of the focus coil or magnet.

If a focus coil is used, the focus control must be adjusted to its mechanical center of rotation and the position of the focus coil along

the neck of the tube must then be adjusted to the point where the best focused picture is obtained. Usually the tilt and the rotation of the focus coil have to be altered slightly to compensate for the change of position on the tube neck. It is necessary that the focus control be adjustable in such a way that one rotation through its range will carry the picture "through focus." If a sharply focused point can be reached or even only approached at one of the extreme positions of the focus control setting, reposition the focus coil as outlined above.

A p-m focus unit must be repositioned in the same manner as the focus coil type unit.

Whenever an adjustment of the focus coil or magnet is necessary, the ion trap must be readjusted for maximum brightness. After the ion trap adjustment, the picture may have moved or neck shadows may result. Always readjust the focus unit to eliminate these effects. Never use the ion trap to center or remove neck shadows in the picture.

Adjust the ion trap by moving it forward or backward rotating it slightly at the same time around the neck of the picture tube so as to produce the brightest raster on the screen. Then reduce the brightness control setting until the raster is barely visible. Readjust the focus control until the line structure of the raster is clearly visible. Again readjust the ion trap for maximum brightness. The final adjustment of the ion trap should then be made with the brightness control at the maximum position where good line focus can be maintained.

Correction Magnets. In many receivers using a large screen picture tube there will be found two magnets mounted on the deflection yoke bracket. These are the correction or anti-pincushioning magnets. Ordinarily their position is along the horizontal picture axis. These magnets are used to obtain linear sweep lines across the entire face of the picture tube. Improperly adjusted correction magnets may cause pincushioning, barreling, keystoneing, poor linearity, etc. If an adjustment becomes necessary, the vertical and horizontal size of the picture should be reduced with the respective controls to a point where the four corners and sides of the raster become visible. Then move the magnet arms until the corners of the raster become right angles and the opposite sides are parallel. After this adjustment, the picture should be restored to normal size.

Magnetic Centering Devices. Electrostatically focused picture tubes do not use external focus coils or magnets. Some other means of centering the picture must be employed. Commonly, two slightly different arrangements are used. In one type, two magnet rings are mounted on the rear of the deflection yoke cover. These magnet rings are provided with tabs so that each ring may be rotated independently around the neck of the pic-

ture tube. Adjustments are made by first moving these tabs together and then rotating the two magnet rings at the same time to center the picture. If the picture cannot be centered in this manner, gradually turn one of the tabs with respect to the other while rotating the complete unit around the neck of the picture tube until the desired result is obtained.

The other type of centering device used has an appearance similar to an ion trap. The only difference is that the magnet itself can be rotated within its mounting by means of a small shaft. The unit is mounted on the neck of the picture about $\frac{1}{8}$ inch away from the rear cover of the deflection yoke. Then the magnet is turned slowly while the entire unit is rotated until the picture is centered on the screen.

Whenever either of these centering devices is used, the ion trap adjustment must be rechecked whenever the centering has been readjusted.

Filament Wiring

Filament wiring diagrams are shown for those receivers with tube filaments wired in series or in series-parallel. When no filament wiring diagram is shown for a particular receiver, it is assumed that the filaments are wired in *parallel*.

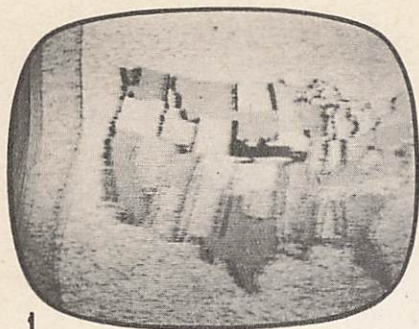
SYMPTOMS AND CAUSES OF FAULTY OPERATION

The numbered picture tube patterns on the following pages (reproduced through the courtesy of the Raytheon Manufacturing Co.) illustrate the faults that are described below. Also included in the text are discussions of some causes of faulty operation which appear in the troubleshooting charts but which are not illustrated here.

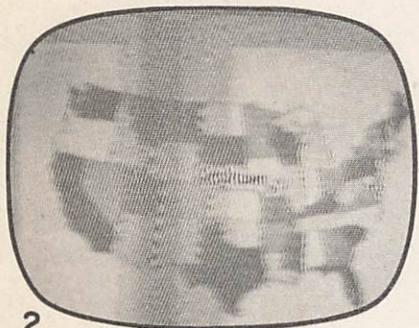
No. 1. Tuner Oscillator Mistuning. This picture condition is usually accompanied by a distorted or low sound output. A similar condition may be caused by a faulty antenna or antenna installation. Also check the following headings on the troubleshooting charts for the receiver on which the condition illustrated exists: *Weak Pix - Sound and Raster OK, Smearred Pix, Poor Pix Detail, Engraved Effect in Pix, and Distorted Sound.*

No. 2. This is a condition referred to as *Cross Channel Interference* or *Channel Crosstalk*. It may be caused by the signal from another station operating on the same channel in a different location or be due to adjacent channel interference. Check the antenna orientation and also the alignment of the adjacent channel traps. The dark bars are the blanking bars of the interfering channel.

No. 3. R-F Interference. This is usually caused by an undesired high-frequency signal which is being picked up by the front end of the receiver on which the interference is visible. Check the antenna installation and orientation. Location of the antenna may have to be changed and a higher gain, more directive unit may have to be installed. The interference pattern is usually in motion and appears as diagonal lines or a herringbone effect.

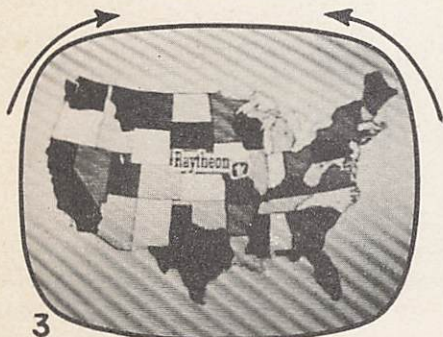


1



2

MAY MOVE SIDEWAYS



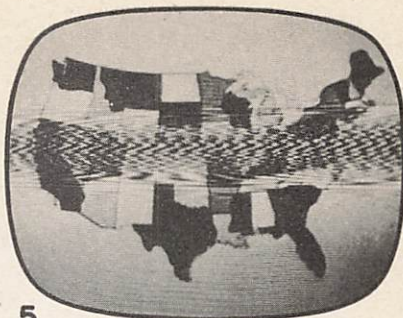
3

VARIES FROM STATION TO STATION



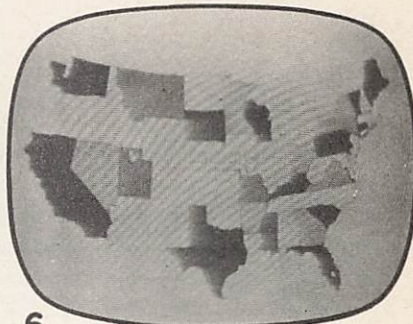
4

MOVES UP OR DOWN

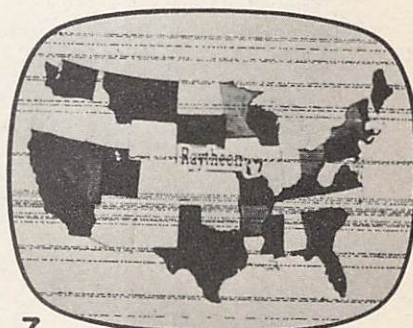


5

MAY MOVE UP OR DOWN



6



7

MOVES UP AND DOWN



8

AVERAGE PICTURE

No. 4. *Sound Bars in Picture.* This condition is caused by sound signal reaching the grid or cathode of the picture tube. This interference can originate either outside the receiver or within it. If several channels are in operation at the same time and only one shows this effect, it is almost certain that it is not caused by the receiver itself (assuming proper tuning is used). However, when this interference appears on all channels, check all items under the heading *Sound Bars in Pix* in the troubleshooting charts. The interfering horizontal bars are usually not stationary, but rather move up and down with their number changing in step with the transmitted sound signal.

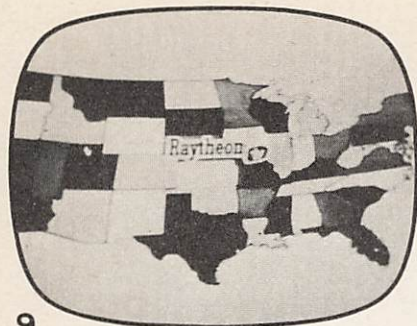
No. 5. A picture tube pattern like this is most commonly referred to as *Diathermy Interference*. The cause always lies outside the receiver, and is due to equipment such as X-ray units, commercial r-f heaters, ultra-violet equipment, fluorescent lights, teletype, etc. For the most effective reduction of this interference, employ filters directly at the source itself.

No. 6. A very strong signal may cause an overloading of the video amplifiers with a resulting *Washout of the Picture* or *Overloading Washout*. If this symptom appears on only one channel, the signal of that station causes the overload and a trap should be installed to reduce this effect. If this condition is visible on all channels, the tuner video i-f or detector, or the video amplifiers are being affected. In receivers where an agc system is used, a defect in this circuit can cause this type of trouble.

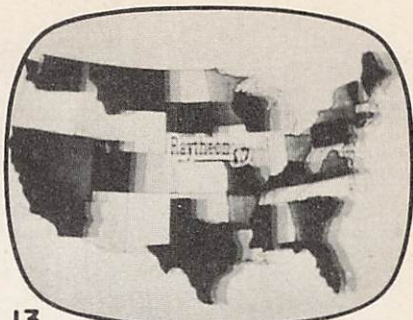
No. 7. *Ignition Interference* is caused by the ignition systems of automobiles and stationary gasoline engines in the immediate vicinity of the receiver on which this pattern appears. A similar condition may result from arcing inside the receiver, such as in the high-voltage supply. If the interference is caused externally, the effects may be reduced by improving the antenna installation. If a long transmission line is used, the shielded variety will almost always reduce the electrical noise pickup over the unshielded lead-ins. The appearance of the interference pattern changes constantly, and black, white and grey streaks run up and down and also across the picture.

No. 8. *Average Picture.* This is a normal picture produced by proper operation of the receiver.

No. 9. *Excessive Raster Width* is a condition caused by a fault in the horizontal output circuit. It is important to bear in mind that

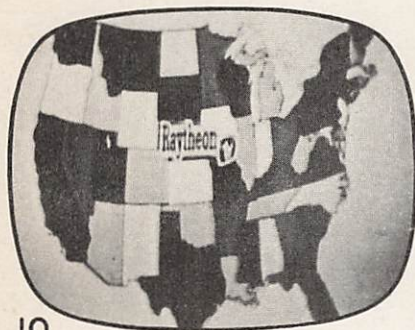


9

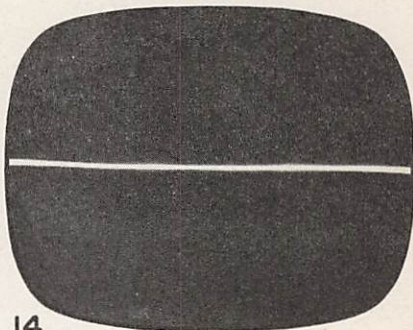


13

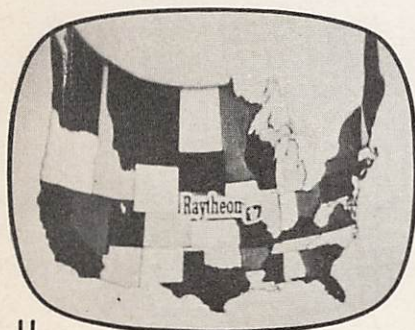
VARIES FROM STATION TO STATION



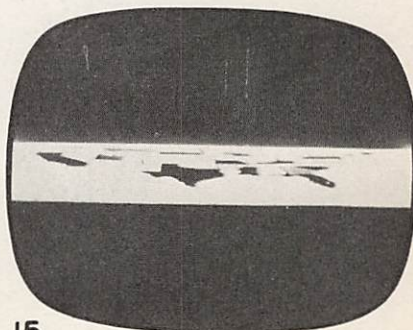
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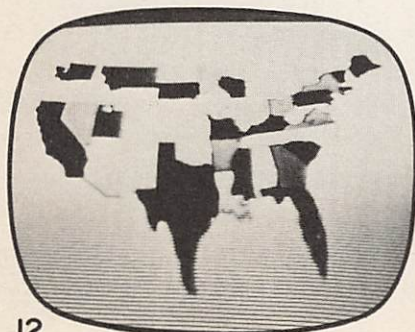
14



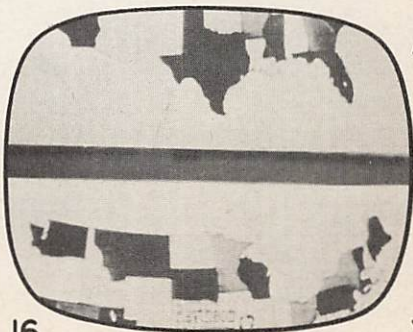
11



15



12



16

MOVES UP AND DOWN



a beam with a low second anode voltage is sluggish or soft and can easily oversweep the picture tube face. Check the *Excessive Raster (Pix Size)* for probable breakdowns and corrective adjustments.

No. 10. *Excessive Picture Height* is a condition usually caused by the misadjustment of the vertical size (height) and the vertical linearity controls. The necessary adjustments should be made when a test pattern is transmitted to assure correct vertical linearity at the proper height setting.

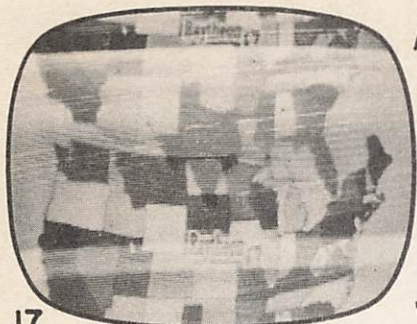
Nos. 11, 12. *Poor Vertical Linearity* is a condition wherein the picture is squeezed or stretched non-uniformly on the screen. This type of condition usually originates in the vertical oscillator or vertical output circuits. For correction, check the following headings on the troubleshooting charts for the receiver on which the condition exists: *Poor Vert. Lin.* or *Insufficient Raster Height*. An adjustment of the vertical linearity control usually makes the adjustment of the height (vertical size) control necessary and vice versa. In the majority of receivers, the height control affects the bottom of the picture and the vertical linearity control affects the upper portion of the picture.

No. 13. *Ghosts* may be due to the transmitted signal being reflected from buildings or other objects. Ghosts usually appear differently on different channels. To eliminate or reduce these effects in the picture, check the orientation of the antenna, or install an antenna with improved directivity.

No. 14. *No Vertical Sweep* is a condition where only a narrow line appears on the picture tube. It is caused by loss of the vertical deflection signal. The trouble is almost always in the vertical oscillator or vertical output circuits. For its correction, check the *No Vert. Defl.* heading on the troubleshooting chart for the receiver in question. An ohmmeter can be used to check the vertical deflection coil and output transformer windings.

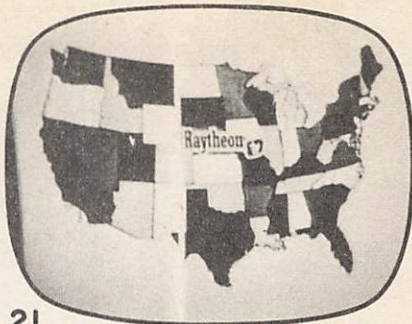
Nos. 15, 26. *Insufficient Vertical Size* is a condition in which the picture does not fill the screen vertically. For its correction, check the *Insufficient Raster Height* heading on the troubleshooting chart for the receiver.

Nos. 16, 17. The two picture tube patterns shown represent a picture which has *Poor Vertical Sync* as indicated by the picture being in motion vertically. For correction, check the *No Vert. Sync. - Hor.*



17

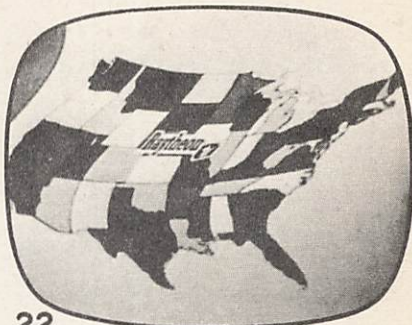
MOVES UP OR DOWN



21



18

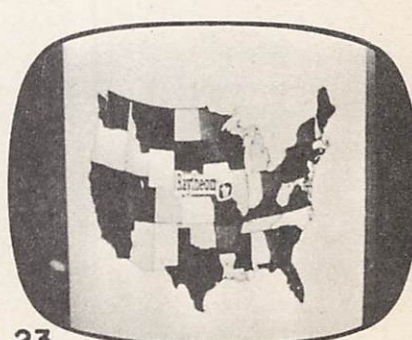


22



19

MOVES FROM SIDE TO SIDE

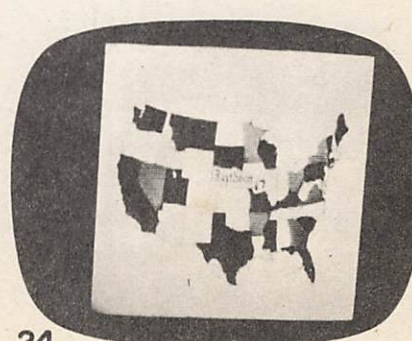


23



20

MOVES FROM SIDE TO SIDE



24

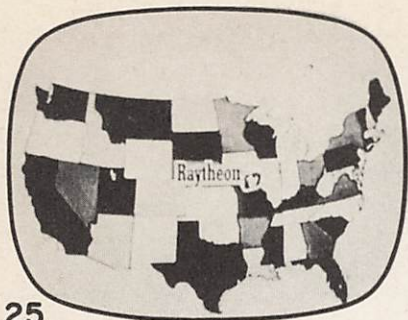
Sync OK heading on the troubleshooting charts. Poor vertical sync is generally caused by improper adjustment of the vertical hold control or a defect in the vertical oscillator, sync amplifier or sync clipper circuits. In receivers where an agc or a noise-gate control is incorporated, these adjustments might need correction and should be checked. Another cause of a poor vertical sync condition may be a defect in the r-f, i-f, video amplifiers, or agc circuits. This may be checked quickly by observing the vertical blanking bar. If the detail in the blanking bar is not blacker than the blackest portion of the picture, an overloading condition exists. For correction, refer to condition No. 33.

No. 18. A Tilted Picture is a condition caused by an incorrectly positioned deflection yoke. For correction refer to *Picture Tube Adjustments*.

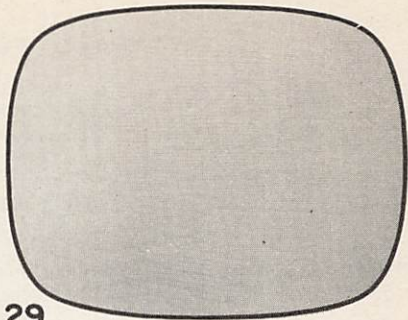
Nos. 19, 20. *Poor Horizontal Sync* is a condition which may be caused by the misadjustment of the horizontal oscillator controls. For correction, check the following headings in the troubleshooting chart for the receiver on which the condition exists: *No Hor. or Vert. Sync. - Pix Signal OK* or *No Hor. Sync. - Vert. Sync. OK*. If agc and noise gate circuits are used, check the adjustment of these controls first.

No. 21. A white *Drive Bar* is often caused by a defective tube or component in the horizontal output circuit. This vertical bar is always at the left side of the picture and might be followed by a number of other bars, equally spaced, but decreasing in intensity from left to right. For the correction of such conditions refer to the *Vert. Bars* heading on the troubleshooting charts. These bright bars are the result of undesired oscillations in the horizontal output circuit. They might be due to poor damping action, Barkhausen oscillation, and ringing of the deflection yoke.

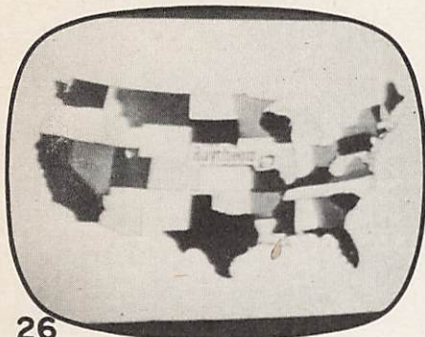
No. 22. *Horizontal Displacement* is an unstable horizontal hold condition. Very similar conditions hold true for patterns No. 19 and 20. Always check the adjustment of the horizontal oscillator controls. Also make certain that the noise gate and agc controls (when used) are correctly adjusted. For correction on a particular receiver, use the suggestions listed under the heading *Pix Bending* on the troubleshooting charts.



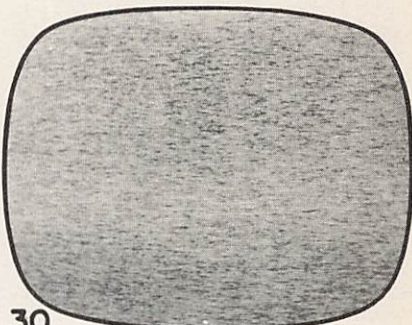
25



29



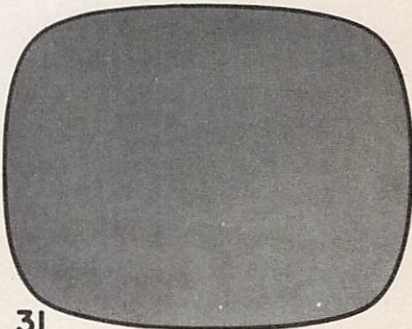
26



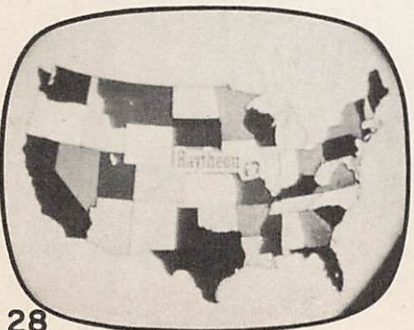
30



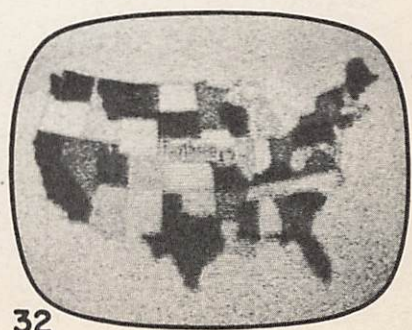
27



31



28



32

No. 23. If the picture or raster does not fill the picture tube horizontally, and a dark section appears either on the left, right or on both sides, the condition can be best classified as *Insufficient Horizontal Size*. The cause of such a reduction in width can usually be traced to the horizontal output stage. For correction, check the heading *Insufficient Width* in the troubleshooting charts.

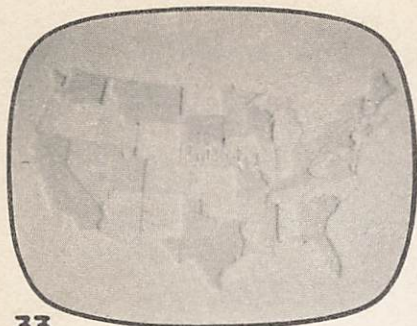
No. 24. *Insufficient Horizontal and Vertical Size* is sometimes caused by an incorrect horizontal drive control, horizontal size (width) control, horizontal linearity, vertical size (height) control, and vertical linearity control adjustments. Another source of such trouble may be the boosted B+ filter network. Also a low B+ voltage, as well as a low a-c line voltage may cause the picture to shrink to small proportions.

No. 25. *Incorrect Centering* is a condition in which the picture has sufficient height and width, but does not fill the useful picture tube area. If the receiver under question incorporates centering controls, these should be used first in an attempt to position the picture correctly on the picture tube. Certain other receivers are equipped with centering magnets mounted directly on the back cover of the deflection yoke. On receivers which use a focus coil or magnet, the centering of the picture can be accomplished by the mechanical alignment of this unit. For the procedure to be used, refer to *Picture Tube Adjustments*.

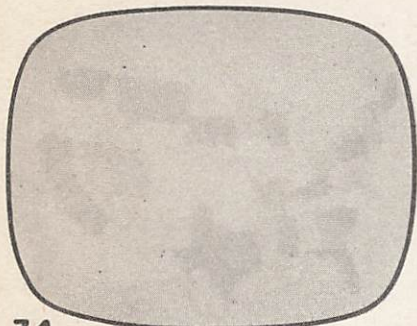
No. 26. See No. 15.

Nos. 27, 28. *Incorrect Centering* and *Tube Shadow* are faulty picture conditions where the picture shows an off-center condition and blacked-out corners. It is usually caused by an incorrect position of the deflection yoke. For correction refer to *Picture Tube Adjustments*.

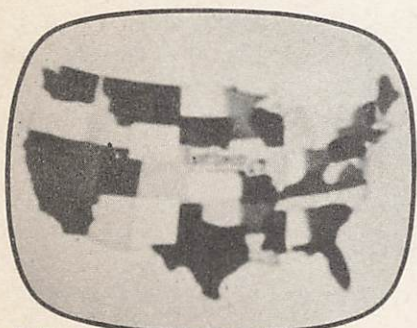
No. 29. When the picture tube is lit (raster is present) but *No Picture* can be seen, loss of video reaching the picture tube is indicated. This condition may be caused by a defect in the r-f, i-f, or video amplifiers. As a fast method to help localize the defective stage causing the trouble, observe the screen of the picture tube at both maximum and minimum picture (contrast) control settings. If an increase in snow is not apparent at the maximum picture control setting, the trouble is usually in the video amplifier, video detector



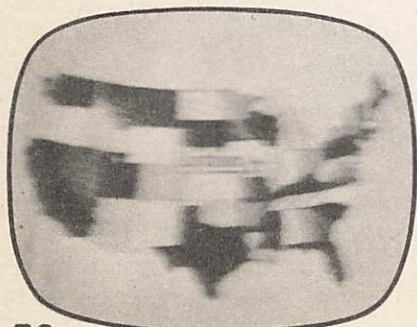
33



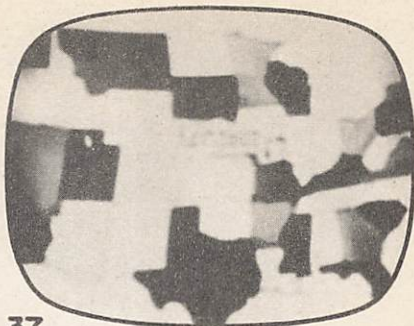
34



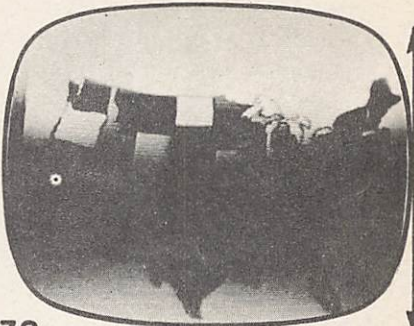
35



36

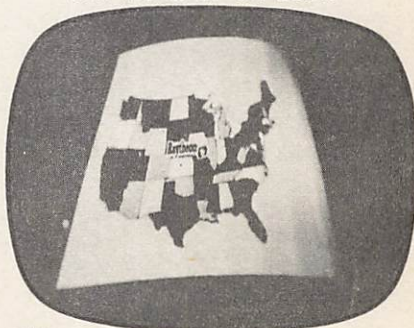


37

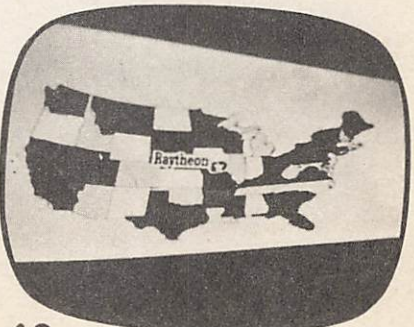


38

MAY MOVE UP OR DOWN



39



40

or i-f amplifier circuits. If an increase in snow can be observed the trouble may be in the tuner or possibly in the first i-f amplifier stage.

Nos. 30, 32. A *Weak Picture with Snow* or *No Picture with Snow* (raster visible) is a condition which is usually caused by a defective antenna installation or a defect in the tuner, the first i-f amplifier, or the agc system. Snow is an indication of a low signal-to-noise ratio. Refer to the troubleshooting charts under the following headings: *Weak or No Pix - Sound Weak - Raster OK* and *Snow in Pix*.

No. 31. *No Raster with Normal Sound* is a condition in which no illumination can be observed on the screen of the picture tube, however the sound is completely normal. Usually the cause of such a failure can be traced to a defect in the high-voltage supply (horizontal oscillator included) or the components directly associated with the picture tube. (It is assumed of course that the ion trap is properly adjusted.)

To check the high-voltage supply, disconnect the second anode lead from the picture tube and measure the voltage with a high-voltage probe and meter. An alternate method is to arc the lead to the chassis. Extreme care must be exercised so as not to touch the terminal of the lead directly to the chassis while the receiver is on. If this is done, the high voltage or B+ fuse will usually blow. If the high voltage appears to be correct, the receiver trouble is probably not located in the h-v circuit. If no second anode voltage is present, all tubes associated with this circuit should be checked first. For correction on a particular receiver, refer to the heading *No Raster - Sound OK* on the troubleshooting charts.

No. 32. See No. 30.

No. 33. *Overloading* is a condition in which one or several of the amplifiers are operated beyond their capabilities. This may happen when either the signal applied to the amplifier is too large in amplitude, or the circuit itself has become defective, due to a faulty component or incorrect operating voltages (including agc) applied to it.

If the overloading condition exists only on one channel, the input signal should be temporarily attenuated. If the overloading disappears, the receiver is not at fault and a permanent attenuator for the strong channel should be installed at the antenna input. If the receiver overloads on more than one channel or the attenuator check

did not clear the trouble, refer to the troubleshooting chart heading *Engraved Effect in Pix*.

No. 34. Weak Picture may or may not be accompanied by weak sound. In a receiver which has a split i-f system, weak sound and picture is an indication of a defect in a stage before the sound i-f takeoff (usually after the first i-f amplifier). In a receiver which incorporates an intercarrier sound i-f system, weak sound and picture does not narrow down the trouble to one particular section, as the trouble may be in the tuner, the i-f system, or the detector. If only the picture is weak but the sound is normal, make the first checks in the video amplifier. Also refer to the troubleshooting charts under the following headings: *Weak Pix - Sound and Raster OK* and *Weak or No Pix - Sound Weak - Raster OK*.

No. 35. Poor Focus is a condition caused by the improper operation or adjustment of the picture tube. Insufficient high voltage, a poor yoke, a defect in the B₊ supply, and improper focus and the ion trap adjustments are a few sources of this type of trouble. For focus and ion trap adjustments, refer to the section *Picture Tube Adjustment*. In addition, check the troubleshooting charts under the heading *Poor Pix Detail*.

No. 36. Smear is a condition which should not be confused with poor focus. Usually the scanning lines are clearly visible, but the darker portions of the picture do not end with a well-defined line but a smear. This condition is usually due to a defective tube, component, or alignment of the i-f or video amplifier circuits. For correction refer to the troubleshooting chart heading *Smeared Pix*.

No. 37. Picture Blooming may be a condition which has the same appearance as *Poor Focus*, but blooming is either caused by a gassy picture tube or a low second anode voltage output. The blooming effect will vary with the adjustment of the contrast (picture) and brightness control. For its correction, refer to the heading of *Picture Blooming* on the troubleshooting charts.

No. 38. 60 Cycle Hum is indicated by a single dark or possibly light wide horizontal band in the picture. This band may very slowly drift up or down the picture. Usually this type of trouble is caused by a filament-to-cathode short or leakage of one of the tubes in the r-f, i-f or video-amplifier stages. For the tubes which might cause this symptom refer to the troubleshooting charts under *AC in Pix Dark Hor. Bar*. A quick check that does not involve substituting tubes, is

to short the cathode of each tube to ground while observing the picture. If this is done on the defective tube, a radical reduction of hum will be noticeable in the picture.

Nos. 39, 40. A *Trapezoidal Raster* is caused by a defective deflection yoke or associated components. A total or partial short in either deflection coil will produce the effect shown (No. 39 is the result of a defect in one horizontal coil while No. 40 is the result of a defect in another vertical coil). Before replacing a yoke, check the damping resistors and equalizing capacitor because one of them may be shorted.

Poor Hor. Lin. (poor horizontal linearity) is a condition in which the picture is stretched or squeezed horizontally in a non-uniform manner. Usually it is caused by a defect in the horizontal output stage or the damper. The horizontal drive and linearity controls will be able to compensate for small changes within these stages.

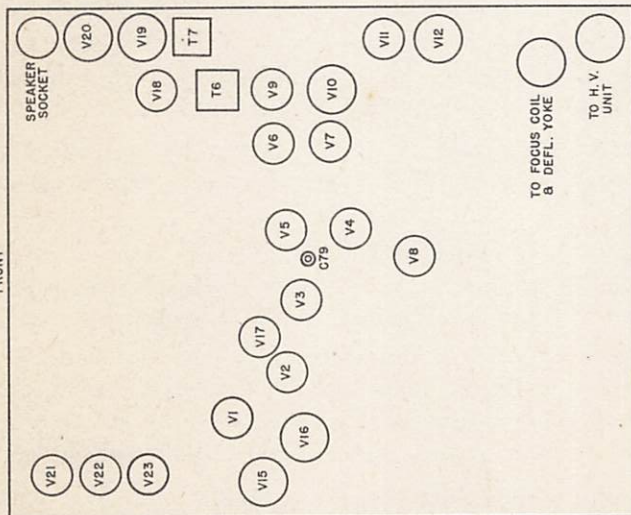
Pix Jitters Sideways is a condition originating from the lack of proper horizontal hold. Often a simple adjustment of the horizontal oscillator and discriminator or control circuit will eliminate such trouble. The tubes listed under the above heading in the troubleshooting charts should also be checked by substitution.

Intermittent Raster - Sound OK is usually caused by intermittently defective components and tubes in the high-voltage or horizontal oscillator circuit.

Insufficient Brightness is indicated by reduction of the overall illumination level of the picture or raster. The correct positioning of the ion trap should always be checked and the brightness control should also be checked (refer to the *Picture Tube Adjustment* procedure). Line and B+ voltages should also be checked to see if they are not below the normal values. Sometimes weak tubes in the horizontal output and rectifier circuits cause a reduction in brightness.

Sound Conditions - Letters A through E. In addition to the above numbers, letters *A* through *E* may be added to the numbers to designate one of five sound conditions as follows: *A*, normal sound; *B*, no sound; *C*, weak sound; *D*, distorted sound; and *E*, hum or buzz in sound. For example, condition *8C* refers to a case where a normal picture is received but the sound which accompanied the picture was weak. In all cases of sound defects, the sound channel of the receiver should be checked thoroughly from the sound take-off point, through the sound i-f amplifiers, detector, audio amplifier, and loudspeaker.

FRONT



TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. & AGC
V5	6AU6	1st Vid. Amp.
V6	6AQ5	2nd Vid. Amp.
V7	12AU7	DC Restorer & Sync Sep.
V8	12AU7	1st & 2nd Sync Amp.
V9	6X4GT	Diode Rectifier & Hor. Con.
V10	6AL5	Phase Inverter & AYC
V11	6SN7GT	Hor. Osc.
V12	6BG6G	Hor. Out.
V13	6W4GT	Hor. Damper
V14	6SN7GT	Vert. Osc.
V15	6K3GT	Vert. Out. IF Amp.
V16	6X4GT	Diode Rectifier & Hor. Con.
V17	6AU6	Audio Limiter
V18	6SN7GT	Audio Power Out.
V19	6V8GT	Disc., Audio Amp.
V20	6J7	Osc.
V21	6J7	Converter
V22	6J6	RF Amp.
V23	6J6	RF Amp. Con.
V24	6AG5	RF Amp.
V25	1B3GT	High Volt. Rect.
V26	1B3GT	High Volt. Rect.
V27	16AP4	Picture Tube
V28	Sol. Rect.	Low Volt. Rect.
V29	Sol. Rect.	Low Volt. Rect.
V30	Sol. Rect.	Low Volt. Rect.
V31	Sol. Rect.	Low Volt. Rect.
V32	Sol. Rect.	Low Volt. Rect.
V33	Sol. Rect.	Low Volt. Rect.
V34	Sol. Rect.	Low Volt. Rect.
V35	Sol. Rect.	Low Volt. Rect.
V36	Sol. Rect.	Low Volt. Rect.
V37	Sol. Rect.	Low Volt. Rect.
V38	Sol. Rect.	Low Volt. Rect.
V39	Sol. Rect.	Low Volt. Rect.
V40	Sol. Rect.	Low Volt. Rect.

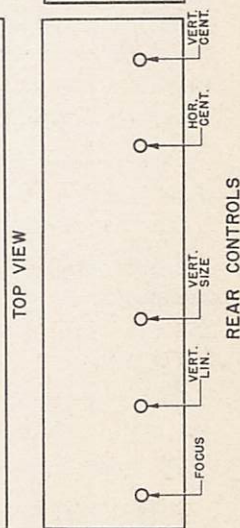
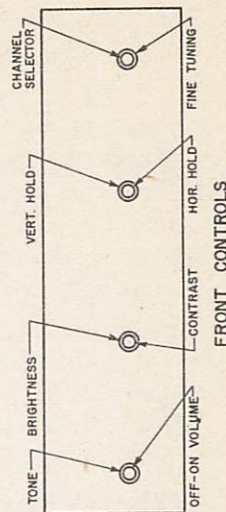
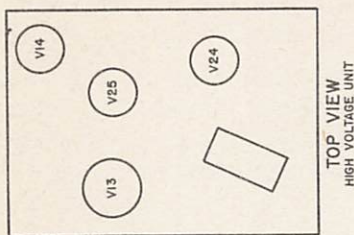
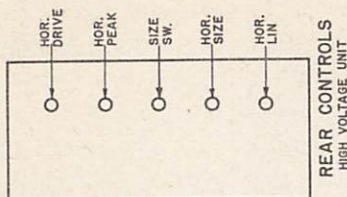
KEY VOLTAGES

B ₁ plate of damper, V14 pin 5	182 vdc
Boosted B ₁ , cath. of damper, V14 pin 3	320 vdc
Plates of Vert. Osc. and Discharge, V15 pin 5	85 vdc
Plate of Vert. Out., V16 pin 2	-30 vdc
Plates of Hor. Osc. and Discharge, V12 pin 2	83 vdc
Grid of Hor. Out., V13 pin 5	150 vdc
Grid of Hor. Out., V13 pin 5	-55 vdc
Grid of Hor. Out., V13 pin 5	-200 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ-2 and ADJ-3.

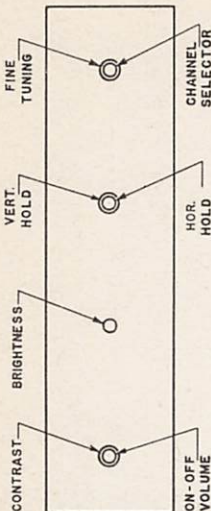


TOP VIEW

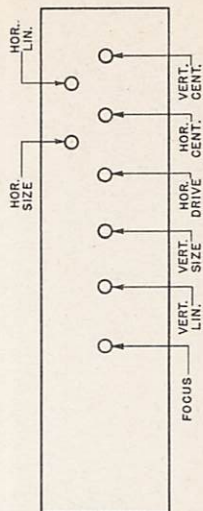
REAR CONTROLS

FRONT CONTROLS

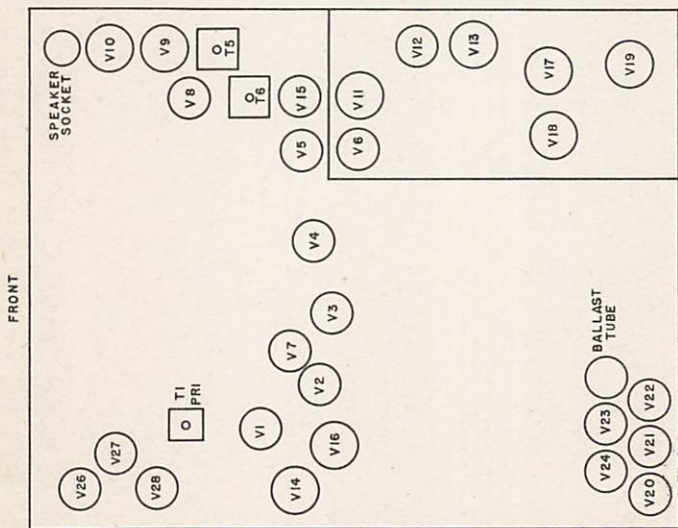
- NO SOUND - NO RASTER (31)**
Power input circuit
Check selenium rectifiers
Check ballast tube
- NO RASTER - SOUND OK (31)**
Brightness con.
Ion trap
1.2-V V13, V14, V24, V25, V26
HV base P-1 (0.25 Amps.)
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. Drive and Peaking Con.
V13, V14
Check 0.05 and 0.25 μ f caps. connected to Hor. Lin. con.
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V15, V16
Check two 0.05 μ f caps. connected to pin 2 of V15
Hor. Lin. Con.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V10, V11, V12, V13
- PIX JITTER UP & DOWN (16, 17)**
Hor. Hold con.
V8, V9, V10, V14, V15
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V7, V8
Check 0.05 μ f caps. connected to pins 1 and 5 of V7
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
V1, V2, V3, V4, V5, V25
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
Check V1, V2, V3, V4, V21, V22, V23
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V21, V22, V23
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V7, V8, V21, V22, V23
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
V1, V2, V3, V4, V5, V7, V8, V24, V25
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive and Peaking Con.
V13, V14
Check 0.05 μ f caps. connected to terminals 1 and 2 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Contrast con.
V8, V9, V10, V11, V12, V13
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V6
RF and IF alignment
Brightness con.
V12, V13, V14, V24, V26
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness, Hor. Drive and Peaking con.
V12, V14, V24, V25, V26
Check selenium rectifiers
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Peaking and Size
V12, V14, V24, V25, V26
- RASTER BLOOMING (37)**
Hor. Drive and Peaking con.
V12, V14, V24, V26
Check selenium rectifiers
Check HV filter caps.
Check 2 Meg Ω res. connected to plate cap. of V25
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Peaking con.
Hor. Size control and switch
V1, V2, V3, V4, V5, V7, V8, V21, V22, V23
Check 470 μ f and 0.01 μ f caps. connected 19 to pin 5 of V13 through a 100 Ω res.
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16
Check selenium rectifiers
Check two 0.05 μ f caps. connected to pin 2 of V15
V. O. T.
- NO VERT. DEFL. (14)**
V15, V16
Check two 0.05 μ f caps. connected to pin 2 of V15
Vert. Defl. yoke
V. O. T. and Vert. osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V10, V14, V15
Check 0.003 μ f caps. connected to pin 4 of V15
Check Vert. Int. Net.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V8, V9, V10
- NO HOR. SYNC. - VERT. SYNC. OK (10, 20)**
Hor. Hold con.
V10, V11, V12
Check 780 μ f cap. connected to pin 1 of V12
- AUDIO HUM IN SOUND (8E)**
V17, V18, V19, V20
- DISTORTED SOUND (8D)**
Tuner line tuning
V5, V17, V18, V19, V20, V21, V22, V23
Check 0.05 μ f cap. connected to pin 5 of V20
Sound and Vid. IF alignment T-5, C-79
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner line tuning
Vol. con.
V5, V17, V18, V19, V20
Speakers (open voice coil or defective connections)
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
Vol. con.
V5, V17, V18, V19, V20, V21, V22, V23
Sound and Vid. IF alignment T-5, C-79
Det. alignment T-7
- NOISY SOUND - PIX OK**
Vol. con.
V17, V18, V19, V20
Check sound system for loose connections
Speakers
Sound IF and Det. alignment T-6, C-79 and T-7
- SYNC. BUZZ IN SOUND**
Tuner line tuning
V5, V6, V7, V18, V19
Sound IF and Det. alignment T-6, C-79 and T-7
- INTERMITTENT SOUND - PIX OK**
V17, V18, V19, V20
Poor connections in sound system



FRONT CONTROLS



REAR CONTROLS



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. & AGC
V5	6AU6	Vid. Amp.
V6	12AU7	2nd Vid. Amp. - Sync. Sep. & DC Restorer
V7	6BA6	Sound IF Amp.
V8	6AU6	Limiter
V9	6S8	Disc. & 1st AF Amp.
V10	6V6GT	AF Outl. -DC Amp.
V11	6SN7GT	Sync. Det. & Sync. Del.
V12	6SN7GT	Hor. Osc. & Discharge
V13	6SN7GT	Hor. Osc. & Discharge
V14	6SN7GT	Vert. Osc. & Discharge
V15	12AU7	Sync. Amp.
V16	6K5GT	Vert. Outl.
V17	6EG6	Hor. Outl.
V18	1B3GT	HV Rect.
V19	6X4	Hor. Damper
V20	25Z6GT	HV Rect.
V21	25Z6GT	LV Rect.
V22	25Z6GT	LV Rect.
V23	25Z6GT	LV Rect.
V24	10BP4	Picture Tube
V25	6J8	Osc.
V26	6X4	Fluxer
V27	6X4	Fluxer
V28	6J8	RF Amp.

KEY VOLTAGES

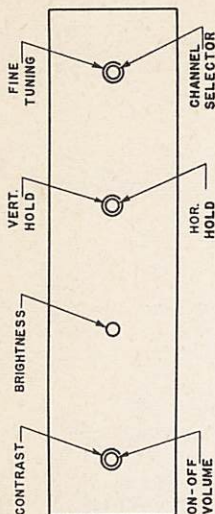
B+	plates of damper, V19 pins 4 and 6	165 vdc
Boosted B+	cath. of damper, V19 pin 8	217 vdc
Plate of Vert. Osc.	V14 pin 5	80 vdc
Plate of Vert. Outl.	V18 pin 3	77 vdc
Plate of Hor. Osc.	V18 pin 2	125 vdc
Grid of Hor. Outl.	V17 pin 5	-200 vdc

(All voltages are measured with a 20,000 ohms/volt meter connected between the tube pins and chassis.)

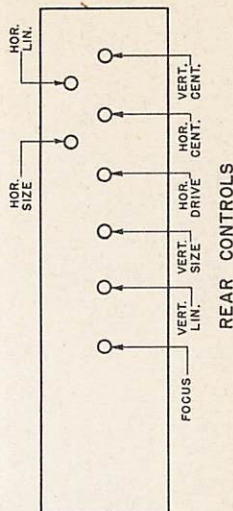
ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC ADJ-3.

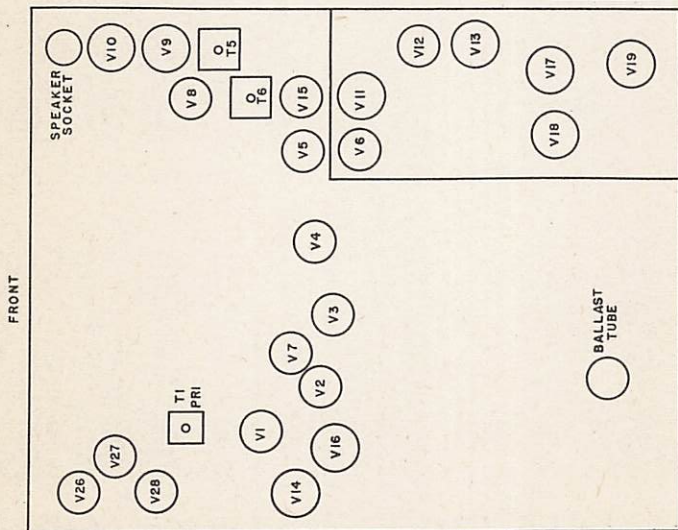
<p>NO SOUND - NO RASTER (81) Poor input circuit V20, V21, V22, V23, V24 Check ballast tube</p> <p>NO RASTER - SOUND OK (81) Brightness con- trol (fuse F-1 (0.25 Amps.) Ion trap EHT V1, V2, V3, V4, V5, V6, V26, V27, V28</p> <p>WEAK PIX - SOUND AND RASTER OK (84) Tuner fine tuning V1, V2, V3, V4, V5, V6, V26, V27, V28</p> <p>POOR HOR. LIN. Hor. Lin. and Drive con. V17, V19 Check 0.05 and 0.05 μf caps. connected to Hor. Lin. Coil H.O.T.</p> <p>POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V14, V16 Check 0.05 μf cap. connected to pin 5 of V15 Check 0.05 μf cap. connected to pin 8 of V16 Check 8 μf Elec. cap. connected to Vert. Lin. Con. V.O.T.</p> <p>PIX JITTER SIDEWAYS V11, V12, V13</p> <p>PIX JITTER UP & DOWN (16, 17) Contrast and Vert. Hold Con. V11, V14, V15</p> <p>SMEARED PIX (86) Tuner fine tuning Contrast con. V1, V2, V3, V4, V5, V6, V12, V26 Check Id. Det. and Amp. peaking coils IF and RF alignment</p> <p>POOR PIX DETAIL (35) Tuner fine tuning Focus con. V1, V2, V3, V4 Check Id. Det. and Amp. peaking coils IF and RF alignment</p> <p>SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Contrast con. V1, V2, V3, V4, V5, V6, V26, V27, V28 Check Id. Det. and Amp. peaking coils connected to pin 1 of V7 IF and RF alignment</p> <p>SNOW IN PIX (32) V1, V2, V3, V4, V26, V27, V28 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6, V15, V26, V27, V28</p> <p>ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast con. V1, V2, V3, V4, V5, V6, V15, V26, V27, V28 Check Vid. Amp. and Det. peaking coils V.O.T.</p> <p>VERT. BARS (21) V17, V19 Check 50 μf cap. connected to terminals 1 and 2 of yoke Defl. yoke ringing V17, V19 Check 50 μf cap. connected to terminals 1 and 2 of yoke Hor. Hold Con. V11, V12, V13, V17 Check 780 μf cap. connected to pin 1 of V13</p> <p>WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V3, V4, V5, V26, V27 RF and IF alignment</p> <p>INTERMITTENT RASTER - SOUND OK Bright spots V13, V15, V18, V19, V25 HV trans.</p> <p>INSUFFICIENT BRIGHTNESS Ion trap EHT V17, V18, V19, V20, V21, V22, V23, V24, V25 Low line voltage</p> <p>EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Size and Vert. Size con. V17, V18, V19</p> <p>RASTER BLOOMING (37) Hor. Drive con. V17, V18, V19, V20, V21, V22, V23, V24, V25 Check HV filter cap.</p> <p>INSUFFICIENT RASTER WIDTH (23) Hor. Drive, Size and Vert. Size con. V17, V18, V19, V20, V21, V22, V23, V24 Check 470 and 1000 μf caps. connected to pin 5 of V13 Check 0.05 μf cap. and 10kΩ Res. connected to pin 8 of V17 Low line voltage H.O.T.</p> <p>NO SOUND - NO RASTER HEIGHT (15) Vert. Size and Lin. con. V14, V16, V20, V21, V22, V23, V24 Check 0.05 μf cap. connected to pin 5 of V16 Check 0.05 μf cap. connected to pin 8 of V16 V.O.T. Low line voltage</p> <p>NO VERT. DEFL. (14) V14, V16 Check 0.05 μf cap. connected to pin 5 of V16 Check 0.05 μf cap. connected to pin 8 of V16 Vert. Defl. yoke V.O.T. and Vert. Osc. trans.</p> <p>NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold Con. V11, V14, V15 Check Vert. Int. Net. Check 3000 μf cap. connected to pin 4 of V14</p> <p>NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V6, V11, V15</p> <p>NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. trans. V1, V2, V3 Hor. Osc. trans. Check 780 μf cap. connected to pin 1 of V13</p> <p>AUDIO HUM IN SOUND (8E) V7, V8, V9, V10</p> <p>DISORTED SOUND (8D) Tuner fine tuning V7, V8, V9, V10, V26, V27 Check 0.05 μf cap. connected to pin 5 of V10 Sound and Vid. IF alignment T-5 Det. alignment T-6</p> <p>NO SOUND - PIX OK (8B) Tuner fine tuning V7, V8, V9, V10 Vol. con. Speaker (open voice coil or defective)</p> <p>WEAK SOUND - PIX OK (8C) Tuner fine tuning V7, V8, V9, V10, V26, V27 Vol. con. Sound and Vid. IF alignment T-5 Det. alignment T-6</p> <p>NOISE SOUND - PIX OK Vol. con. V7, V8, V9, V10 Check sound system for loose connections Sound IF and Det. alignment T-5 and T-6</p> <p>SYNC. BUZZ IN SOUND Tuner fine tuning V4, V7, V9, V27 Contrast con. Sound IF and Det. alignment T-5 and T-4</p> <p>INTERMITTENT SOUND - PIX OK V7, V8, V9, V10 Poor connections in sound system</p>
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FRONT CONTROLS



REAR CONTROLS



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. & AGC
V5	6AU6	Vid. Amp.
V6	12AU7	2nd Vid. Amp. - Sync. Sep. & Restorer
V7	6BA6	Sound IF Amp.
V8	6AU6*	Limiter
V9	6S8	Disc. & 1st AF Amp.
V10	6V6GT	AF Out.
V11	6SN7GT	Sync. Inv. & DC Amp.
V12	6AL5	AFC Phase Det.
V13	6SN7GT	Vert. Osc. & Charge
V14	6SN7GT	Vert. Osc. & Discharge
V15	12AV7	Sync. Amp.
V16	6K6GT	Vert. Out.
V17	6BG6	Hor. Out.
V18	1B3GT	HV Rect.
V19	5Y4GT	Hor. Damper
V20	10BP4	Picture Tube
V21	6X4	Rectifier
V22	6T6	Deflection
V23	6T6	Deflection
V24	6T6	Deflection
V25	6T6	Deflection
V26	6T6	Deflection
V27	6T6	Deflection
V28	6T6	Deflection

KEY VOLTAGES

B+, plates of damper, V19 pins 4 and 6 185 vdc
 Boosted B+, cath. of damper, V19 pin 8 217 vdc
 Plate of Vert. Osc., V18 pin 5 90 vdc
 Plate of Hor. Osc. and Discharge, V13 pin 2 125 vdc
 pin 5 -37 vdc
 pin 5 -200 vdc

(All voltages are measured with a 20,000 ohms/volt meter connected between the tube pins and chassis.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ.-3.

- NO SOUND - NO RASTER (31)**
 Brightness con.
 Power input circuit
 Check selenium rectifiers
 Check ballast
- NO RASTER - SOUND OK (31)**
 Brightness con.
 HV fuse F-1 (0.25 Amp.)
 Ion trap
 V1, V2, V3, V4, V5, V6, V15, V25, V27, V28
 HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
 Tuner fine tuning
 V1, V2, V3, V4, V5, V6, V25, V27, V28
- POOR HOR. LIN.**
 Hor. Lin. and Drive con.
 V1, V19 0.035 and 0.05 μ f caps. connected
 C to hor. lin. coil
 H. O. T.
- POOR VERT. LIN. (11, 12)**
 Vert. Lin. and Height con.
 V14, V16 0.05 μ f cap. connected to
 pin 5 of V15
 Check 0.05 μ f cap. connected to pin 8
 of V16
 Check 8 μ f Elec. cap. connected to Vert.
 Lin. con.
 V. O. T.
- PIX JITTER SIDEWAYS**
 V11, V12, V13
- PIX JITTER UP & DOWN (16, 17)**
 Contrast and Vert. Hold con.
 V11, V14, V15
- SMEARED PIX (36)**
 Tuner fine tuning
 Tuner hold con.
 Contrast con.
 V1, V2, V3, V4, V5, V6, V12, V25
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- POOR PIX DETAIL (35)**
 Tuner fine tuning
 Focus con.
 V1, V2, V3, V4
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5, V25, V27, V28
 Check alignment of 4.5-mc trap
 connected to pin 1 of V7
 IF and RF alignment
- SNOW IN PIX (32)**
 V1, V2, V3, V4, V5, V6, V15, V25, V26
 Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
 V1, V2, V3, V4, V5, V6, V15, V25, V27, V28
 ENGRAVED EFFECT IN PIX (33)
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5, V6, V15, V25, V26, V27, V28
 Check Vid. Det. and Amp. peaking coils
 V7, V28
 Hor. Drive con.
 V17, V19
 Check 50 μ f cap. connected
 to terminals 1 and 2 of yoke
 Defl. yoke ringing
 PIX BENDING (32)
 Hor. Hold con.
 V11, V12, V13, V17
 Check 780 μ f cap. connected
 to pin 1 of V13
- WEAK OR NO PIX - SOUND WEAK -
 RASTER OK (32C, 34C)**
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5, V25, V27
 RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
 V13, V17, V18, V19, V25
 HV trans.
- INSUFFICIENT BRIGHTNESS**
 Ion trap
 Br-lightness and Hor. Drive con.
 V17, V18, V19, V25
 Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
 Hor. Drive, Size and Size con.
 V17, V18, V19
- RASTER BLOOMING (37)**
 Contrast con.
 V17, V18, V19, V25
 Check 1 Mgr. O. Res. to HV filter cap.
 Check HV filter cap.
- NO SOUND - PIX OK (8B)**
 Hor. Drive and Size con.
 V17, V18, V19
 Yoke con.
 Speaker (open voice coil or defective
 connection)
 Sound and Vid. IF alignment T-5
 Det. alignment T-9
- WEAK SOUND - PIX OK (8C)**
 Tuner fine tuning
 Yoke con.
 V17, V8, V9, V10, V26, V27
 Sound and Vid. IF alignment T-5
 Det. alignment T-6
- NOISY SOUND - PIX OK**
 Hor. Drive con.
 V17, V8, V9, V10
 Check sound system for loose
 connections
 Speaker
 Sound IF and Det. alignment T-5 and T-6
- SYNC BUZZ IN SOUND**
 Contrast con.
 Tuner fine tuning
 V4, V7, V8, V9, V27
 Sound IF and Det. alignment T-5 and T-6
- INTERMITTENT SOUND - PIX OK**
 V17, V8, V9, V10
 Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
 Hor. Drive and Size con.
 V17, V18, V19
 Check the selenium rectifiers
 Check 470 and 1000 μ f caps. connected
 to pin 5 of V13
 Check 0.05 μ f cap. and 10k Ω res.
 connected to pin 8 of V17
 Low line voltage
 H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
 Vert. Size and Lin. con.
 V14, V16
 Check 0.05 μ f cap. connected to pin 5 of
 V16
 Check 0.05 μ f cap. connected to pin 8 of
 V16
 V. O. T.
 Low line voltage
- NO VERT. DEFL. (14)**
 V4, V16
 Check 0.05 μ f cap. connected to pin 5
 of V16
 Check 0.05 μ f cap. connected to pin 8
 of V16
 Vert. Defl. yoke
 V. O. T. and Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
 V6, V11, V15
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
 Hor. Hold con.
 V11, V12, V13
 Hor. osc. trans.
 Check 780 μ f cap. connected
 to pin 1 of V13
- AUDIO HUM IN SOUND (8E)**
 V17, V8, V9, V10
- DISTORTED SOUND (8D)**
 Tuner fine tuning
 V1, V8, V9, V10, V26, V27
 Check 0.05 μ f cap. connected
 to pin 5 of V10
 Sound and Vid. IF alignment T-5
 Det. alignment T-6

TUBE LIST

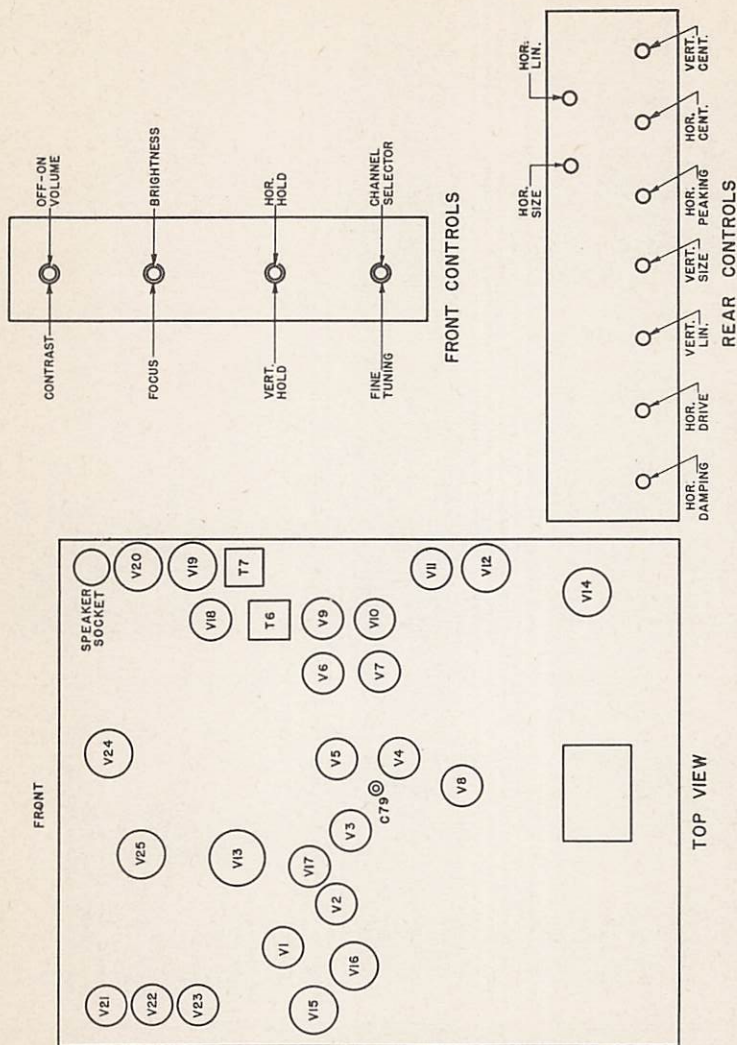
Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AU6	1st Det. AGC
V6	6AU6	2nd Det. AGC
V7	6AU6	2nd Vid. Amp.
V8	12AU7	Vid. Out. -DC Restorer
V9	12AU7	1st & 2nd Sync Amp.
V10	6SN7GT	Sync Inverter & Hor. Con.
V11	6AL5	Phase Det. AFC
V12	6X6GT	Hor. Osc.
V13	6X6GT	Hor. Def.
V14	5V4G	Damper
V15	6SN7GT	Vert. Osc.
V16	6K5GT	Vert. Out.
V17	6AU6	1st Audio IF Amp.
V18	6AU6	Audio Limiter
V19	6X6GT	Audio Pre-Def. Out.
V20	6V6GT	Disc., Audio Amp.
V21	6J6	Osc., Audio Amp.
V22	6J6	Converter
V23	6J6	RF Amp.
V24	6J6	Osc. & Con.
V25	6AG5	RF Amp.
V26	6X6GT	High Volt. Rect.
V27	1B3GT	High Volt. Rect.
V28	16AP4	Picture Tube
V29	Sel. Rect.	Low Volt. Rect.
V30	Sel. Rect.	Low Volt. Rect.
V31	Sel. Rect.	Low Volt. Rect.

KEY VOLTAGES

B ₁	plates of damper, V14 pins 4 and 6	170 vdc
B ₂	Grid of damper, V14 pin 6	265 vdc
Plates of Vert. Osc. and Discharge, V13	pin 5	88 vdc
Grid of Vert. Osc., V16	pin 2	-30 vdc
Plates of Hor. Osc. and Discharge, V12	pin 2	88 vdc
Grid of Hor. Osc., V13	pin 5	150 vdc
		200 vdc
		-300 vdc

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ-2 and ADJ-3.



FRONT

TOP VIEW

FRONT CONTROLS

REAR CONTROLS

- NO SOUND - NO RASTER (31)**
Check selenium rectifiers
Check ballast tube
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV fuse F-1 (0.25 Amps.)
Check HV transformer
V1, V2, V3, V4, V24, V25, V26
HV trans., Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin., Drive and Peaking
Hor. Damping con.
V13, V14, V15, V16
Check 0.05, 0.15, and 0.25 μ f caps.
connected to Hor. Lin. con.
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V15, V16
0.05 μ f caps. connected to
pin 2 of V15
Check 10 μ f cap. connected to Hor. Lin. con.
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V10, V11, V14, V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V8, V9, V10, V14, V15
- SMEARED PIX (36)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f caps. connected to pins 1
and 5 of V7
- IF AND RF alignment**
POOR PIX DETAIL (35)
Tuner fine tuning
Focus con.
V1, V2, V3, V4, V5, V26
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Check adjustment of C-79
V1, V2, V3, V4, V21, V22, V23
IF and RF alignment
- NO SOUND - NO RASTER HEIGHT (15)**
V1, V2, V3, V4, V5, V21, V22, V23
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5, V6, V7, V8, V21, V22, V23
Tuner fine tuning
ENGRAVED EFFECT IN PIX (33)
Contrast con.
V1, V2, V3, V4, V5, V6, V7, V8, V21, V22, V26
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive, Peaking and Damping con.
V13, V14
Check 50 μ f cap. connected to terminals
1 and 2 of yoke
Defl. yoke ringing
- PIX BUNDLING (22)**
Hor. Hold Drive and Contrast con.
V8, V9, V10, V11, V12, V13
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V12, V13, V14, V24, V26
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V1, V2, V3, V4, V5, V6
V12, V13, V14, V24, V25, V26
Check selenium rectifiers
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. peaking, Drive, Peaking and Size con.
V12, V13, V14, V24, V25, V26
- RASTER BLOOMING (37)**
Hor. Drive, Peaking and Damping con.
V12, V13, V14, V24, V25, V26
Check selenium rectifiers
Check V1 filter caps.
Check 2 Meg. Ω res. connected to plate
cap. of V25
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive, Peaking, Size and Damping con.
V12, V13, V14
Check 0.15 and 0.01 μ f caps. connected
to pin 5 of V13 through a 100 Ω res.
H. O. T.
Low line voltage
- NO SOUND - PIX OK**
Vol. con.
V5, V17, V18, V19, V20
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
V5, V17, V18, V19, V20, V21, V22, V23
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
Vol. con.
V5, V17, V18, V19, V20
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- NO SOUND - PIX OK (8E)**
Tuner fine tuning
Vol. con.
V5, V17, V18, V19, V20
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- NO SOUND - PIX OK (8D)**
V5, V17, V18, V19, V20, V21, V22, V23
Check 0.05 μ f cap. connected to pin 5
of 20
Sound and Vid. IF alignment T-6, C-79
Det. alignment T-7
- AUDIO HUM IN SOUND (8E)**
V17, V18, V19, V20
to pin 1 of V12
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
V10, V11, V12
Check 750 μ f cap. connected
to pin 1 of V12
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V8, V9, V10
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V10, V14, V15
Check 0.003 μ f cap. connected to
pin 4 of V15
Check vert. int. network
- NO VERT. DEF. Yoke**
V. O. T. and Vert. Osc. trans.
- NO VERT. DEF. (14)**
V15, V16
Check 0.05 μ f caps. connected to
pin 2 of V15
V. O. T.
- LOW line voltage**
- NO SOUND - BUZZ IN SOUND**
V17, V18, V19, V20
Contrast con.
Tuner fine tuning
V5, V6, V7, V16, V19
Sound IF and Det. alignment T-6, C-79, T-7
- INTERMITTENT SOUND - PIX OK**
V17, V18, V19, V20
Poor connections in sound system
- NOISY SOUND - PIX OK**
V17, V18, V19, V20
Check sound system for loose connection
Speaker
Sound IF and Det. alignment
T-6, C-79 and T-7

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AL5	1st Vid. Det. & AOC
V4	6AL5	2nd Vid. Det. & AOC
V5	6AU6	1st Vid. Amp., Spnc.
V6	12AU7	2nd Vid. Amp., Spnc.
V7	6BA6	Audio IF Amp.
V8	6AU6	Audio Limiter, Inhibit
V11	6SN7GT	Syn. Amp., Hur. Phase
V12	6AL5	Inv. DC Amp.
V13	6AV6	Phase Detector, AFC
V14	6SN7GT	Vert. Osc. & Discharge
V15	12AU7	1st & 2nd Syn. Amps. & Vert. Out.
V16	6K6GT	Hor. Out.
V17	6BC6G	Hor. Out.
V18	6SN7GT	High Volt. Rect.
V19	12X4	Picture Tube
V25	6T6	Osc. Modulator
V26	6T6	RF Amp.
V29	Sat. Rect.	Low Volt. Rect.
V30	Sat. Rect.	Low Volt. Rect.
V31	Sat. Rect.	Low Volt. Rect.
V32	Sat. Rect.	Low Volt. Rect.

RADIO CHASSIS

Symbol	Type	Circuit Function
V100	6SB7Y	FM & AM Osc.
V101	6SG7	FM & AM 1st IF Amp.
V102	6SG7	FM 2nd IF Amp.
V103	6SG7	FM 3rd IF Amp.
V104	6SG7	FM Detector, AM Det., AVC Audio Amp.
V105	6AT6	Phase Inverter
V106	6X4	Rectifier
V107	251EGT	Push-pull Out.
V108	6BA6	RF Amp.
V109	252EGT	Rectifier

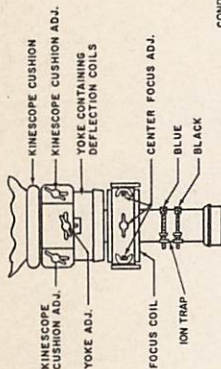
KEY VOLTAGES

B-plates of detector, V10 plus 4 and 6 145 vdc
 B-cathode of detector, V10 pin 8 245 vdc
 Plates of Vert. Osc. and Discharge, V14 pin 5 92 vdc
 Plates of Hor. Osc. and Discharge, V13 pin 2 145 vdc
 Grid of Hor. Out., V17 pin 5 pin 2 -210 vdc
 pin 3 -145 vdc
 pin 4 -210 vdc

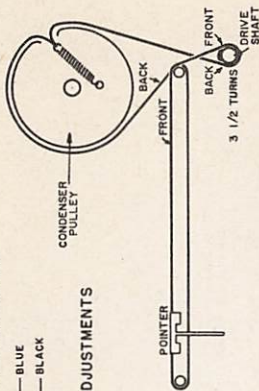
(All voltages are measured with a 20,000 ohms/volt meter connected between the tube pins and chassis.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. section on which tuner is used by receiver (under check.)

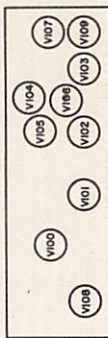


PICTURE TUBE ADJUSTMENTS

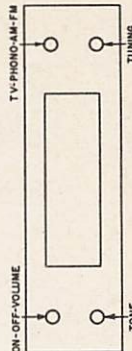


DRIVE CORD ASSEMBLY (RADIO CHASSIS)

FRONT

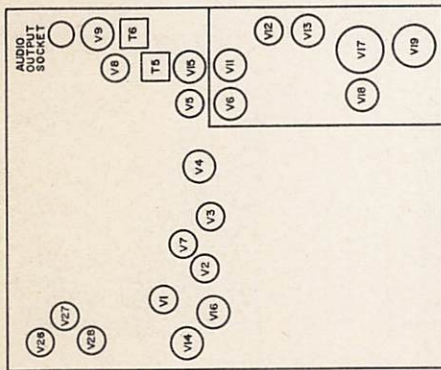


TOP VIEW (RADIO CHASSIS)



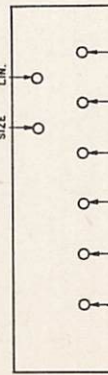
FRONT CONTROLS (RADIO CHASSIS)

FRONT



TOP VIEW

HOR. SIZE LIN.



REAR CONTROLS

HOR. HOLD

HOR. DRIVE

VERT. POS.

VERT. DRIVE

VERT. POS.

FINE TUNING

HOR. HOLD

HOR. DRIVE

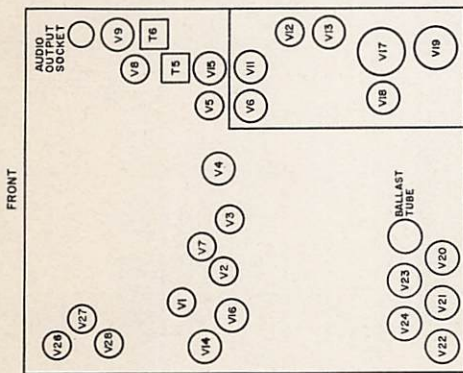
VERT. POS.

VERT. DRIVE

CHANNEL SELECTOR

FRONT CONTROLS

- NO SOUND - NO RASTER (11)**
Power input circuit
Check selenium rectifiers
Check ballast tube
- NO RASTER - SOUND OK (31)**
Brightness con.
RV fuse F-1 (0.25 Amps.)
Ion trap
V6, V13, V17, V18, V19, V25
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V26
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
Check 0.05 and 0.05 μ f caps. connected to Hor. Lin. con.
H.O.T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V14, V16
Check 0.05 μ f cap. connected to pin 5 of V16
Check 0.05 μ f cap. connected to pin 8 of V16
V. O. T.
- PIX JITTER SIDEWAYS**
H.O.T.
V11, V12, V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V6, V11, V14, V15
- SMARDED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V6
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f cap. connected to pin 2 of V25
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4, V25
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
Check 4.5-mc trap connected to pin 1 of V7
V1, V2, V3, V4, V26, V27, V28
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V26, V27, V28
Antenna and Transmission line
AC IN PIX (DARK HOR. BAR) (39)
V1, V2, V3, V4, V5, V6, V26, V27, V28
- ENGAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V26, V27, V28
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f cap. connected to pin 2 of V6 and pin 5 of V5
- VERT. BARS (21)**
Hor. Drive con.
V17, V19
Check 0.05 μ f cap. connected to pins 1 and 2 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Contrast con.
V6, V11, V12, V13, V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V26, V27, V28
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V13, V17, V18, V19, V25
HV trans.
- INSUFFICIENT BRIGHTNESS**
Tuner fine tuning
Brightness and Hor. Drive con.
V17, V18, V19, V25
Check selenium rectifiers
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V17, V18, V19, V25
- RASTER BLOOMING (37)**
Hor. Drive con.
V17, V18, V19, V25
Check selenium rectifiers
Check HV filter cap.
Check 1 Meg Ω res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V13, V17, V19
Check selenium rectifiers
Check 0.05 μ f and 0.01 μ f caps. connected to pin 5 of V13
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Lin. and Size con.
V14, V16
Check selenium rectifiers
Check 0.05 μ f cap. connected to pin 5 of V16
Check 0.05 μ f cap. connected to pin 8 of V16
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V14, V16
Check 0.05 μ f cap. connected to pin 5 of V16
Check 0.05 μ f cap. connected to pin 8 of V16
Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
V11, V14, V16
Check Vert. Int. Network
Check 0.003 μ f cap. connected to pin 4 of V14
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V6, V11, V14, V15
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
V11, V12, V13
- AUDIO HUM IN SOUND (8E)**
V7, V8, V9, V105, V106, V107, V109
- DISTORTED SOUND (8D)**
Tuner fine tuning
V7, V8, V9, V26, (8D), V106, V107, V109
Sound and Vid. IF alignment T-5
Det. alignment T-6
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V7, V8, V9, V105, V106, V107, V109
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5
Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
V7, V8, V9, V26, V105, V106, V107, V109
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5 and T-6
- NOISY SOUND - PIX OK**
Vol. con.
V7, V8, V9, V105, V106, V107, V109
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5 and T-6
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V6, V11, V14, V15, V26
Sound IF and Det. alignment T-5 and T-6
- INTERMITTENT SOUND - PIX OK**
V7, V8, V9, V105, V106, V107, V109
Poor connections in sound system



FRONT

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AL5	Vid. Det. & AGC
V4	6SN7GT	1st & 2nd Vid. Amp.
V5	6AV6	Audio IF Amp.
V6	6AV6	Audio Limiter
V7	6AV6	Audio Disc. Hor. Phase Invt., DC Amp.
V8	6AL5	Phase Det. AFC
V9	6SN7GT	Vert. Osc. & Discharge
V10	6SN7GT	1st. & 2nd Sync. Amp.
V11	6K5GT	Vert. Out.
V12	6X4	High Volt. Rect.
V13	5Y4G	Hor. Damper
V14	6X4	Hor. Def. Beam Def. Tube
V15	6X4	Low Volt. Rect.
V16	25Z6GT	Low Volt. Rect.
V17	25Z6GT	Low Volt. Rect.
V18	1583GT	Picture Tube
V19	6X4	Osc.
V20	6X4	RP Amp.
V21	6X4	RP Amp.
V22	6X4	RP Amp.
V23	6X4	RP Amp.
V24	6X4	RP Amp.
V25	6X4	RP Amp.
V26	6X4	RP Amp.
V27	6X4	RP Amp.
V28	6X4	RP Amp.
V29	6X4	RP Amp.

RADIO CHASSIS

Symbol	Type	Circuit Function
V100	6BE6	FM & AM Osc.
V101	6BE6	FM & AM 1st IF Amp.
V102	6BE6	FM 2nd IF Amp.
V103	6SR7	FM Limiter, AM Det., AVC Audio Amp.
V104	6SR7	Phase Inverter
V105	6AT6	Phase Inverter
V106	25Z6GT	push-pull Out. Rectifier
V107	25Z6GT	push-pull Out. Rectifier
V108	25Z6GT	Rectifier

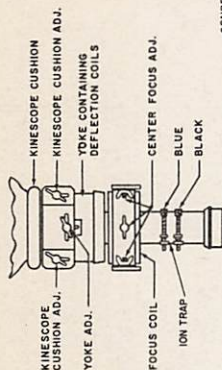
KEY VOLTAGES

- 180 vdc
- Boosted B+, cath. of damper, V19 pin 8
- 275 vdc
- Phase of Vert. Osc., V15 pin 2
- 90 vdc
- Phase of Hor. Osc., V13 pin 2
- 145 vdc
- Grid of Hor. Out., V17 pin 5
- 150 vdc

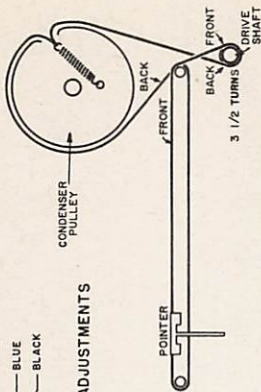
(All voltages are measured with a 20,000 ohms/volt meter connected between the tube pins and chassis.)

ADJUSTMENTS

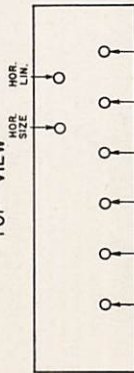
For tuner oscillator adjustment, see TUNER OSC. ADJ-3.



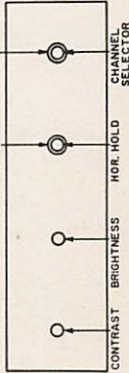
PICTURE TUBE ADJUSTMENTS



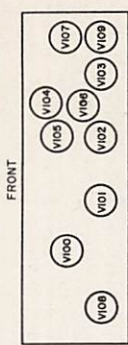
DRIVE CORD ASSEMBLY (RADIO CHASSIS)



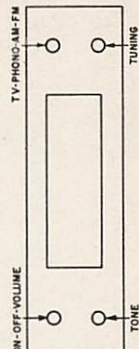
REAR CONTROLS



FRONT CONTROLS (RADIO CHASSIS)



TOP VIEW (RADIO CHASSIS)



FRONT CONTROLS (RADIO CHASSIS)

NO SOUND - NO RASTER (31)

Power input circuit
V20, V21, V22, V23, V24
Check ballast tube

NO RASTER - SOUND OK (31)

Check 450 μ f caps.
Check HV line F-1 (0.25 Amps.)
Ion trap

WEAK PIX - SOUND AND RASTER OK (34)

Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6

POOR HOR. LIN.

Pin and Drive con.
V17, V18, V19, V20
Check 0.035 and 0.05 μ f caps.
connected to Hor. Lin. coil

H. O. T.

POOR VERT. LIN. (11, 12)
Pin and Size con.
V14, V16

Check 0.01 μ f cap. connected to
pin 5 of V16

Check 0.05 μ f cap. connected to
pin 8 of V16

Check 10 μ f Elec. cap. connected to
Vert. Lin. con.

V. O. T.

PX JITTER SIDWAYS
V11, V12, V13
Hor. Hold con.

PX JITTER UP & DOWN (15, 17)
Vert. Hold and Contrast con.
V14, V15, V16

SMEARED PIX (35)
Tuner fine tuning
Contrast con.

V1, V2, V3, V4, V5, V6, V26, V27
Check 0.035 and 0.05 μ f caps.
connected to Det. and Amp. peaking coils
IF and RF alignment

POOR PX DETAIL (35)
Tuner fine tuning
Focus con.

V1, V2, V3, V4, V5
Check 0.035 and 0.05 μ f caps.
connected to Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (44, 4E)
Tuner fine tuning
Focus con.

V1, V2, V3, V4, V26, V27, V28
IF and RF alignment

SNOW IN PIX (32)

V1, V2, V3, V4, V5, V6, V27, V28
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (39)
Check 0.01 μ f cap. connected to
pin 5 of V16

ENGRAVED EFFECT IN PIX (33)
Contrast con.
V17, V19

Check 50 μ f cap. connected to
terminals 1 and 2 of yoke

Defl. yoke ringing

VERT. BARS (21)
Tuner fine tuning
V17, V19

Check 50 μ f cap. connected to
terminals 1 and 2 of yoke

PX BENDING (22)
Contrast con.
V11, V12, V13, V17

WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)
Tuner fine tuning
V11, V12, V13, V17

Check 0.01 μ f cap. connected to
pin 5 of V16

Check 0.05 μ f cap. connected to
pin 8 of V16

Check 10 μ f Elec. cap. connected to
Vert. Lin. con.

INTERMITTENT RASTER - SOUND OK
V13, V15, V16, V19, V25
HV trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive con.
V17, V18, V19, V20, V21, V22, V23,
V24, V25

Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Size, Drive and Vert. Size con.
V17, V18, V19, V25

RASTER BLOOMING (37)
Hor. Drive con.
V17, V18, V19, V20, V21, V22, V25, V24,
V25

Check HV filter cap.
Check 450 μ f res. connected to
HV filter cap.

INSUFFICIENT RASTER WIDTH (23)
Hor. Size and Drive con.
V13, V17, V19

Check 470 and 1000 μ f caps.
connected to pin 8 of V17

Low line voltage
H. O. T.

INSUFFICIENT RASTER HEIGHT (15)

Vert. Size and Lin. con.
V17, V18, V19, V20, V21, V22, V23, V24

Check 0.01 μ f cap. connected to
pin 5 of V16

Check 0.05 μ f cap. connected to
pin 8 of V16

V. O. T.
Low line voltage

NO VERT. DEFL. (14)
V14, V16
Check 0.01 μ f cap. connected to
pin 5 of V16

Check 0.05 μ f cap. connected to
pin 8 of V16

Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.

NO VERT. SYNC. - HOR. SYNC. OK
(16, 17)
Vert. Hold con.
V6, V14, V15, V16

Check Vert. Int. Network
Check 0.003 μ f cap. connected to
pin 1 of V14

NO HOR. OR VERT. SYNC. -
V6, V11, V15 PIX SIGNAL OK

NO HOR. SYNC. - VERT. SYNC. OK
(19, 20)
Hor. Hold con.
V11, V12, V13, V17

Check 0.01 μ f cap. connected to
pin 1 of V16

AUDIO HUM IN SOUND (8F)
V7, V8, V9, V105, V106, V107, V109

DISTORTED SOUND (8D)
Tuner fine tuning
V1, V7, V9, V9, V26, V27, V105, V106,
V107, V109

Sound and Vid. IF alignment T-5
Det. alignment T-6

NO SOUND - PIX OK (8B)
Tuner fine tuning
V7, V8, V9, V105, V106, V107, V109

Check 450 μ f res. connected to
Speaker (open voice coil or
defective connection)

Sound and Vid. IF alignment T-5
Det. alignment T-6

WEAK SOUND - PIX OK (8C)
V1, V7, V8, V9, V27, V28, V105, V106,
V107, V109

Sound and Vid. IF alignment T-5
Det. alignment T-6

NOISE SOUND - PIX OK

Vol. con.
V1, V7, V8, V9, V105, V106, V107, V109

Check connections
Speaker
Sound IF and Det. alignment T-5 and T-6

INTERMITTENT SOUND - PIX OK
V7, V8, V9, V105, V106, V107, V109

Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Sound IF Amp.
V6	6AU6	Sound Limiter
V7	6AV6	Disc., Det., AVC, AF Amp.
V8	6V8GT	Audio Out.
V9	12AU7	FM Ret. Osc.
V10	6AU6	AGC Amp.
V11	6AV6	1st Vid. Amp.
V12	6AP5	2nd Vid. Amp.
V13	12AU7	DC Rest., Sync. Sep.
V14	6SN7GT	Vert. Osc.
V15	6K6GT	Vert. Out.
V16	6W4	Hor. Damper
V17	6X4	High Volt. Rect.
V18	1B6GG	High Volt. Out.
V19	6SN7GT	Hor. Osc., Hor. Con.
V20	6AL5	Hor. Phase Det. Sync. Disc.
V21	6SN7GT	Sync. Amp., Phase Inverter
V22	6U4G	Low Volt. Rect.
V23	10BP4	Picture Tube
V24	6L6-4	Osc. & Conv.
V26	6AG5	RF Amp.
V27	6BA6	IF Amp. AM-FM
AV-1		Conv. & Osc. AM-FM
FV-1	8BA7	

KEY VOLTAGES

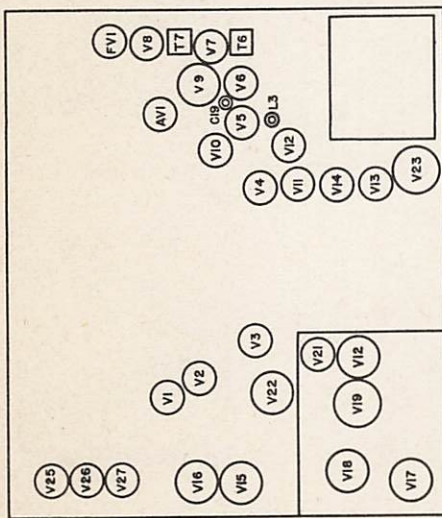
B+	340 vdc
Boosted B+	300 vdc
Plate of Vert. Osc., V15 pin 2	300 vdc
Plate of Vert. Osc., V16 pin 3	80 vdc
Plate of Hor. Osc. and Control, V20 pin 5	275 vdc
Grid of Hor. Out., V19 pin 5	205 vdc
16 vdc	16 vdc
-4 vdc	-4 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

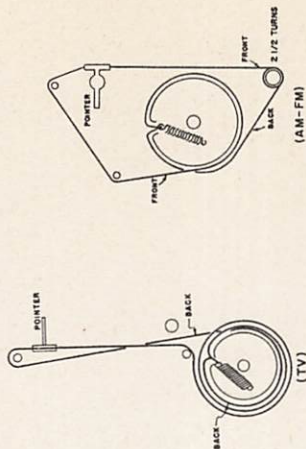
ADJUSTMENTS

See tuner oscillator adjustment, see TUNER OSC. ADJ-2 and ADJ-3.

FRONT

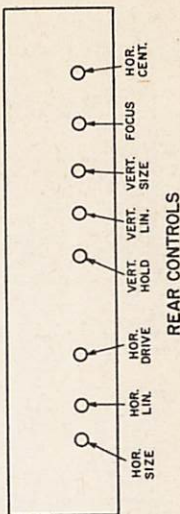


TOP VIEW

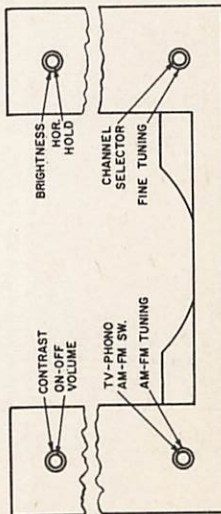


PICTURE TUBE ADJUSTMENTS

DRIVE CORD ASSEMBLIES



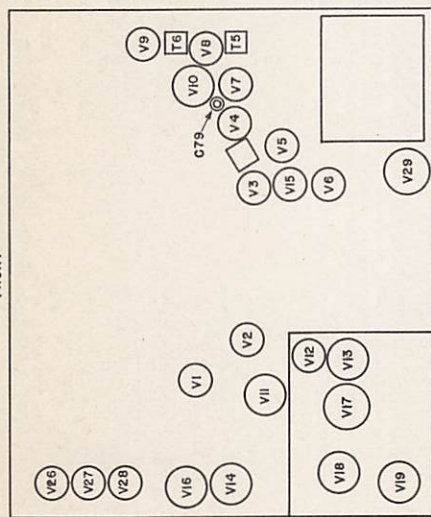
FRONT CONTROLS



REAR CONTROLS

- NO SOUND - NO RASTER (31)**
Power input circuit
V23
Check focus control circuit
Check Rad. -Phono-TV-function switch
- NO RASTER - SOUND OK (31)**
Brightness con.
Ion trap
Check HV fuse (0.25 Amps.)
V1, V2, V3, V4, V5, V11
V17, V18, V19, V20, V24
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V1, V2, V3, V4, V5, V11, V12, V13
Contrast con.
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
Check 0.035 μ f cap. connected to hor. lin. coil
Check 0.05 μ f cap. connected to HV fuse
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V15, V16
Check two 0.05 μ f caps. connected to pin 2 of V15
Check 50 μ f elec. cap. connected to pin 8 of V16
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V20, V21, V22
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold con. and Det. alignment
V11, V14, V15, V16, V22 con.
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V12, V13
Check Vid. tube
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f caps. connected to pins 1 and 5 of V13
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4, V5, V11
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Check alignment of L-3 and C-19
V1, V2, V3, V4, V5, V11, V25, V26, V27
IF and RF alignment
- SNOW IN PIX (32)**
Tuner fine tuning
V1, V2, V3, V4, V5, V11
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V11, V12, V13
Contrast con.
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V1, V2, V3, V4, V5, V11, V12, V13, V14, V24
Check tuner tubes
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V17, V19
Check 50 μ f cap. connected across terminals 1 and 2 of yoke
Defl. yoke Ringing
- PIX BENDING (22)**
Hor. Hold, Drive and Contrast con.
V11, V14, V15, V20, V21, V22
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V11, V25, V26, V27
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V17, V18, V19, V23, V24
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V17, V18, V19, V23, V24
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V17, V18, V19, V24
- RASTER BLOOMING (37)**
Hor. Drive con.
V17, V18, V19, V23, V24
Check HV filter cap.
Check 1 Meg D res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V17, V18, V23
Check 300 μ f cap. connected through a 680 res. to pin 5 of V19
Check 0.05 μ f cap. and 8, 2K Ω res. connected to pin 8 of V19
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V23
Check two 0.05 μ f caps. connected to pin 2 of V15
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V16
Check two 0.05 μ f caps. connected to pin 2 of V15
Check 0.05 μ f cap. connected to V17, V19
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Hold con. and Det. alignment
V15, V16, V22
Check 0.005 μ f cap. connected to pin 5 of V15
NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V11, V14, V22
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
V11, V20, V21, V20
Check 0.05 μ f cap. connected to pin 4 of V20
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9
- DISORTED SOUND (8D)**
V6, V7, V8, V9, V11, V25, V26, V27
Check 0.05 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment C-19, L-3, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V6, V7, V8, V9
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment C-19, L-3, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
V6, V7, V8, V9, V11, V25, V26, V27
Sound and Vid. IF alignment C-19, L-3, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
Vol. con.
V6, V7, V8, V9
Check sound system for loose connections
Speaker
Sound IF and Det. alignment
C-19, L-3, T-6 and T-7
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V1, V2, V3, V4, V5, V11, V12
Sound IF and Det. alignment
C-19, L-3, T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9
Poor connections in sound system

FRONT



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. & AGC
V5	6AL5	2nd Vid. Amp., 2nd Sync. Amp.
V6	12AU7	Sound IF Amp.
V7	6AU6	Sound Limiter
V8	6AU6	Sound Disc. & Audio Amp.
V9	6T8	Audio Out.
V10	6GT	Hor. Invert., Hor. Con. DC Amp.
V11	6SN7GT	Hor. Phase Det. Sync. Disc.
V12	6AL5	Hor. Osc. & Discharge
V13	6SN7GT	Vert. Osc. & Discharge
V14	6SN7GT	Sync. Sep. & DC Rest., 1st Sync. Amp.
V15	12AU7	Vert. Amp.
V16	6K6GT	Hor. Out.
V17	6K6GT	Hor. Out.
V18	1B3GT	High Volt. Rect.
V19	6W4GT	Hor. Damper
V20	10BP4 or 12LP4	Picture Tube
V21	6X4	Osc. & Con.
V22	6X4	Osc. & Con.
V23	5U4G	Low Volt. Rect.

KEY VOLTAGES

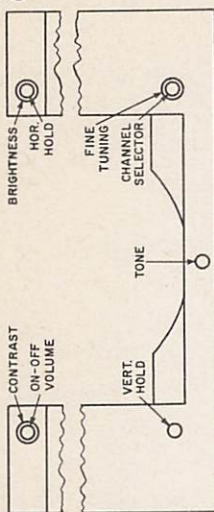
B+	Plate of damper, V19	pin 5	380 vdc
Boosted B+	cath. of damper, V19	pin 3	470 vdc
Plate of Vert. Osc., V14	pin 5	100 vdc	
Plate of Vert. Out., V14	pin 2	320 vdc	
Plates of Hor. Osc. and Discharge, V13	pin 2	320 vdc	
	pin 5	125 vdc	
	pin 14	125 vdc	

Grid of Hor. Out., V17 pin 5

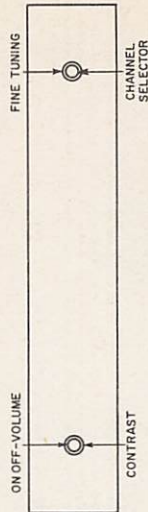
(All voltages are measured with a VTVM connected between the tube pins and B+.)

ADJUSTMENTS

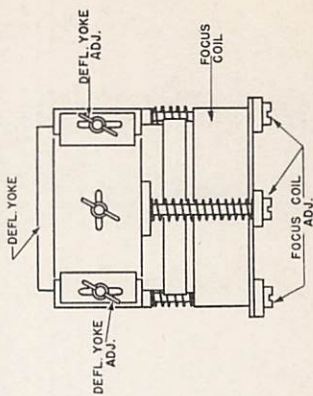
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



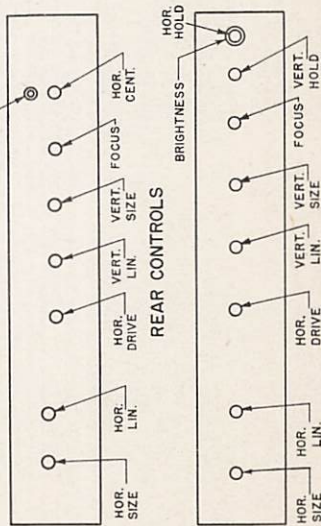
FRONT CONTROLS



FRONT CONTROLS (ALTERNATE)



PICTURE TUBE ADJUSTMENTS

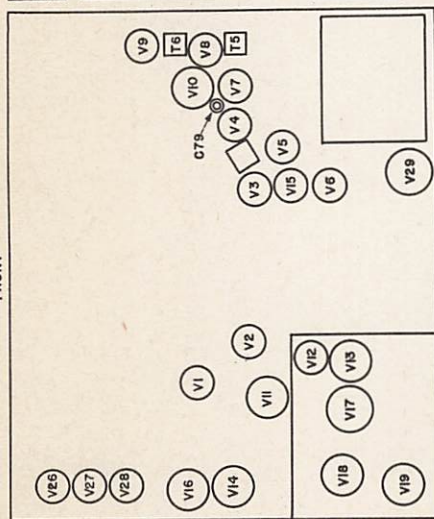


REAR CONTROLS

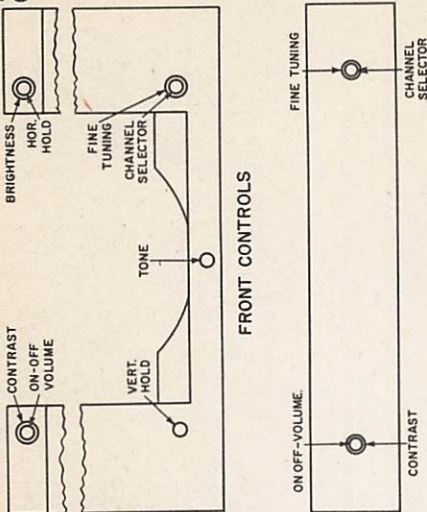
REAR CONTROLS (ALTERNATE)

- NO SOUND - NO RASTER (31)**
Power input circuit
V29
- Check focus control circuit
- NO RASTER - SOUND OK (31)**
Br-krusher con.
Check HV fuse F-1 (0.25 Amps.)
Ion trap
V13, V17, V18, V19, V25
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V15, V27, V28
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V17, V19
- Check 0.033 and 0.047 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V14
- Check 0.001 μ f cap. connected to pin 2 of V14
Check 0.01 μ f cap. connected to pin 5 of V14
Check 100 μ f Elec. cap. connected to pin 3 of V14
V. O. T.
- PIX JITTER SIDEWAYS**
V11, V12, V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V5, V10, V14, V15
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6
- Check 0.09 μ f cap. connected to pin 1 of V5
Check 0.047 μ f cap. connected to pin 1 of V6
- Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- NO SOUND - NO RASTER (31)**
Tuner fine tuning
Focus con.
V1, V2, V3, V25
- Check Vid. Det. and Amp. peaking coils and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V27, V28
- Check alignment of C-79
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V27, V28
- Antenna and transmission line
V1, V2, V5, V6, V27, V28
- AC IN PIX (BARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V6, V27, V28
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V25, V27, V28
- Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V17, V19
- Check 50 μ f cap. connected to terminals 1 and 2 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Hor. Drive and Contrast con.
V6, V11, V12, V13, V15, V17
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V27, V28
- RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V13, V15, V17, V18, V19, V25
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V17, V18, V19, V25, V29
- Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V15, V16, V19, V25
- RASTER BLOOMING (37)**
Hor. Drive con.
V17, V18, V19, V25, V29
- Check HV filter cap.
Check 1 Meg p. res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V17, V19, V25
- Check 470 μ f and 0.001 μ f cap.
Check 0.05 μ f cap. and 10K Ω res. connected to pin 8 of V17
- Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT**
Vert. Size and Lin. con.
V14, V29
- Check 0.001 μ f cap. connected to pin 2 of V14
Check 0.035 μ f cap. connected to pin 5 of V14
V. O. T.
- Low line voltage
- NO VERT. DEFL. (14)**
V14
- Check 0.001 μ f cap. connected to pin 5 of V14
Check 0.035 μ f cap. connected to pin 5 of V14
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V11, V14
- Check Vert. Int. Network
Check 0.001 μ f cap. connected to pin 2 of V14
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V6, V11, V15
- Check 0.05 μ f cap. connected to pin 7 of V6
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
V11, V12, V13
- Check 760 μ f cap. connected to pin 1 of V13
- AUDIO HUM IN SOUND (8E)**
V7, V8, V9, V10
- DISTORTED SOUND (8D)**
Tuner fine tuning
V7, V8, V9, V10, V27, V28
- Check 0.047 μ f cap. connected to pin 5 of V10
- Sound and Vid. IF alignment
C-79, T-5
- Det. alignment T-6
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
Vol. con.
V7, V8, V9, V10
- Speaker (open voice coil or speaker) connected to Sound and Vid. IF alignment C-79, T-5
- Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
V7, V8, V9, V10, V27, V28
- Sound and Vid. IF alignment
C-79, T-5
- Det. alignment T-6
- NOISY SOUND - PIX OK**
Vol. con.
V7, V8, V9, V10
- Check sound system for loose connections
Speaker
Sound IF and Det. alignment C-79, T-5, and T-6
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V4, V7, V8, V9, V27
- Sound IF and Det. alignment C-79, T-5 and T-6
- INTERMITTENT SOUND - PIX OK**
V7, V8, V9, V10
- Poor connections in sound system

FRONT

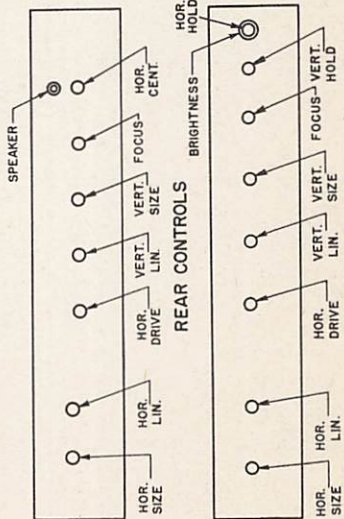


TOP VIEW



FRONT CONTROLS

FRONT CONTROLS (ALTERNATE)



REAR CONTROLS

REAR CONTROLS (ALTERNATE)

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	1st Vid. Amp. & AGC
V5	6AU6	1st Vid. Amp.
V6	12AU7	2nd Vid. Amp., 2nd Sync. Amp.
V7	6AU6	Sound IF Amp.
V8	6AU6	Sound Limiter
V9	6X4	Sound Disc. & Audio Amp.
V10	6X4	Hor. Phase Invert., Hor. Con. DC Amp.
V11	6SN7GT	Hor. Phase Invert., Hor. Con. DC Amp.
V12	6AL5	Hor. Phase Det. Sync. Disc.
V13	6SN7GT	Hor. Osc. & Discharge
V14	6SN7GT	Vert. Osc. & Discharge
V15	12AU7	Sync. Sep. & DC Rest., 1st Spt. Amp.
V16	6K6GT	1st Spt. Amp.
V17	6B6GT	Hor. Out.
V18	1B3GT	High Volt. Rect.
V19	9W4GT	Hor. Damper
V25	10BP4 or 12LP4	Picture Tube
V27	6Y4G5	Rect. C. Con.
V28	6Y4G5	RF Amp.
V29	50HG	Low Volt. Rect.

KEY VOLTAGES

B-, plate of damper, Y19 pin 5	380 vdc
Boosted B-, cath. of damper, Y19 pin 3	470 vdc
Plates of Vert. Osc. and Discharge, V14 pin 5	300 vdc
pin 5	100 vdc
Plates of Hor. Osc. and Discharge, V13 pin 2	320 vdc
pin 2	125 vdc
pin 5	-14 vdc

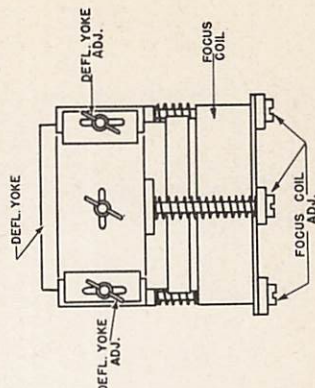
Grid of Hor. Out., V17 pin 5

(All voltages are measured with a VTVM connected between the tube pins and B-.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ-2 and ADJ-3.

PICTURE TUBE ADJUSTMENTS



- NO SOUND - NO RASTER (31)**
V1, V2, V3, V4, V7, V28
Speaker input circuit
Check focus control circuit
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV fuse F-1 (0.25 Amps.)
V13, V17, V18, V19, V25
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V15, V27, V28
POOR HOR. LIN.
Hor. Lin. and Drive con.
V17, V19
Check 0.05 and 0.005 μ f caps.
connected to Hor. Lin. con.
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V14, V16
Check 0.05 μ f cap. connected to pin 5
Check 0.05 μ f cap. connected to pin 8
of V16
Check 25 μ f Elec. cap. connected to
vert. lin. con.
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V11, V12, V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V6, V11, V14, V19
- SMEARED PIX (35)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6
Check 0.05 μ f caps. connected to
pins 1 and 2 of V13
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
V11, V12, V13
Focus con. V25
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V27, V28
C-79, T-5
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V27, V28
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
Brightness con.
V1, V2, V3, V4, V5, V6, V26, V27, V28
ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
V17, V19, V24, V5, V6, V25, V26,
V27, V28
Check Vid. Det. and Amp. peaking
coils
- VERT. BARS (31)**
Hor. Drive con.
Contrast con.
Check 50 μ f cap. connected to
terminals 1 and 2 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Hor. Drive and
Contrast con.
V6, V11, V12, V13, V15, V17
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V26, V27, V28
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V13, V15, V17, V18, V19, V25
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
V11, V12, V13
V17, V18, V19, V25, V29
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V17, V18, V19, V25
- RASTER BLOOMING (37)**
Hor. Drive con.
Check HV filter cap.
Check 470k Ω res. connected to HV
filter cap.
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V1, V2, V3, V4, V7, V10
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment C-79, T-5
Det. alignment T-5
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V1, V2, V3, V4, V7, V10, V26, V27, V28
Sound and Vid. IF alignment C-79, T-5
Det. alignment T-5
- NOISY SOUND - PIX OK**
Vol. con.
V1, V2, V3, V4, V7, V10
Check speaker system for loose
connections
Speaker
Sound IF and Det. alignment C-79, T-5
and T-6
- SYNC BUZZ IN SOUND**
V1, V2, V3, V4, V7, V10
Contrast con.
V4, V7, V8, V9
Sound IF and Det. alignment C-79, T-5
and T-6
- INTERMITTENT SOUND - PIX OK**
V1, V2, V3, V4, V7, V10
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V17, V18, V19, V29
Check 470 μ f and 0.001 μ f caps.
connected to pin 5 of V13
Check 0.05 μ f cap. connected to
pin 8 of V17
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V14, V16, V29
Check 0.05 μ f caps. connected to
pin 5 of V16 and to pin 8 of V16
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V14, V16
Check 0.05 μ f caps. connected to
pin 5 of V16 and to pin 8 of V16
Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK
(16, 17)**
Vert. Hold con.
V11, V14, V16
Check Vert. Int. network
Check 0.005 μ f cap. connected to
pin 4 of V14
- NO HOR. OR VERT. SYNC. -
PIX SIGNAL OK**
V6, V11, V15
Check 0.05 μ f cap. connected to
pin 7 of V16
- NO HOR. SYNC. - VERT. SYNC. OK
(19, 20)**
Hor. Hold con.
V11, V12, V13
Check 780 μ f cap. connected
to pin 1 of V13
- AUDIO HUM IN SOUND (8E)**
V1, V2, V3, V4, V7, V10
Tuner fine tuning
V17, V18, V19, V26, V27, V28
Check 0.05 μ f cap. connected to
pin 5 of V10
Sound and Vid. IF alignment C-79,
T-5
Det. alignment T-5
- DEFORTED SOUND (8D)**
Tuner fine tuning
V17, V18, V19, V26, V27, V28
Check 0.05 μ f cap. connected to
pin 5 of V10
Sound and Vid. IF alignment C-79,
T-5
Det. alignment T-5

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. Det.
V6	6AU6	Sound IF Amp.
V7	6AU6	Sound Limiter
V8	6AV6	Sound Limiter, AVC AF Amp.
V9	6V6GT	Audio Out.
V10	12AU7	FM Het. Osc.
V11	6AU6	AGC Amp.
V12	6AU6	1st Vid. Amp.
V13	6AR5	2nd Vid. Amp.
V14	12AU7	DC Rest., Sync. Sep.
V15	6AV6	Vid. Det.
V16	6K6GT	Vert. Out.
V17	6W4	Hor. Damper
V18	1B3	High Volt. Rect.
V19	6BG6G	Hor. Out.
V20	6SN7GT	Hor. Osc., Hor. Con.
V21	6AV6	1st Sync. Amp., Disc.
V22	6SN7GT	2nd Sync. Amp., Phase Inverter
V23	5U4G	Low Volt. Rect.
V24	16AP4	Picture Tube
V26	6J6	Osc. & Conv.
V27	6AG5	RF Amp.
V28	1B3	High Volt. Rect.
AV-1	6AV6	Sound Limiter, AVC AF Amp.
FV-1	6BA7	Conv. & Osc. AM-FM

KEY VOLTAGES

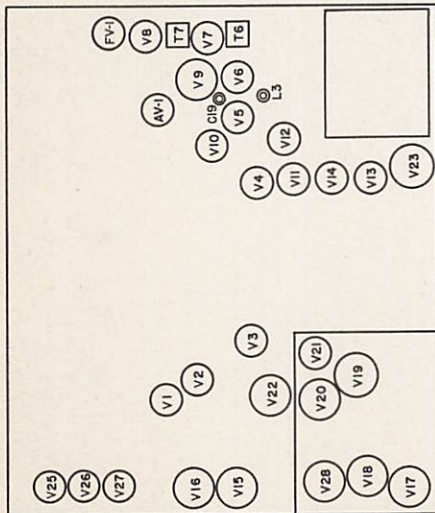
B+	plate of damper, V17	pin 5	340 vdc
Boosted B+	cath. of damper, V17	pin 3	390 vdc
Plates of Hor. Osc.	V15	pin 2	60 vdc
Plates of Vert. Out.	V16	pin 5	275 vdc
Plates of Hor. Osc. and Control	V20	pin 5	205 vdc
Grid of Hor. Out.	V19	pin 5	18 vdc
		pin 2	-4 vdc

(All voltages are measured with a VTVM connected between the tube pins and B-.)

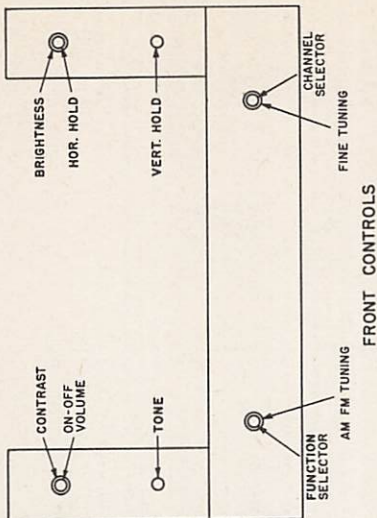
ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ-2.

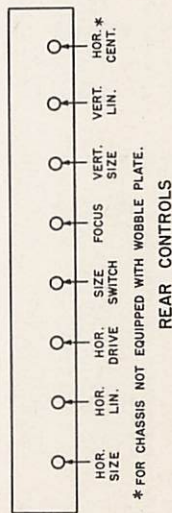
FRONT



TOP VIEW



FRONT CONTROLS

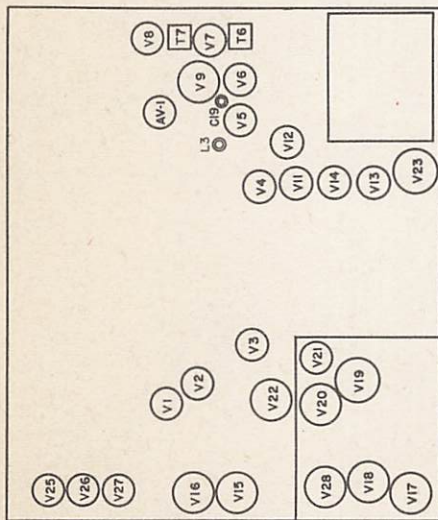


REAR CONTROLS

* FOR CHASSIS NOT EQUIPPED WITH WOBBLE PLATE.

- NO SOUND - NO RASTER (31)**
Power input circuit
V23
Check TV-Phono, -AM-FM function switch
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV fuse F-1 (0.25 Amps.)
Ion trap
V17, V16, V19, V20, V24, V28
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V10, V11, V12, V13
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V17, V19
- POOR VERT. LIN. (11, 12)**
V15, V16
Check 0.05 μ f caps. connected to pins 5 and 8 of V16
Check 50 μ f Elec. cap. connected to pin 8 of V16
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V20, V21, V22
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V14, V15, V16, V22
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V10, V11, V12, V13
Check 0.05 μ f caps. connected to pins 5 and 8 of V16
Check 0.047 μ f cap. connected to pin 1 of V13
- IF and RF alignment**
- POOR PIX DETAIL (35)**
Tuner fine tuning
V1, V2, V3, V4, V5, V10, V11
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V5
Check tuner tubes
IF and RF alignment
- NO SOUND - NO RASTER WIDTH (23)**
Hor. Drive and Size control
Hor. Size switch
V14, V23
Check 470 μ f and 0.01 μ f cap. connected to yellow lead of V.O.T.
Hor. Osc. trans.
V.O.T.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V23
Check 0.05 μ f caps. connected to pin 5 of V16 and pin 8 of V16
Check 0.005 μ f cap. connected to pin 5 of V16
V.O.T.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V16
Check 0.05 μ f caps. connected to pin 5 of V16 and pin 8 of V16
Check 0.005 μ f cap. connected to pin 5 of V16
Vert. Defl. yoke
V.O.T.
- NO HOR. SYNC. - HOR. SYNC. OK (10, 17)**
Vert. Hold con.
V15, V16, V22
Check vert. int. network
Check 0.005 μ f cap. connected to pin 1 of V15
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V10, V11, V14, V22
Check 0.047 μ f cap. connected to pin 2 of V14
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Drive con.
V11, V20, V21, V22
Check 820 μ f cap. connected to pin 4 of V20
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V6, V7, V8, V9, V10, V11
Check tuner tubes
Check 2 Meg Ω res. connected to pin 5 of V9 tone con.
Sound and Vid. IF alignment C-19, L-3, T-6 and T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V6, V7, V8, V9
Speaker (check voice coil or defective connection)
Sound and Vid. IF alignment C-19, L-3, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. and tone con.
V6, V7, V8, V9, V10, V11
Check tuner tubes
Sound and Vid. IF alignment C-19, L-3, T-6
Det. alignment T-7
- NOBY SOUND - PIX OK**
Vol. con.
V6, V7, V8, V9
Check sound system for loose connections
Sound IF and Det. alignment C-19, L-3, T-6 and T-7
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V6, V7, V8, V9, V10, V11
Check tuner tubes
Sound IF and Det. alignment C-19, L-3, T-6, T-7
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9
Poor connections in sound system
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V10, V11
Check tuner tubes
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V10, V11, V12, V13
Check tuner tubes
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V17, V19
V12, V3, V4, V5, V10, V11, V12, V13, V24
Check tuner tubes
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V17, V19
Check 50 μ f cap. connected to yoke terminals 1 and 2
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Drive and Contrast con.
V20, V21, V22
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V12
Check tuner tubes
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V17, V18, V19, V20, V24, V28
Check 2 Meg Ω res. connected to plate cap. of V28
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V17, V18, V19, V20, V21, V24, V28
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Vert. Size con.
Hor. Size control and switch
V17, V18, V19, V28
- RASTER BLOOMING (37)**
Hor. Drive con.
V17, V18, V19, V20, V23, V24, V28
Check 2 Meg Ω res. connected to plate cap. of V28
Check HV filter caps.

FRONT



TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. Det.
V6	6AU6	Sound IF Amp.
V7	6AU6	Sound Limiter.
V8	6AV6	AVC AF Amp.
V9	5Y6GT	Audio Out.
V10	12AU7	FM Ret. Osc.
V11	6AU6	AGC Amp.
V12	6AU6	1st Vid. Amp.
V13	6AR5	2nd Vid. Amp.
V14	12AU7	DC Rest., Sync. Sep.
V15	6AV6	AVC AF Amp.
V16	6K6GT	Vert. Out.
V17	6W4	Hor. Damper
V18	1B3	High Volt. Rect.
V19	6BG6G	Hor. Out.
V20	6SN7GT	Hor. Osc., Hor. Com.
V21	6AV6	Hor. Phase Ret. Sync. Disc.
V22	6SN7GT	Phase Inverter
V23	5U4G	Low Volt. Rect.
V24	16AP4	Picture Tube
V25	6J6	Osc. & Converter
V26	6AG5	RF Amp.
V27	1B3	High Volt. Rect.

KEY VOLTAGES

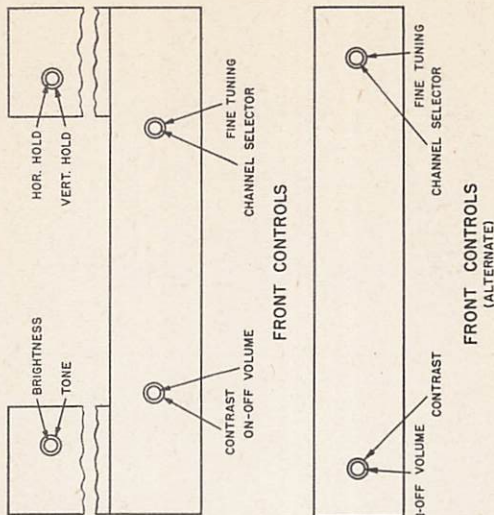
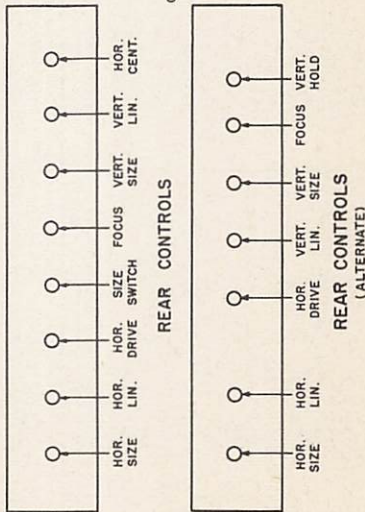
B+, plate of damper, V17 pin 5	340 vdc
Boosted B+, cath. of damper, V17 pin 3	390 vdc
Plates of Hor. Osc., V15 pin 2	60 vdc
pin 5	80 vdc
Plate of Vert. Out., V16 pin 3	275 vdc
Plates Hor. Osc. and Control, V20 pin 2	205 vdc
pin 5	18 vdc
Grid of Hor. Out., V19 pin 5	-4 vdc

(All voltages are measured with a VTVM connected between the tube pins and B+.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.

TOP VIEW

FRONT CONTROLS
(ALTERNATE)REAR CONTROLS
(ALTERNATE)

- NO SOUND - NO RASTER (B1)**
 Peer input circuit
 V23
 Check focus control circuit
- NO RASTER - SOUND OK (B1)**
 Brightness con.
 Ion trap
 F-1 (0.25 Amps.)
 V17, V18, V19, V20, V24, V28
 HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (B4)**
 Tuner fine tuning
 Hor. Lin. and Drive con.
 V1, V2, V3, V4, V5, V11, V12, V14, V26
 Contrast con.
- POOR HOR. LIN.**
 V17, V18, V19, V20, V24, V28
 Check 0.047 μ f caps. connected to
 and connected to Hor. Lin. coil
 H. O. T.
- POOR VERT. LIN. (11, 12)**
 Vert. Lin. and Size con.
 V15, V16, V22
 Check 0.047 μ f caps. connected to
 pin 2 of V15
 Check 50 μ f elec. cap. connected to
 pin 8 of V16
 V. O. T.
- PIX JITTER SIDEWAYS**
 Hor. Hold con.
 V20, V21, V22
- PIX JITTER UP & DOWN (16, 17)**
 Vert. Hold and Contrast con.
 V11, V14, V15, V22
- SMEARED PIX (G5)**
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5, V11, V12, V13, V14
 Check Vid. Det. and Amp. peaking coils
 Check 0.047 μ f cap. connected to pin 1
 of V13
- IF and RF alignment**
- POOR PIX DETAIL (B5)**
 Tuner fine tuning
 Focus con.
 V1, V2, V3, V4, V5, V11
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
 Tuner fine tuning
 Check alignment of L-3 and C-19
 V6, V7, V8, V9, V27
 IF and RF alignment
- SNOW IN PIX (B2)**
 V1, V2, V3, V4, V5, V11, V26, V27
 Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (B9)**
 V1, V2, V3, V4, V5, V11, V12, V13
 Tuner fine tuning
- ENGRAVED EFFECT IN PIX (B3)**
 Contrast con.
 V1, V2, V3, V4, V5, V11, V12, V13, V24,
 V25, V26
 Check Vid. Det. and Amp. peaking coils
- VERT. BARS (B1)**
 Hor. Drive con.
 V17, V19
 Check 50 μ f cap. connected between
 yoke terminals 1 and 2
 Det. yoke rugging
- PIX BENDING (Z2)**
 Hor. Hold, Contrast and Hor. Drive con.
 V19, V20, V21, V22
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (Z2C, Z4C)**
 Tuner fine tuning
 V1, V2, V3, V4, V5, V11, V12, V25, V26, V27
 RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
 Brightness con.
 V17, V18, V19, V20, V24, V28
 Check 0.047 μ f res. connected to
 plate cap. of V28
 HV trans. *
- INSUFFICIENT BRIGHTNESS**
 Ion trap
 Focus con. and Hor. Drive con.
 V14, V17, V18, V19, V23, V24, V28
 Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
 Hor. Drive and Vert. Size con.
 Hor. Size control and switch
 V11, V16, V18, V19, V24, V26
- RASTER BLOOMING (B7)**
 Hor. Drive con.
 V17, V18, V19, V23, V24, V28
 Check HV filter caps.
 Check 2 Meg. D. res. connected to
 HV filter cap.
- NO SOUND - PIX OK (8B)**
 Tuner fine tuning
 V6, V7, V8, V9
 Vol. con.
 Speaker (open voice coil or defective
 connection)
 Sound IF and Det. alignment C-19, L-3, T-6
 Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
 Tuner fine tuning
 V6, V7, V8, V9, V11, V26
 Sound IF and Det. alignment C-19, L-3, T-6
 Det. alignment T-7
- NOISY SOUND - PIX OK**
 Vol. con.
 V6, V7, V8, V9
 Check sound system for loose
 connections
 Speaker
 Sound IF and Det. alignment C-19, L-3, T-6
 and T-7
- SYNC BUZZ IN SOUND**
 Tuner fine tuning
 V5, V6, V7, V8, V11, V12
 Sound IF and Det. alignment C-19, L-3, T-6
 and T-7
- INTERMITTENT SOUND - PIX OK**
 V6, V7, V8, V9
 Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (Z3)**
 Hor. Drive and Size con.
 V17, V19, V20, V23
 Check 470 μ f and 0.01 μ f caps.
 connected to yellow lead of Hor. Osc. trans.
 Check 0.047 μ f cap. connected to pin 8 of V19
 Low line voltage
 H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
 Vert. Size and Lin. con.
 V15, V16, V22
 Check 0.047 μ f caps. connected to
 pin 2 of V15
 Check 0.005 μ f cap. connected to pin 1
 of V15
 V. O. T.
 Low line voltage
- NO VERT. DEFL. (14)**
 V15, V16
 Check 0.047 μ f caps. connected to pin 2
 of V15
 Check 0.005 μ f cap. connected to pin 1
 of V15
 Vert. Defl. yoke
 V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
 Vert. Hold con.
 V15, V16, V22
 Check vert. int. network
 Check 0.005 μ f cap. connected to pin 1
 of V15
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
 V11, V14, V22
 Check 0.047 μ f cap. connected to pin 2
 of V14
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
 Hor. Hold con.
 V19, V20, V21, V22
 Check 820 μ f cap. connected to
 pin 4 of V20
- AUDIO HUM IN SOUND (8E)**
 V6, V7, V8, V9
- DISTORTED SOUND (8D)**
 Tuner fine tuning
 V6, V7, V8, V9, V28
 Check 0.05 μ f cap. connected to pin 5 of V9
 Sound and Vid. IF alignment C-19, L-3, T-5
 Det. alignment T-7

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. Det.
V6	6AU6	Sound IF Amp.
V7	6AU6	Sound Limiter
V8	6AU6	Visc. AT Amp.
V9	6T6GT	AGC Amp.
V11	6AU6	AGC Amp.
V12	6AU6	1st Vid. Amp.
V13	6AR5	2nd Vid. Amp.
V14	12AU7	Sync. Sep.
V15	6SN7GT	Vert. Osc.
V16	6X4	Vert. Out. Transformer
V17	6W4	Hor. Driver
V18	1B3	High Volt. Rect.
V19	6CD6G	Hor. Out.
V20	6SN7GT	Hor. Osc., Hor. Con.
V21	6AL5	Hor. Phase Det., Sync. Disc.
V22	6SN7GT	Sync. Amp., Phase Splitter
V23	50Y3	500 Cycle Rect.
V24	16G1P4	Picture Tube
	or 16AP4	
V26	6T6	Osc. & Conv.
V27	6AG5	RF Amp.
V28	1B3	High Volt. Rect.

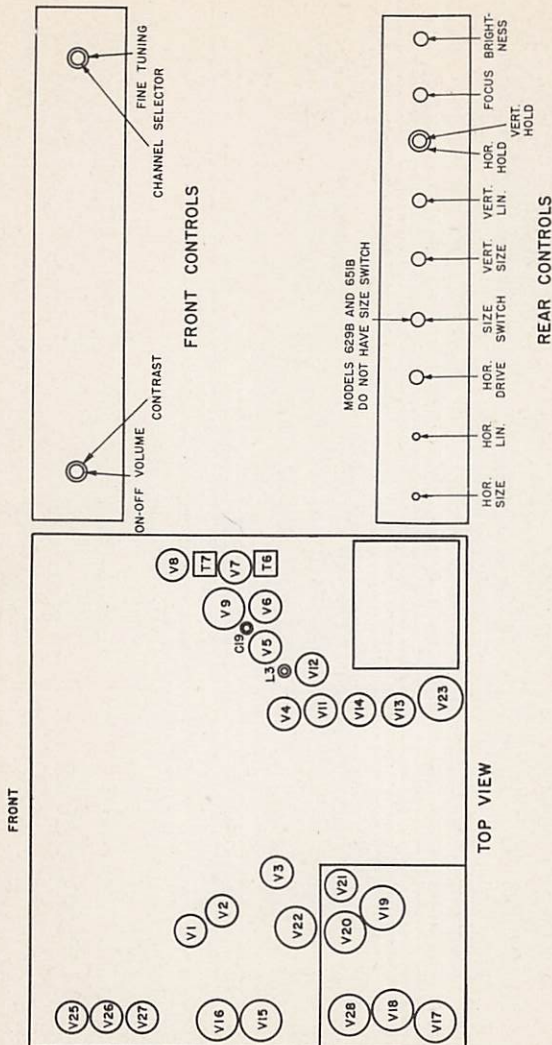
KEY VOLTAGES

B ₁ , plate of damper, V17 pin 5	225 vdc
Boosted B ₁ , cath. of damper, V17	345 vdc
Plate(s) of VERT. OSC., V15 pin 2	-46 vdc
pin 3	-20 vdc
pin 5	-20 vdc
Plate of Vert. Out., V16 pin 9	300 vdc
Plate(s) of Hor. Osc. (and control),	
V20 pin 2	-145 vdc
pin 5	-118 vdc
Grid of Hor. Out., V19 pin 5	-180 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ. -2 or ADJ.-3.

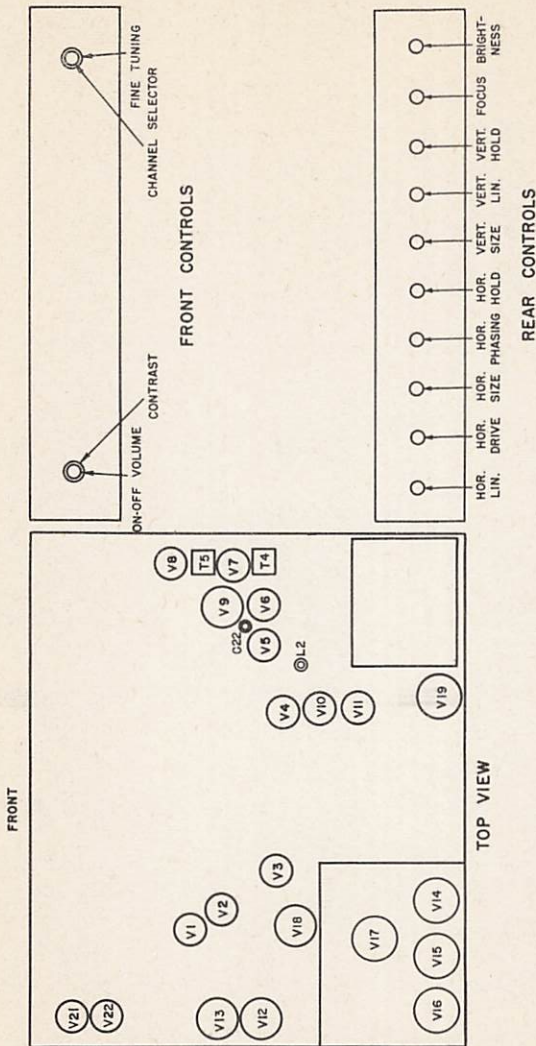


TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AU6	5th Vid. IF Amp.
V6	6AU6	6th Vid. IF Amp.
V7	6AU6	Audio IF Limiter
V8	6T8	Sound Discr. & Audio Amp.
V9	6V6GT	Audio Out.
V10	12AU7	1st Sync. Sep.
V11	12AU7	1st & 2nd Vid. Amp.
V12	6X4GT	Rect. & Discharge
V13	6K8GT	Vert. Out. Amp.
V14	6W4GT	Hor. Damp.
V15	1B3CT/8016	Hor. Volt. Rect.
V16	6BG6GT	Hor. Out. Amp.
V17	6X4GT	Rect. & Discharge
V18	12AU7	Hor. Osc. & Conv.
V19	5U4G	Low Volt. Rect.
V20	16GP4	Picture Tube
V21	6J6	Osc. & Conv.
V22	6AG5 or 6BC5	RF Amp.

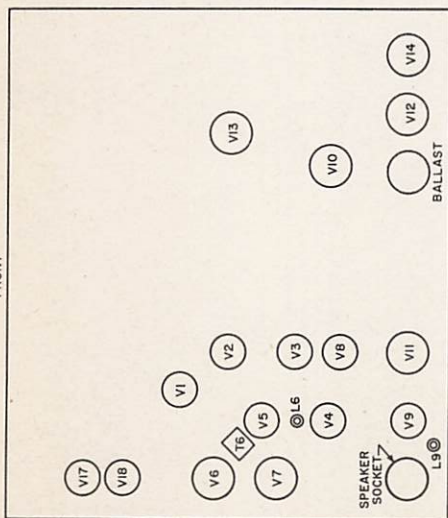
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ-2.

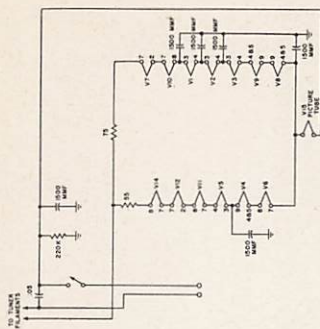


- NO SOUND - NO RASTER (31)**
Power input circuit
V19
Check focus control network
- NO RASTER - SOUND OK (31)**
Brightness con.
Line HV fuse F-1 (0.25 Amps.)
V14, V15, V16, V17, V20
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
V1, V2, V3, V4, V5, V11, V21
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V14, V16
Check 0.018 and 0.022 μ f caps. connected to hor. lin. coil
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V12, V13
Check 0.047 and 0.22 μ f caps. connected to V12 and 50 μ f elect. caps. connected to Vert. Lin. con.
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold and Phasing con.
V14, V16
Check 32 μ f caps. connected to pin 1 of V17
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V12, V13, V16
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V21
Check Vid. Det. and Amp. peaking coils
Check 0.047 μ f cap. connected to pin 2 of V17
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus con.
V1, V2, V3, V4, V5
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
Check alignment of L-2 and L-4
V1, V2, V3, V4, V5, V21, V22
IF and RF alignment
- SNOW IN PIX (23)**
V1, V2, V3, V4, V5, V21, V22
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5, V11, V21, V22
ENGRAVED EFFECT IN PIX (33)
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V20, V21
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V16
Check 50 μ f cap. connected to yoke terminals
Defl. yoke ringing
V. O. T.
- PIX BENDING (22)**
Hor. Hold and Phasing con.
Contrast con.
V16, V17
Caps. connected to pin 3 of V17
Check 0.02, 0.05 and 0.5 μ f
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner line tuning
V1, V2, V3, V4, V5, V11, V21, V22
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V14, V15, V16, V17, V20
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V14, V16, V17, V20
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V14, V15, V16, V20
- RASTER BLOOMING (37)**
Hor. Drive con.
V14, V15, V16, V19, V20
Check HV filter cap.
Check 470k Ω res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V14, V16, V19
Check 470 and 1000 μ f caps. connected to terminal "P"
Check 0.047 μ f cap. and 10k Ω res. connected to pin 8 of V16
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V12, V13, V19
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Check 0.005 μ f cap. connected to pin 1 of V12
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V12, V13
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Check 0.009 μ f cap. connected to pin 1 of V12
V. O. T.
Vert. Defl. yoke
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V12, V13
Check vert. lin. network
Check 0.005 μ f cap. connected to pin 1 of V12
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V10, V18
Check 0.01 μ f caps. connected to pin 1 of V18 and pin 2 of V10
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Phasing con.
Check 180 μ f cap. connected to pin 4 of V17
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner line tuning
V1, V2, V3, V4, V5, V21
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment L-2, L-4, T-4
Det. alignment T-5
- NO SOUND - PIX OK (8B)**
Tuner line tuning
Vol. con.
V6, V7, V8, V9
Speaker (open voice coil or defective speaker)
Sound and Vid. IF alignment L-2, L-4, T-4
Det. alignment T-5
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V6, V7, V8, V9, V21
Sound and Vid. IF alignment L-2, L-4, T-4
Det. alignment T-5
- NOISY SOUND - PIX OK**
V6, V7, V8, V9
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-2, L-4, T-4 and T-5
- SYNCH. BUZZ IN SOUND**
Tuner line tuning
V5, V6, V7, V8, V21
Sound IF and Det. alignment L-2, L-4, T-4 and T-5
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9
Poor connections in sound system

FRONT



TOP VIEW



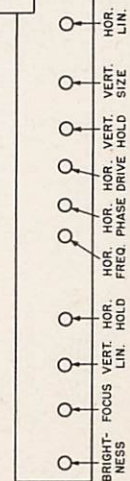
FILAMENT WIRING

TUBE LIST

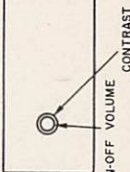
Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	12AT7	Vid. Det. - 1st Vid. Amp.
V5	6X4	Sound IF Limiter
V6	6X4	Sound IF Limiter - Sound Amp.
V7	25L6GT	Sound Out.
V8	12AU7	Vid. Det. - 2nd Sync. Amp.
V9	12AU7	2nd Vid. Amp. - 1st Sync. Amp.
V10	12SN7GT	Vert. Osc. - Vert. Out.
V11	12SN7GT	Hor. Osc. - Hor. Con.
V12	12X6	500 Ohm HV Rect.
V13	1X2	500 Ohm HV Rect.
V14	25W4GT	Damper
V15	10BP4	Picture Tube
V17	6J6	Mixer Osc.
V18	6AG5 or 6BC5	R.F. Amp.

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-2.
For vertical oscillator adjustment, see TUNER OSC. ADJ-2.

HOR.
SIZE

REAR CONTROLS



FRONT CONTROLS

FINE TUNING
CHANNEL SELECTOR

- NO SOUND - NO RASTER (31)**
Power input circuit
Check Ballast tube
Check selenium rectifiers
- NO RASTER - SOUND OK (31)**
Brightness con.
Ion trap
V1, V12, V13, V14, V15
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V9, V17
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V14
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V10
Check 0.033 and 0.1 μ f caps.
connected to pin 2 of V10
V. O. T.
- PIX JITTER SIDWAYS**
Hor. Hold and Phasing con.
V11, V12
Check 0.0022 μ f cap. connected to
pin 4 of V11
- PIX JITTER UP & DOWN (15, 17)**
Vert. Hold and Contrast con.
V8, V10
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V8, V9, V17
Check Vid. Det. and Amp. peaking coil
- Check 0.05 μ f cap. connected to
pin 2 of V9**
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Check alignment of L-9
V1, V2, V3, V4, V8, V17
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V8, V17, V18
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (36)**
V1, V2, V3, V4, V8, V9, V17, V18
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V8, V9, V15
Check Vid. Det. and Amp. peaking
coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V10
Check 0.10 μ f cap. connected
to terminals of yoke
- Defl. yoke rugging**
- PIX BENDING (22)**
Hor. Hold, Phasing and Contrast con.
V10
Check 0.01 μ f cap. connected to
pin 6 of V11
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V8, V17, V18
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V11, V12, V13, V14, V15
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V11, V12, V13, V14, V15
Check B+ voltages
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
V12, V13, V14, V15
- RASTER BLOOMING (37)**
Hor. Drive con.
V1, V2, V3, V4, V15
Check B+ voltages
Check 470K Ω res. inserted in
second anode lead
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V4, V5, V6, V7
Speaker (open voice coil or
defective connection)
Sound and Vid. IF alignment L-6
Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V4, V5, V6, V7
Speaker
Sound and Vid. IF alignment L-6
Det. alignment T-6
- NOISY SOUND - PIX OK**
Vol. con.
V4, V5, V6, V7
Close sound system for loose
connections
Speaker
Sound IF and Det. alignment L-6 and
T-6
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V4, V5, V6, V7
Sound IF and Det. alignment L-6 and
T-6
- INTERMITTENT SOUND - PIX OK**
V4, V5, V6, V7
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V12, V14
Check B+ voltages
C12, V10 and 1200 μ f caps.
connected to hor. phasing coil
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Hor. Size and Lin. con.
V10
Check B+ voltages
Check 0.033 and 0.1 μ f caps.
connected to pin 2 of V10
V. O. T.
- NO VERT. DEFL. (14)**
V10
Check 0.033 and 0.1 μ f caps.
connected to pin 2 of V10
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK
(16, 17)**
Vert. Hold con.
V9, V10
Check vert. int. network
Check 0.001 μ f cap. connected to
pin 1 of V10
- NO HOR. OR VERT. SYNC.
PIX SIGNAL OK**
V8, V9
Check 0.05 μ f cap. connected to
pin 6 of V9
- NO HOR. SYNC. - VERT. SYNC. OK
(19, 20)**
Hor. Hold and Phasing con.
V11, V12
Check 200 μ f cap. connected to
pin 1 of V11
- AUDIO HUM IN SOUND (8E)**
V4, V5, V6, V7
- DISTORTED SOUND (8D)**
Tuner fine tuning
V4, V5, V6, V7, V17
Check 0.01 μ f cap. connected to
pin 5 of V7
Sound and Vid. IF alignment L-6
Det. alignment T-6

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	Sound IF Amp.
V5	6AU6	Sound IF Limiter
V6	959GT	Sound Dect. & AF Amp.
V7	959GT	Sound Out.
V8	12AT7	2nd Sync. Amp.
V9	12AU7	2nd Vid. Amp.
V10	12BH7	Vert. Osc. & Out.
V11	12SN7GT	Hor. Osc.
V12	19BG6	Hor. Out. Amp.
V13	6X4	Light Indicator
V14	23W4CT	High Defect.
V15	12LP4	Picture Tube
V16	1N80	2nd Det., Video Germanium Crystal
V17	6J6	Osc. & Conv.
V18	6CB6 or 6BC6	RF Amp.

KEY VOLTAGES

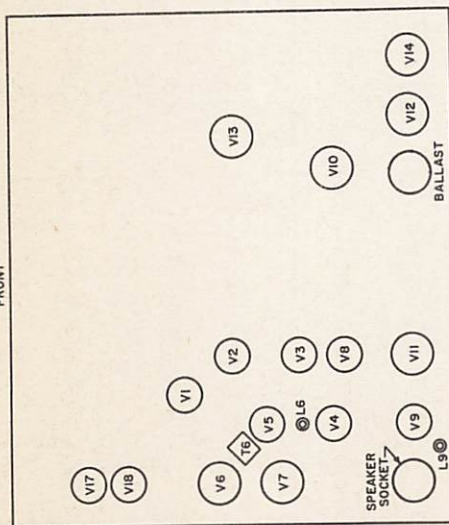
B ₁ , plate of damper, V14 pin 5	260 vdc
Bocatted B ₁ , cath. of damper, V14 pin 2	400 vdc
Plate of Vert. Osc., V10 pin 6	36 vdc
Plate of Vert. Out., V10 pin 1	360 vdc
Plates of Hor. Out., V11 pin 2	180 vdc
Grid of Hor. Out., V12 pin 5	-22 vdc

(All voltages are measured with a VTVM connected between the tube pins and pin 8 of V9.)

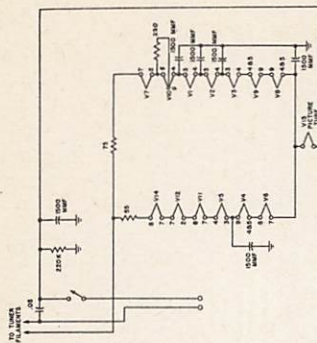
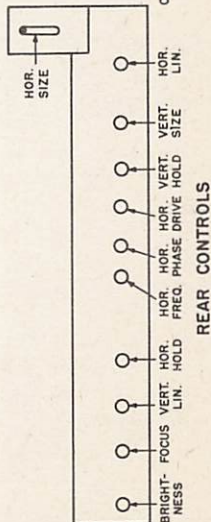
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ-2.

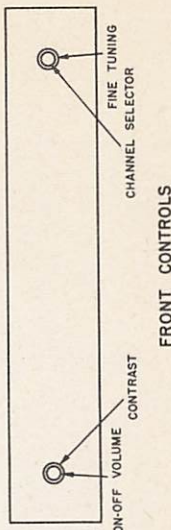
FRONT



TOP VIEW



FILAMENT WIRING



FRONT CONTROLS

- NO SOUND - NO RASTER (81)**
Power input circuit
Check Ballast tube
Check selenium rectifiers
Check filament strings for open heaters
- NO RASTER - SOUND OK (81)**
Brightness con.
Check HV fuse F-1 (0.25 Amps.)
Ion trap
V1, V2, V3, V4, V5, V14, V15
V11, V12, V13, V14, V15
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (84)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9, V17
Check Vid. Det. crystal
Check Vid. Det. crystal (1N60)
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V14
Check 0.033 and 0.047 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V10
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Phasing con.
V11, V12
Check 0.002 μ f cap. connected to pin 4 of V11
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V8, V10
- SMEARED PIX (86)**
Tuner fine tuning
V1, V2, V3, V8, V9, V17
Check Vid. Det. crystal (1N60)
Check Vid. Det. and Amp. peaking coils
Check 0.01 μ f cap. connected to pin 7 of V10
IF and RF alignment
- POOR PIX DETAIL (85)**
Tuner fine tuning
Focus con.
V1, V2, V3
Check Vid. Det.
Check Vid. Det. and Amp. peaking coils
IF and RF alignment (1N60)
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V12, V13, V14, V15
Check HV filter cap. of L-9
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V17, V18
Check Vid. Det. crystal (1N60)
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V8, V9, V17, V18
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9, V15, V17
Check Vid. Det. crystal
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
Check 50 μ f cap. connected to terminal 1 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Freq., Drive and Phasing con.
Check 0.02 μ f cap. connected to pin 6 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V8, V9, V17, V18
Check Vid. Det. crystal (1N60)
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Bright. con.
V1, V13, V15, V14, V15
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V1, V2, V3, V8, V9, V17
Check B+ voltages
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V12, V13, V15
- NO SOUND - NO RASTER (81)**
Power input circuit
Check Ballast tube
Check selenium rectifiers
Check filament strings for open heaters
- NO SOUND - SOUND OK (81)**
Brightness con.
Check HV fuse F-1 (0.25 Amps.)
Ion trap
V1, V2, V3, V4, V5, V14, V15
V11, V12, V13, V14, V15
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (84)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9, V17
Check Vid. Det. crystal
Check Vid. Det. crystal (1N60)
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V14
Check 0.033 and 0.047 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V10
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Phasing con.
V11, V12
Check 0.002 μ f cap. connected to pin 4 of V11
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V8, V10
- SMEARED PIX (86)**
Tuner fine tuning
V1, V2, V3, V8, V9, V17
Check Vid. Det. crystal (1N60)
Check Vid. Det. and Amp. peaking coils
Check 0.01 μ f cap. connected to pin 7 of V10
IF and RF alignment
- POOR PIX DETAIL (85)**
Tuner fine tuning
Focus con.
V1, V2, V3
Check Vid. Det.
Check Vid. Det. and Amp. peaking coils
IF and RF alignment (1N60)
- RASTER BLOOMING (87)**
Hor. Drive con.
V12, V13, V14, V15
Check HV filter cap. and 470K Ω res. connected to it.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V12, V14
Check B+ voltages
Check 390 and 1200 μ f caps. connected to Hor. Phasing coil
H. O. T.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V10
Check B+ voltages
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V10
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
Check 0.001 μ f cap. connected to Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V8, V10
Check vert. int. network
Check 0.001 μ f cap. connected to pin 7 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL**
V8, V9
Check 0.05 μ f cap. connected to pin 2 of V8
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold, Freq. and Phasing con.
V8, V11, V12
Check 3300 μ f cap. connected to pin 1 of V11
- AUDIO HUM IN SOUND (8E)**
V4, V5, V6, V7
- DISTORTED SOUND (8D)**
Tuner fine tuning
V4, V5, V6, V7, V17
Check Vid. Det. crystal (1N60)
Check 0.01 μ f cap. connected to pin 5 of V7
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V4, V5, V6, V7
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V4, V5, V6, V7, V17
Check Vid. Det. crystal (1N60)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- NOISY SOUND - PIX OK**
V4, V5, V6, V7
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-5, L-6
and T-6
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V4, V5, V6, V7
Check Vid. Det. crystal (1N60)
Sound IF and Det. alignment L-5, L-6
and T-6
- INTERMITTENT SOUND - PIX OK**
V4, V5, V6, V7
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	Sound IF Amp.
V5	6AU6	Sound Limiter
V6	6SG6T	Sound Osc.
V7	12AT7	2nd Sync. Amp.
V8	12AU7	2nd Vid. Amp.
V9	12BH7	Vert. Osc. & Out.
V10	12SN7GT	Hor. Osc.
V11	19BG6	Hor. Out. Amp.
V12	12X4	High Volt. Sect.
V13	12X4	High Volt. Sect.
V14	12LP4	Picture Tube
V15	12LP4	Picture Tube
V16	1N80	2nd Det., Vid., Germanium Crystal
V17	6J5	Osc. & Conv.
V18	6CB6 or 6AG5 or 6BC5	RF Amp.

KEY VOLTAGES

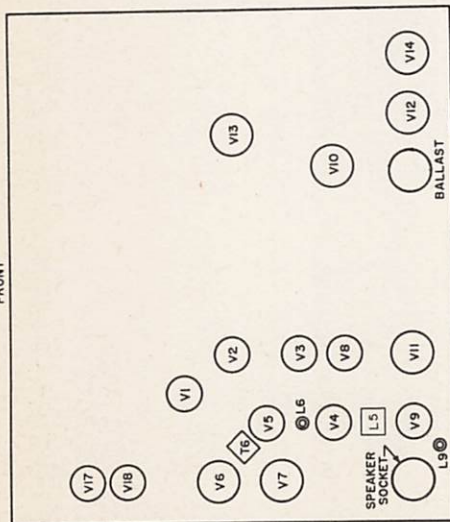
B ₁ , plate of damper, V14 pin 5	260 vdc
Boosted B ₁ , cath. of damper, V14 pin 3	400 vdc
Plate of Vert. Osc., V10 pin 6	32 vdc
Plate of Vert. Out., V10 pin 1	365 vdc
Plate of Hor. Osc., V11 pin 2	210 vdc
Grid of Hor. Out., V12 pin 5	-22 vdc

(All voltages are measured with a VTVM connected between the tube pins and pin 8 of V9.)

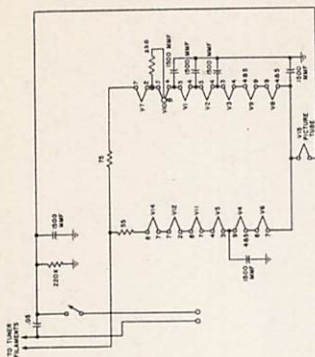
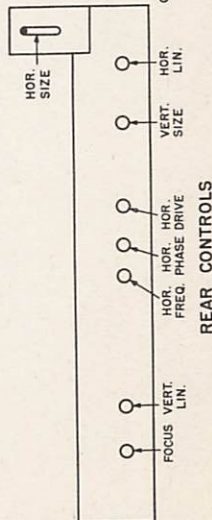
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuning oscillator adjustment, see TUNER OSC. ADJ.-2.

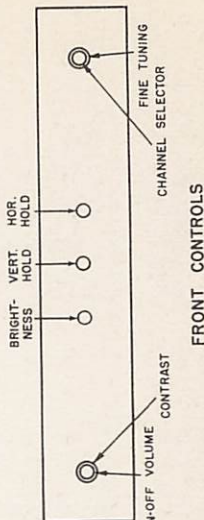
FRONT



TOP VIEW



FILAMENT WIRING



- NO SOUND - NO RASTER (31)**
Power input circuit
Check Ballast tube
Check stentium rectifiers
Check filament strappings for open heater
- NO RASTER - SOUND OK (31)**
Brightness con.
Ion trap
V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9, V17
Check Vid. Det. crystal (IN60)
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V14
Check 0.033 and 0.047 μ f caps.
connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
V10
Vert. Lin. and Size con.
Check 0.033 and 0.1 μ f cap. connected
to pin 6 of V10
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Phasing con.
V11, V12
Check 0.002 μ f cap. connected to pin 4
of V11
- PIX JITTER UP & DOWN (16, 17)**
V8, V10
Vert. Hold and Contrast con.
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9
Check Vid. Det. crystal (IN60)
Check Vid. Det. and Amp. peaking coils
Check 0.01 μ f cap. connected to pin 7
of V9
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3
Check Vid. Det. and Amp. peaking coils
Check Vid. Det. crystal (IN60)
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
Check alignment of L-9
V1, V2, V3, V17, V18
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V17, V18
Check Vid. Det. crystal (IN60)
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V8, V9, V17, V18
ENHANCED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
V1, V2, V3, V8, V9, V15, V17
Check Vid. Det. and Amp. peaking coils
Check Vid. Det. crystal (IN60)
- VERT. BARS (21)**
Hor. Drive con.
V12, V14
Check 50 μ f cap. connected to
terminal 1 of yoke
Det. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Freq., Drive and Phasing con.
V11, V12
Check 0.02 μ f cap. connected to pin
6 of V11
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V8, V17, V18
Check Vid. Det. crystal (IN60)
IF and RF alignment
- INTERMITTENT RASTER - SOUND OK**
V11, V12, V13, V14, V15
HF trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V15
Check B- voltages
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V12, V13, V15
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V4, V5, V6, V7
Vol. con.
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V4, V5, V6, V7, V17
Check Vid. Det. crystal (IN60)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- NOISY SOUND - PIX OK**
V4, V5, V6, V7
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-5,
L-6 and T-6
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V4, V5, V6, V17
Check Vid. Det. crystal (IN60)
Sound IF and Det. alignment L-5, L-6 and
T-6
- INTERMITTENT SOUND - PIX OK**
V4, V5, V6, V7
Poor connections in sound system
- FASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V15
Check B- voltages
Check HV filter cap. and 470k Ω res.
connected to it.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V12, V14
Check B- voltages
H. O. T. or Phasing coil
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V10
Check B- voltages
Check 0.033 and 0.1 μ f caps. connected
to pin 6 of V10
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
Check 0.033 and 0.1 μ f caps. connected
to pin 6 of V10
Check 0.001 μ f cap. connected to pin 7
of V10
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V8, V10
Check vert. int. network
Check 0.001 μ f cap. connected to
pin 7 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V8, V9
Check 0.05 μ f cap. connected to pin 2 of V8
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
H. O. T. or Phasing coil
V8, V10, V17
Check 200 μ f cap. connected to pin 1
of V11
- AUDIO HUM IN SOUND (8E)**
V4, V5, V6, V7
DISTORTED SOUND (8D)
Tuner fine tuning
V4, V5, V6, V7, V17
Check Vid. Det. crystal (IN60)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6

- NO SOUND - NO RASTER (31)**
 Heater input circuit
 Baffle
 Check selenium rectifiers
 Check filament strings for open heaters
- NO RASTER - SOUND OK (31)**
 Brightness con.
 Ion trap
 Ion HV fuse F-1 (0.25 Amps.)
 V11, V12, V13, V14, V15
 HV trans, Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
 Tuner fine tuning
 V1, V2, V3, V4, V8, V9
 Check tuner tubes
- POOR HOR. LIN.**
 Hor. Lin. and Drive con.
 V12, V13, V14, V15
 Check 0.033 and 0.1 μ f caps. connected to hor. lin. con.
 H. O. T.
- POOR VERT. LIN. (11, 12)**
 Vert. Lin. and Size con.
 Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
 V. O. T.
- PIX JITTER SIDEWAYS**
 Hor. Hold and Phasing
 Check 0.002 μ f cap. connected to pin 4 of V11
- PIX JITTER UP & DOWN (16, 17)**
 Vert. Hold and Contrast con.
 V8, V10
- SMEARED PIX (G5)**
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V8, V9
 Check Vid. Det. and Amp. peaking coils
 Check 0.05 μ f cap. connected to pin 2
- IF and RF alignment**
- POOR PIX DETAIL (35)**
 Tuner fine tuning
 Focus con.
 V1, V2, V3, V4, V8, V9
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
 Tuner fine tuning
 Check alignment of L-9
 V1, V2, V3, V8
 Contrast con.
 IF and RF alignment
- SNOW IN PIX (32)**
 Check tuner tubes
 V1, V2, V3, V8
 Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
 V1, V2, V3, V4, V8, V9
 Check tuner tubes
- ENGRAVED EFFECT IN PIX (33)**
 Contrast con.
 Tuner fine tuning
 V1, V2, V3, V8, V9
 Check tuner tubes
 Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
 Hor. Drive con.
 V12, V14
 Check 50 μ f cap. connected to terminals 1 and 2 of yoke
 Defl. yoke ringing
- PIX BENDING (22)**
 Hor. Hold and Phasing con.
 Hor. Drive and Hor. Drive con.
 V8, V11, V12
- WEAK OR NO PIX - SOUND WEAK - RASTER OK**
 Tuner fine tuning
 Contrast con.
 Check tuner tubes
 V1, V2, V3, V4, V8
 RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
 Brightness con.
 V11, V12, V13, V14, V15
 HV trans.
- INSUFFICIENT BRIGHTNESS**
 Ion trap
 Brightness and Hor. Drive con.
 V12, V13, V14, V15
 Check B- voltages
 Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
 Hor. Drive, Size and Vert. Size con.
 V12, V13, V15
- RASTER BLOOMING (37)**
 Hor. Drive con.
 V12, V13, V14, V15
 Check B- voltages
 Check HV 410 cap.
 Check 470k Ω res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
 Hor. Drive and Size con.
 Check B- voltages
 Check 390 and 1200 μ f caps. connected to hor. phasing coil
 Low line voltage
 H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
 Tuner fine tuning
 Vert. Size and Lin. con.
 V10
 Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
 V. O. T.
 Check B- voltages
 Low line voltage
- NO VERT. DEFL. (14)**
 V10
 Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
 Check 0.001 μ f cap. connected to pin 7 of V10
 Vert. Defl. yoke
 V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
 Vert. Hold con.
 Check vert. int. network
 Check 0.001 μ f cap. connected to pin 7 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
 V8, V9
 Check 0.01 μ f cap. connected to pin 7 of V9
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
 Hor. Hold and Phasing con.
 V8, V11, V12
 Check 200 μ f cap. connected to pin 1 of V11
- AUDIO HUM IN SOUND (8E)**
 V4, V5, V6, V7
- DEFORMED SOUND (8D)**
 Tuner fine tuning
 V4, V5, V6, V7
 Check tuner tubes
 Check 0.01 μ f cap. connected to pin 5 of V7
 Sound and Vid. IF alignment L-6
 Det. alignment T-6
- NO SOUND - PIX OK (8B)**
 Tuner fine tuning
 V4, V5, V6, V7
 Volt. con.
 Speaker (open voice coil or defective connection)
 Sound and Vid. IF alignment L-6
 Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
 Tuner fine tuning
 Volt. con.
 Check tuner tubes
 V4, V5, V6, V7
 Sound and Vid. IF alignment L-6
 Det. alignment T-6
- NOSY SOUND - PIX OK**
 Volt. con.
 Check sound system for loose connections
 Speaker
 Sound IF and Det. alignment L-6 and T-6
- SYNC. BUZZ IN SOUND**
 Tuner fine tuning
 V4, V5, V6
 Sound IF and Det. alignment L-6 and T-6
- INTERMITTENT SOUND - PIX OK**
 V4, V5, V6, V7
 Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det.
V5	6AU6	Sound IF Amp.
V6	6X4	Sound Limiter
V7	6T8	Sound Diacr. & AF Amp.
V8	12L6GT	Sound Out.
V9	6AU6	1st Vid. Amp.
V10	12AU7	2nd Vid. Amp.
V11	12AU7	1st Sync. Amp.
V12	12SN7GT	3rd Sync. Amp. & Clipper
V13	12SN7GT	Hor. Osc. Amp. & Clipper
V14	10BQ6G	Hor. Out. Amp.
V15	25W4GT	Hor. Damper
V16	1B3GT	
	8016	HV Rect.
V17	12SN7GT	Vert. Osc.
V18	12AU7	Vert. Amp.
V19	5Y4G	Low Volt. Rect.
V21	6T6	Mixer Osc.
V22	6AG5	RF Amp.

KEY VOLTAGES

B+, plate of damper, V15 pin 5 115 vdc
 Boosted B+, cath. of damper, V15 pin 3 260 vdc
 *Plate of Hor. Osc., V13 pin 2 160 vdc
 pin 5 110 vdc
 Plate of Hor. Out., V14 pin 5 -200 vdc

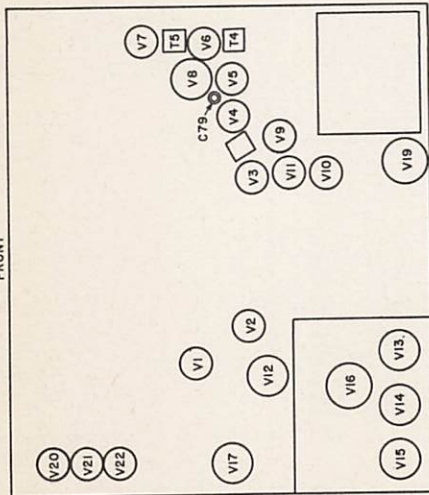
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

*Voltage is measured between tube pin and B+.

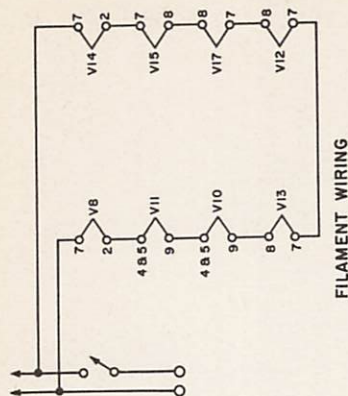
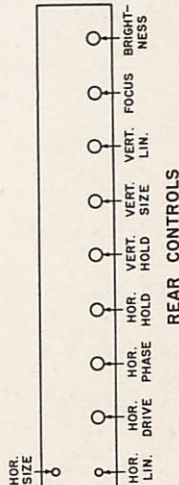
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
 For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.

FRONT



TOP VIEW



FRONT CONTROLS

CONTRAST
 ON-OFF VOLUME
 BRIGHTNESS
 VERT. SIZE
 VERT. HOLD
 VERT. SIZE LIN.
 FINE TUNING CHANNEL SELECTOR

- NO SOUND - NO RASTER (31)**
Power input circuit
V19
Check filament string for open circuits
- NO RASTER - SOUND OK (31)**
Brightness con.
V13, V14, V15, V16, V18
Ion trap
Check HV fuse F-1 (0.25 Amps.)
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V9, V10, V22
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V14, V15
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V17
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
Check 100 μ f elec. cap. connected to pin 3 of V17
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold and Phasing con.
V17
Check 0.033 μ f caps. connected to pin 1 of V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V11, V12, V17
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
Check tuner tubes
V1, V2, V3, V4, V9, V10
Check Vid. Det. and Amp. peaking
Check 0.047 μ f caps. connected to pin 7 of V10 and to pin 1 of V9
- IF and RF alignment**
- NO SOUND - NO RASTER (31)**
Tuner fine tuning
V19
Check 100 μ f elec. cap. connected to pin 3 of V17
V. O. T.
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con. V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (44, 4E)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4
Check tuner tubes
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4
Check tuner tubes
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V9, V10
Check tuner tubes
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V9, V10, V18
Check tuner tubes
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V15
Check 50 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIX BENDING (23)**
Hor. Hold and Phasing con.
V11, V12, V13, V14
Check 0.02 μ f cap. connected to pin 3 of V13
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast con.
Check tuner tubes
V1, V2, V3, V4
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V13, V14, V15, V16, V18
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Focus con. V4
Check Vid. Det. and Amp. peaking coils
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Size and Vert. Size con.
V14, V15, V16, V18
- RASTER BLOOMING (37)**
Hor. Drive con.
V14, V15, V16, V18, V19
Check HV filter cap.
Check 1 Meg Ω res. connected to HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V14, V15, V19
Check 330 and 1500 μ f caps. connected to terminal "D" of HV filter cap.
Check 0.05 μ f cap. and 3.9K Ω res. connected to pin 8 of V14
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT**
Vert. Size and Lin. con.
V17, V19
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V17
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Int. network
Check 1000 μ f cap. connected to pin 4 of V17
NO HOR. OR VERT. SYNC.
PIX SIGNAL OK
V10, V11, 05 μ f caps. connected to pin 6 of V11
and to pin 7 of V11
- NO HOR. SYNC. - VERT. SYNC. OK (15, 20)**
Hor. Hold and Phasing con.
V11, V13
Check 180 μ f cap. connected to pin 4 of V13
- AUDIO HUM IN SOUND (8E)**
V3, V6, V7, V8
- DISTORTED SOUND (8D)**
Tuner fine tuning
V5, V6, V7, V8
Check tuner tubes
Check 0.02 μ f caps. connected to pin 5 of V9
Sound and Vid. IF alignment
L-4, T-4
Det. alignment T-5
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V5, V6, V7, V8
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment
L-4, T-4
Det. alignment T-5
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
Check tuner tubes
V3, V6, V7, V8
Sound and Vid. IF alignment
Det. alignment T-5
- NOISY SOUND - PIX OK**
Vol. con.
V3, V6, V7, V8
Check Vid. Det. and Amp. peaking system for loose connections
Speaker
Sound IF and Det. alignment
L-4, T-4 and T-5
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V3, V6, V7, V8
V4, V5, V6, V7
Sound IF and Det. alignment L-4, T-4 and T-5
- INTERMITTENT SOUND - PIX OK**
V3, V6, V7, V8
Post connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AU6	Vid. & AGC Det.
V6	6AU6	Vid. & AGC Det.
V7	6AU6	Audio IF Limiter
V8	6AL5	Sound Discr.
V9	6V6GT	Audio Out.
V10	12AU7	1st Sync. Sep.
V11	6AC7	Vid. Amp.
V12	6X4	Vert. Out. & Discharge
V13	6E5GT	Vert. Out. Amp.
V14	6W4GT	Hor. Damper
V15	1B3GT/	
	8016	High Volt. Rect.
V16	6E5GT	Hor. Out. Amp.
V17	6SN7GT	Hor. Osc. & Con. Tube
V18	6X4	Hor. Out. & Sync. Amp.
V19	5Y4G	Low Volt. Rect.
V20	17BP4A	Picture Tube
V21	6J5	Osc. & Conv.
V22	6AG5 or 6BC5 or 6CB6	RF Amp.
V24	6AV6	Audio Amp.

*V18 - 12AU7 in some sets.

KEY VOLTAGES

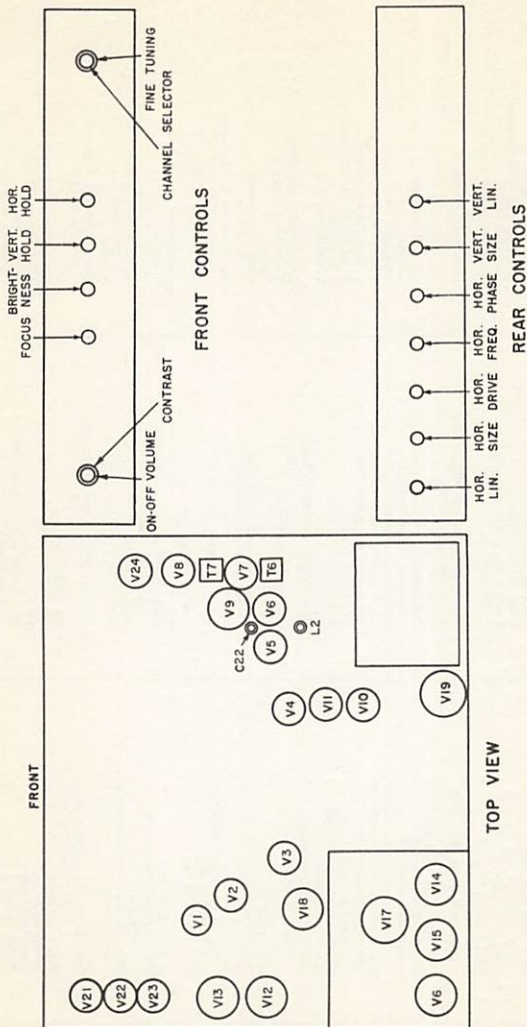
B+, plate of damper, V14 pin 5	225 vdc
Boosted B-, cath. of damper, V14 pin 3	520 vdc
Plate(s) of VERT. OSC., V12 pin 2	-45 vdc
Plate(s) of VERT. OSC., V12 pin 3	-47 vdc
Plate of Vert. Out., V13 pin 3	210 vdc
Plate(s) of Hor. Osc. (and control), V17 pin 5	42 vdc
Grid of Hor. Out., V16 pin 5	42 vdc
Grid of Hor. Out., V16 pin 6	-170 vdc

(All voltages are measured with a VTVM

connected between the tube plus and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



BRIGHT- VERT. HOR.
FOCUS, MESS. HOLD HOLD

ON-OFF VOLUME
CONTRAST

CHANNEL SELECTOR
FINE TUNING

FRONT CONTROLS

HOR. HOR. HOR. HOR. HOR. VERT.
L.I.N. SIZE DRIVE FREQ. PHASE SIZE L.I.N.

REAR CONTROLS

TOP VIEW

- NO SOUND - NO RASTER (31)**
Power input circuit
V19
- NO RASTER - SOUND OK (31)**
F-1 HV Fuse (0.25 amp.)
V14, V15, V16, V17, V20
Ion trap
Brightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V21
- POOR HOR. LIN.**
V1, V2, V3, V4, V5, V11, V21
V14, V16
V19 and Lin. con.
V12, V13
V15, L1, and S16 con.
- POOR VERT. LIN. (11, 12)**
V12, V13
V15, L1, and S16 con.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. and Phasing con.
V16, V17
Check 82 μ f caps. connected to pin 1 of V17
- PIX JITTER UP & DOWN (16, 17)**
V12, V13, V18
Vert. Hold and Contrast con.
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f cap. connected to pin 4 of V11
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus con.
V1, V2, V3, V4, V5
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- NO SOUND - NO RASTER (31)**
Tuner line tuning
V6, V7, V8, V9
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V5, V6, V7, V8, V9, V21
Vol. con.
Sound and Vid. IF alignment L-2,
C-22, T-4
- NOISY SOUND - PIX OK**
V6, V7, V8, V9, V24
Vol. con.
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L-2,
C-22, T-4 and T-5
- SYNC BUZZ IN SOUND**
Tuner line tuning
V5, V6, V7, V8
Sound IF and Det. alignment L-2,
C-22, T-4 and T-5
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9, V24
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V14, V16, V17, V19
Check 470 and 1000 μ f caps. connected to hor. phasing coil
H. O. T.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V14, V16, V17, V19
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
V. O. T.
Low line voltage
- NO VERT. DEF. L. (14)**
V14, V16, V17, V19
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
pin 1 of V12
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold and Contrast con.
V5, V12, V13, V18
Vert. Int. network
Check 0.047 μ f cap. connected to pin 1 of V12
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V5, V10, V18
Check 0.047 μ f cap. connected to pin 1 of V10
- NO HOR. SYNC. - VERT. SYNC. OK**
Hor. Hold, Freq. and Phasing con.
V16, V17
Check 180 μ f cap. connected to pin 4 of V17
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9, V24
- DISORTED SOUND (8D)**
Tuner line tuning
V5, V6, V7, V8, V9, V21
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment L-2,
C-22, T-4
Det. alignment T-5
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
V1, V2, V3, V4, V11
Check alignment of L-2 and C-22
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V22, V23
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (39)**
V1, V2, V3, V4, V5, V11, V21, V22, V23
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V20, V21
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V16
Check 50 μ f cap. connected to yoke terminal 3
Defl. yoke ranging
- PIX BENDING (22)**
V16, V17, V18
Hor. Hold, Freq. and Phasing con.
Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 3 of V17
- WEAK OR NO PIX - SOUND WEAK - RASTER OK**
Tuner line tuning
V1, V2, V3, V4, V5, V11, V21, V22, V23
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V14, V15, V16, V17, V20
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness con.
V14, V15, V16, V19, V20
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
Vert. Size con.
V16, V15, V14
Hor. Drive con.
- RASTER BLOOMING (87)**
V14, V15, V16, V19, V20
- NO SOUND - NO RASTER (31)**
Power input circuit
V19
- NO RASTER - SOUND OK (31)**
F-1 HV Fuse (0.25 amp.)
V14, V15, V16, V17, V20
Ion trap
Brightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V21
- POOR HOR. LIN.**
V1, V2, V3, V4, V5, V11, V21
V14, V16
V19 and Lin. con.
V12, V13
V15, L1, and S16 con.
- POOR VERT. LIN. (11, 12)**
V12, V13
V15, L1, and S16 con.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. and Phasing con.
V16, V17
Check 82 μ f caps. connected to pin 1 of V17
- PIX JITTER UP & DOWN (16, 17)**
V12, V13, V18
Vert. Hold and Contrast con.
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V11
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f cap. connected to pin 4 of V11
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus con.
V1, V2, V3, V4, V5
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vfd. IF Amp.
V2	6AU6	2nd Vfd. IF Amp.
V3	6AU6	3rd Vfd. IF Amp.
V4	6AU6	Sound IF Amp.
V5	6AU6	Sound IF Limiter
V6	6890T	Sound Discr. & AF Amp.
V7	25L6GT	Sound Out.
V8	12A7T	2nd Sync. Amp. & 1st Vfd. Amp
V9	12B7	1st Sync. Amp. & 2nd Vfd. Amp
V10	12BH7	Vert. Osc. & Out.
V11	12SN7GT	Hor. Osc.
V12	19BG6	Hor. Out. Amp.
V13	1X2	High Volt. Rect.
V14	25W4GT	Hor. Damper
V15	12LP4	Picture Tube
V16	1R80	2nd Vfd. Vid., Germanium Crystal
V17	GJ6	Osc. & Conv.
V18	6CB6 or 6AG5 or 6BC5	RF Amp.

RADIO CHASSIS

Symbol	Type	Circuit Function
V1	6BJ6	RF Amp. - Mixer
V2	6BJ6	Osc.
V3	6BJ6	1st IF Amp.
V4	6BJ6	2nd IF Amp.
V5	12AT6	Det. - 1st Audio Amp.
V6	50C5	Audio Out.
V7	35W4	Rect.

KEY VOLTAGES

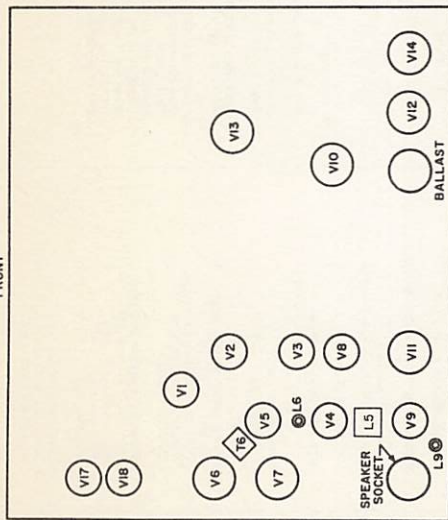
B-	plate of damper, V14	pin 5	260 vdc
B+	Boosted B+, cath. of damper	V14	
Plate of Vert. Osc.	V10	pin 3	400 vdc
Plate of Vert. Out.	V10	pin 6	32 vdc
Plate(s) of Hor. Osc. (and control)	V11	pin 1	365 vdc
Grid of Hor. Out.	V12	pin 5	150 vdc
		pin 2	210 vdc
			-22 vdc

(All voltages are measured with a VTVM connected between the tube pins and B- (pin 8 of V8).)

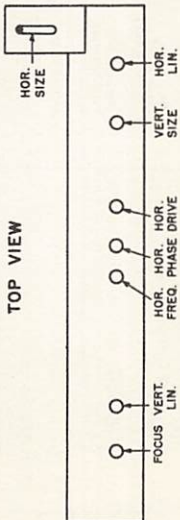
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. CSC ADJ-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ-2.

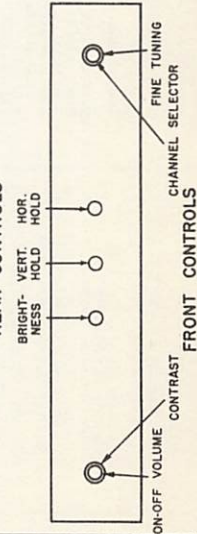
FRONT



TOP VIEW



REAR CONTROLS



FRONT CONTROLS

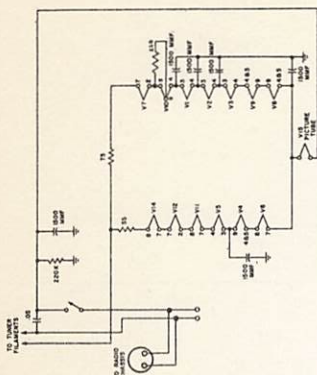
FRONT CONTROLS

FINE TUNING

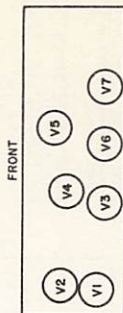
CHANNEL SELECTOR

ON-OFF VOLUME

CONTRAST

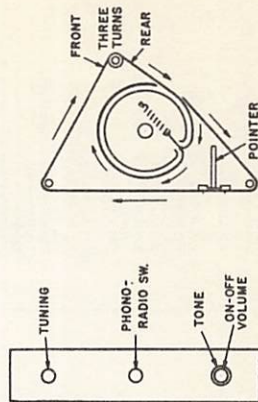


FILAMENT WIRING



TOP VIEW

(RADIO CHASSIS)



FRONT CONTROLS

(RADIO CHASSIS)

DRIVE CORD ASSEMBLY

- NO SOUND - NO RASTER (31)**
Ballast tube circuit
Check selenium rectifiers
- NO RASTER - SOUND OK (31)**
F-1 HV Fuse (0.25 Amps.)
No. 11, V12, V13, V14, V15
Brightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V1, V2, V3, V8, V9, V16, V17
Contrast con.
Vid. Det. (1N60 crystal)
- POOR HOR. LIN.**
Hor. Drive and Lin. con.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V11, V12
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Vert. Hold and Phasing con.
V11, V12
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V8, V10
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
Vid. Det. (1N60 crystal)
V1, V2, V3, V8, V9, V16
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V9, V15
V1, V2, V3
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V5, V8, V16
Vid. Det. (1N60 crystal)
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V17, V18
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V9, V17, V18
ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
Vid. Det. (1N60 crystal)
V1, V2, V3, V8, V9, V15, V16, V17
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V14
Check 50 μ f cap. connected to terminal 1 of yoke
Defl. yoke ringing
- PIX BENDING (23)**
Hor. Hold, Phasing and Freq. con.
V11, V12
Check 0.02 μ f cap. connected to pin 6 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V8, V16
Vid. Det. (1N60 crystal)
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V11, V12, V13, V14, V15
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V15
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
Vert. Size
V12, V13, V15
- RASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V15
Check HV filter cap. and 470K Ω res. connected to it.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V11, V12, V14
Check 390 and 1200 μ f caps. connected to hor. phasing coil
H. O. T.
Low line voltage
- NOISY SOUND - PIX OK**
V4, V5, V6, V7
Vol. con.
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L-5, L-6, T-8
- SYNC BUZZ IN SOUND**
Tuner fine tuning
Vid. Det. (1N60 crystal)
V4, V5, V6, V16
Sound IF and Det. alignment L-5, L-6, T-8
- INTERMITTENT SOUND - PIX OK**
V4, V5, V6, V7
Poor connections in sound system
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size con.
V10
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V10
Check 0.033 and 0.1 μ f caps. connected to pin 6 of V10
Check 0.001 μ f cap. connected to pin 7 of V10
Vid. Det.
Vert. Det. yoke
V. O. T.
- NO VERT. SYNC - HOR. SYNC. OK (16, 17)**
V8, V10
Vert. Hold con.
Vert. Int. network
Check 0.001 μ f cap. connected to pin 7 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V8, V16
Check 0.05 μ f cap. connected to pin 6 of V9
Hor. Hold con.
Hor. Sync. - VERT. SYNC. OK (19, 20)
Hor. Hold con.
Hor. Freq. and Phasing con.
V11, V12
Check 200 μ f cap. connected to pin 1 of V11
- AUDIO HUM IN SOUND (8E)**
V4, V5, V6, V7
- DISTORTED SOUND (8D)**
V4, V5, V6, V7, V17
Check 0.01 μ f cap. connected to pin 5 of V7
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V4, V5, V6, V7
Vol. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V4, V5, V6, V7, V17
Vol. con.
Sound and Vid. IF alignment L-5, L-6
Det. alignment T-6

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. & AGC Det.
V6	6AU6	Audio IF Amp.
V7	6X4	Audio IF Limiter
V8	6X4	Audio Osc. & Audio Amp.
V9	6Y6GT	Audio Out.
V10	12AU7	1st Sync. Sep.
V11	6AC7	Vid. Amp.
V12	6SN7GT	Vert. Osc. & Discharge
V13	6E5GT	Vert. Out. Amp.
V14	6X4	Hor. Osc.
V15	12XGT/	Hor. Damp.
V16	8016	High Volt. Rect.
V18	6CD6G	Hor. Out. Amp.
V17	6SN7GT	Hor. Osc. & Con. Tube
V18	12AU7	2nd Sync. Sep. & Sync. Amp.
V19	504G	Low Volt. Rect.
V20	6X4	Picture Tube
V21	816	Osc. & Contr.
V22	6AG5 or 6CB5 or 6CB6	RF Amp.

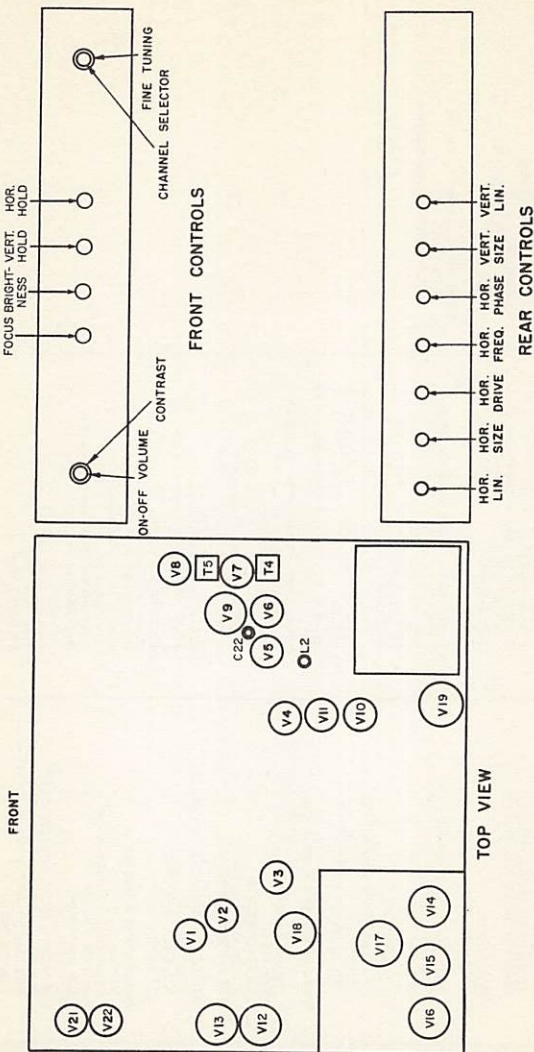
KEY VOLTAGES

B+, plate of damper, V14 pin 5	210 vdc
Plates of Vert. Osc., V12 pin 2	-60 vdc
Plate of Vert. Out., V13 pin 5	-70 vdc
Plates of Hor. Osc. and Control, V17 pin 3	160 vdc
Grid of Hor. Out., V16 pin 5	25 vdc
Grid of Hor. Out., V16 pin 5	-25 vdc
Grid of Hor. Out., V16 pin 5	-180 vdc

(All voltages are measured with a VTVM connected to the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For vertical oscillator adjustment, see TUNER OSC. ADJ.-2.



- NO SOUND - NO RASTER (81)**
Power input circuit
V19
- NO RASTER - SOUND OK (81)**
F-1 HV Fuse (0.25 Amps.)
V17, V16, V15, V14, V20
Ion trap
Brightness con.
- WEAK PIX - SOUND AND RASTER OK (84)**
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (84)**
Tuner fine tuning
V1, V2, V3, V4, V5, V10, V11, V21
Contrast con.
- POOR HOR. LIN.**
Hor. Drive and Lin. con.
V1, V2, V3, V4, V5, V10, V11, V21
Check 0.018 and 0.022 μ f caps. connected to hor. lin. con.
H. O. T.
- POOR VERT. LIN. (11, 12)**
V12, V13 and Size con.
V12, V13
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Check 20 and 50 μ f elec. caps. connected to center terminal of vert. lin. con.
V. O. T.
- PIX JITTER SIDWAYS**
Hor. Hold con.
Hor. Osc. Adj. (Synchronguide)
V16, V17
Check 82 μ f caps. connected to pin 1 of V17
- PIX JITTER UP & DOWN (16, 17)**
V10, V12, V13, V16
Vert. Hold and Contrast con.
- SMEARED PIX (86)**
Tuner fine tuning
Ca.
V1, V2, V3, V4, V5, V11
V1, V2, V3, V4, V5, V11
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f cap. connected to pin 4 of V11
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4
V5, V11
Check Vid. Det. and Amp. peaking coils
V1, V2, V3, V4, V5, V10, V11, V20
Check HV filter cap. and 1 Meg Ω res. connected to it.
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V11
Check alignment of L-2 and L-3
IF and RF alignment
- SNOW IN PIX (23)**
V22, V23
Antenna and transmission line
V1, V2, V3, V4, V5
V1, V2, V3, V4, V5, V11, V21, V22
- AC IN PIX (DARK HOR. BAR) (88)**
V1, V2, V3, V4, V5, V11, V21, V22
- ENGRAVED EFFECT IN PIX (93)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V20, V21
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V16
Check 50 μ f cap. connected to pin 2 of V12
Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 3 of V17
Defl. yoke ringing
- PIX BENDING (22)**
V16, V17, V18
Hor. Hold and Osc. Adj. con.
Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 3 of V17
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V21, V22
V1, V2, V3, V4, V5, V11
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V17, V16, V15, V14, V20
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness con.
V14, V15, V16, V19, V20
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
Vert. Size con.
V16, V15, V20
- RASTER BLOOMING (37)**
V1, V2, V3, V4, V5, V10, V11, V20
Check HV filter cap. and 1 Meg Ω res. connected to it.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V14, V16, V17, V19
Check 470 and 820 μ f cap. connected to pin 2 of V12
Check 0.047 μ f cap. connected to hor. osc. trans.
Check 0.047 of cap. and 116K res. connected to pin 8 of V16
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V12, V13, V19
Check 0.047 and 0.22 μ f cap. connected to pin 2 of V12
V. O. T.
Low line voltage
- NO VERT. DEF. L. (14)**
V12, V13
Check 0.047 and 0.22 μ f cap. connected to pin 2 of V12
Check 0.005 μ f cap. connected to pin 1 of V12
V. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold and Contrast con.
Vert. Int. network
V5, V12, V13, V18
Check 0.005 μ f cap. connected to pin 1 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V5, V10, V18
Check 0.01 μ f caps. connected to pin 7 of V10 and pin 7 of V18
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Osc. Adj. con.
V16, V17
Check 330 μ f cap. connected to pin 4 of hor. osc. trans.
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V5, V6, V7, V8, V9, V21
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-3
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V6, V7, V8, V9
Vols. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-5
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V2, V6, V7, V8, V9, V5
Vols. con.
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-5
- NOISY SOUND - PIX OK**
V5, V6, V7, V8
Vols. con.
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L-4, T-4, T-5
- SYNC. BUZZ IN SOUND**
V5, V6, V7, V8
Tuner fine tuning
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9
Poor connections in sound system

- NO SOUND - NO RASTER (31)**
 Heater input circuit
 V16
- NO RASTER - SOUND OK (31)**
 F-1 HV Fuse (0.25 Amps.)
 V14, V15, V16, V17, V22
 Ion trap
 HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
 Tuner line tuning
 Contrast con.
 V1, V2, V3, V4, V5, V20
- POOR HOR. LIN.**
 Hor. Drive and Lin. con.
 V15, V16
 Check 0.047 and 0.022 μ f caps. connected to Hor. Lin. coil
 H. O. T.
- POOR VERT. LIN. (11, 12)**
 V12, V13
 Check 0.047 and 0.1 μ f caps. connected to V12, V13
 Check 80 μ f elec. cap. connected to pin 8 of V13
 V. O. T.
- PIX JITTER SIDEWAYS**
 Hor. Hold con.
 Hor. Defl. con. (Synchroguide)
 V10, V14, V15
 Check 82 μ f caps. connected to pin 4 of V14
- PIX JITTER UP & DOWN (16, 17)**
 Hor. Drive and contrast con.
 V10, V11, V12, V13
- SMEARED PIX (36)**
 Tuner line tuning
 Contrast con.
 V1, V2, V3, V4, V5
 Check 0.047 and Amp. peaking coils
 Check 0.047 μ f cap. connected to pin 4 of V5
 IF and RF alignment
- POOR PIX DETAIL (35)**
 Tuner line tuning
 V1, V2, V3, V4
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
 Tuner line tuning
 V1, V2, V3, V5
 Check alignment of L-3
 IF and RF alignment
- SNOW IN PIX (32)**
 V1, V2, V3, V19
 Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
 V1, V2, V3, V4, V5, V19, V20
- ENGRAVED EFFECT IN PIX (33)**
 Tuner line tuning
 Contrast con.
 V1, V2, V3, V4, V5, V20, V22
 Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
 Hor. Drive con.
 Check 56 μ f cap. connected to terminals 7 and 3 of yoke
 Defl. yoke ringing
- PIX BENDING (22)**
 Hor. Hold and Osc. Adj. con.
 V1, V2, V3, V4
 Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 6 of V14
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
 Tuner line tuning
 V1, V2, V3, V4
 RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
 Brightness con.
 V4, V15, V16, V17, V22
 HV trans.
- INSUFFICIENT BRIGHTNESS**
 Ion trap
 Brightness and Hor. Drive con.
 V15, V16, V17, V18, V22
 Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
 Hor. Drive and Size con.
 Vert. Size con.
 V15, V17, V22
- RASTER BLOOMING (37)**
 Hor. Drive con.
 V15, V16, V17, V18, V22
 Check HV filter cap. and 1 Meg Ω res. connected to it.
- NO SOUND - PIX OK (8B)**
 Tuner line tuning
 V6, V7, V8, V9
 Vol. con.
 Speaker (open voice coil or defective connections)
 Sound and Vid. IF alignment L-3, T-5
 Det. alignment T-6
- WEAK SOUND - PIX OK (8C)**
 Tuner line tuning
 V6, V7, V8, V9, V20
 Vol. con.
 Sound and Vid. IF alignment L-3, T-5
 Det. alignment T-6
- NOISY SOUND - PIX OK**
 V6, V7, V8, V9
 Vol. con.
 Check for loose connections in speaker system
 Sound IF and Det. alignment L-3, T-5 and T-6
- SYNC BUZZ IN SOUND**
 Tuner line tuning
 V6, V7, V8, V9
 Contrast con.
 Sound IF and Det. alignment L-3, T-5 and T-6
- INTERMITTENT SOUND - PIX OK**
 V6, V7, V8, V9
 Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
 Hor. Drive and Size con.
 V15, V16, V18
 Check 560 and 1000 μ f caps. connected to hor. phase coil
 Check 0.05 μ f cap. and 10M Ω res. connected to pin 8 of V15
 Low line voltage
 H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
 Vert. Size and Lin. con.
 V12, V13, V18
 Check 0.047 and 0.1 μ f caps. connected to V. O. T. and V12
 Low line voltage
- NO VERT. DEF. L. (14)**
 V12, V13
 Check 0.047 and 0.1 μ f caps. connected to V. O. T.
 Check 0.005 μ f cap. connected to pin 7 of V12
 Vert. Defl. yoke
 V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
 Vert. Hold con.
 Vert. Int. network
 V12, V13
 Check 0.009 μ f cap. connected to pin 7 of V12
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
 V10, V11
 Check 0.047 μ f cap. connected to pin 1 of V10
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
 Hor. Hold con.
 Hor. Int. Adj. (Synchroguide)
 V14, V15
 Check 180 μ f cap. connected to pin 1 of V14
- AUDIO HUM IN SOUND (8E)**
 V6, V7, V8, V9
- DEFORMED SOUND (8D)**
 V6, V7, V8, V9, V20
 Check 0.01 μ f cap. connected to pin 5
 Sound and Vid. IF alignment L-3, T-5
 Det. alignment T-6

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st IF Amp.
V2	6AU6	2nd IF Amp.
V3	6AU6	3rd IF Amp.
V4	6AL5	Vid. Det. & AGC
V5	6AU6	1st Vid. Amp.
V6	6AU6	2nd Vid. Amp.
V7	12AU7	Vid. Out. & DC Restorer
V8	12AU7	Sync. Amp. & Limiter
V9	6X4	Phos. Pen. & Hor. Con.
V10	6AL5	Phos. Pen. & A.C.
V11	6SN7GT	Hor. Osc.
V12	6BG6G	Hor. Out.
V13	5V4G	Hor. Damper
V14	6SN7GT	Hor. Osc.
V15	6K9GT	Vert. Out.
V16	6AV6	Audio IF Amp.
V17	6AU6	Audio IF Amp.
V18	6SN7GT	Diser. & Audio Amp.
V19	6V6GT	Audio Power Out.
V20	6V6GT	Conv. & Osc.
V21	6AG5	RF Amp.
V22	6J6	Conv. & Osc.
V23	6AG5	RF Amp.
V24	6SC7	Scanning Interlock Con.
V25	6X4	Phos. Pen. & Hor. Con.
V26	6SN7T	HV Osc.
V27	6RG6G	HV Osc. Amp.
V28	3NP4	Kinesco.
V29	3X0	Set. Rect. Low Volt. Rect.
V30	3X0	Set. Rect. Low Volt. Rect.
V31	3X0	Set. Rect. Low Volt. Rect.
V32	3X0	Set. Rect. Low Volt. Rect.
V33	3X0	Set. Rect. Low Volt. Rect.
V34	EY51	High Volt. Rect.
V35	EY51	High Volt. Rect.
V36	EY51	High Volt. Rect.

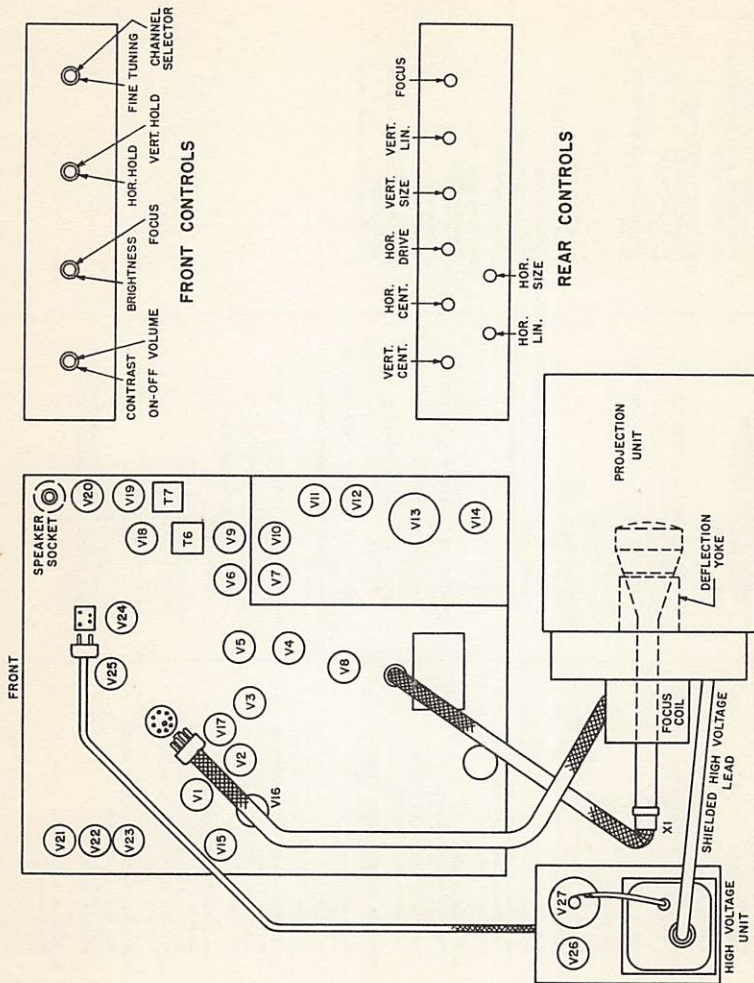
KEY VOLTAGES

B+	Plates of damper, V14 pins 4 and 6	138 vdc
B+	Boosted B+, cath. of damper, V14 pin 8	200 vdc
Plates of Vert. Osc. and Discharge	V15 pin 5	55 vdc
	pin 2	72 vdc
Plate of Vert. Out., V16	pin 3	-180 vdc
Plates of Hor. Osc. and Discharge	pin 3, 12	105 vdc
	pin 2	-39 vdc
Grid of Hor. Out., V13	pin 5	-215 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For tuner oscillator adjustment, see TUNER OSC. ADJ-2.



TOP VIEW

- NO SOUND - NO RASTER (31)**
Power input circuit
Antenna coil
Check selenium rectifiers
- NO RASTER - SOUND OK (31)**
F-1 HV Fuse (0.25 Amps.)
Rectifier
Check selenium rectifiers
- NO RASTER - SOUND AND RASTER OK (34)**
Tuner fine tuning
V22, V1, V3, V4, V5, V6, V7, V8
Contrast con.
- POOR HOR. LNK.**
Hor. Drive and Lnk. con.
Check 0.035 and 0.05 μ f cap.
connected to Hor. lnk. coil
H. O. T.
- POOR VERT. LNK. (11, 12)**
V22, V1, V3, V4, V5, V6, V7, V8
V11, V12, V15, V14
Check two 0.05 μ f caps. connected
to pin 2 of V15
V. O. T.
- PIX JITTER SIDEWAYS**
V11, V12, V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V15, V16
- SMEARED PIX (35)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking
coil
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking
coil
IF and RF alignment
- SOUND BARS IN PIX (44, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V6, V7
Check alignment of L-4
IF and RF alignment
- SNOW IN PIX (33)**
V1, V2, V3, V4, V5, V6, V7, V8
Antenna and transmission line
V22, V23
V1, V2, V3, V4, V5, V6, V7, V8
- AC IN PIX (DARK HOR. BAR) (38)**
V22, V23
V1, V2, V3, V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7,
V8, V28
Contrast con.
Check Vid. Det. and Amp.
peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V13, V24, V26, V27
Defl. yoke ringing
Hor. Hold con.
V11, V12, V13
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
V22, V23, V4, V5
RF and IF alignment
to pin 2 of V15
V. O. T.
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V25, V26, V27, V33, V34, V35, V28
V11, V12, V15, V14
Check HV unit
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness con.
V25, V27, V26
Check HV unit
Low line voltage
- EXCESSIVE RASTER (PIX SIZE)**
Hor. Drive and Size con.
Vert. Size con.
V12, V13, V24, V26, V27
- RASTER BLOOMING (37)**
Hor. Drive con.
V26, V27, V28
Check HV unit
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V12, V13
Check 470 μ f and 0.001 μ f caps.
connected to pin 5 of V12
H. O. T.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lnk. con.
V15, V16, V24
Check two 0.05 μ f caps. connected
to pin 2 of V15
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V16, V24
Check two 0.05 μ f caps.
connected to pin 2 & V15
Vert. Defl. yoke
V. O. T. and Vert. osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (15, 17)**
Vert. Hold con.
Vert. Int. network
V10, V15, V16, V24
Check 0.003 μ f cap. connected to
pin 4 of V15
- NO HOR. OS VERT. SYNC.
PIX SIGNAL OK**
V8, V9, V10, V24
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold
V10, V11, V13
Check 760 μ f cap. connected
to pin 1 of V12
- AUDIO HUM IN SOUND (8E)**
V17, V18, V19, V20
- DISTORTED SOUND (8D)**
V17, V18, V19, V20, V22
Check 0.05 μ f cap. connected to
pin 5 of V20
Sound and Vid. IF alignment L-4, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V17, V18, V19, V20
Vol. con.
Speaker (open voice coil or
defective connection)
Sound and Vid. IF alignment L-4, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V17, V18, V19, V20, V22
Vol. con.
Sound and Vid. IF alignment L-4, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V17, V18, V19, V20
Vol. con.
Check sound system for loose
connections
Sound and Vid. IF alignment L-4,
T-6 and T-7
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V17, V18, V19
Contrast con.
Sound and Vid. IF alignment L-4,
T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V17, V18, V19, V20
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	4th Vid. IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. & AGC Det.
V6	6AU6	Audio IF Amp.
V7	6AU6	Audio IF Limiter
V8	6T8	Sound Discr. & Audio Amp.
V9	6X4	Audio Osc. & Mod.
V10	6AC7	Vid. Amp.
V11	6SN7GT	Vert. Osc. & Discharge
V12	6K8GT	Vert. Out. Amp.
V14	6W4GT	Hor. Damper
V15	1B9GT/	Hor. Damper
V16	6X6GT	High Volt. Rect.
V17	6X6GT	Hor. Osc. & Con. Tube
V18	6SN7GT	Hor. Osc. & Con. Tube
V19	12AU7	2nd Sync. Sep. & Sync. Amp.
V20	5U4G	Low Volt. Rect.
V21	15GP4	Picture Tube
V22	6U6 or 6CG5 or 6CB6	Osc. & Conv.
V23	6U6 or 6CB6	RF Amp.

ALTERNATE TUNER

V21	6AG5 or 6BC5	1st RF Amp.
V22	6AG5 or 6BC5 or 6CB6	2nd RF Amp.
V23	6U6 or 6CB6	Osc. - Mixer

KEY VOLTAGES

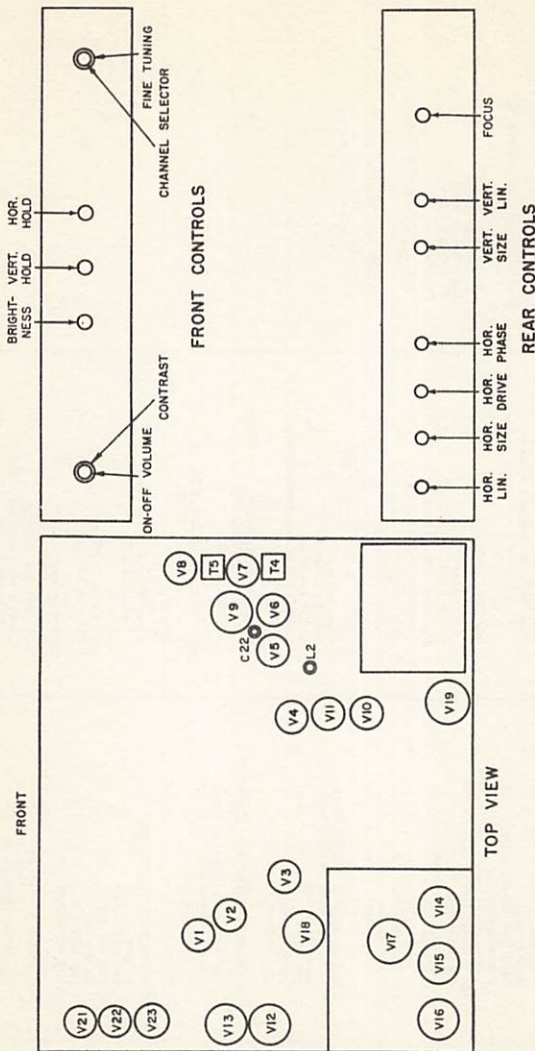
B+, plate of damper, Y14 pin 5	225 vdc
Boosted B+, cath. of damper, V14	400 vdc
Plate(s) of Vert. Osc., V12 pin 3	-50 vdc
Plate(s) of Vert. Osc., V12 pin 5	-45 vdc
Plate of Vert. Out., V13 pin 3	205 vdc
Plate(s) of Hor. Osc. (and control), V17 pin 5	44 vdc
Grid of Hor. Out., V16 pin 2	-9* vdc
	-195 vdc

*Varies with control settings.

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



NO SOUND - NO RASTER (31)
Power input circuit
V19

NO RASTER - SOUND OK (31)
F-1 HV Fuse (0.25 Amp.)
V17, V16, V15, V14, V20
Ion trap
V19
RF trans. con.
HV trans. Hdr. yoke CRT connections

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
V17, V2, V3, V4, V5, V11, V21
Contrast con.

POOR HOR. LIN.
Hor. Drive and Lin. con.
V17, V16, V14
Check 0.018 and 0.022 μ f caps. connected to Hor. Lin. coil
H. O. T.

POOR VERT. LIN. (11, 12)
Vert. Lin. and Size con.
V12, V13
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Check 0.20 μ f Elec. caps. connected to Vert. Lin. con.
V. O. T.

PIX JITTER SIDEWAYS
Hor. Hold con.
V15, V11, V10
Check 0.05 μ f caps. connected to pin 1 of V17

PIX JITTER UP & DOWN (16, 17)
V12, V13, V18
Check 0.05 μ f caps. connected to pin 7 of V18

SMEARED PIX (36)
Tuner fine tuning
Contrast con.
V14, V5, V10
Check 0.047 and 0.10 μ f peaking coils
Check 0.05 μ f cap. connected to pin 4 of V11
IF and RF alignment

POOR PIX DETAIL (85)
Tuner fine tuning
Focus con.
V1, V2, V3, V4
V5, V11
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
V1, V2, V3, V4, V21, V22
Check alignment of L-2 and L-4
IF and RF alignment

SNOW IN PIX (32)
V1, V2, V3, V4, V5, V21, V22
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5, V11, V21, V22

ENGRAVED EFFECT IN PIX (33)
Contrast con.
V1, V2, V3, V4, V5, V11, V20, V21
Check Vid. Det. and Amp. peaking coils

VERT. BARS (21)
V14, V16
Check 50 μ f cap. connected to terminal 3 of yoke
Defl. yoke ringing

PIX BENDING (22)
V16, V18
Hor. Hold, Focus, and Phasing con.
Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 3 of V17

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
Tuner fine tuning
V1, V2, V3, V4, V5, V11, V21, V22
RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Brightness con.
V17, V16, V15, V14, V20
HV trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Hor. Drive and Brightness con.
V17, V16, V15, V20
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive and Size con.
Vert. Size con.
V14, V15, V15

RASTER BLOOMING (37)
Hor. Drive and Size con.
V14, V16, V15, V19, V20
Check HV filter cap. and 1 Meg Ω res. connected to it.

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Size con.
V17, V16, V19
Check 470 and 1000 μ f cap. connected to Hor. Phasing coil
Check 0.047 and 0.22 μ f caps. connected to pin 8 of V16
Low line voltage
H. O. T.

INSUFFICIENT RASTER HEIGHT (15)
Vert. Size con.
V17, V16, V19
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
V. O. T.
Low line voltage

NO VERT. DEFL. (14)
V14, V16
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Vert. Defl. yoke
V. O. T.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
V1, V18, V12, V13
V14, V16
Contrast con.
Vert. Int. network
Check 0.005 μ f cap. connected to pin 1 of V12

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V5, V10, V18
Check 0.01 μ f cap. connected to pin 7 of V10
V15, V17
Check 180 μ f cap. connected to pin 4 of V17

AUDIO HUM IN SOUND (8E)
V9, V7, V8, V9

DISTORTED SOUND (8D)
Tuner fine tuning
V6, V7, V8, V9, V5, V21
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment L-2, C-22, Det. alignment T-5

NO SOUND - PIX OK (8B)
Tuner fine tuning
V4, V7, V8, V9
Vol. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-2, C-22, T-4
Det. alignment T-5

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V21, V6, V7, V8, V9
Vol. con.
Sound and Vid. IF alignment L-2, C-22, T-4
Det. alignment T-5

NOISY SOUND - PIX OK
V6, V7, V8, V9
Vol. con.
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L-2, C-22, and T-5

SYNC. BUZZ IN SOUND
Tuner fine tuning
V5, V6, V7, V8
Sound IF and Det. alignment

INTERMITTENT SOUND - PIX OK
V6, V7, V8, V9
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. & AGC Det.
V5	6AU6	Sound IF Amp.
V6	6AU6	Sound IF Amplifier
V7	6AL5	Sound Discr.
V8	6AV6	Audio Amp.
V9	6V6GT	Audio Out.
V10	6CB6	Vid. Amp.
V11	12AU7	Sync. Out. & Sync. Amp.
V12	6X4	Sync. Sep.
V13	6SN7GT	Hor. Osc. Cont.
V14	6V6GT	Vert. Out.
V15	6SN7GT	Hor. Con. & Hor. Osc. Tube
V16	6B06GT	Hor. Out.
V17	6W4GT	Hor. Damper
V18	1B3GT	High Volt. Rect.
V19	6X5	Low Volt. Rect.
V20	6AX5	Low Volt. Rect.
V21	6AG5 or 6BC5 or 6CB6	1st RF Amp. Osc. & Conv.
V22	6J6	Osc. & Conv.
V23	17CP4	Picture Tube

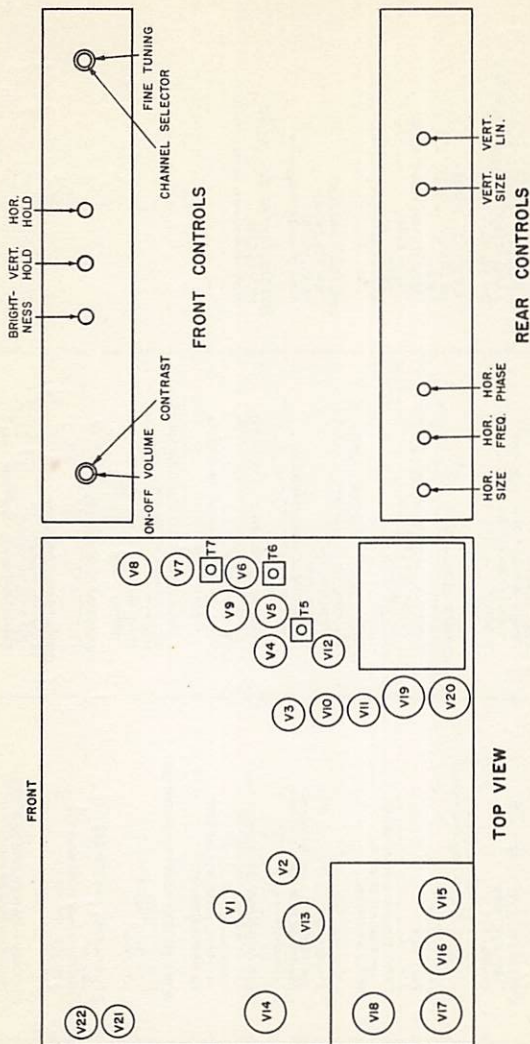
KEY VOLTAGES

B+	plate of damper, V17 pin 5	230 vdc
Boosted B+	cath. of damper, V17 pin 3	495 vdc
Plates of Vert. Osc.	V13 pin 2	82 to 150 vdc
Plates of Hor. Osc.	V14 pin 3	225 vdc
Plates of Hor. Osc. and Control	V15 pin 5	220 vdc
Grid of Hor. Out.	V16 pin 2	175 to 250 vdc
	V16 pin 5	-17.5 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ. 2.
For tuner oscillator adjustment, see TUNER OSC. ADJ. 2.



- NO SOUND - NO RASTER (31)**
Power input circuit
V19, V20
- NO RASTER - SOUND OK (31)**
F-1 HV Fuse (0.25 Amps.)
Ion trap
V15, V16, V17, V18, V23
Brightnes con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
V4, V10, V22
V1, V2, V3
- POOR HOR. LIN.**
V15, V17
Check 0.03 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
V13, V14 and Bias con.
V11, V12
Check 0.047 and 0.1 μ f cap. connected to pin 2 of V13
Check 100 μ f elec. cap. connected to pin 8 of V14
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 82 μ f caps. connected to pin 1 of V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V13, V14
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V10
Check Vid. Det. and Amp. peaking coils
Check 0.047 μ f cap. connected to pin 1 of V10
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus Adj.
V1, V2, V3, V10, V16, V23
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
V1, V2, V3, V4, V5, V6, V7
RF and IF alignment
SNOW IN PIX (32)
V21, V1, V2, V3, V4
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V21, V22
V1, V2, V3, V4, V10
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
V19, V20, V24, V10, V21, V22, V23
Check Vid. Det. and Amp. peaking coils
VERT. BARS (21)
V15, V17
Check 50 μ f cap. connected to terminals 3 and 7 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 0.05 and 0.5 μ f caps. connected to pin 3 of V15
Brightnes con.
V16, V15, V19, V20, V23, V18
Low line voltage
- WEAK OR NO PIX - SOUND WEAK**
V15, V16
Tuner line tuning OR (26C, 34C)
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V15, V16, V17, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightnes con.
V16, V15, V19, V20, V23, V18
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size
V16, V18, V23
- RASTER BLOOMING (37)**
V16, V15, V19, V20, V23, V18
Check HV filter cap. and 1 M Ω 0 res. connected to it.
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V3, V6, V7, V8, V9
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V22, V5, V6, V7, V8, V9
Vol. con.
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6 and T-7
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V4, V5, V6, V7
Contrast con.
Sound IF and Det. alignment T-5, T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V18, V20, V19
Check 820 μ f caps. connected to hor. phasing coil
Check 0.1 μ f cap. and 6.8K Ω res. connected to pin 4 of V16
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V13, V14, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
V. O. T.
Low line voltage
- NO VERT. DEF. (14)**
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 5 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK**
(16, 17)
Vert. Hold con.
V11, V13, V14
Vert. line network
Check 0.0047 μ f cap. connected to pin 5 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V11, V12, V15
Check 0.047 μ f cap. connected to pin 7 of V11
- NO HOR. SYNC. - VERT. SYNC. OK**
(19, 20)
Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 220 μ f cap. connected to pin 4 of V15
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

TUBE LEFT

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	1st IF Amp.
V4	6AU6	4th Vid. IF Amp.
V5	6AL5	Vid. & AGC Det.
V6	6AU6	Audio IF Amp.
V7	6AU6	Audio IF Limiter
V8	6AL5	Sound Discer.
V9	9Y6GT	Audio Out.
V10	6AC7	Vid. Sync. Sep.
V11	6AC7	Vid. Osc. & Discharge
V12	6SN7GT	Vert. Osc. & Discharge
V13	6K5GT	Vert. Out. Amp.
V14	6W4GT	Hor. Damp.
V15	1B3GT/	Hor. Damp.
V16	8018	High Volt. Rect.
V17	6X4GT	Hor. Out. Amp.
V18	6SN7GT	Hor. Osc. & Sync. Tube
V19	5U4G	2nd Sync. Sep. & Sync. Amp.
V20	17CP4	Low Volt. Rect.
V21	816	Picture Tube
V22	816 or 816CS or 816CS	Osc. & Conv.
V23	6AG5	RF Amp.
V24	6AV6	RF Amp.
V25	6AV6	Audio Amp.

*V18 - 12AU7 in some sets.

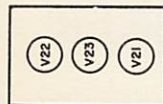
KEY VOLTAGES

B-, plate of damper, V14 pin 5	225 vdc
Boosted B+, cath. of damper, V14	400 vdc
Plate(s) of Vert. Osc., V12 pin 2	-45 vdc
Pin 5 of Vert. Osc., V12 pin 5	-47 vdc
Plate of Vert. Out., V13 pin 3	210 vdc
Plate(s) of Hor. Osc. (and control), V17 pin 3	42 vdc
Grid of Hor. Out., V16 pin 2	42 vdc
Grid of Hor. Out., V16 pin 5	-176 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



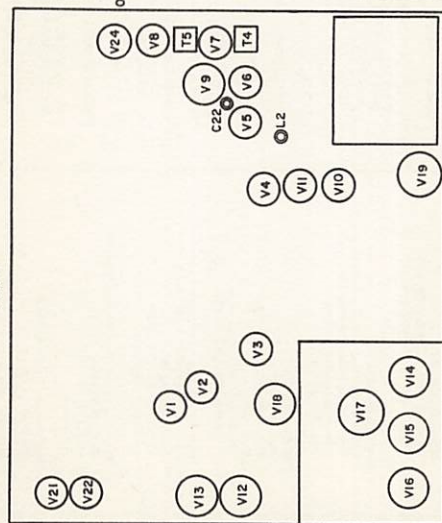
ALTERNATE TUNER

V21

V22

V23

FRONT



TOP VIEW

BRIGHT- VERT. HOR.
MESS HOLD HOLD

ON-OFF VOLUME

CONTRAST

CHANNEL SELECTOR

FINE TUNING

FRONT CONTROLS

HOR. HOR. HOR. HOR. HOR. VERT. VERT.
L.I.N. SIZE DRIVE FREQ. PHASE SIZE L.I.N.

REAR CONTROLS

- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V6, V7, V8, V9, V24
Vol. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-5
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V6, V7, V8, V9, V21, V24
Vol. con.
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-5
- NOISY SOUND - PIX OK**
V6, V7, V8, V9, V24
Vol. con.
Check for loose connection in speaker system
Speaker
Sound IF and Det. alignment L-4, T-4
and T-5
- SYNC BUZZ IN SOUND**
V6, V7, V8, V9, V24
Tuner fine tuning
Contrast con.
Sound IF and Det. alignment L-4, T-4
and T-5
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9, V24
Vol. con.
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V1, V2, V3, V4, V21, V22
Check alignment of L-2 and L-4
IF and RF alignment
yellow dot of Hor. Osc. trans.
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size con.
V12, V13, V18
Check alignment of L-2 and L-4
connected to pin 2 of V12
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V12, V13, V18 and 0.22 μ f caps.
connected to pin 2 of V12
Check 0.0047 μ f cap. connected to pin 1 of V12
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold and Contrast con.
V5, V12, V13, V18
Vert. Int. network
Check 0.0047 μ f cap. connected to pin 1 of V12
NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V5, V10, V18
Check 0.047 μ f cap. connected to pin 6 of V10
NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold and Osc. Adj. con.
V16, V17
Check 10 μ f cap. connected to pin 4 of V17
AUDIO HUM IN SOUND (8E)
V8, V7, V8, V9, V24
- DISTORTED SOUND (8D)**
V8, V7, V8, V9, V21, V24
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment L-4, T-4
Det. alignment T-5
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V21, V22
Check alignment of L-2 and L-4
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V22
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (39)**
V1, V2, V3, V4, V5, V11, V21, V22
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V20, V21
Check V1, V2, V3, V4, V5, V11, V20, V21
C142, V1, Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V16
Check 0.0047 μ f cap. connected to terminals 3 and 7 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
V11, V16, V17, V18
Hor. Hold and Osc. Adj. con.
Check 0.047 μ f cap. connected to pin 3 of V17
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V11
Check 82 μ f caps. connected to RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightnes con.
V14, V15, V16, V17, V20
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness con.
V14, V15, V16, V17, V19, V20
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
V16, V15, V20
- RASTER BLOOMING (87)**
V14, V15, V16, V19, V20
Check HV filter cap. and 1 Meg Ω res. connected to it.
- NO SOUND - PIX OK (31)**
Power input circuit
V19
- NO RASTER - SOUND OK (31)**
V1, V2, V3, V4, V5, V22 (86.)
Ion trap
Brightnes con.
- WEAK PIX - SOUND AND RASTER OK (34)**
HV trans. Hor. yoke CRT connections
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V11, V21
- POOR HOR. LIN.**
Hor. Drive and Lin. con.
V12, V13, V18
Check 0.018 and 0.022 μ f caps. connected to hor. lin. coil
H. O. T.
- POOR VERT. LIN. (17, 12)**
V12, V13, V18
Check 0.047 and 0.22 μ f caps. connected to pin 2 of V12
Check 20 and 50 μ f elec. caps. connected to center tap of vert. lin. con.
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Osc. Adj. (Synchroguide)
V16, V17
Check 82 μ f caps. connected to pin 1 of V17
- PIX JITTER UP & DOWN (16, 17)**
V11, V12, V13, V18
Vert. Hold and Contrast con.
- SMEARED PIX (85)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4
V5, V11
Check Vid. Det. and Amp. peaking coil
Check 0.047 μ f cap. connected to pin 4 of V11
IF and RF alignment
- POOR PIX DETAIL (85)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. & AGC Det.
V5	6AU6	Sound IF Amp.
V6	6AU6	Sound IF Limiter
V7	6AL5	Sound Discr.
V8	6V6GT	Audio Amp.
V9	6V6GT	Audio Out.
V10	6CB6	Vid. Amp.
V11	12AU7	Sync. Out. & Sync. Amp.
V12	6AU6	Sync. Sep.
V13	6SN7GT	Vert. Osc.
V14	6SN7GT	Vert. Out.
V15	6SN7GT	Hor. Osc. & Hor. Osc.
V16	6V6GT	Hor. Out.
V17	6W4GT	Hor. Damper
V18	1B3GT	High Volt. Rect.
V19	6AX5	Low Volt. Rect.
V20	6AX5	Low Volt. Rect.
V21	6AG5 or 6BC5 or 6BE6	1st RF Amp.
V22	6BE6	2nd RF Amp.
V23	17CP4	Picture Tube

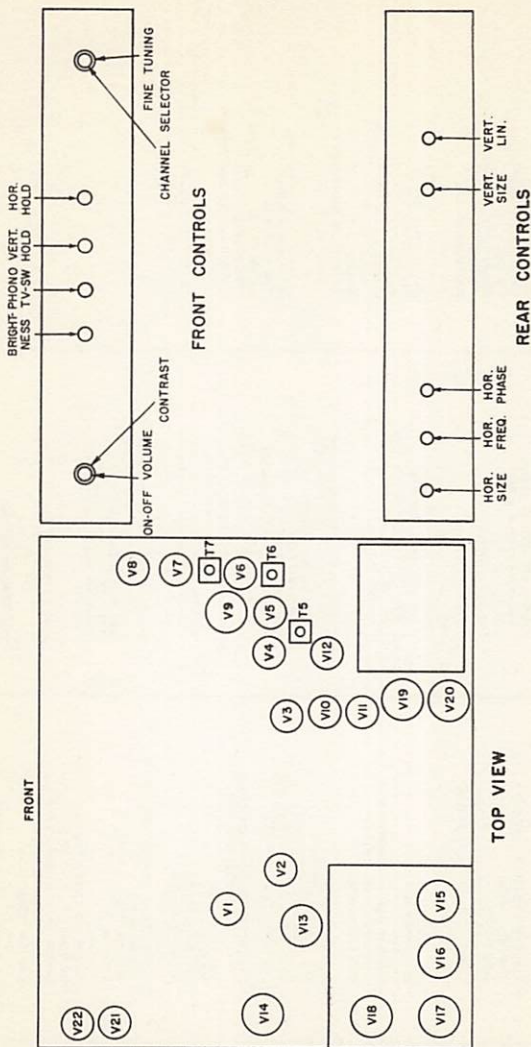
KEY VOLTAGES

B ₁ , plate of damper, V17	pin 5	230 vdc
Boosted B ₁ , cath. of damper, V17	pin 3	495 vdc
Plates of Vert. Osc., V13	pin 2	82 to 155 vdc
	pin 5	64 vdc
Plate of Vert. Out., V14	pin 3	225 vdc
Plates of Hor. Osc. and Control, V15	pin 2	220 vdc
	pin 5	175 to 250 vdc
Grid of Hor. Out., V16	pin 5	-17.5 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V5, V6, V7, V8, V9
Speaker (open voice coil or defective connections)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Vol. con.
Circuit and system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6, and T-7
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V5, V6, V7, V8
Contrast con.
Sound IF and Det. alignment T-5, T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V16, V17, V19, V20
Check 330 and 290 μ f caps. connected to hor. phasing coil
Check 0.01 μ f cap. and 8 Ω g res. connected to pin 4 of V16
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V16, V17, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V16, V17, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 1 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
V11, V13, V14
Vert. Hold con.
Vert. int. network
Check 0.0047 μ f cap. connected to pin 1 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V11, V12, V15
Check 0.01 μ f cap. connected to pin 7 of V11
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 220 μ f cap. connected to pin 4 of V15
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V21
Check alignment of T-5
IF and RF alignment
- SHOWS IN PIX (23)**
V1, V2, V3, V4, V21
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V21, V22
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V1, V2, V3, V4, V5, V10
- CONTRAST CON.**
V1, V2, V3, V4, V5, V23
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V16, V17
Check 50 μ f cap. connected to terminals 3 and 7 of yoke
Defl. yoke ringing
- PIX BENDING (23)**
Hor. Hold and Contrast con.
Hor. Freq. and Phase con.
V15, V16
Check 0.05 and 0.5 μ f cap. connected to pin 3 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V21, V1, V2, V3, V4
Contrast con.
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightnes con.
V1, V2, V3, V4, V11, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightnes con.
V16, V18, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size con.
V15, V16, V18
- RASTER BLOOMING (8T)**
V16, V18, V19, V20, V23
Check HV filter cap. and 1 Meg. O. res. connected to it.
- NO SOUND - NO RASTER (31)**
Power input circuit
F-1 B. Fuse (0.5 Amps.)
- NO RASTER - SOUND OK (31)**
V1, V2, V3, V4, V18, V23
Brightnes con.
Ion trap
- HV trans. Hor. yoke CRT connections**
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Contrast con.
- POOR HOR. LIN.**
V16, V17
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 8 of V14
Check 100 μ f caps. connected to pin 8 of V14
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
V11, V15, V16
Phase con.
Check 82 μ f caps. connected to pin 1 of V15
- PIX JITTER UP & DOWN (16, 17)**
Hor. Hold and Contrast con.
V13, V14
- SMEARED PIX (36)**
Tuner fine tuning
V1, V2, V3, V4
Contrast con.
Check 0.047 μ f cap. connected to pin 1 of V10
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3
V4, V10, V8
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

NO SOUND - PIX OK (8B)

Tuner fine tuning
V5, V6, V7, V8, V9
Speaker (open voice coil or defective connections)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

WEAK SOUND - PIX OK (8C)

Tuner fine tuning
V22, V5, V6, V7, V8, V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

NOISY SOUND - PIX OK

V5, V6, V7, V8, V9
Vol. con.
Circuit and system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6, and T-7

SYNC BUZZ IN SOUND

Tuner fine tuning
V5, V6, V7, V8
Contrast con.
Sound IF and Det. alignment T-5, T-6 and T-7

INTERMITTENT SOUND - PIX OK

V5, V6, V7, V8, V9
Poor connections in sound system

INSUFFICIENT RASTER WIDTH (23)

Hor. Size con.
V16, V17, V19, V20
Check 330 and 290 μ f caps. connected to hor. phasing coil
Check 0.01 μ f cap. and 8 Ω g res. connected to pin 4 of V16
Low line voltage
H. O. T.

INSUFFICIENT RASTER HEIGHT (15)

Vert. Size and Lin. con.
V16, V17, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
V. O. T.
Low line voltage

NO VERT. DEFL. (14)

V16, V17, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 1 of V13
Vert. Defl. yoke
V. O. T.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)

V11, V13, V14
Vert. Hold con.
Vert. int. network
Check 0.0047 μ f cap. connected to pin 1 of V13

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK

V11, V12, V15
Check 0.01 μ f cap. connected to pin 7 of V11

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)

Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 220 μ f cap. connected to pin 4 of V15

AUDIO HUM IN SOUND (8E)

V5, V6, V7, V8, V9
DISTORTED SOUND (8D)
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

SOUND BARS IN PIX (4A, 4E)

Tuner fine tuning
V1, V2, V3, V4, V21
Check alignment of T-5
IF and RF alignment

SHOWS IN PIX (23)

V1, V2, V3, V4, V21
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)

V21, V22

ENGRAVED EFFECT IN PIX (33)

Tuner fine tuning
V1, V2, V3, V4, V5, V10
CONTRAST CON.
V1, V2, V3, V4, V5, V23
Check Vid. Det. and Amp. peaking coils

VERT. BARS (21)

V16, V17
Check 50 μ f cap. connected to terminals 3 and 7 of yoke
Defl. yoke ringing

PIX BENDING (23)

Hor. Hold and Contrast con.
Hor. Freq. and Phase con.
V15, V16
Check 0.05 and 0.5 μ f cap. connected to pin 3 of V15

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)

Tuner fine tuning
V21, V1, V2, V3, V4
Contrast con.
RF and IF alignment

INTERMITTENT RASTER - SOUND OK

Brightnes con.
V1, V2, V3, V4, V11, V18, V23
HV trans.

INSUFFICIENT BRIGHTNESS

Ion trap
Brightnes con.
V16, V18, V19, V20, V23
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)

Hor. and Vert. Size con.
V15, V16, V18

RASTER BLOOMING (8T)

V16, V18, V19, V20, V23
Check HV filter cap. and 1 Meg. O. res. connected to it.

NO SOUND - NO RASTER (31)

Power input circuit
F-1 B. Fuse (0.5 Amps.)

NO RASTER - SOUND OK (31)

V1, V2, V3, V4, V18, V23
Brightnes con.
Ion trap

HV trans. Hor. yoke CRT connections

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Contrast con.

POOR HOR. LIN.

V16, V17
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.

POOR VERT. LIN. (11, 12)

Vert. Lin. and Size con.
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 8 of V14
Check 100 μ f caps. connected to pin 8 of V14
V. O. T.

PIX JITTER SIDEWAYS

Hor. Hold con.
V11, V15, V16
Phase con.
Check 82 μ f caps. connected to pin 1 of V15

PIX JITTER UP & DOWN (16, 17)

Hor. Hold and Contrast con.
V13, V14

SMEARED PIX (36)

Tuner fine tuning
V1, V2, V3, V4
Contrast con.
Check 0.047 μ f cap. connected to pin 1 of V10
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL (35)

Tuner fine tuning
Focus con.
V1, V2, V3
V4, V10, V8
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	1st Vid. IF Amp.
V4	6AU6	2nd Vid. IF Amp.
V5	6AU6	Sound IF Amp.
V6	6AU6	Sound IF Limiter
V7	6AL5	Sound Diect.
V8	6AV6	Audio Amp. - AGC Clamp.
V9	6V6GT	Audio Out.
V10	6AV6	Audio Amp.
V11	12AU7	Hor. Sync. Amp. - Sync. Amp.
V12	12AU7	Hor. Sync. Sep. - Vert. Sync. Sep.
V13	6SN7GT	Vert. Osc.
V14	6W6GT	Vert. Out.
V15	6SN7GT	Hor. Osc. - Hor. Osc. Con.
V16	6BQ6GT	Hor. Out.
V17	6BQ6GT	Hor. Out.
V18	18X6GT	HV Rect.
V19	6AX5GT	Low Volt. Rect.
V20	6AX5GT	Low Volt. Rect.
V21	6BQ7 or 6BK7	RF Amp.
V22	6J6	Mixer-Osc.
V23	6X4	Picture Tube

*Tubes are not interchangeable.

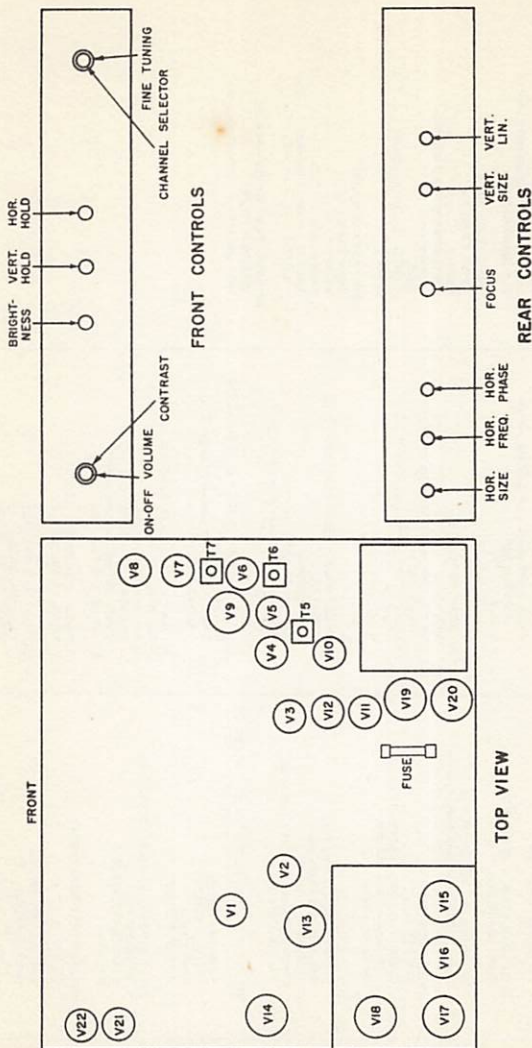
KEY VOLTAGES

B+	Plate of damper, V17	pin 5	230 vdc
Boosted B+	cath. of damper, V17		
	pin 3		600 vdc
Plates of Vert. Osc.	V13	pin 2	115 vdc
		pin 5	80 vdc
Plate of Vert. Out.	V14	pin 3	240 vdc
Plates of Hor. Osc. and Control	V15	pin 2	300 vdc
		pin 5	265 vdc
Grid of Hor. Out.	V16	pin 5	-28 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



- NO SOUND - NO RASTER (B1)**
Power input circuit
B- Fuse F-1 (0.5 Amps.)
- NO RASTER - SOUND OK (B1)**
V1, V2, V17, V18, V23
B-rightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (B4)**
Tuner fine tuning
V15, V16, V17, V18, V7
- POOR HOR. LIN.**
V16, V17
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR PIX DETAIL (B5)**
Tuner fine tuning
V1, V2, V3
V4, V10, V23
Check V16, Det. and Amp. peaking coils
IF and RF alignment
- NO SOUND - PIX OK (BB)**
Tuner fine tuning
V5, V6, V7, V8, V9
Vol. con.
Speaker (open voice coil or defective con. or short)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (BC)**
Tuner fine tuning
V22, V4, V5, V6, V7, V8, V9
Vol. con.
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Vol. con.
Check amp. system for loose connections
Speaker
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7
Contrast con.
Sound IF and Det. alignment T-5, T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V16, V17, V19, V20
Check 330 and 820 μ f caps. connected to hor. phasing coil
Check 0.047 and 0.8M Res. connected to pin 4 of V16
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V1, V2, V3, V4, V5, V6, V7, V8, V9
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
V. O. T.
Low line voltage
- NO VERT. DEF. (14)**
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
V13
Check 0.0047 μ f cap. connected to pin 5 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
V12, V13, V14
Hor. Hold con.
Check 0.047 μ f cap. connected to pin 6 of V12
Check 0.0047 μ f cap. connected to pin 5 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V11, V12, V15
Check 0.01 μ f cap. connected to pin 2 of V11
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
Hor. Freq. and Phase con.
V11, V15, V16, V12
Check 280 μ f cap. connected to pin 4 of V15
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DEFORMED SOUND (8D)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V22, V1, V2, V3, V10
Check alignment of T-5
IF and RF alignment
- SNOW IN PIX (32)**
V21, V22
V1, V2, V3, V4, V7
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (8B)**
V1, V2, V3, V4, V7, V10
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V1, V2, V3, V4, V22, V4, V7, V10
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V16, V17
Check 50 μ f caps. connected to terminals 3 and 7 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold con.
Hor. Freq. and Phase con.
V15, V16
Check 0.05 and 0.5 μ f caps. connected to pin 3 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V7, V22
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
B-rightness con.
V15, V16, V17, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Contrast con.
B-rightness con.
V16, V18, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size con.
V15, V16
- RASTER BLOOMING (37)**
V16, V18, V19, V20, V23
- NO SOUND - NO RASTER (B1)**
Power input circuit
B- Fuse F-1 (0.5 Amps.)
- NO RASTER - SOUND OK (B1)**
V1, V2, V17, V18, V23
B-rightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (B4)**
Tuner fine tuning
V15, V16, V17, V18, V7
- POOR HOR. LIN.**
V16, V17
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR PIX DETAIL (B5)**
Tuner fine tuning
V1, V2, V3
V4, V10, V23
Check V16, Det. and Amp. peaking coils
IF and RF alignment
- NO SOUND - NO RASTER (B1)**
Power input circuit
B- Fuse F-1 (0.5 Amps.)
- NO RASTER - SOUND OK (B1)**
V1, V2, V17, V18, V23
B-rightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (B4)**
Tuner fine tuning
V15, V16, V17, V18, V7
- POOR HOR. LIN.**
V16, V17
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR PIX DETAIL (B5)**
Tuner fine tuning
V1, V2, V3
V4, V10, V23
Check V16, Det. and Amp. peaking coils
IF and RF alignment
- NO SOUND - NO RASTER (B1)**
Power input circuit
B- Fuse F-1 (0.5 Amps.)
- NO RASTER - SOUND OK (B1)**
V1, V2, V17, V18, V23
B-rightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (B4)**
Tuner fine tuning
V15, V16, V17, V18, V7
- POOR HOR. LIN.**
V16, V17
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR PIX DETAIL (B5)**
Tuner fine tuning
V1, V2, V3
V4, V10, V23
Check V16, Det. and Amp. peaking coils
IF and RF alignment

TUBE LIST

Symbol	Type	Circuit Function
V1	6AL5	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. & AGC Det.
V5	6AU6	Sound IF Amp.
V6	6AU6	Sound IF Limiter
V7	6AL5	Sound Discr.
V8	6AV6	Radio Acq., AGC Clamp & Picture Compensator
V9	6V6GT	Audio Out.
V10	6CB6	Vid. Amp.
V11	12AU7	Hor. Sync. Amp. & Sync. Amp.
V12	12AU7	Hor. & Vert. Sync Sep.
V13	6SN7GT	Vert. Osc. & Disch.
V14	6SN7GT	Hor. Osc.
V15	6SN7GT	Hor. Cont. & Hor. Osc.
V16	6BQ6GT	Hor. Out.
V17	6W4GT	Hor. Damper
V18	1B3GT	High Volt. Rect.
V19	6AX5GT	Low Volt. Rect.
V20	6AX5GT	Low Volt. Rect.
V21	6BK7	1st RF Amp.
V22	6J6	Osc. & Conv.
V23	17BP4A	Picture Tube

KEY VOLTAGES

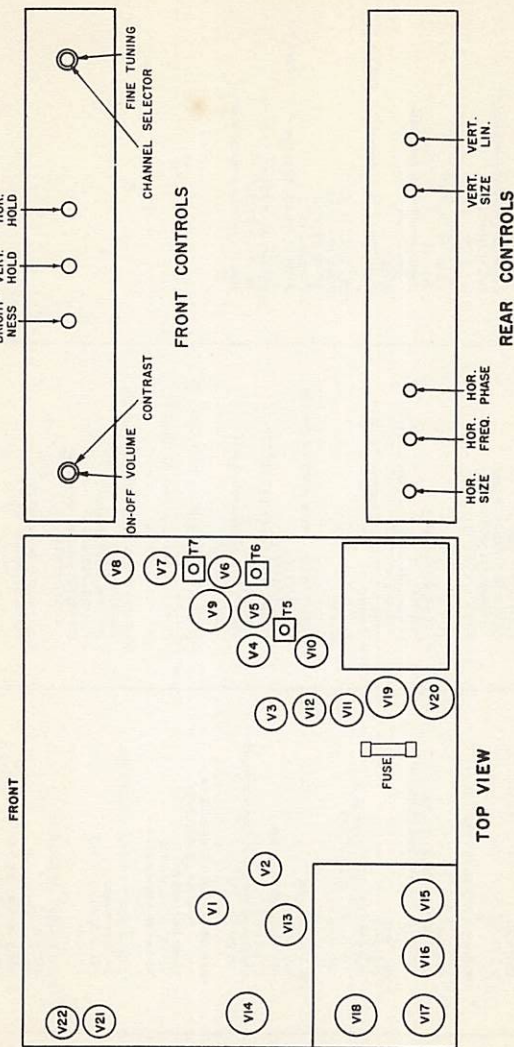
B ₁ , plate of damper, V17	pin 5	230 vdc
Plates of Vert. Osc., V13	pin 2	115 vdc
Plate of Vert. Out., V14	pin 5	80 vdc
Plates of Hor. Osc. and Control, V15	pin 3	220 vdc
Grid of Hor. Out., V16	pin 2	265* vdc
	pin 5	300* vdc
	pin 5	-28 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

*This voltage varies with control settings.

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



TOP VIEW

- NO SOUND - NO RASTER (31)**
Power input circuit
F-1 B. Fuse (0.5 Amps.)
V15, V20
- NO RASTER - SOUND OK (31)**
V15, V16, V17, V18, V23
Brightness con.
Ion trap
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V10, V8, V22
- POOR HOR. LIN.**
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
V14 pin and Size con.
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 100 μ f Elec. cap. connected to pin 8 of V14
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. and Phase con.
V11, V15, V16, V12
Check 82 μ f caps. connected to pin 1 of V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V11, V13, V14
- SMEARED PIX (36)**
Tuner fine tuning
Coil
V1, V2, V3, V4, V10
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus Adj.
V1, V2, V3, V4, V10, V23
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V21
Check alignment of T-5
IF and RF alignment
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size con.
V13, V14, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V13
Check 0.0047 μ f cap. connected to pin 5 of V13
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V13
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 5 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V12, V13, V14
Check 0.047 μ f cap. connected to pin 4 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V11, V12
Check 0.047 μ f cap. connected to pin 6 of V11
- NO HOR. SYNC. VERT. SYNC. OK (19, 20)**
Hor. Hold con.
Hor. Freq. and Phase con.
V11, V15, V16, V12
Check 220 μ f cap. connected to pin 4 of V15
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V22, V5, V6, V7, V8, V9
Check 0.047 μ f cap. connected to pin 5 of V11
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V5, V6, V7, V8, V9
Vert. Hold con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V6, V7, V8, V9
Voi. con.
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- SNOW IN PIX (32)**
V1, V2, V3, V4, V21
Antenna and transmission line
- AC IN PIX DARK HOR. BAR (38)**
V1, V2, V3, V4, V10, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V10, V22, V23
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Check 270 μ f caps. connected to terminal 1 of yoke
Defl. yoke ringing
Hor. Hold con.
Hor. Freq. con.
V11, V15, V16, V12
Check 0.02, 0.05 and 0.5 μ f caps. connected to pin 3 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V21, V1, V2, V3, V4, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V1, V16, V17, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness con.
V16, V17, V18, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Vert. and Hor. Size con.
V16, V18
- RASTER BLOOMING (87)**
V16, V17, V18, V19, V20, V23
- INSUFFICIENT RASTER WIDTH (23)**
Ion trap
V16, V18, V19, V20
Check 330 and 820 μ f cap. connected to L-7 (hor. phase coil)
Check 6800 Ω res. and 0.1 μ f caps. connected to pin 4 of V16
Low line voltage
- NO SOUND - NO RASTER (31)**
Power input circuit
F-1 B. Fuse (0.5 Amps.)
V15, V20
- NO RASTER - SOUND OK (31)**
V15, V16, V17, V18, V23
Brightness con.
Ion trap
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V10, V8, V22
- POOR HOR. LIN.**
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
V14 pin and Size con.
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 100 μ f Elec. cap. connected to pin 8 of V14
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. and Phase con.
V11, V15, V16, V12
Check 82 μ f caps. connected to pin 1 of V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V11, V13, V14
- SMEARED PIX (36)**
Tuner fine tuning
Coil
V1, V2, V3, V4, V10
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus Adj.
V1, V2, V3, V4, V10, V23
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V21
Check alignment of T-5
IF and RF alignment
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Check sound system for loose connections
Sound IF and Det. alignment T-5, T-6 and T-7
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V5, V6, V7, V8, V22
Contrast con.
Sound IF and Det. alignment T-5, T-6, and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6AL5	1st Vid. - AGC Det.
V4	6AL5	Vid. Det. - AGC Det.
V5	6AU6	1st Sound IF
V6	6AU6	Sound Limiter
V7	6AL5	Sound Disc.
V8	6AU6	Audio Amp. - AGC Clamp.
V9	6V6GT	Audio Out.
V10	6V6GT	Mixer Amp.
V11	12AU7	Hor. Sync. Amp. - Sync. Amp.
V12	12AU7	Vert. Sync. Sep. - Hor. Sync. Sep.
V13	6SN7GT	Vert. Osc.
V14	5W6GT	Vert. Out.
V15	6SN7GT	Hor. Osc. - Hor. Con.
V16	6BQ8GT	Hor. Out.
V17	5W6GT	Damper
V18	6X4GT	Full-Wave Rect.
V19	6AX5GT	Low Volt. Rect.
V20	6AX5GT	Low Volt. Rect.
V21	6BQ7	RF Amp.
V22	616	Mixer-Osc.
V23	17BP4A	Picture Tube

KEY VOLTAGES

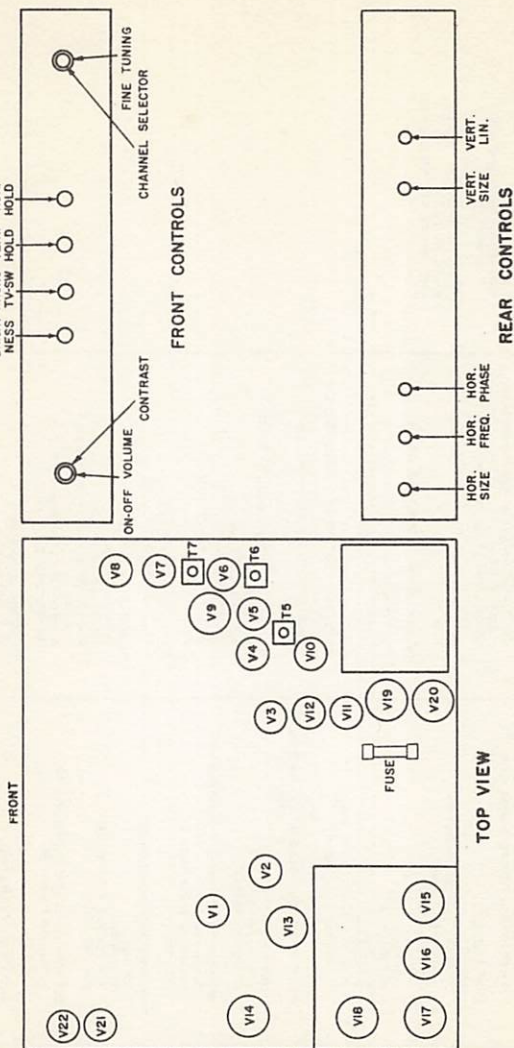
E ₁ , plate of damper, V17 pin 5	230 vdc
Plates of Vert. Osc., V13 pin 2	115* vdc
Pin 5 of V17	80 vdc
Plate of Vert. Out., V14 pin 3	220 vdc
Plates of Hor. Osc. and Control, V15 pin 5	205* vdc
Pin 5 of V15	500 vdc
Grid of Hor. Out., V16 pin 5	-25 vdc

*This voltage varies with control settings.

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



- NO SOUND - NO BASTER (31)**
P-outlet circuit.
F-1 B. Fuse (0.5 Amps.)
V18, V20
- NO RASTER - SOUND OK (31)**
V15, V16, V17, V18, V23
Brightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V24, V1, V2, V3, V4, V8, V10
- POOR HOR. LIN.**
V18, V17
Check 0.033 and 0.1 μ f caps. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
V13, V14
Vert. Lin. and Size con.
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.05 and 0.1 μ f caps. connected to pin 9 of V13
V. O. T.
- PK JITTER SIDEWAYS**
Hor. Hold con.
Hor. Line and Phase con.
V1, V2, V3, V4, V8, V21
Check 82 μ f caps. connected to pin 8 of V14
V. O. T.
- PK JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V11, V13, V14
- SMEARED PIX (35)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V10
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus Adj.
V1, V2, V3
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V21, V22
Check alignment of T-5
IF and RF alignment
- NO SOUND - NO BASTER (32)**
V1, V2, V3, V21
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (39)**
V21, V22
V1, V2, V3, V4, V8, V10
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V8, V10, V22
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V16, V17
Check 270 μ f cap. connected to terminal 1 of yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold con.
Hor. Freq. and Phase con.
V11, V12, V15, V16
Check 0.02, 0.05 and 0.1 μ f caps. connected to pin 9 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (23C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V8, V21
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V15, V16, V17, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness con.
V18, V17, V18, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Vert. and Hor. Size con.
V16, V18, V23
- RASTER BLOOMING (37)**
V16, V17, V18, V19, V20, V23
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con. V19, V20
V16, V17, V23
Check 330 and 820 μ f caps. connected to Hor. Phase coil L-7
Check 6800 Ω res. and 0.1 μ f cap. connected to pin 4 of V16
Low line voltage
H. O. T.
- NO SOUND - PIX OK (8C)**
Tuner fine tuning
V8, V7, V8, V9
Vol. con.
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Vol. con.
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6 and T-7
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V5, V6, V7
Contrast con.
Sound IF and Det. alignment T-5, T-6 and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
Poor connections in sound system
- INSUFFICIENT RASTER HEIGHT**
Vert. Size con.
V13, V14, V18, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 5 of V13
V. O. T.
Low line voltage
- NO VERT. DEFL.**
V13, V14
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 5 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK**
Vert. Hold con.
V12, V13, V14
Check 0.047 μ f cap. connected to pin 4 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V11, V12
Check 0.047 μ f cap. connected to pin 6 of V11
- NO HOR. SYNC. - VERT. SYNC. OK**
Hor. Hold con.
Hor. Line and Phase con.
V11, V12, V15, V18
Check 220 μ f cap. connected to pin 4 of V15
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V5, V6, V7, V8, V9, V22
Check 0.047 μ f cap. connected to pin 5 of V8
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V5, V6, V7, V8, V9
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det., -AGC Det.
V5	6AU6	Sound Limiter
V6	6AL5	Sound Disc.
V7	6AU6	Audio Amp. -AGC Clamp.
V8	6V6GT	Audio Out.
V9	6CB6	Vid. Amp.
V10	12AU7	Hor. Sync. Amp. - Sync. Amp.
V11	6X4	Hor. Sync. Sep. - Hor. Sync. Sep.
V12	6X4	Vert. Sync. Sep.
V13	6W6GT	Vert. Osc.
V14	6W6GT	Hor. Osc. - Hor. Con.
V15	6SN7GT	Hor. Osc.
V16	6BQ6GT	Hor. Out.
V17	6W4GT	Damper
V18	1B3GT	HV Rect.
V19	6X4	Low Volt. Rect.
V20	6AX5GT	RF Amp. Rect.
V21	6BQ7	RF Amp.
V22	6J5	Mixer-Osc.
V23	20CP4	Picture Tube

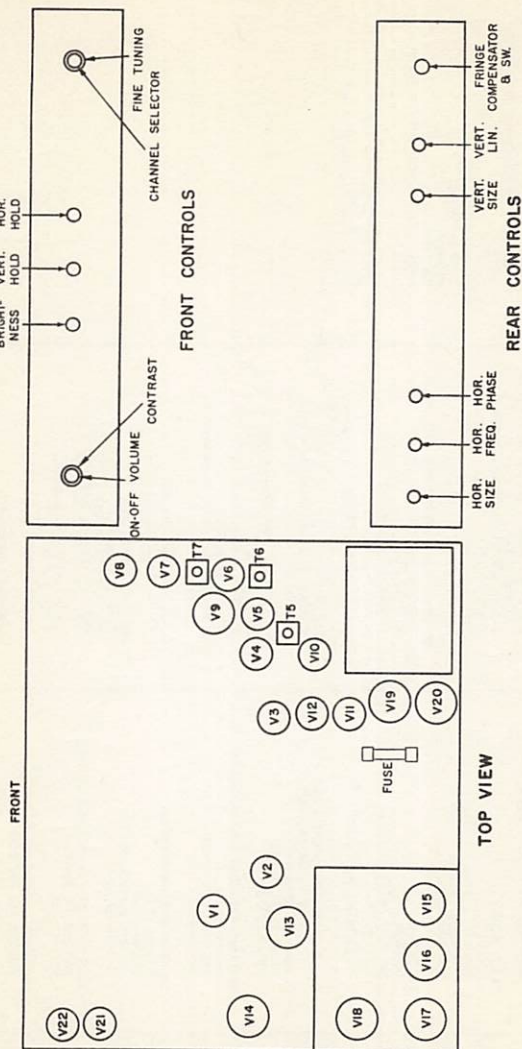
KEY VOLTAGES

B+, plate of damper, V17 pin 5	210 vdc
Plates of Vert. Osc., V13 pin 2	65 to 88 vdc
pin 5	63 vdc
Plates of Vert. Out., V14 pin 3	195 vdc
Plates of Hor. Osc. and Control, V15 pin 2	145 vdc
pin 5	145 to 200 vdc
Grid of Hor. Out., V16 pin 5	-16.5 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



- NO SOUND - NO RASTER (31)**
Power input circuit
V19, V20
F-1 - B+ Fuse
- NO RASTER - SOUND OK (31)**
V15, V16, V17, V18, V23
Brightness con.
Ion trap
- NO RASTER - SOUND OK (31)**
V15, V16, V17, V18, V23
Brightness con.
Ion trap
- WEAK PIX - SOUND AND RASTER OK**
Tuner fine tuning
Contrast con.
Fringe Compensator and Switch
V22, V1, V2, V3, V8, V10, V10
- POOR HOR. LIN.**
V16, V17, V18, V19, V20
Check 0.1 μ f cap. connected to pin 5 of V17
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V14
V. O. T.
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 100 μ f Elec. cap. connected to pin 8 of V14
- PIX JITTER SIDEWAYS**
Hor. Hold con.
Hor. Freq. add Phase con.
V15, V16, V11, V12
Check 82 μ f caps. connected to pin 1 of V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold con.
Vert. In. and Contr. con.
V12, V13, V14
Fringe Compensator and Switch
- SMOARED PIX (36)**
Tuner fine tuning
Contr. con.
V1, V2, V3, V4, V5, V10, V8
Fringe Compensator and Switch
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus Adj.
V1, V2, V3, V4, V5, V8, V10, V23
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V5, V6, V7, V8, V9, V21, V22
Fringe Compensator and Switch
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V21
Fringe Compensator and Switch
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V21, V22, V1, V2, V3, V4, V10, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V13, V14, V19, V20
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
pin 5 of V13
V. O. T.
Low line voltage
- NO VERT. DEF. (14)**
Check 0.047 and 0.1 μ f caps. connected to pin 2 of V13
Check 0.0047 μ f cap. connected to pin 4 of V13
Vert. Defl. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. In. and Contr. con.
V12, V13, V14
Fringe compensator con.
Check 0.047 μ f cap. connected to pin 4 of V13
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
Fringe compensator con.
V8, V11, V12
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
Hor. Freq. and Phase con.
V16, V15, V12, V11, V8
Check 270 μ f cap. connected to pin 4 of V15
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V5, V6, V7, V8, V9
V. O. T.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (6C)**
Tuner fine tuning
V22, V4, V5, V6, V7, V8, V9
Vol. con.
Fringe compensator
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V5, V6, V7, V8, V9
Vol. con.
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6
and T-7
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V5, V6, V7, V8
F. and S. con.
Sound IF and Det. alignment T-5, T-6
and T-7
- INTERMITTENT SOUND - PIX OK**
V5, V6, V7, V8, V9
V. O. T.
Poor connections in sound system
- VERT. BARS (21)**
V15, V17
Check 50 μ f cap. connected to pin 5 of V15
V. O. T.
Defl. yoke ring
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V11, V12, V15, V16
Fringe Compensator and Switch
Contr. con.
Check 0.05 μ f caps. connected to pin 3 of V16
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V21, V22, V1, V2, V3, V4, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V14, V15, V16, V17, V18, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness con.
V15, V17, V18, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size con.
V16, V18
- RASTER BLOOMING (37)**
V16, V17, V18, V23
V19, V20
Check HV filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V16, V19, V20
Check 100 μ f caps. connected to L-7 Hor. phase coil
Check 0.1 μ f cap. and 6800 Ω res. connected to pin 4 of V16
H. O. T.
- AUDIO HUM IN SOUND (8E)**
V5, V6, V7, V8, V9
- DEFORMED SOUND (8D)**
Tuner fine tuning
V22, V4, V5, V6, V7, V8, V9
Fringe compensator
Check 0.047 μ f cap. connected to pin 5 of V9
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

- NO SOUND - NO RASTER (31)**
Power input circuit
V19, V20
B- base F-1 (0.5 Amps.)
- NO RASTER - SOUND OK (31)**
B-rightness con.
V13, V14, V15, V16, V23
Ion trap
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V22
- POOR HOR. LIN.**
V14, V16
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V17, V18
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
Check 100 μ f Elec. cap. connected to
pin 6 of V18
V.O.T.
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Phase con.
V12, V13, V14
Check 82 μ f caps. connected to
pin 1 of V13
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
Fringe Compensator con.
V11, V12, V13
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5
Check 0.047 μ f cap. connected to
Hor. and Vert. Size con.
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Ion trap
V19, V20, V24
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
V1, V2, V3, V4, V21, V22
Check V19, V20 alignment T-5
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V21, V22
Fringe Compensator con.
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
V19, V20, V22, V23
Fringe Compensator con.
Contrast and Fringe Compensator
con.
Check Vid. Det. and Amp. peaking con.
- VERT. BARS (21)**
V14, 15 μ f cap. connected to
terminal 1 of yoke
Defl. yoke rugging
- PIX BENDING (23)**
Hor. Hold, Freq. and Phase con.
V11, V12, V13
Fringe Compensator con.
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner line tuning
V1, V2, V3, V4
Fringe Compensator con.
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
B-rightness con.
V13, V14, V15, V16, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
B-rightness con.
V14, V15, V16, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size con.
V14, V15, V16
- RASTER BLOOMING (37)**
V14, V15, V16, V19, V20, V23
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V14, V15, V19, V20
Check 0.001 μ f and 820 μ f caps.
connected to Hor. Phase coils
res. connected to pin 4 of V14
Low line voltage
H.O.T.
- SNOW IN PIX (32)**
Vert. Size and Lin. con.
V17, V19, V19, V20
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
V.O.T.
Low line voltage
- NO VERT. DEFL. (14)**
V17, V19
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
Check 0.0047 μ f cap. connected to
pin 4 of V17
Vert. Defl. yoke
V.O.T.
- NO VERT. SYNC. - HOR. SYNC. OK
(10, 17)**
Vert. Hold con.
V11, V12, V17
Check 0.047 μ f cap. connected to
pin 1 of V17
Check 0.0047 μ f cap. connected to
pin 4 of V17
- NO HOR. OR VERT. SYNC. -
PIX SIGNAL OK**
V11, V12
Check 0.047 μ f cap. connected to
pin 6 of V11
- NO HOR. SYNC. - VERT. SYNC. OK
(19, 20)**
Hor. Hold, Freq. and Phase con.
V11, V12, V13
Check 270 μ f cap. connected to
pin 4 of V13
- AUDIO HUM IN SOUND (8E)**
V6, V7, V8, V9, V10
- DEFORMED SOUND (8D)**
Tuner line tuning
V19, V20, V22
Check 0.047 μ f cap. connected to
pin 5 of V10
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner line tuning
V6, V7, V8, V9, V10
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
Vol. con.
V6, V7, V9, V9, V10, V22
Speaker
Sound IF and Det. alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
Vol. con.
V6, V7, V9, V9, V10
Check sound system for loose
connections
Speaker
Sound IF and Det. alignment T-5, T-6
and T-7
- SYNC. BUZZ IN SOUND**
Tuner line tuning
Contrast con.
V4, V6, V7, V3
Sound IF and Det. alignment T-5, T-6
and T-7
- INTERMITTENT SOUND - PIX OK**
V6, V7, V9, V9, V10
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. -AGC Det.
V5	6CB6	Vid. Amp.
V6	6AV6	1st Sound IF Amp.
V7	6AV6	Sound Limiter
V8	6AL5	Ratio Det.
V9	6AV6	1st Audio Amp. -AGC Clamp
V10	6V6GT	Audio Out.
V11	12AU7	Sync. Amp. -Hor. Sync. Sep.
V12	6SN7GT	Hor. Sync. Amp. -Vert. Sync. Sep.
V13	12AU7	Hor. Out.
V14	12SN7GT	Hor. Out.
V15	12SN7GT	Hor. Out.
V16	6W4GT	Damper
V17	6SN7GT	Vert. Osc.
V18	6W6GT	Vert. Out.
V19	5D4G	Low Volt. Rect.
V20	5D4G	Low Volt. Rect.
V21	6X4	HT Amp.
V22	816	Met. Osc.
V23	21MP4	Picture Tube

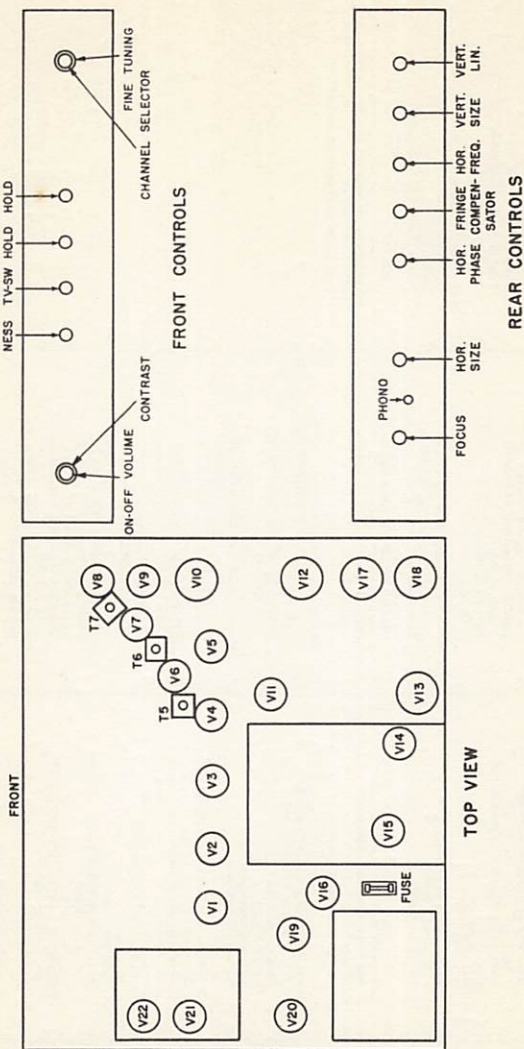
KEY VOLTAGES

B+, plate of damper, V16 pin 5	210 vdc
Boosted B+, cath. of damper, pin 3	430 vdc
Plate(s) of Vert. Osc., V17 pin 2	62 to 64 vdc
pin 5	-20 to 25 vdc
Plate of Vert. Out., V18 pin 3	210 vdc
Plate(s) of Hor. Osc. (and control), V13 pin 2	150 vdc
pin 5	150 to 210 vdc
Grid of Hor. Out., V14 pin 5	-16.5 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For inner oscillator adjustment, see TUNER OSC. ADJ.-2.



REAR CONTROLS

- NO SOUND - NO RASTER (31)**
Power input circuit
F-1, B, Fuse (0.5 Amps.)
V19, V20
- NO RASTER - SOUND OK (31)**
V15, V14, V15, V16, V23
Ion trap
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Fringe Compensator and Switch
V1, V2, V3, V9, V10, V22
- POOR HOR. LIN.**
H14, V16
Check 0.1 μ f cap. and 6.8K Ω res.
connected to pin 4 of V14
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V11, V18 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
Check 100 μ f elec. cap. connected to
pin 8 of V17
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Freq. and Phasing con.
V11, V12, V13, V14
Check 82 μ f caps. connected to
pin 1 of V13
- PIX JITTER UP & DOWN (16, 17)**
V11, V12, V17, V18
Contrast con.
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
Fringe Compensator and Switch
V1, V2, V3, V4, V9, V10, V22
Check Vid. Det. and Amp. peaking
coils
- IF and RF alignment**
- POOR PIX DETAIL (35)**
Line tuning
Focus con.
V1, V2, V3, V4, V5, V9
Check Vid. Det. and Amp. peaking
coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V5, V21
Check alignment of T-5
Fringe Compensator and Switch
IF and RF alignment
SNOW IN PIX (33)
V1, V2, V3, V22
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V21, V22, V1, V2, V3, V4, V5, V9
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Fringe Compensator and Switch
V9, V5, V4, V22
V1, V2, V3, V22
Check Vid. Det. and Amp.
peaking coils
- VERT. BARS (21)**
V14, V16
Check 47 μ f cap. connected to
pin 8 of V16
Deflt. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V11, V12, V13, V14
Check Hor. Fringe con. adjustment
connected to pin 3 of V13
caps. connected to pin 3 of V13
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V22
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V19, V14, V15, V16, V23
Brightness con.
HV trans.
- INSUFFICIENT BRIGHTNESS**
Line tuning
Brightness con.
V14, V15, V19, V20, V23
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Line and Vert. Size con.
V14, V15, V16
- RASTER BLOOMING (37)**
V14, V15, V19, V20, V23
Check HV filter cap. and 100K Ω or
470K Ω res. connected to it.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Size con.
V14, V15, V19, V20
Check 820 and 1000 μ f caps.
connected to Hor. Phasing coil
Check 0.1 μ f and 0.18K Ω res.
connected to pin 4 of V14
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size con.
V14, V15, V19, V20
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
Check 0.0047 μ f cap. connected
to pin 2 of V17
Vert. Deflt. yoke
V. O. T.
- NO VERT. SYNC. - HOR. SYNC. OK
(16, 17)**
V11, V12, V17, V18
Vert. Hold con.
Check 0.047 μ f caps. connected
to pin 1 and 2 of V17
- NO HOR. OR VERT. SYNC. -
PIX SIGNAL OK**
V4, V11, V12
Check 0.047 μ f cap. connected to
pin 6 of V11
- NO HOR. SYNC. - VERT. SYNC. OK
(19, 20)**
Hor. Hold con.
Hor. Freq. and Phasing con.
V11, V12, V13, V14
Check 270 μ f cap. connected to
pin 4 of V13
- AUDIO HUM IN SOUND (8E)**
V8, V7, V8, V9, V10
- DISTORTED SOUND (8D)**
Tuner fine tuning
V8, V7, V8, V9, V10, V4, V22
Contrast con.
Check 0.047 μ f cap. connected to pin 5
of V10
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V6, V7, V8, V9, V10
Yol. con.
Speaker (open voice coil or defective
component)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V22, V4, V6, V7, V8, V9, V10
Yol. con.
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7
- NOISY SOUND - PIX OK**
V6, V7, V8, V9, V10
Yol. con.
Ground system for loose
connections
Speaker
Sound IF and Det. alignment T-5, T-6
and T-7
- SYNC. BUZZ IN SOUND**
V11, V12, V17, V18
Contrast con.
V4, V6, V7, V8
Fringe Compensator con.
Sound IF and Det. alignment T-5, T-6
and T-7
- INTERMITTENT SOUND - PIX OK**
V6, V7, V8, V9, V10
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6AV6	1st AF Amp.
V4	6AL5	Vid. & AGC Det.
V5	6CB6	Vid. Amp.
V6	6AU6	1st Sound IF Amp.
V7	6AU6	Sound Limiter
V8	6AL5	Ratio Det.
V9	6AV6	1st Audio Amp. -AGC Clamp.
V10	6AV6	2nd Audio Amp.
V11	12AU7	Sync. Amp. -Hor. Sync. Sep.
V12	12AU7	Hor. Sync. Inv. -Hor. Phase Det.
V13	6SN7GT	Hor. Osc.
V14	6BQ6GT	Hor. Out.
V15	1B3GT	HV Rect.
V16	6W4GT	Damper
V17	6SN7GT	Vert. Osc. Sep.
V18	6SN7GT	Vert. Osc.
V19	6W8GT	Vert. Out.
V20	5U4G	Low Volt. Rect.
V21	5U4G	Low Volt. Rect.
V22	6BQ7	RF Amp.
V23	6J7	Mixer-Osc.
V24	17LP4 21MP4	Picture Tube

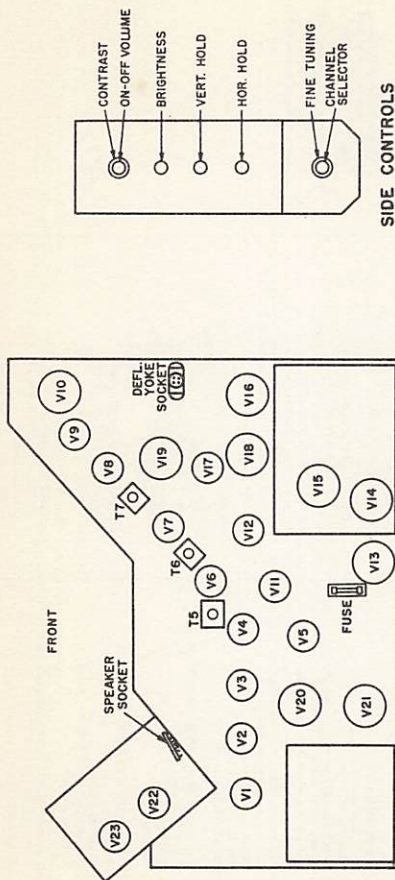
KEY VOLTAGES

B+	plate of damper, V16	pin 5	210 vdc
Boosted B+	cath. of damper, V16	pin 3	430 vdc
Plate(s) of Vert. Osc., V18	pin 2	60 to 115 vdc	
Plate of Vert. Out., V19	pin 5	58 vdc	
Plate(s) of Hor. Osc., V13	pin 3	205 vdc	
Grid of Hor. Out., V14	pin 5	150 vdc	
Grid of Hor. Out., V14	pin 5	-17 vdc	

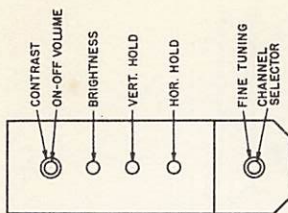
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

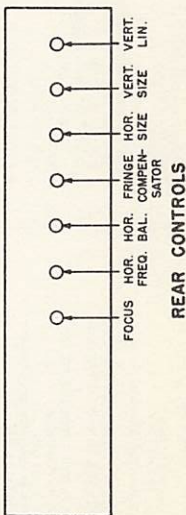
For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



TOP VIEW



SIDE CONTROLS



REAR CONTROLS

NO SOUND - NO RASTER (31)
 Power input circuit
 Check B-1 (0.5 Amps.)
 Check B- fuse F-1 (0.5 Amps.)

NO RASTER - SOUND OK (31)
 Brightness con.
 V13, V14, V15, V16, V24
 Ion trap
 HV trans. Hor. yoke CRT connections

WEAK PIX - SOUND AND RASTER OK (34)
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V23

POOR HOR. LIN.
 V14, V16

POOR VERT. LIN. (11, 12)
 Vert. Lin. and Size con.
 V8, V9, V10, V11
 Check 0.047 and 0.1 μ f caps.
 connected to pin 2 of V18

WEAK PIX - SOUND AND RASTER OK (34)
 Check 100 μ f elec. cap. connected to pin 8 of V19
 V. O. T.

PIX JITTER SIDEWAYS
 Hor. Hold Phase con.
 V12, V13, V14
 Check 470 μ f caps. connected to pin 6 and pin 8 of V12

PIX JITTER UP & DOWN (16, 17)
 V. H. Trans. Contrast con.
 V11, V17, V18

SMEARED PIX (36)
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5
 Check V14 Det. and Amp. peaking coils

POOR PIX DETAIL (35)
 Tuner fine tuning
 Focus con.
 V1, V2, V3, V4

FRINGE COMPENSATOR CON.
 Check V14 Det. and Amp. peaking coil
 IF and RF alignment

POOR PIX DETAIL (35)
 Tuner fine tuning
 Focus con.
 V1, V2, V3, V4

FRINGE COMPENSATOR CON.
 Check V14 Det. and Amp. peaking coil
 IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
 Tuner fine tuning
 V1, V2, V3, V4, V23
 Check alignment of L-8
 IF and RF alignment

SNOW IN PIX (32)
 V1, V2, V3, V4, V22, V23
 Check Fringe Compensator con.
 Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (39)
 V1, V2, V3, V4, V5

ENGRAVED EFFECT IN PIX (33)
 Tuner fine tuning
 Contrast con.
 V1, V2, V3, V4, V5, V23, V24
 Check Vid. Det. and Amp. peaking coil

VERT. BARS (31)
 Check cap. connected to terminal 1 of yoke
 Defl. yoke ringing

PIX BENDING (22)
 Hor. Hold, Balance and Phase con.
 V11, V12, V13, V14
 Check 0.001 and 0.015 μ f caps. connected to pin 1 of V13

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
 Tuner fine tuning
 Fringe Compensator con.
 V1, V2, V3, V4, V5
 Check Vid. Det. and Amp. peaking con.
 Check 0.047 μ f cap. connected to yellow lead of the pix tube socket
 RF and IF alignment

INTERMITTENT RASTER - SOUND OK
 Brightness con.
 V13, V14, V15, V16, V24
 HV trans.

INSUFFICIENT BRIGHTNESS
 Brightness con.
 V14, V15, V16, V20, V21, V24
 Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
 Hor. and Vert. Size con.
 V14, V15, V16, V24

RASTER BLOOMING (37)
 V14, V15, V16, V20, V21, V24

INSUFFICIENT RASTER WIDTH (23)
 Contrast con.
 V14, V15, V20, V21
 Check 0.001 μ f and 220 μ f caps. connected to pin 5 of V13
 Check 0.1 μ f cap. and 6.8k Ω res. connected to pin 4 of V14
 Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
 Vert. Size and Lin. con.
 V6, V7, V8, V9, V10, V23
 Check 0.047 and 0.1 μ f caps. connected to pin 2 of V18
 V. O. T.
 Low line voltage

NO VERT. DEFL. (14)
 Check 0.047 and 0.1 μ f caps. connected to pin 2 of V18
 Check 0.0047 μ f cap. connected to pin 1 of V18
 Vert. Defl. yoke
 V. O. T.

NO VERT. SYNC. - HOR. SYNC. OK (19, 17)
 Vert. Hold con.
 V11, V17, V18, V19
 Check 0.0047 μ f cap. connected to pin 1 of V18
 Check 0.0047 μ f cap. connected to pin 4 of V18

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
 V11, V12, V17
 Check 0.047 μ f cap. connected to pin 1 of V11

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
 Hor. Hold, Balance and Phase con.
 V13, V14
 Check 470 μ f caps. connected to pin 4 of V13

AUDIO HUM IN SOUND (8E)
 V6, V7, V8, V9, V10

DISTORTED SOUND (8D)
 V6, V7, V8, V9, V10, V23
 Check 0.047 μ f cap. connected to pin 5 of V10
 Sound and Vid. IF alignment T-5, T-6
 Det. alignment T-7

NO SOUND - PIX OK (8E)
 Tuner fine tuning
 Vol. con.
 V6, V7, V8, V9, V10
 Speaker (open voice coil or defective)
 Sound and Vid. IF alignment T-5, T-6
 Det. alignment T-7

WEAK SOUND - PIX OK (8C)
 Tuner fine tuning
 V6, V7, V8, V9, V10, V23
 Speaker
 Sound and Vid. IF alignment T-5, T-6
 Det. alignment T-7

NOISE SOUND - PIX OK
 Vol. con.
 V6, V7, V8, V9, V10
 Contrast con.
 Sound system for loose connections
 Speaker
 Sound IF and Det. alignment T-5, T-6 and T-7

SYNC. BUZZ IN SOUND
 Tuner fine tuning
 V4, V5, V7, V8
 Contrast con.
 Sound IF and Det. alignment T-5, T-6 and T-7

INTERMITTENT SOUND - PIX OK
 V6, V7, V8, V9, V10
 Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp.
V3	6AL5	2nd Vid. IF Amp. Det.
V4	6AL5	Vid. Det. - AGC Det.
V5	6CB6	Vid. Amp.
V6	6AU6	1st Sound IF Amp.
V7	6AU6	Sound Limiter
V8	6AL5	Ratio Det.
V9	6X4GT	1st Audio Amp. - AGC Clamp.
V10	6X4GT	2nd Audio Amp.
V11	12AU7	Sync. Amp. - Hor. Sync. Sep.
V12	12AU7	Hor. Phase Det. - Hor. Sync. Amp
V13	6SN7GT	Hor. Osc.
V14	6BQ6GT	Hor. Out.
V15	1X2A	HV Rect.
V16	6X4GT	500 Cycle Rect.
V17	6X4GT	Vert. Amp.
V18	6SN7GT	Vert. Osc.
V19	6W6GT	Vert. Out.
V20	5U4G	Low Volt. Rect.
V21	5U4G	Low Volt. Rect.
V22	6BQ7	RF Amp.
V23	6X4GT	500 Cycle Rect.
V24	17LP4	Picture Tube

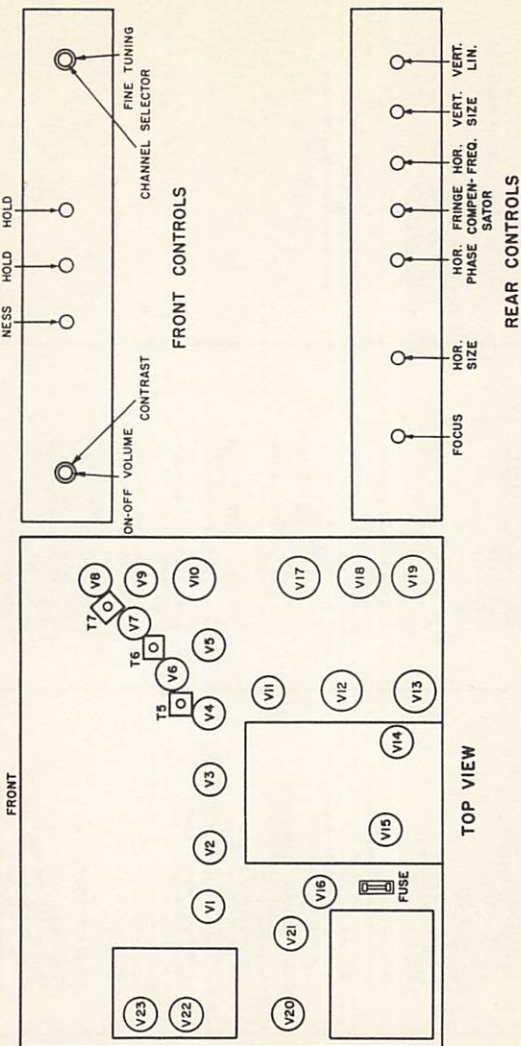
KEY VOLTAGES

B+	plate of damper, V16	pin 5	230 vdc
Boosted B+	cat. of damper, V16	pin 3	430 vdc
Plate(s) of Vert. Osc.	V18	pin 2	68 vdc
Plate of Vert. Out.	V19	pin 5	75 to 115 vdc
Grid of Hor. Osc.	V13	pin 3	200 vdc
Grid of Hor. Out.	V14	pin 5	175 vdc
		pin 5	-20 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-1.
For tuner oscillator adjustment, see TUNER OSC. ADJ-2.



NO RASTER - NO SOUND (31)
Power input circuit
V1, V2, V3, V22
Check B - Fuse (0.5 Amps.)
NO RASTER - SOUND OK (31)
Brightness con.
Ion trap
V13, V14, V15, V16, V24
HW trans. Hor. yoke CRT connections
WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast and Fringe Compensator con.
V1, V2, V3, V4, V5, V23

POOR HOR. LNK.
V14, V16 and Drive con.
Hor. Out. trans.

POOR VERT. LNK. (11, 12)
Vert. Size and Lin. con.
V18, V19
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V18
Check 100 μ f Elec. cap. connected to pin 8 of V19
Vert. Out. trans.

PIX JITTER SDEWAYS
V13, V14, V15, V16, V23
Check 0.001 μ f cap. connected to pin 1 of V12

PIX JITTER UP & DOWN (16, 17)
Vert. Hold and Contrast con.
V11, V17, V18
Check 0.047 μ f cap. connected to pin 1 of V18

SMEARED PIX (36)
Tuner fine tuning
Cage Compensator con.
V1, V2, V3, V4, V5
Check Vid. Det. and Amp. peaking coils
Check 0.047 μ f cap. connected to yellow lead of CRT socket
IF and RF alignment

POOR PIX DETAIL (35)
Tuner fine tuning
Focus con.
V1, V2, V3, V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
V1, V2, V3, V22, V23
Check adjustment of L-8 and T-5
IF and RF alignment

SNOW IN PIX (32)
Fringe Compensator con.
V1, V2, V3, V22
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5, V22, V23

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
Fringe Compensator con.
V1, V2, V3, V4, V5, V23, V24
Check Vid. Det. and Amp. peaking coils

VERT. BARS (21)
V14, V16
Check cap. connected to yoke terminal 1
Defl. yoke ringing

PIX BENDING (22)
Hor. Hold, Freq. and Balance con.
V12, V13, V14
Check 0.015 and 0.001 μ f caps. connected to pin 1 of V13

WEAK OR NO PIX - SOUND WEAK - RASTER OK (3C, 34C)
Tuner fine tuning
V1, V2, V3, V4, V22, V23
RF and IF alignment
Check 0.001 μ f cap. connected to pin 2 of V13

INTERMITTENT RASTER - SOUND OK
V13, V14, V15, V16, V24
Hor. Out. trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness con.
V14, V15, V16, V20, V21, V24
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. and Vert. Size con.
V14, V15, V16, V24

RASTER BLOOMING (37)
V14, V15, V16, V20, V21, V24

INSUFFICIENT RASTER WIDTH (23)
V14, V16, V20, V21
Check 820 μ f and 0.001 μ f caps.
connected to pin 3 of V13
Hor. Out. trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Size and Lin. con.
V19, V19, V20, V21
Check 0.047 and 0.1 μ f caps. connected to pin 5 of V19
Vert. Out. trans.
Low line voltage

NO VERT. DEFL. (14)
V17, V18
Check 0.047 and 0.1 μ f caps.
connected to pin 5 of V17
Check 0.0047 μ f cap. connected to pin 4 of V18
Vert. Defl. coils (yoke)
V. O. T.

NO VERT. SYNC - HOR. SYNC OK (16, 17)
Vert. Hold and Fringe Compensator con.
V11, V17, V18, V19
Check 0.047 μ f cap. connected to pin 1 of V18

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V4, V11, V12, V17
Check 0.047 μ f cap. connected to pin 6 of V11
Check Fringe Compensator con.

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Vert. Hold and Fringe con.
V11, V12, V13, V14
Check 470 μ f cap. connected to pin 2 of V13

AUDIO HUM IN SOUND (8E)
V6, V7, V8, V9, V10

DISTORTED SOUND (8D)
Tuner fine tuning
V6, V7, V8, V9, V10, V23
Check 0.047 μ f cap. connected to pin 5 of V10
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

NO SOUND - PIX OK (8B)
Tuner fine tuning
V6, V7, V8, V9, V10
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V6, V7, V8, V9, V10
Sound and Vid. IF alignment T-5, T-6
Det. alignment T-7

NOISY SOUND - PIX OK
Vol. con.
V6, V7, V8, V9, V10
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-5, T-6 and T-7

SYNC. BUZZ IN SOUND
Tuner fine tuning
Fringe Compensator con.
V4, V6, V7, V8
Sound IF and Det. alignment T-5, T-6 and T-7

INTERMITTENT SOUND - PIX OK
V6, V7, V8, V9, V10
poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	RF Amp.	
V2	RF Amp.	
V3	Converter	
V104	6BA6	1st Sound IF Amp.
V105	6BA6	2nd Sound IF Amp.
V106	6AU6	3rd Sound IF Amp.
V107	6AL5	Sound Disc.
V108	6X4	AF Amp.
V109	6K6GT	AF Out.
V110	6AG5	1st Pix IF Amp.
V111	6AG5	2nd Pix IF Amp.
V112	6AG5	3rd Pix IF Amp.
V113	6AG5	4th Pix IF Amp.
V114	6AL5	DC Rest., and
V115	6AU6	1st Vid. Amp.
V116	6K6GT	2nd Vid. Amp.
V117	10BP4	Kinescope
V118	6SK7	1st Sync Amp.
V119	6SH7	Sync. Sep. Amp.
V120	6SN7GT	1st and Hor. Discharge
V121	6J5	Vert. Sweep Osc. and Discharge
V122	6K6GT	Vert. Sweep Out.
V123	6AL5	Hor. Sync. Disc.
V124	6K6GT	Hor. Sweep Osc.
V125	6AC6	Hor. Sweep Osc. Con.
V126	6X6	Hor. Sweep Out.
V127	1B3SGT/8016	H. V. Rect.
V128	5V4G	Hor. Reaction Scan
V129	5U4G	Power Supply Rects.
V130		

KEY VOLTAGES

B₊ plate of damper, V128 plus 4 and 6
 B₊ plate of 6X6, V126 plus 120 pin 6
 Plate of Vert. Osc., V121 pin 3
 Plate of Vert. Out., V122 pin 3
 Plate of Hor. Osc., V125 pin 3
 Grid of Hor. Out., V128 pin 5
 -113 vdc

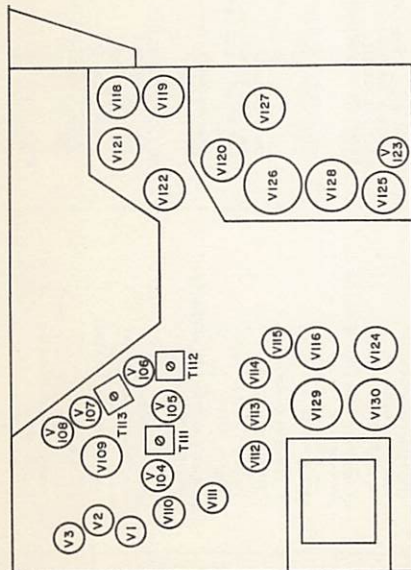
*Varies with control setting.

(All voltages are measured with a VTVM
 connected between the tube pins and chassis.)

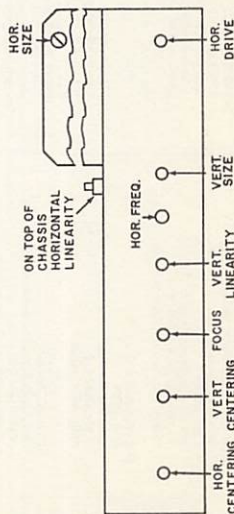
ADJUSTMENTS

For horizontal oscillator adjustment, see
 HOR. OSC. ADJ.-3.
 For tuner oscillator adjustment, see
 TUNER OSC. ADJ.-3.

FRONT

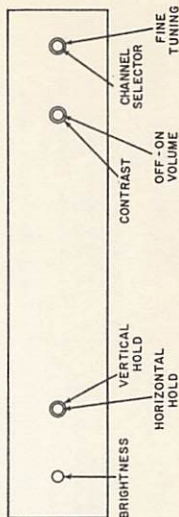
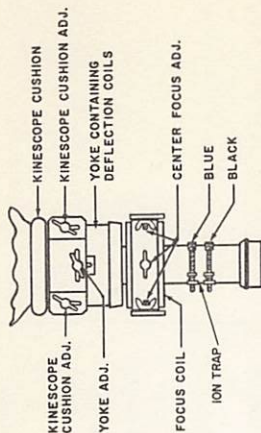


TOP VIEW



REAR CONTROLS

PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

NO RASTER - PIX OK (21)
Power input circuit
V120, V130

NO RASTER - SOUND OK (31)
Brightness con.
Ion trap

WEAK PIX - SOUND AND RASTER OK (34)
HV trans. Hor. yoke CRT connections
V127, V128

WEAK PIX - SOUND AND RASTER OK (34)
Raster con.
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116

POOR HOR. L.N.
Hor. Lin. and Drive con.
V120, V126, V128

Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
Hor. Out. trans.

POOR VERT. L.N. (11, 12)
Vert. Size and Lin. con.
V121, V122

Check 0.05 and 0.1 μ f caps. connected to red Lead of vert. osc. trans.
Check 50 μ f Elec. cap. connected to V122
Vert. Out. trans.

PIX JITTER SIDEWAYS
Hor. Hold, Freq. and Phasing coil
V123, V124, V125, V126

Check 82 μ f cap. connected to terminal "E" of Hor. Osc. trans.

PIX JITTER UP & DOWN (16, 17)
Vert. Hold and Contrast con.
V121, V122

Check 4700 μ f cap. connected to pin 5 of V111

SMEARED PIX (35)
Tuner fine tuning
Contrast con.
V110, V111, V112, V113, V114, V115, V116

Check Vid. Det. and Amp. peaking coils
V115 and pin 5 of V116
IF and RF alignment

PIX DETAIL (35)
Tuner fine tuning
V110, V111, V112, V113, V114

Check Vid. Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
Check tuner tubes
V110, V111, V112, V113, V114

IF and RF alignment

SNOW IN PIX (32)
Check tuner tubes
V110, V111, V112, V113, V114

Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116

V117
Check Vid. Det. and Amp. peaking coils

VERT. BARS (21)
Hor. Drive con.
V121, V122

Check 58 μ f cap. connected to yoke terminals
Defl. yoke finging

PIX BENDING (23)
Hor. Hold, Freq. and Phasing con.
V123, V124, V125, V126

Check 0.05 and 0.004 μ f caps. connected to pin 4 of V124 through a 500k Ω res.

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
Tuner fine tuning
Check tuner tubes
V110

RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Brightness con.
V117, V120, V123, V124, V125, V126, V127, V128

Hor. Out. trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive con.
V117, V120, V126, V127, V129, V130

Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive con.
Hor. and Vert. Size con.
V117, V126, V127, V128

Check 22k and 18k Ω res.
connected to pin 8 of V126
Check 0.05 μ f cap. connected to pin 8 of V126

RASTER BLOOMING (37)
Hor. Drive con.
V117, V120, V126, V127, V129, V130

Check HV Filter cap.
Check 1 Meg Ω res. connected to HV Filter cap.

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Size con.
V120, V126, V129, V130

Check 850 and 1000 μ f caps. connected to pin 3 of V120
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Size and Lin. con.
V121, V122, V129, V130

Check 0.05 and 0.1 μ f caps. connected to red Lead of vert. osc. trans.
Vert. Out. trans.
Low line voltage

NO VERT. DEFL. (14)
V121, V122

Check 0.05 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
Vert. Hold con.
V118, V119, V120, V121, V122

Check 4700 μ f cap. connected to pin 5 of V121

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V110, V119, V120

Check 0.05 μ f cap. connected to pin 1 of V120
Check 0.05 μ f cap. connected to pin 4 of V118

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
V110, V119, V120

Check 0.05 μ f cap. connected to pin 5 of V120, V123, V124, V125

AUDIO HDN IN SOUND (3E)
V104, V105, V106, V107, V108, V109

DISTORTED SOUND (8D)
Tuner fine tuning
Check tuner tubes
V104, V105, V106, V107, V108, V109

Check 0.005 μ f cap. connected to pin 5 of V109
Sound and Vid. IF alignment T111, T112
Det. alignment T113

NO SOUND - PIX OK (8B)
Tuner fine tuning
Voi. con.
V104, V105, V106, V107, V108, V109

Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T111, T112
Det. alignment T113

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
Voi. con.
Check tuner tubes
V104, V105, V106, V107, V108, V109

Sound and Vid. IF alignment T111, T112
Det. alignment T113

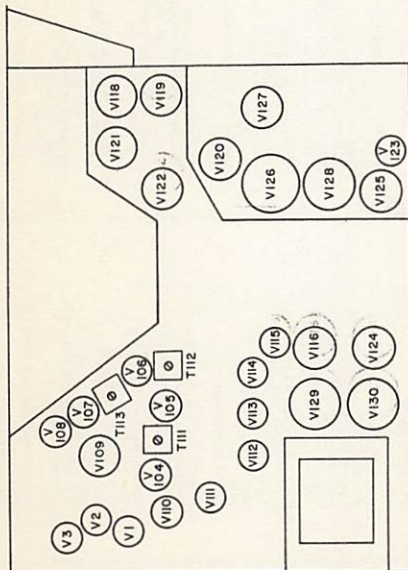
NOISY SOUND - PIX OK
Voi. con.
V104, V105, V106, V107, V108, V109

Check speaker system for loose connections
Speaker
Sound IF and Det. alignment T111, T112, T113

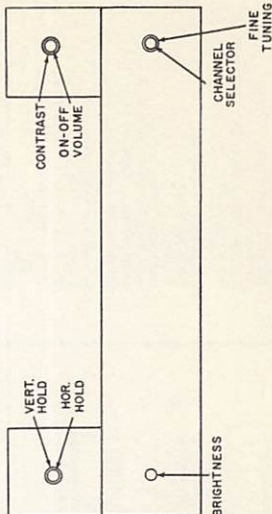
INTERMITTENT SOUND - PIX OK
V104, V105, V106, V107, V108, V109

Poor connections in sound system

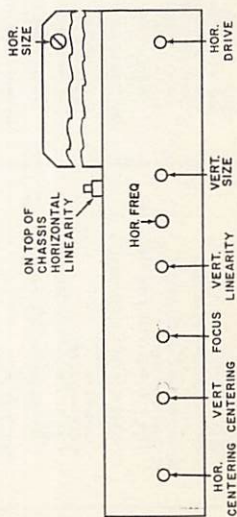
FRONT



TOP VIEW



FRONT CONTROLS



REAR CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6J6	RF Amp.
V2	6J6	Converter
V3	6J6	RF Osc.
V104	6BA6	1st Sound IF Amp.
V105	6BA6	2nd Sound IF Amp.
V106	6AV6	Sound Discr. IF Amp.
V107	6AL5	1st AF Amp.
V108	6AT6	1st AF Amp.
V109	6K6GT	AF Out.
V110	6AG5	1st Pix IF Amp.
V111	6AG5	2nd Pix IF Amp.
V112	6AG5	3rd Pix IF Amp.
V113	6AG5	4th Pix IF Amp.
V114	6AL5	Pix 2nd Det. and DC Rest.
V115	6AU6	1st Vid. Amp.
V116	6K6GT	2nd Vid. Amp.
V117	2L1P4	Kinescope
V118	6X4	Rect. Sep. Amp.
V119	6SN7	Sync. Sep. Amp.
V120	6SN7GT	2nd Sync. Amp. and Hor. Discharge and Hor. Sweep Osc. and Discharge
V121	6J5	Vert. Sweep Osc. and Discharge
V122	6K6GT	Vert. Sweep Out.
V123	6K6GT	Hor. Sweep Osc. and Discharge
V124	6K6GT	Hor. Sweep Osc.
V125	6AC7	Hor. Sweep Osc. Con.
V126	6BG6G	Hor. Sweep Out.
V127	1B3GT/8016	H. V. Rect.
V128	5Y4G	Hor. Reaction Scan
V129	5Y4G	Power Supply Rects.
V130	5U4G	Power Supply Rects.

KEY VOLTAGES

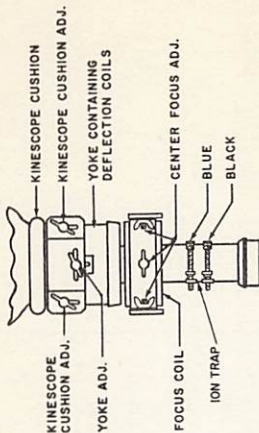
B+, plate of damper, V128 pins 4 & 6 275 vdc
 Boosted B+, cath. of damper, V128 pin 8 350 vdc
 Plate of Vert. Out., V122 pin 3 100 vdc
 Plate of Hor. Out., V126 pin 3 100 vdc
 Grid of Hor. Out., V126 pin 9 -113 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-3.
 For tuner oscillator adjustment, see TUNER OSC. ADJ.-3.

PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

REAR CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V129, V130
- NO RASTER - SOUND OK (31)**
Blind. cap. c/s.
AC. IN. PX (DARK HOR. BAR) (38)
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
- ENGRAVED EFFECT IN PPK (33)**
Tuner fine tuning
V121, V122, V129, V130
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V121, V122
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
V126, V128
Check 56 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIK BENDING (22)**
V121, V122
Hor. Hold, Freq. and Phasing con.
V120, V123, V124, V125, V126
Check 0.004 and 0.05 μ f caps. connected to pin 4 of V124 through a 500K Ω res.
- WEAK OR NO PIK - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Check tuner tubes
V110, V111, V112, V113, V114
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V117, V120, V124, V125, V126, V127, V128
Hor. Out. trans.
- PIK JITTER UP & DOWN (16, 17)**
Virt. Hold and Contrast con.
V118, V119, V120, V121, V122
- SMEARED PIK (36)**
Tuner fine tuning
V110, V111, V112, V113, V114
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIK DETAIL (35)**
Tuner fine tuning
V110, V111, V112, V113
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIK (4A, 4E)**
Tuner fine tuning
V110, V111, V112, V113, V114
IF and RF alignment
- NO RASTER - NO SOUND (31)**
Power input circuit
V129, V130
- NO RASTER - SOUND OK (31)**
Blind. cap. c/s.
AC. IN. PX (DARK HOR. BAR) (38)
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
- ENGRAVED EFFECT IN PPK (33)**
Tuner fine tuning
V121, V122, V129, V130
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V121, V122
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
V126, V128
Check 56 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIK BENDING (22)**
V121, V122
Hor. Hold, Freq. and Phasing con.
V120, V123, V124, V125, V126
Check 0.004 and 0.05 μ f caps. connected to pin 4 of V124 through a 500K Ω res.
- WEAK OR NO PIK - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Check tuner tubes
V110, V111, V112, V113, V114
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V117, V120, V124, V125, V126, V127, V128
Hor. Out. trans.
- PIK JITTER UP & DOWN (16, 17)**
Virt. Hold and Contrast con.
V118, V119, V120, V121, V122
- SMEARED PIK (36)**
Tuner fine tuning
V110, V111, V112, V113, V114
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIK DETAIL (35)**
Tuner fine tuning
V110, V111, V112, V113
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIK (4A, 4E)**
Tuner fine tuning
V110, V111, V112, V113, V114
IF and RF alignment
- NO SOUND - PIK OK (8B)**
Tuner fine tuning
Vol. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T-111, T-112
Check alignment of
V104, V105, V106, V107, V108, V109
- WEAK SOUND - PIK OK (8C)**
Tuner fine tuning
Vol. con.
V104, V105, V106, V107, V108, V109
Check alignment of
Sound and Vid. IF alignment T-111, T-112
Det. alignment T-113
- NOISY SOUND - PIK OK**
Vol. con.
V104, V105, V106, V107, V108, V109
Check system for loose connections
Speaker
Sound IF and Det. alignment T-111, T-112, T-113
- INTERMITTENT SOUND - PIK OK**
V104, V105, V106, V107, V108, V109
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V120, V126, V128, V129, V130
Check 680 μ f and 0.001 μ f caps. connected to pin 5 of V120
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Virt. Size and Lin. con.
V121, V122, V129, V130
Check 0.05 and 0.1 μ f caps. connected to pin 1 of Vert. Osc. trans.
Virt. Out. trans.
Low line voltage
- NO VERT. DEF. L. (14)**
V121, V122
Check 0.05 and 0.1 μ f caps. connected to pin 1 of Vert. osc. trans.
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Virt. Hold con.
V120, V121, V122
Check 4700 μ f cap. connected to pin 5 of V121
- NO HOR. OR VERT. SYNC. - PIK SIGNAL OK**
V114, V118, V119, V120
Check 0.05 μ f caps. connected to pin 1 of V120 and to pin 4 of V118
Check 270 μ f cap. connected to pin 4 of V119
- NO HOR. SYNC. - VERT. SYNC. OK (16, 20)**
Hor. Hold, Freq. and Phasing con.
V120, V123, V124, V125
Check 0.004 μ f cap. connected to pin 3 of V125
- AUDIO HUM IN SOUND (8E)**
V104, V105, V106, V107, V108, V109
- DISTORTED SOUND (8D)**
Tuner fine tuning
Check tuner tubes
V104, V105, V106, V107, V108, V109
Check 0.005 μ f cap. connected to pin 5 of V105
Sound and Vid. IF alignment T-111, T-112
Det. alignment T-113
- SNOW IN PIK (32)**
Check tuner tubes
V110, V111, V112, V113, V114
Antenna and transmission line
AC. IN. PX (DARK HOR. BAR) (38)
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
- UNGRAVED EFFECT IN PPK (33)**
Tuner fine tuning
V121, V122, V129, V130
Check tuner tubes
V110, V111, V112, V113, V114, V115, V116
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V121, V122
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
V126, V128
Check 56 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIK BENDING (22)**
V121, V122
Hor. Hold, Freq. and Phasing con.
V120, V123, V124, V125, V126
Check 0.004 and 0.05 μ f caps. connected to pin 4 of V124 through a 500K Ω res.
- WEAK OR NO PIK - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Check tuner tubes
V110, V111, V112, V113, V114
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V117, V120, V124, V125, V126, V127, V128
Hor. Out. trans.
- PIK JITTER UP & DOWN (16, 17)**
Virt. Hold and Contrast con.
V118, V119, V120, V121, V122
- SMEARED PIK (36)**
Tuner fine tuning
V110, V111, V112, V113, V114
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIK DETAIL (35)**
Tuner fine tuning
V110, V111, V112, V113
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIK (4A, 4E)**
Tuner fine tuning
V110, V111, V112, V113, V114
IF and RF alignment

TUBE LIST

Symbol	Type	Circuit Function
V1	6J6	RF Amp.
V2	6J6	Converter
V3	6X4	1st. Sound IF Amp.
V104	6BA6	2nd Sound IF Amp.
V105	6BA6	3rd Sound IF Amp.
V106	6AL5	Sound Discr.
V107	6AL5	1st. Audio Amp.
V108	6AT6	Audio Out.
V109	6X4	2nd Vid. IF Amp.
V110	6X4	3rd Vid. IF Amp.
V111	6AG5	4th Vid. IF Amp.
V112	6AG5	5th Vid. IF Amp.
V113	6AL5	Vid. Det. - DC Restorer
V114	6AL5	1st Vid. Amp.
V115	6AU6	2nd Vid. Amp.
V116	6V6GT	Picture Tube
V117	or 15AP4	
V118	6SK7	1st Sync. Amp.
V119	6SH7	2nd Sync. Amp. - Hor. Discr.
V120	6SN7GT	Sync. Sep.
V121	6J5	Vert. Osc.
V122	6V6GT	Vert. Out.
V123	6AL5	Hor. Osc. Discr.
V124	6AC7	Hor. Osc. Conv.
V125	6K6GT	Hor. Osc.
V126	6BG6G	Hor. Out.
V127	1BSGT	HV Rect.
V128	5Y4G	Damper
V129	5Y4G	Rect.
V130	5U4G	Rect.
V131	1BSGT	HV Rect.

KEY VOLTAGES

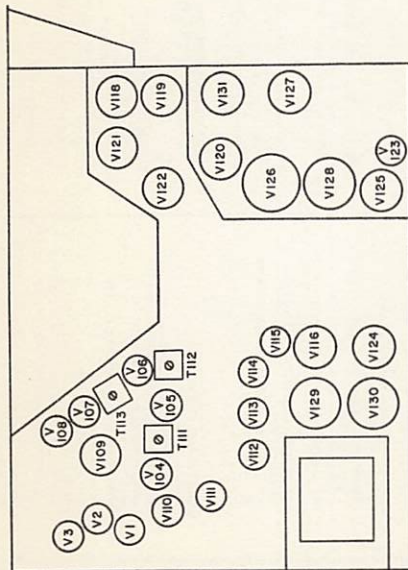
B+, plate of damper, V128 pins 4 & 6 275 vdc
 Boosted B+, cath. of damper, V128 pin 8 350 vdc
 B-1, cath. of V125 pin 3 180 vdc
 Plate of Vert. Osc., V122 pin 3 180 vdc
 Plate of Hor. Osc., V125 pin 3 190 vdc
 Grid of Hor. Out., V126 pin 5 -113 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

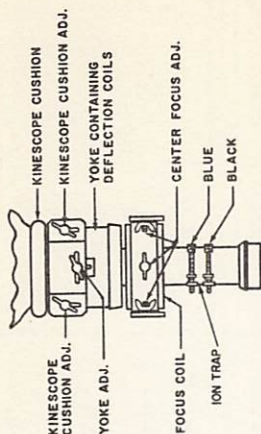
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-3.
 For tuner oscillator adjustment, see TUNER OSC. ADJ.-3.

FRONT

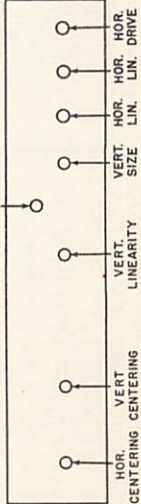


TOP VIEW



PICTURE TUBE ADJUSTMENTS

HOR. FREQ.



REAR CONTROLS

FRONT CONTROLS

- NO RASTER - NO SOUND (31)**
Tuner fine tuning and circuit
V125, V130
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse (0.25 Amps.)
V1 cap. V17, V120, V124, V125, V126, V127, V128, V129, V130, V131, V132, V133
Check 470 μ F res. connected between V127 and V131
Check HV Filter caps.
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
Vol. con.
V2, V3, V104, V105, V106, V107, V108, V109
Speaker (check voice coil or defective connection)
Sound and Vid. IF alignment T-111, T-112
Det. alignment T-113
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Vol. con.
V2, V3, V104, V105, V106, V107, V108, V109
Sound and Vid. IF alignment T-111, T-112
Det. alignment T-113
- NOISY SOUND - PIX OK**
Vol. con.
V104, V105, V106, V107, V108, V109
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-111, T-112 and T-113
- INTERMITTENT SOUND - PIX OK**
V104, V105, V106, V107, V108, V109
Poor connections in sound system
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V110, V111, V112, V113
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3
V110, V111, V112, V113, V114
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V110, V111, V112, V113, V114, V115, V116
and V131
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V2, V3, V110, V111, V112, V113, V114, V115, V116, V117
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (31)**
Hor. Drive and Hor. Lin. con.
V126, V128
Check 55 μ F cap. connected to yoke terminals
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 0.004 μ F cap. connected to pin 1 of V123
- WEAK OR NO PIX - SOUND WEAK -**
Tuner fine tuning
V1, V2, V3, V110
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V17, V120, V124, V125, V126, V127, V128, V131
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V1, V120, V125, V127, V128, V129, V130, V131
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
V126, V128
Check 0.05 μ F cap. connected to pin 8 of V126
- NO RASTER - NO SOUND (31)**
Tuner fine tuning and circuit
V125, V130
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse (0.25 Amps.)
V1 cap. V17, V120, V124, V125, V126, V127, V128, V129, V130, V131, V132, V133
Check 470 μ F res. connected between V127 and V131
Check HV Filter caps.
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V2, V3, V10, V111, V112, V113, V114, V115, V116
- POOR HOR. LIN.**
Hor. Lin. Coll. Drive con.
V120, V125, V128
Check 0.05 and 0.15 μ F caps. connected to hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V21, V22
Check 0.05 and 0.1 μ F caps. connected to red Lead of vert. osc. trans.
Check 50 μ F Elec. cap. connected to 8 of V122
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 82 μ F cap. connected to terminal 2 of hor. osc. trans.
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V18, V19, V120, V121
Check 4700 μ F cap. connected to pin 5 of V121
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V10, V11, V12, V13, V14, V115, V116
Check 0.05 Det. and Amp. peaking coils
V115 and pin 5 of V116
IF and RF alignment
- POOR PIX DETAIL (85)**
Tuner fine tuning
V10, V11, V12, V13, V14, V115, V116
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- RASTER BLOOMING (37)**
Hor. Drive con.
V120, V124, V125, V126, V127, V128, V129, V130, V131
Check 470 μ F res. connected between V127 and V131
Check HV Filter caps.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Vid. Width con.
V120, V124, V125, V126, V127, V128, V129, V130, V131
Check 680 μ F and 0.01 μ F cap. connected to pin 5 of V120
Check 220 μ F caps. connected to terminals 4 and 6 of Hor. Out. trans.
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V121, V122, V129, V130
Check 0.05 and 0.1 μ F caps. connected to red Lead of Vert. Osc. trans.
Low line voltage
- NO VERT. DEF. L. (14)**
V121, V122
Check 0.05 and 0.1 μ F caps. connected to red Lead of Vert. Osc. trans.
Vert. Hold con.
V.C.T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V121, V122
Check 4700 μ F cap. connected to pin 5 of V121
Check 0.01 μ F cap. connected to pin 2 of V120
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V118, V119, V120
Check 0.05 μ F cap. connected to pin 1 of V120
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 0.05 μ F cap. connected to pin 5 of V124
- AUDIO HUM IN SOUND (8E)**
V104, V105, V106, V107, V108, V109
- DISTORTED SOUND (8D)**
V2, V3, V104, V105, V106, V107, V108, V109
Check 0.01 μ F cap. connected to pin 5 of V109
Sound and Vid. IF alignment T-111, T-112
Det. alignment T-113

TUBE LIST

Symbol	Type	Circuit Function
V1	6B8	RF Amp.
V2	6X4	Rectifier
V3	6J6	Osc.
V4	6BA6	1st Sound IF Amp.
V5	6AV6	2nd Sound IF Amp.
V6	6AL5	Diacr.
V7	6AT6	1st Audio Amp.
V8	6AV6	2nd Audio Amp.
V9	6AG5	3rd Vfd. IF Amp.
V10	6AG5	4th Vfd. IF Amp.
V11	6AG5	5th Vfd. IF Amp.
V12	6AG5	6th Vfd. IF Amp.
V13	6AV6	1st Vfd. Amp.
V14	6K8GT	2nd Vfd. Amp.
V15	6AV6	3rd Vfd. Amp.
V16	6K8GT	4th Vfd. Amp.
V17	6AV6	5th Vfd. Amp.
V18	6K8GT	6th Vfd. Amp.
V19	6SN7GT	2nd Sync. Amp. - Hor. Diacr.
V20	6SN7GT	3rd Sync. Amp. - Vert. Osc.
V21	6AL5	Hor. Sync. Diacr.
V22	6AV6	Hor. Osc. Con.
V23	6K8GT	Hor. Osc.
V24	6B6GT	Hor. Out.
V25	1B3GT	HV Rect.
V26	6X4	Rectifier
V27	5U4G	Rect.
V28	5U4G	Rect.

AM-FM CHASSIS

V1	6B8	AM-RF Amp.
V2	6X4	Rect.
V3	6BA6	FM-RF Amp.
V4	12AT7	FM-Mixer Osc.
V5	6AV6	1st AM-FM IF Amp.
V6	6BA6	2nd AM-FM IF Amp.
V7	6BA6	FM Driver
V8	6AL5	Ratio Det.
V9	6AV6	1st Audio Amp.
V10	6AT6	Phase Inverter
V11	6V6G	Audio Out.
V12	6V6G	Audio Out.
V13	5U4G	Rect.

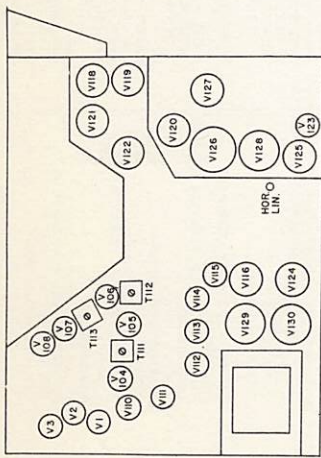
KEY VOLTAGES

- B+ - plate of damper, V128 pin 4 & 6
- B- - cath. of damper, V128 pin 8
- Plate of V1, cath. of V2, V128 pin 6
- Plate of V3, cath. of V4, V128 pin 3
- Plate of Hor. Osc., V128 pin 3
- Grid of Hor. Osc., V128 pin 3
- Grid of Hor. Out., V128 pin 5
- 115 vdc

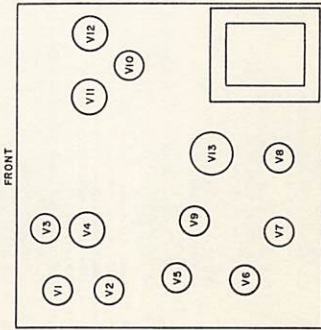
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-3.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-3.

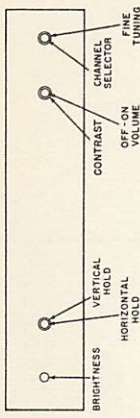
FRONT



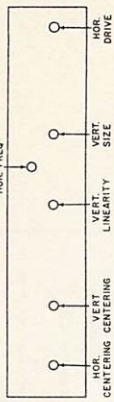
TOP VIEW



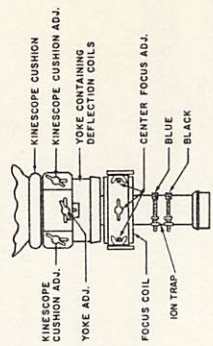
TOP VIEW (AM-FM CHASSIS)



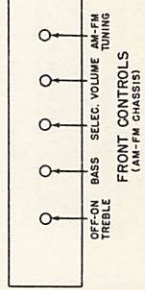
FRONT CONTROLS



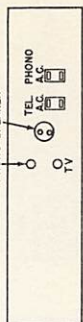
REAR CONTROLS



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS (AM-FM CHASSIS)



REAR VIEW (AM-FM CHASSIS)

- NO RASTER - NO SOUND (31)**
Power input circuit
V129, V130
- NO RASTER - SOUND OK (31)**
Res. caps. con.
Ion trap
V128
- HV trans. Hor. yoke CRT connections**
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V2, V3, V10, V11, V12, V13, V14, V15, V16
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
Check 0.05 and 0.1 μ f caps. connected to hor. Lin. coil
Hor. Out trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V121, V122
Check 0.05 and 0.1 μ f caps. connected to red Lead of vert. osc. trans.
Check 50 μ f cap. connected to pin 1 of V122
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 82 μ f cap. connected to terminal "E" of Hor. Osc. trans.
- PIX JITTER UP & DOWN (15, 17)**
Vert. Hold and Contrast con.
V119, V115, V120, V121
Check 0.01 μ f cap. connected to pin 2 of V120
- SMEARED PIX (35)**
Tuner fine tuning
Contrast con.
Check Vid. Det. and Amp. peaking coils
Check 0.05 μ f caps. connected to pin 1 of V115 and to pin 5 of V116
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V110, V111, V112, V113, V114
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V10, V11, V12, V13
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V10, V11, V12, V13, V14
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V10, V11, V12, V13, V14, V15, V16
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V2, V3, V10, V11, V12, V13, V14, V15, V16, V17
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V126, V128
Check 56 μ f cap. connected to yoke
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 0.004 μ f cap. connected to pin 1 of V123
- WEAK OR NO PIX - SOUND WEAK**
RASTER OK (32C, 34C)
- Tuner fine tuning**
V1, V2, V3, V10, V11, V12
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V117, V120, V124, V125, V126, V127, V128
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Brightness and Hor. Drive con.
V117, V120, V125, V127, V128, V129, V130
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. and Vert. Size con.
V117, V126, V127, V128
Check 0.05 μ f cap. and 18K Ω and 22K Ω res. connected to pin 8 of V126
- RASTER BLOOMING (37)**
Tuner fine tuning
Focus con.
V120, V126, V127, V128, V129, V130
Check HV Filter cap.
Check 1 Meg Ω Res. connected to HV Filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V126, V128, V129, V130
Check 0.05 μ f caps. connected to terminals 4 and 6 of Hor. Out. trans.
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
V121, V122 and Lin. con.
Check 0.05 and 0.1 μ f caps. connected to red Lead of vert. osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEF. (14)**
V121, V122
Check 0.05 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. OK**
(15, 17)
- Vert. Hold con.**
Vert. Int. network
V120, V121, V122
Check 0.05 μ f cap. connected to pin 5 of V121
Check 0.01 μ f cap. connected to pin 2 of V120
- NO HOR. OR VERT. SYNC. OK**
PIX SIGNAL OK
V118, V119
Check 0.05 μ f cap. connected to pin 1 of V120
- NO HOR. SYNC. - VERT. SYNC. OK**
(19, 20)
Hor. Hold and Freq. con.
V123, V124, V125, V126
Check 0.004 μ f cap. connected to pin 5 of V125
- AUDIO HUM IN SOUND (8E)**
V104, V105, V106, V107, V108, V109
- DISTORTED SOUND (8D)**
V2, V3, V104, V105, V106, V107, V108, V109
Check 0.01 μ f cap. connected to pin 5 of V109
Sound and Vid. IF alignment T-111, T-112
Defl. alignment T-113
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
Voi. con.
V104, V105, V106, V107, V108, V109
Sound and Vid. IF alignment T-111, T-112
Defl. alignment T-113
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V2, V3, V104, V105, V106, V107, V108, V109
Sound and Vid. IF alignment T-111, T-112
Defl. alignment T-113
- NOISY SOUND - PIX OK**
Voi. con.
V104, V105, V106, V107, V108, V109
Check sound system for loose connections
Speaker
Sound IF and Defl. alignment T-111, T-112, and T-113
- INTERMITTENT SOUND - PIX OK**
V104, V105, V106, V107, V108, V109
Peer connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6AU6	Mixer-Osc.
V3	6AU6	1st Sound IF Amp.
V4	6AU6	2nd Sound IF Amp.
V5	6AU6	3rd Sound IF Amp.
V6	6AL5	Sound Discr.
V7	6AV6	1st Audio Amp.-Bias Clamp.
V8	6AR5	Audio Outl.
V9	6AV6	2nd Audio Amp.
V10	6AG5	2nd Vid. IF Amp.
V11	6AG5	3rd Vid. IF Amp.
V12	6AG5	4th Vid. IF Amp.
V13	6AL5	Vid. Det.-Limiter
V14	6AU6	1st Vid. Amp.
V15	6AR5	2nd Vid. Amp.
V16	6AV6	3rd Vid. Amp.
V17	6SN7	Sync. Amp.-2nd Sync. Sep.
V18	6SN7	AGC Amp.-Vert. Osc.
V19	6S4	Vert. Outl.
V20	6SN7	Hor. Osc.-Hor. Osc. Con.
V21	6CD9G	Hor. Outl.
V22	100T	Damper
V23	100T	100T
V24	1B3GT	HV Rect.
V25	5U4G	Rect.
V26	15AP4	Picture Tube

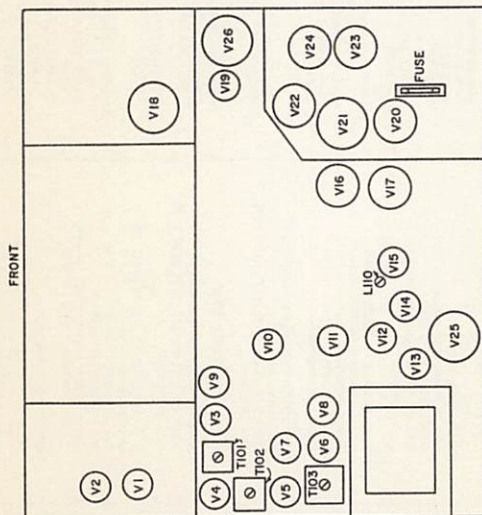
KEY VOLTAGES

B+, plate of damper, V22 pin 5	245 vdc
Boosted B+, cath. of damper, V22	380 vdc
Plate of Vert. Osc., V18 pin 3	140 vdc
Plate of Vert. Osc., V19 pin 6	370 vdc
Plate(s) of Hor. Osc. (and control),	
V20 pin 5	110 vdc
V20 pin 2	30 to 100 vdc
V21 pin 5	-140 vdc

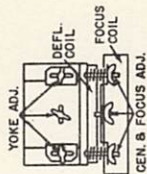
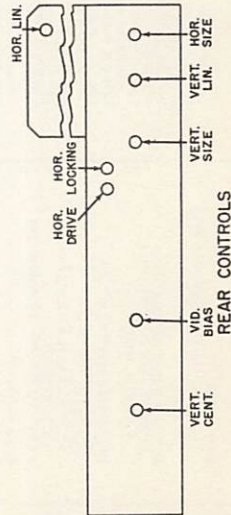
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-2.
For vertical oscillator adjustment, see TUNER OSC. ADJ-3.



TOP VIEW



PICTURE TUBE ADJUSTMENTS

- NO RASTER - NO SOUND (31)**
V23, V24
Check HV fuse
Power input circuit
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse (0.25 Amps.)
V20, V21, V22, V23, V24
C.R.T.
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast and Vid. Bias con.
Check tuner tubes
V9, V10, V11, V12, V13, V14, V15
POOR HOR. LIN.
Hor. Lin. and Drive con.
V21, V22
Check 0.043 and 0.1 μ f cap. connected to Hor. Lin. coil
Hor. Osc. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V18, V19
Check 0.047 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans
Check 90 μ f Eric-cap. connected to Vert. Osc. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Locking range con.
Hor. Osc. Adj.
Check 0.022 μ f cap. connected to pin 1 of V20
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V18, V19
- SMEARED PIX (36)**
Tuner fine tuning
Contrast Vid. Bias con.
V9, V10, V11, V12, V13, V14, V15
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V9, V10, V11, V12
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
V9, V10, V11, V12
Check tuner tubes
Check adjustment of L-110 IF and RF alignment
- SNOW IN PIX (32)**
V9, V10, V11, V12, V18
Antenna and transmission line
Check tuner tubes
V9, V10, V11, V12, V13, V14, V15, V18
- AC IN PIX (DARK HOR. BAR) (36)**
V9, V10, V11, V12, V13, V14, V15, V18
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast Vid. Bias con.
Check tuner tubes
V9, V10, V11, V12, V13, V14, V15
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (11)**
Hor. Drive con.
V21, V22
Check 55 μ f cap. connected to yoke terminals
- PIX BENDING (23)**
Hor. Hold and Locking Range con.
Hor. Osc. Adj.
V17, V18, V20, V21
Check 0.022 and 0.22 μ f caps. connected to pin 5 of V20
- WEAK OR NO PIX - SOUND WEAK - NO RASTER OK (33C, 34C)**
Tuner fine tuning
Check tuner tubes
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V20, V21, V22, V23, V24
Hor. Osc. trans.
C.R.T.
- INSUFFICIENT BRIGHTNESS**
Cap. connected to Hor. Drive con.
Brightness and Hor. Drive con.
V20, V21, V22, V23, V24, V25, V26
Low line voltage
C.R.T.
- SOUND BARS IN PIX (SIZE) (9, 10)**
Hor. Drive con.
Hor. and Vert. Size con.
V21, V22, V23, V24
C.R.T.
Check 22k Ω res. connected to pin 8 of V21
- RASTER BLOOMING (37)**
Hor. Drive con.
V21, V22, V23, V24, V25, V26
Check 500k Ω res. connected to V25 and V26
Check HV filter caps.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V21, V22, V25, V26
Check 680 μ f and 0.0017 μ f caps. connected to hor. osc. trans.
Hor. Osc. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V18, V19, V25, V26
Check 0.047 and 0.1 μ f caps. connected to red Lead of vert. osc. trans.
Vert. Osc. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V18, V19
Check 0.047 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Hor. Osc. Adj.
V17, V18, V19
Check 0.0047 μ f cap. connected to yellow Lead of Vert. Osc. trans.
- NO HOR. OR VERT. SYNC.**
V16, V17, V18
Check 0.047 μ f cap. connected to pin 1 of V17
PIX SIGNAL OK
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Locking Range con.
Hor. Osc. Adj.
V20, V21
- AUDIO HUM IN SOUND (8E)**
V3, V4, V5, V6, V7, V8
- DISTORTED SOUND (8D)**
Tuner fine tuning
Check tuner tubes
V3, V4, V5, V6, V7, V8
Check 0.01 μ f cap. connected to pin 1 of V8
Sound and Vid. IF alignment
T-102
Det. alignment T-103
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V9, V4, V5, V6, V7, V8
Check 0.01 μ f cap. connected to defective Substation voice coil or defective connection
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Check tuner tubes
V3, V4, V5, V6, V7, V8
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103
- NOISY SOUND - PIX OK**
Voi. con.
V3, V4, V5, V6, V7, V8
Check sound system for loose connections
Speaker connections
Sound IF and Det. alignment T-101, T-102 and T-103
- INTERMITTENT SOUND - PIX OK**
V3, V4, V5, V6, V7, V8
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AU6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. - AGC Det.
V5	6AC7	Vid. Amp.
V6	12LP4	Picture Tube
V7	6AU6	Ratio Det. Driver
V8	6Y8	Ratio Det. - Audio Amp.
V9	6SN7GT	Audio Amp.
V10	12AU7	DC Rect. - Sync. Amp. Splitter
V11	6SN7GT	Hor. Osc.
V12	6AU5	Hor. Out.
V13	6AU5	Damper
V14	6WAGT	5Y4 Rect.
V15	1Y2	RV Rect.
V16	1V2	RV Rect.
V17	6SN7GT	Vert. Osc. -Vert. Out.
V18	5V4GT	Low Volt. Rect.
Tuner Tubes		
6CB5		RF Amp.
6CB5		Mixer
5J6		Osc.

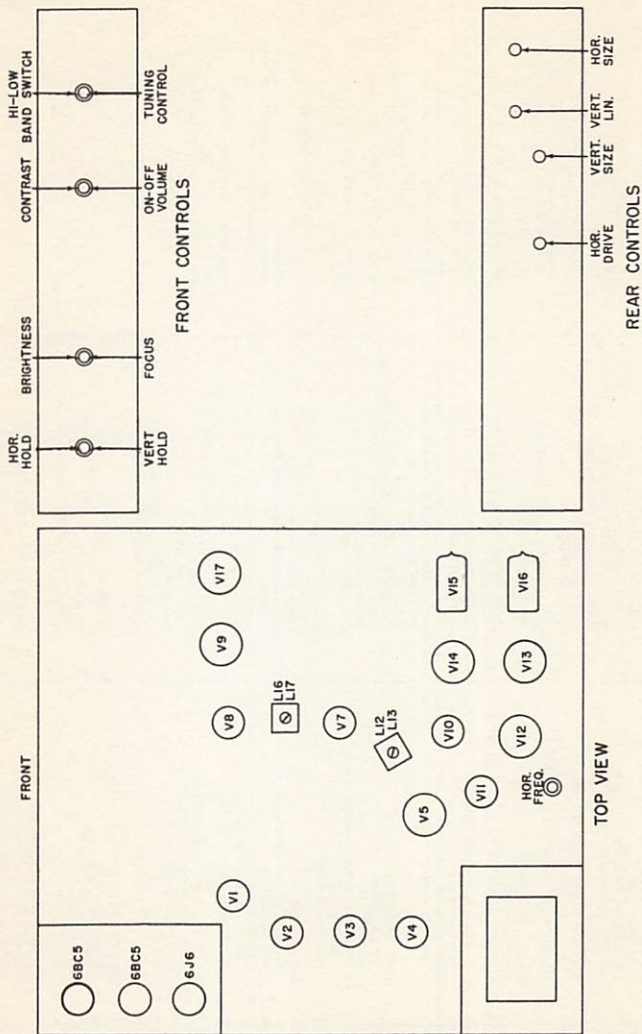
KEY VOLTAGES

B+	Plate of damper, V14	pin 5	250 vdc
Boosted B+	cath. of damper, V14		
Plate of Vert. Osc.	V17	pin 3	370 vdc
Plate of Vert. Out.	V17	pin 2	130 vdc
Plate(s) of Hor. Osc.	V12	pin 2	360 vdc
		pin 5	215 vdc
Grid of Hor. Out.	V13	pin 1	120 vdc
		pin 5	-23 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

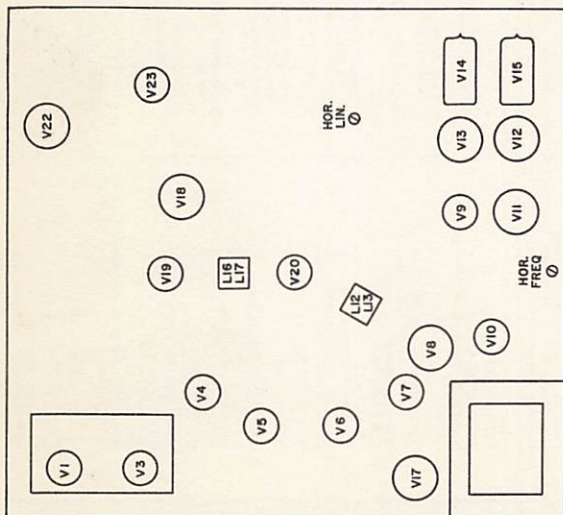
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-1.

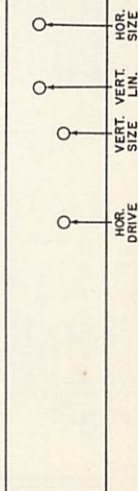


- NO RASTER - NO SOUND (31)**
Poor input circuit
V18
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse F-1 (0.25 Amps.)
V6, V12, V13, V14, V15, V16
V6 HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
V1, V2, V3, V4, V5, V10
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V13, V14
Check 0.03 and 0.1 μ f caps. connected to yoke
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V17
Check 0.1 and 0.25 μ f caps. connected to pin 3 of V17
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. and Freq. con.
V1, V2, V3, V4
Check 100 μ f caps. connected to pins 1 and 2 of V11
- PIX JITTER UP & DOWN (16, 17)**
Hor. and Contrast con.
V10, V17
Check 0.0047 μ f caps. connected to pin 4 of V17
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus con.
V1, V2, V3
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
Check tuner tubes
V1, V2, V3, V4
IF and RF alignment
- SNOW IN PIX (32)**
Check tuner tubes
V1, V2, V3, V4, V5, V10
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V10
Check tuner tubes
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
Contrast con.
V1, V2, V3, V4, V5, V6, V10
Check tuner tubes
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V13, V14
Check 56 μ f cap. connected to yoke terminal 3
Defl. yoke ringing
- PIX BENDING (22)**
V10, V11, V12, V13
Check 0.05 μ f cap. connected to pin 1 of V12
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (3C, 34C)**
Check tuner tubes
V1, V2, V3, V4
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V6, V12, V13, V14, V15, V16
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V10, V11, V12, V13, V14, V15, V16, V18
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
Check HV Fuse F-1
V13, V14, V15, V16
Check 50 μ f caps. connected between V15 and V16
- RASTER BLOOMING (37)**
Hor. Drive con.
V6, V13, V14, V15, V16, V18
Check HV Filter cap.
Check HV trans. connected between V15 and V16
- NO RASTER - NO SOUND (8C)**
Tuner line tuning
V1, V2, V3, V4, V5, V6, V7, V8, V9
Check tuner tubes
V1, V2, V3, V4, V5, V6, V7, V8, V9
Det. alignment L12, L13, L16, L17
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V1, V2, V3, V4, V5, V6, V7, V8, V9
Check tuner tubes
V1, V2, V3, V4, V5, V6, V7, V8, V9
Sound and Vid. IF alignment L12, L13
Det. alignment L16, L17
- NOISY SOUND - PIX OK**
Vol. con.
V1, V8, V9
Check sound system for loose connections
Speaker and Det. alignment L12, L13, L16, L17
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V17
Check 0.01 μ f and 470 μ f caps. connected to pin 1 of V13
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V14, V18
Check 0.1 and 0.25 μ f caps. connected to Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V17
Check 0.1 and 0.25 μ f caps. connected to Vert. Osc. trans.
Vert. Defl. coils (yoke)
Vert. Out. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK**
V17
Check 0.0047 μ f cap. connected to pin 4 of V17
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V10
Check 1.8 Meg Ω res. connected to pin 1 of V10
- NO HOR. SYNC. - VERT. SYNC. OK**
Hor. Hold and Freq. con.
V10, V11, V12, V13
Check 330 μ f cap. connected to pin 4 of V12
- AUDIO HUM IN SOUND (8E)**
V1, V8, V9
- DISTORTED SOUND (8D)**
Tuner line tuning
Check tuner tubes
V1, V2, V3, V4, V5, V6, V7, V8, V9
Check 0.02 μ f cap. connected to pin 5 of V9
- NO SOUND - PIX OK (8B)**
Tuner line tuning
V1, V2, V3, V4, V5, V6, V7, V8, V9
Vol. con.
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L12, L13
Det. alignment L-16, L-17

FRONT



TOP VIEW



REAR CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB5	RF Amp.
V3	6J7	Osc.
V4	6AU6	1st Vid. IF Amp.
V5	6AU6	2nd Vid. IF Amp.
V6	6AU6	3rd Vid. IF Amp.
V7	6AC7	Vid. Det. AGC Rect.
V8	6AC7	Vid. Amp.
V9	12AU7	1st & 2nd Sync. Clipper
V10	6AL5	Hor. Phase Det.
V11	6SN7GT	Hor. Osc. - Discharge
V12	6AU5	Hor. Out.
V13	6X4	Rectifier
V14	1V2	HV Rect.
V15	1V2	HV Rect.
V17	5U4G	Rect.
V18	6K6GT	Audio Out.
V19	6T8	Audio Amp. - Rat. Det.
V20	6AU6	Ratio Det. Driver
V21	14CP4	Picture Tube
V22	6SN7GT	Phase Inv. - Vert. Osc.
V23	6S4	Vert. Osc.

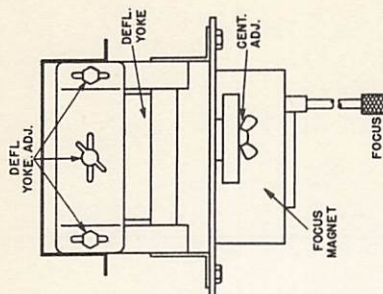
KEY VOLTAGES

B+, plate of damper, V13 pin 5	285 vdc
Boosted B+, cath. of damper, pin 3	400 vdc
Plate of Vert. Osc., V23 pin 3	105 vdc
Plate of Vert. Out., V23 pin 9	390 vdc
Plate of Hor. Osc., V11 pin 2	225 vdc
Plate of Hor. Out., V12 pin 5	148 vdc
Ratio Det. Driver, V21 pin 1	-21.5 vdc

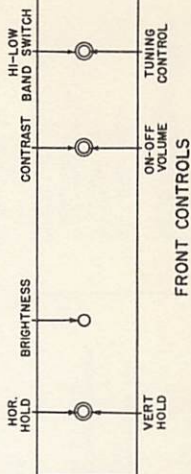
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-1.

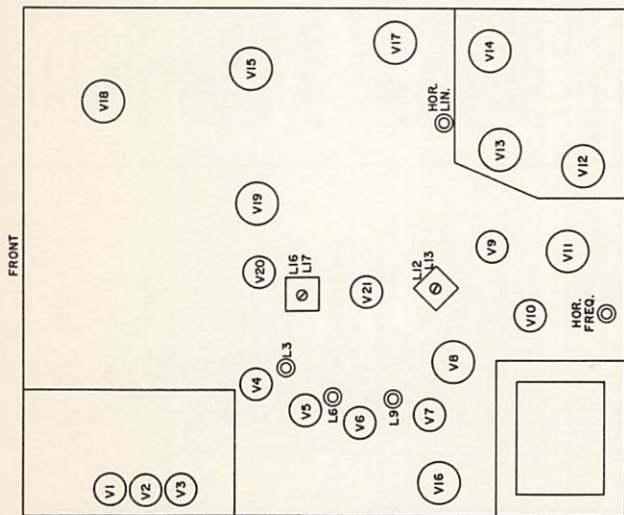


PICTURE TUBE ADJUSTMENTS



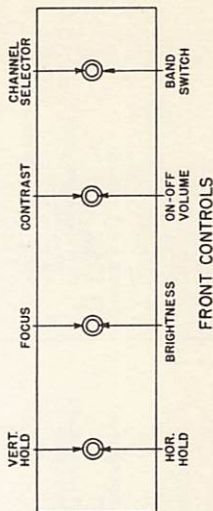
FRONT CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V1
- NO RASTER - SOUND OK (31)**
Br-khness con.
Check HV Fuse F-1 (0.25 Amps.)
Ion trap
V11, V12, V13, V14, V15, V21
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast con.
V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13
Check 0.03 and 0.1 μ f caps. connected to
Hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V22, V23
Check 0.05 and 0.1 μ f caps. connected
to red Lead of Vert. Osc. trans.
Check 100 μ f Elec. cap. connected
to V23
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.01 μ f cap. connected to pins 5 and
7 of V10
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V9, V22, V23
- SMEARED PIX (36)**
Tuner line tuning
Contrast con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner line tuning
Focus Adj.
V4, V5, V6, V7
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
Check tuner tubes
V4, V5, V6, V7
Check adjustment of L-12 and L-13
IF and RF alignment
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V12, V13
Check tuner tubes
V18, V19, V20
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NOISY SOUND - PIX OK**
V12, V13, V20
Check sound system for loose
connections
Speaker
Sound IF and Det. alignment L-12, L-13,
L-16, L-17
- SYNC. BUZZ IN SOUND**
Contrast con.
Tuner line tuning
V7, V9, V19, V20
Sound IF and Det. alignment L-12, L-13,
L-16, L-17
- INTERMITTENT SOUND - PIX OK**
V18, V19, V20
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width con.
V12, V13
Check 0.01 μ f and 470 μ f caps.
connected to pin 1 of V12
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
V12, V13, V20
Check 0.05 and 0.1 μ f caps. connected
to red Lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V22, V23
Check 0.05 and 0.1 μ f caps.
connected to red Lead of Vert. Osc.
trans.
Vert. Defl. coils (yoke)
V, O, P, and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Int. network
V9, V22, V23
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V22
Check 0.01 μ f cap. connected to pin 1
of V22
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Freq. con.
V12, V13, V22
Check 330 μ f cap. connected to pin 1
of V11
- AUDIO HUM IN SOUND (8E)**
V18, V19, V20
- DISTORTED SOUND (8D)**
Tuner line tuning
Check tuner tubes
V18, V19, V20
Check
V18
Sound and Vid. IF alignment L12, L13
Det. alignment L-16, L-17
- NO SOUND - PIX OK (8B)**
Tuner line tuning
V18, V19, V20
Speaker (open voice coil or defective
connection)
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- SNOW IN PIX (32)**
Check tuner tubes
V4, V5, V6, V7
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
Check tuner tubes
V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
Contrast con.
Check tuner tubes
V4, V5, V6, V7, V8, V21
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V12, V13
Check 56 μ f cap. connected to yoke
terminal 3
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V9, V12, V23
Check 0.005 and 0.05 μ f caps. connected
to pin 1 of V11
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)**
Tuner line tuning
V4, V5, V6, V7, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V11, V12, V13, V14, V15
Check 470M Ω res. connected between
V16 and V15
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V15, V17, V21
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
Hor. and Vert. Size con.
V12, V13, V14, V15
Check 0.45 μ f cap. connected to
Pin 8 of V12
- RASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V15, V17, V21
Check 470M Ω res. connected between
V16 and V15
Check HV Filter caps.

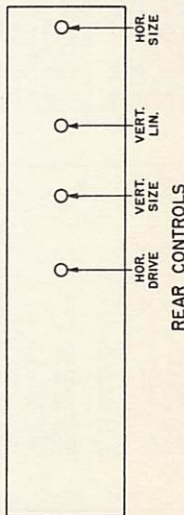


PICTURE TUBE ADJUSTMENTS

TOP VIEW



FRONT CONTROLS



REAR CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6BC5	1st RF Amp.
V2	6AG5 or 6BC5	2nd RF Amp.
V3	6J6	Osc. Mixer
V4	6AU6	1st IF Amp.
V5	6AU6	2nd IF Amp.
V6	6AU6	3rd IF Amp.
V7	6AL5	AGC-Vid. Det.
V8	6AG7	Vid. Out.
V9	12AL7	Sync. Sep.-Clipper
V10	6AL5	Hor. Phase Det.
V11	6XWT	Hor. Osc. & Discharge
V12	6XGT	Vert. Osc.
V13	6WAGT	Damper
V14	1B3GT	High Volt. Rect.
V15	854	Vert. Out.
V16	5U4G	Low Volt. Rect.
V17	5U4G	Low Volt. Rect.
V18	6X4	Vert. Osc. (in some chassis)
V19	857	Vert. Sync. In.
V20	6K8GT	Audio Out.
V21	6AU6	Rat. Det.-Audio Amp.
V22	16RP4 16RP4 16RP4 16KP4 17GP4	Ratio Det. Driver Picture Tube

KEY VOLTAGES

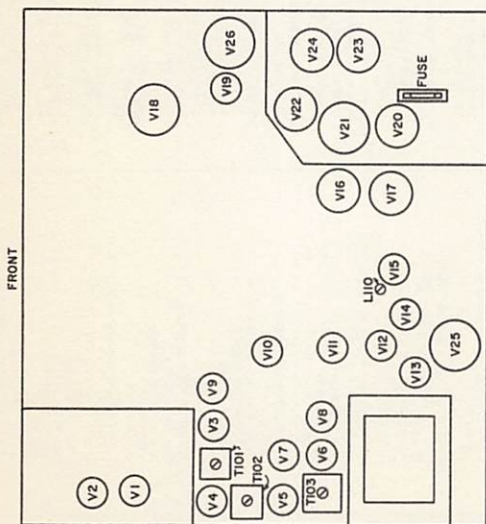
B+	plate of damper, V13 pin 5	350 vdc
Boosted B+	cath. of damper, V13 pin 3	510 vdc
Plate of Vert. Osc.	V18 pin 5	88 vdc
Plate of Vert. Out.	V15 pin 9	380 vdc
Plate(s) of Hor. Osc.	V11 pin 2	305 vdc
Grid of Hor. Out.	V12 pin 5	70 vdc
	pin 3	-21 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

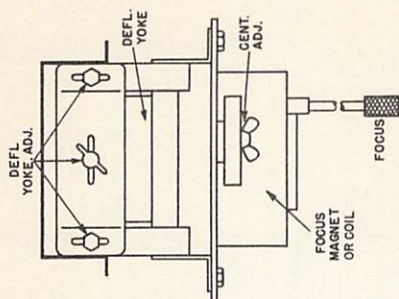
For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1.

- NO RASTER - NO SOUND (81)**
No picture
V16, V17
- NO RASTER - SOUND OK (81)**
Brightness con.
Check HV Fuse (0.25 Amps.)
C.R.T.
V11, V12, V13, V14
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (84)**
Tuner fine tuning
V3, V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13
Check 0.033, 0.05 and 0.25 μ f caps.
Hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V18
Check 0.05 and 0.1 μ f caps. connected to pin 2 of V15
Check 100 μ f Elec. cap. connected to pin 2 of V15
Vert. Out. trans.
- PIX JITTER SIDWAYS**
V10, V11, V12
Check 0.01 μ f cap. connected to pin 5 of V10
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V15, V18
- SMEARED PIX (36)**
Tuner fine tuning
V4, V5, V5, V7, V8
Check 10 μ f Elec. cap. connected to pin 6 of V8
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
V4, V5, V6, V7
Check Vid. Det. and Amp. peaking coils
V12, V13
Check 0.05 μ f cap. connected to pin 8 of V12
- RASTER BLOOMING (37)**
Amp. Drive con.
V12, V13, V16, V17
C.R.T.
Check HV Filter cap.
HV Filter cap.
- SOUND BARS IN PIX (4A, 4B)**
Amp. Drive con.
V12, V13, V16, V17
Check adjustment of L-12 and L-13
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V6, V7
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V6, V7, V8
C.R.T.
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V3, V4, V5, V6, V7, V8
C.R.T.
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Amp. Drive con.
V12, V13
Check 56 μ f cap. connected to yoke terminals 2 and 3
Defl. yoke ring
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.05 μ f cap. connected to pin 1 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
V1, V2, V3, V4, V5, V6, V7, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V10, V11, V12
Hor. Out. trans.
C.R.T.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V1, V2, V3, V4, V5, V6, V7
Low line voltage
C.R.T.
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
V10, V11, V12
V12, V13
C.R.T.
Check 0.05 μ f cap. connected to pin 8 of V12
- NO RASTER - NO SOUND (81)**
No picture and size con.
V12, V13
Check 270 and 330 μ f caps. connected to pin 5 of V16
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V18
Check 0.05 and 0.1 μ f caps. connected to red Lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOE, SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Int. network
V9, V15, V18
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V18
Check 0.01 μ f cap. connected to pin 1 of V18
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Amp. Drive con. and Freq. con.
V10, V11, V12
Check 330 μ f cap. connected to pin 4 of V11
- AUDIO HUM IN SOUND (8F)**
V19, V20, V21
- DETORTED SOUND (8D)**
Tuner fine tuning
V3, V8, V19, V20, V21
Contrast con.
- Check 0.02 μ f cap. connected to pin 5 of V19
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
Vol. con.
V19, V20, V21
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V19, V20, V21
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NOISY SOUND - PIX OK**
Vol. con.
V19, V20, V21
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-12, L-13, L-16 and L-17
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V7, V8, V20, V21
Sound IF and Det. alignment L-12, L-13, L-16 and L-17
- INTERMITTENT SOUND - PIX OK**
V19, V20, V21
Poor connections in sound system

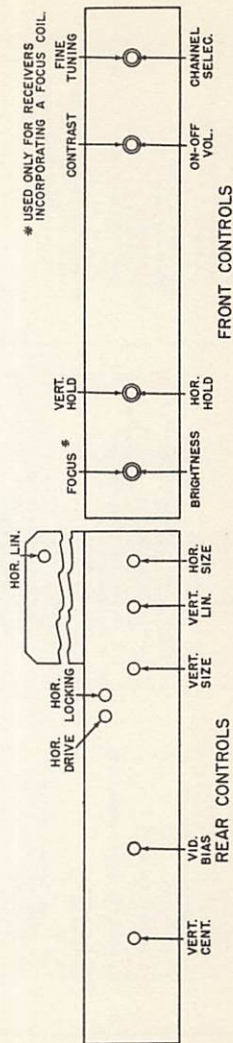


TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6J6	Mixer-Osc.
V3	6AU6	1st Sound IF Amp.
V4	6AU6	2nd Sound IF Amp.
V5	6AU6	3rd Sound IF Amp.
V6	6AV6	Sound Mixer.
V7	6AV6	1st Audio Amp. -AGC Clamp.
V8	6AR5	Audio Out.
V9	6AG5	1st Vid. IF Amp.
V10	6AG5	2nd Vid. IF Amp.
V11	6AG5	3rd Vid. IF Amp.
V12	6AG5	4th Vid. IF Amp.
V13	6AR5	Vid. Amplifier
V14	6AU6	1st Vid. Amp.
V15	6AR5	2nd Vid. Amp.
V16	6SN7	AGC Rect. -1st Sync. Sep.
V17	6SN7	2nd Sync. Sep. -Sync. Amp.
V18	6SN7	AGC Amp. -Vert. Osc.
V19	6SN7	Vert. Osc. -Hor. Con.
V20	6SN7	Hor. Con.
V21	6CD6G	Hor. Out.
V22	6W4GT	Damper
V23	1B3	HV Rect.
V24	1B3	HV Rect.
V25	5U4	Rect.
V26	17BP4	Picture Tube



PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31)
Power input circuit
V25, V26

NO RASTER - SOUND (31)
Brightness con.
Check HV Fuse (0.25 Amps.)
V20, V21, V22, V23, V24
V20, V21, V22, V23, V24
HV trans. Hor. yoke CRT connections
Check four 500kΩ res. connected between
V23, V24

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast con.
V9, V10, V11, V12, V16, V17

POOR HOR. LIN.
Hor. Lin. Drive con.
V18, V19
Check 0.047 and 0.1 μf caps. connected to
hor. Lin. coil
Hor. Out. trans.

POOR VERT. LIN. (11, 12)
Hor. Lin. and Lin. con.
V18, V19
Check 0.047 and 0.1 μf caps. connected
to red Lead of Vert. Osc. trans.
Check 90 μf Elec. cap. connected to pin 2
of V19
Vert. Out. trans.

PIX JITTER SIDWAYS
Hor. Hold, Freq., Phasing and Lock Range con.
V17, V20, V21
Check 0.0022 μf cap. connected to pin 1 of V20

PIX JITTER UP & DOWN (16, 17)
V16, V18, V19
Contrast con.

SMEARED PIX (36)
Tuner fine tuning
Contrast con.
Check V14 Det. and Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL (35)
Tuner fine tuning
V9, V10, V11, V12, V13
Check V14 Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
V8, V10, V11, V12, V13
Check adjustment of L-110
IF and RF alignment

SNOW IN PIX (32)
Check tuner tubes
V9, V10, V11, V12, V13, V16, V18
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
Check tuner tubes
V9, V10, V11, V12, V13, V14
V15, V16, V18

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
Check tuner tubes
V9, V10, V11, V12, V13, V14, V15, V16, V18
C. R. T.
Check Vid. Det. and Amp. peaking coils

VERT. BARS (21)
Hor. Drive con.
V18, V19
Check 56 μf cap. connected to yoke
terminal 2
Defl. yoke Ringing

PIX BENDING (22)
Hor. Hold, Freq., Phasing, and
Lock Range con.
V16, V18, V20, V21

**WEAK OR NO PIX - SOUND WEAK
RASTER OK (32C, 34C)**
Tuner fine tuning
V9, V16, V18
RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Brightness con.
V20, V21, V22, V23, V24
Hor. Out. trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive con.
V21, V22, V23, V24, V25, V26
Check tuner fine voltage
C. R. T.

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive con.
V21, V22, V23, V24
Check V23, V24 cap. and 30kΩ res.
connected to pin 6 of V21

RASTER BLOOMING (37)
Hor. Drive con.
V21, V22, V23, V24, V25, V26
C. R. T.
Check HV Filter caps.
Check four 500kΩ res. connected
between V23 and V24

INSUFFICIENT RASTER WIDTH (25)
Hor. Drive and Size con.
V21, V22, V25, V26
Check 680 μf and 0.0017 μf caps.
connected to Hor. Osc. trans.
Hor. Out. trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Size and Lin. con.
V18, V19, V25, V26
Check 0.047 and 0.1 μf caps. connected
to red Lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage

NO VERT. DEFL. (14)
V18, V19
Check 0.047 and 0.1 μf caps.
connected to red Lead of Vert. Osc. trans.
Vert. Defl. coil (Yoke)
V.O.T. and Vert. Osc. trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
Vert. Hold con.
V16, V17, V18, V19
Check 0.047 μf cap. connected to yellow
terminal 2
Lead of Vert. Osc. trans.

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V16, V17, V18
Check 0.047 μf cap. connected to pin 1
of V17

NO HOR. SYNC. - PHASING AND LOCK RANGE con.
Hor. Hold, Freq., Phasing and Lock Range con.
V17, V20, V21
Check 180 μf cap. connected to pin 4 of V20

AUDIO HUM IN SOUND (8E)
V3, V4, V5, V6, V7, V8

DISTORTED SOUND (8D)
Check tuner tubes
V3, V4, V5, V6, V7, V8
Check 0.01 μf cap. connected to pin 1
of V8
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103

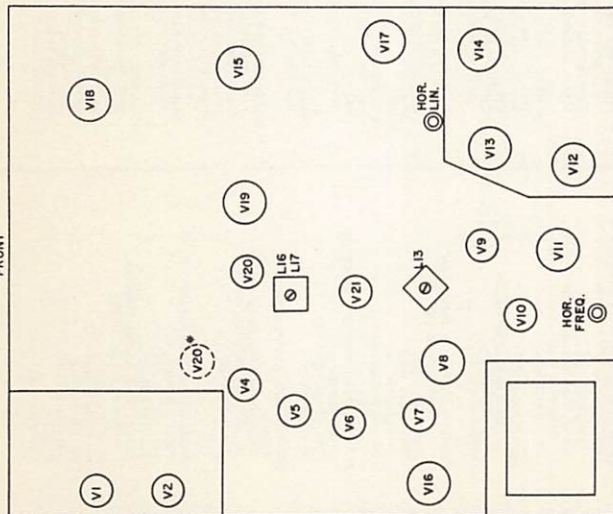
NO SOUND - PIX OK (8B)
Tuner fine tuning
Voi. con.
V3, V4, V5, V6, V7, V8
Speaker (open voice coil or defective
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
Voi. con.
Check tuner tubes
V3, V4, V5, V6, V7, V8, V18
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103

NOISY SOUND - PIX OK
Voi. con.
V3, V4, V5, V6, V7, V8
Check sound system for loose
connections
Speaker
Sound IF and Det. alignment T-101, T-102, T-103

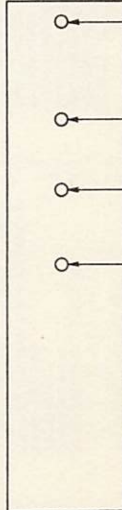
INTERMITTENT SOUND - PIX OK
V3, V4, V5, V6, V7, V8
Poor connections in sound system

FRONT



* USED IN SOME MODELS

TOP VIEW



REAR CONTROLS

(IN CERTAIN MODELS, CHASSIS IS MOUNTED VERTICALLY)

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	6J8	Osc. - Mixer
V4	6AU6	1st Vid. IF Amp.
V5	6AU6	2nd Vid. IF Amp.
V6	6CB8	
V7	6AU6	3rd Vid. IF Amp.
V8	6AG7	Vid. Det. - AGC
V9	6AG7	Vid. Out.
V10	12AU7	Sync. Sep. - Clipper
V11	6AL5	Hor. Phase Det.
V12	6SN7GT	Hor. Osc. & Discharge
V13	6CD6G	Hor. Out.
V14	1B5GT	High Volt. Rect.
V15	6S4	Vert. Out.
V16	5U4G	Low Volt. Rect.
V17	5U4G	Low Volt. Rect.
V18	6SN7	Vert. Osc. - Sync. Inv.
V19	6XGT	Audio Out.
V20	6XGT	Audio Out. - Ratio Det.
V21	6AU6	Ratio Det. Driver
V22	17BP4 or 20CP4	Picture Tube

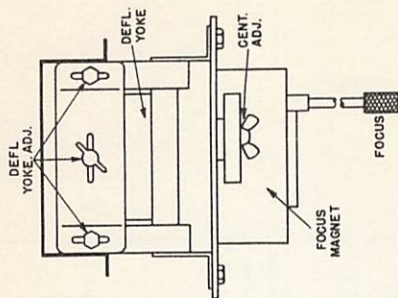
KEY VOLTAGES

B+	plate of damper, V13 pin 5	350 vdc
Boosted B+	cath. of damper, V13	410 vdc
Plate of Vert. Osc.	V18 pin 3	410 vdc
Plate of Vert. Osc.	V18 pin 5	380 vdc
Plate of Vert. Out.	V15 pin 9	380 vdc

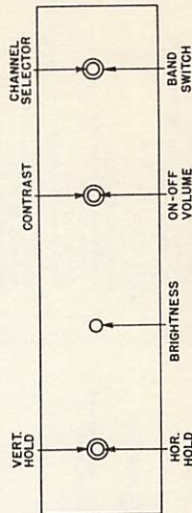
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-1.



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

(IN CERTAIN MODELS, CHASSIS IS MOUNTED VERTICALLY)

- NO RASTER - NO SOUND (31)**
Power input circuit
V16, V17
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse (0.25 Amps.)
Ion trap
V11, V12, V13, V14, V22
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Drive con.
V12, V13
Check 0.033, 0.05 and 0.25 μ f caps.
connected to Hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V18
Check 0.05 and 0.1 μ f caps. connected
to red Lead of Vert. Osc. trans.
Check 100 μ f Elec. cap. connected
to pin 2 of V15
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.01 μ f cap. connected to pins 5 and 7
at V10
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V9, V15, V18
- SMEARED PIX (9)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V4, V5, V6
Check Vid. Det.
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
Check HV Filter cap.
V4, V5, V6, V7
Check adjustment of L-12, L-13
IF and RF alignment
- SNOW IN PIX (32)**
Check tuner tubes
V4, V5, V6, V7
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
Check tuner tubes
V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Check contrast con.
Check chassis
V4, V5, V6, V7, V8, V22
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V13
Check 56 μ f cap. connected to yoke
terminals 1 and 2
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.005 and 0.05 μ f caps. connected
to pin 4 of V11
- WEAK OR NO PIX - SOUND WEAK -
RASTER OK (23C, 34C)**
Tuner fine tuning
Check tuner tubes
V9, V15, V17, V8
IF and RF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V11, V12, V13, V14, V22
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V16, V17, V22
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Tuner fine tuning
Hor. Drive con.
Hor. and Vert. Size con.
V12, V13, V14, V22
Check 0.05 μ f cap. and 17.5k Ω res.
connected to pin 8 of V12
- RASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V16, V17, V22
Check HV Filter cap.
Check 100k Ω res. connected to
HV Filter cap.
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V9, V19, V20, V21
Speaker (open voice coil or
defective connection)
Sound IF and Det. alignment
L-12, L-13
Det. alignment L-16, L-17
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V9, V19, V20, V21
Sound and Vid. IF alignment
L-12, L-13
Det. alignment L-16, L-17
- NOISY SOUND - PIX OK**
V9, V20, V21
Check sound system for loose
connections
Speaker
Sound IF and Det. alignment L-12,
L-13, L-16, L-17
- SYNC BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V7, V8, V19, V20, V21
Sound IF and Det. alignment L-12,
L-13, L-16, L-17
- INTERMITTENT SOUND - PIX OK**
V19, V20, V21
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V12, V13, V16, V17
Check 270 and 390 μ f caps. connected
to pin 5 of V11
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected
to red Lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V18
Check 0.05 and 0.1 μ f caps.
connected to red Lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V.O.T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V10, V11, V12
V9, V15, V18
network
Check 0.005 μ f cap. connected to Vert. Int.
network
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V18
Check 0.01 μ f cap. connected to pin 1
of V18
Check 0.02 μ f cap. connected to pin 1
of V9
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 330 μ f cap. connected to pin 4
of V11
- AUDIO HUM IN SOUND (8E)**
V19, V20, V21
- DEFORTED SOUND (8D)**
Tuner fine tuning
Contrast con.
V9, V19, V20, V21
Check 0.02 μ f cap. connected to
pin 5 of V19
Sound and Vid. IF alignment L-12,
L-13
Det. alignment L-16, L-17

TUBE LIST

Symbol	Type	Circuit Function
V1	6BQ7 or 6BK7	RF Amp.
V2	6CQ6	1st IF Amp.
V4	6CB8	2nd IF Amp.
V5	6CB8	3rd IF Amp.
V7A	6AL5	Vid. Det.
V7B	6AL5	AGC
V8	12BY6 or 12AY7	Vid. Out.
V9A	12AU7	Sync. Sep.
V9B	12AU7	Sync. Clipper
V10	6AL5	Hor. Phase Det.
V11	6SN7GT	Hor. Osc. & Discharge
V12	6CD6G	Hor. Out.
V13	6AV6	Hor. Def.
V14	1B3GT	High Volt. Rect.
V15	6S4	Vert. Out.
V16	5U4G	Low Volt. Rect.
V17	5U4G	Low Volt. Rect.
V18A	6SN7	Sync. Inv.
V18B	6SN7	Sync. Inv.
V19	6SN7GT	Audio Amp.
V20A	6T8	Radio Det.
V20B	6T8	Radio Det.
V21	6AU6	Ratio Det. Driver
V22	17BP4 or 17RP4	Picture Tube

KEY VOLTAGES

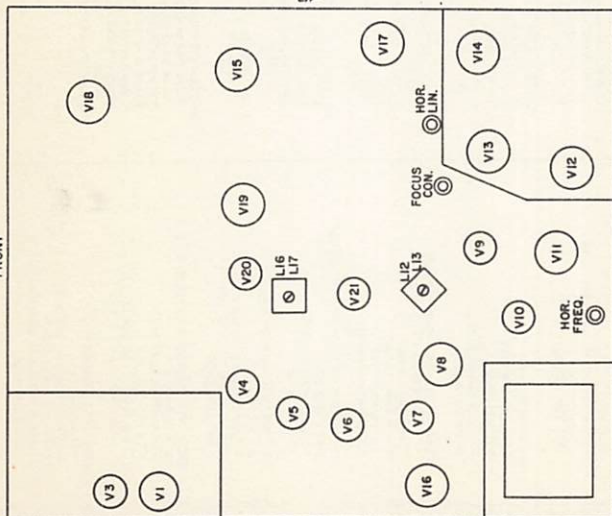
B+, plate of damper, V13 pin 5	340 vdc
Boosted B+, cath. of damper, V13 pin 3	520 vdc
Plate of Vert. Osc., V18 pin 9	415 vdc
Plate of Hor. Osc., V11 pin 2	335 vdc
Grid of Hor.-Out., V12 pin 5	170 vdc
Grid of Hor.-Out., V12 pin 5	-19 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

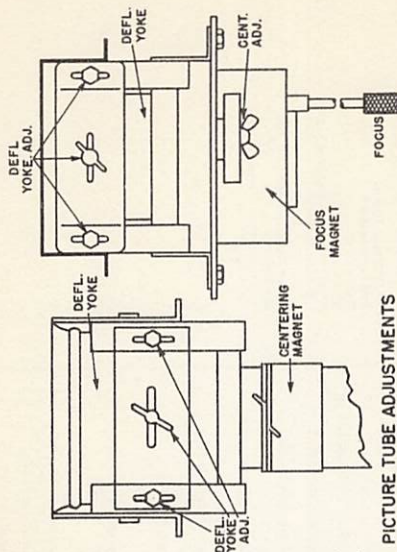
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ-1.
For tuner oscillator adjustment, see TUNER OSC. ADJ-2.

FRONT

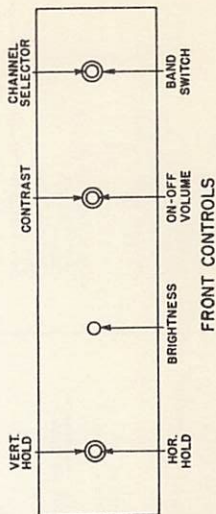


TOP VIEW

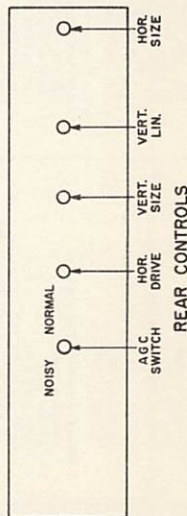


PICTURE TUBE ADJUSTMENTS

(ALTERNATE)
(USED ONLY FOR ELECTROSTATIC PICTURE TUBE ADJUSTMENTS
FOCUSED PICTURE TUBES)



FRONT CONTROLS



REAR CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V16, V17
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Tune F-1 (0.25 Amps.)
V1, V2, V3, V4, V5, V6, V7, V8
V11, V12, V13, V14, V22
HV trans. Hor. yoke CRT connections
- WFAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Check 0.025 μ f cap. connected to red lead of V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13
Check 0.025 μ f cap. connected to yoke terminal 1
Defl. yoke ringing
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V18
Check 0.005 and 0.05 μ f caps. connected to red lead of V4, V5, V6, V7, V8
Check 100 μ f Elec. cap. connected to pin 2 of V15
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V4, V5, V6, V7, V8
Check 0.01 μ f cap. connected to pins 5 and 7 of V10
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V9, V15, V16
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V4, V5, V6, V7
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
Check tuner tubes
V4, V5, V6
Check adjustment of L-12, L-13
IF and RF alignment
- SNOW IN PIX (32)**
Check tuner tubes
V4, V5, V6, V7
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
Check HV Transformer
V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
Check tuner tubes
V4, V5, V6, V7, V8, V22
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V13
Check 0.025 μ f cap. connected to yoke terminal 1
Defl. yoke ringing
- PIX BENDING (23)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.005 and 0.05 μ f caps. connected to pin 1 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V4, V5, V6, V7, V8
Check 0.01 μ f cap. connected to pins 5 and 7 of V10
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V1, V12, V13, V14, V22
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V16, V17, V22
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
Hor. and Vert. Size con.
V12, V13, V14, V22
Check 0.05 μ f cap. and 17.5k Ω res. connected to pin 8 of V12
- RASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V16, V17, V22
Check HV Filter cap.
Check 100k Ω res. connected to HV Filter cap.
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V4, V5, V6, V7
Check tuner tubes
V19, V20, V21
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
Low line voltage
- NOISY SOUND - PIX OK**
V4, V5, V6, V7
V19, V20, V21
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-12, L-13, L-16, L-17
- SYNC BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V7, V8, V20, V21
Sound IF and Det. alignment L-12, L-13, L-16, L-17
- INTERMITTENT SOUND - PIX OK**
V19, V20, V21
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. and Vert. Size con.
V12, V13, V14, V22
Check 270 and 350 μ f cap. connected to pin 5 of V11
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.025 μ f caps. connected to red lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V18
Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
V9, V15, V18
Check 0.005 μ f cap. connected to vert. int. network
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
Check 0.01 μ f cap. connected to pin 1 of V18
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.10 μ f cap. connected to pin 4 of V11
- AUDIO HUM IN SOUND (8E)**
V19, V20, V21
- DEFORTED SOUND (8D)**
Tuner fine tuning
Check tuner tubes
V19, V20, V21
Check 0.02 μ f cap. connected to pin 5 of V18
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V19, V20, V21
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17

TUBE LIST
 Symbol Type Circuit Function

V1	6BQ7 or 6BK7	RF Amp.
V3	6J6	Osc. Mixer
V4	6CB6	1st IF Amp.
V5	6CB6	2nd IF Amp.
V6	6AL5	Vid. Det.
V7A	6AL5	AGC
V7B	6AG7 or 12BY7	Vid. Out.
V8	12AU7	Sync. Sep.
V9	6AV6	Sync. Separator
V10	6AL5	Hor. Phase Det.
V11	6SN7GT	Hor. Osc. & Discharge
V12	6CD8G	Hor. Out.
V13	6W4GT	Damper
V14	1B3GT	High Volt. Rect.
V15	6X4	Low Volt. Rect.
V16	504G	Low Volt. Rect.
V17	504G	Low Volt. Rect.
V18A	6SN7	Vert. Osc.
V18B	6SN7	Sync. Inv.
V19	6K6GT	Audio Out.
V20A	6T8	Audio Amp.
V20B	6T8	Audio Amp.
V21	6AU6	Ratio Det. Driver
V22	17RP4 or 17RP4	Picture Tube

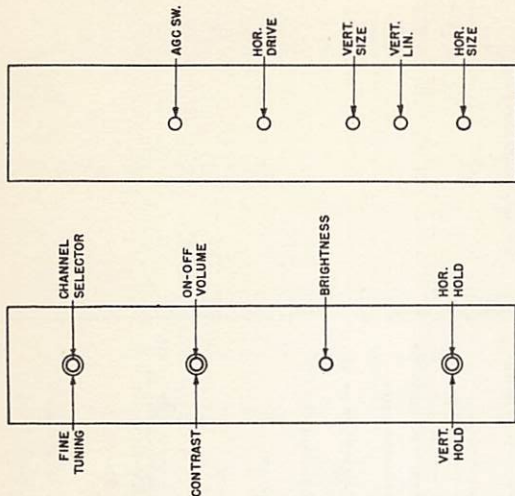
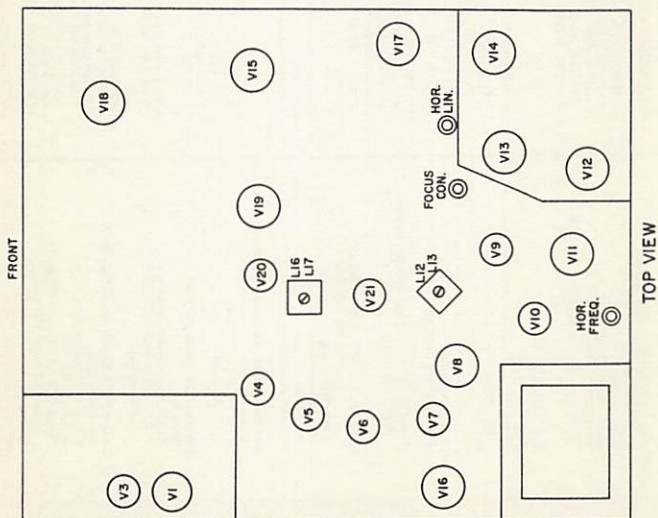
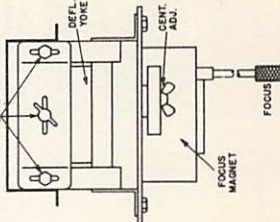
KEY VOLTAGES

B+	plate of damper, V13 pin 5	340 vdc
Booster B+	cath. of damper, V13 pin 3	520 vdc
Plate of Vert. Osc.	V18 pin 9	-48 vdc
Plate of Vert. Out.	V15 pin 9	415 vdc
Plate of Hor. Osc.	V11 pin 2	335 vdc
Grid of Hor. Out.	V12 pin 5	170 vdc
Grid of Hor. Out.	V12 pin 5	-19 vdc

(All voltages are measured with a VTVM connected between the tube pins and chassis.)

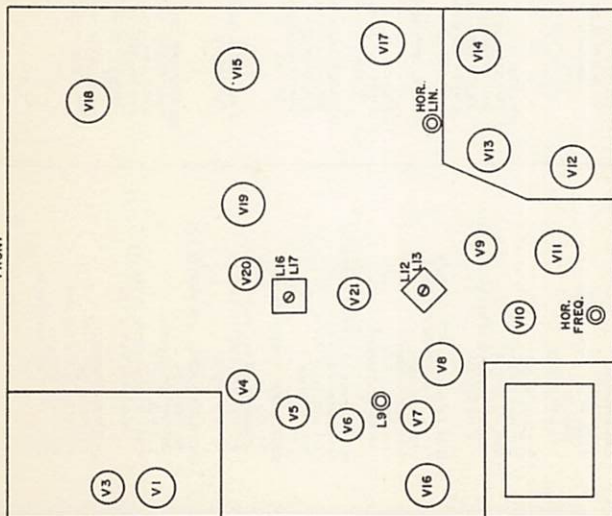
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1.
 For vertical oscillator adjustment, see TUNER OSC. ADJ.-2.

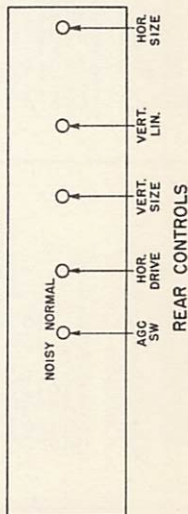

REAR CONTROLS
FRONT CONTROLS

TOP VIEW

PICTURE TUBE ADJUSTMENTS

- NO RASTER - NO SOUND (31)**
Power input circuit
V15, V17
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse F-1 (0.25 Amps.)
Ion trap
V11, V12, V13, V14, V22
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V15, V19
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V18
Check 0.05 and 0.1 μ f caps. connected to F-100 and Vert. Osc. trans.
Check 0.005 μ f cap. connected to pin 2 of V13
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V15, V17, V18
Check 0.01 μ f cap. connected to pin 5 and T of V10
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
V5, V15, V18
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V4, V5, V6, V7
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
Check tuner tubes
V4, V5, V6
Check adjustment of L-12, L-13
IF and RF alignment
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V19, V20, V21
Speaker (open)
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
Voi. con.
Check tuner tubes
V19, V20, V21
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NOISY SOUND - PIX OK**
Voi. con.
V19, V20, V21
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-12, L-13, L-16, L-17
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
Contrast con.
V9, V10, V20, V21
Sound IF and Det. alignment L-12, L-13, L-16, L-17
- INTERMITTENT SOUND - PIX OK**
V19, V20, V21
Poor connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V15, V16, V17, V18
Check 370 and 370 μ f caps. connected to pin 5 of V11
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps.
connected to red lead of Vert. Osc. trans.
Vert. Defl. coils (yoke)
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold
Vert. Int. network
V9, V15, V18
Check 0.005 μ f cap. connected to Vert. Int. network
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V18
Check 0.01 μ f cap. connected to pin 1 of V18
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
V10, V11, V12
Check 330 μ f cap. connected to pin 4 of V11
- AUDIO HUM IN SOUND (8E)**
V19, V20, V21
- DISTORTED SOUND (8D)**
Tuner fine tuning
Check tuner tubes
V19, V20, V21
Check 0.02 μ f cap. connected to pin 5 of V19
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- SNOW IN PIX (32)**
Check tuner tubes
V15, V16, V17, V18
Antenna and transmission line
- AC IN PIX (DARK BAR) (38)**
Check tuner tubes
V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
Check tuner tubes
V4, V5, V6, V7, V8, V22
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V13, V14, V22
Check 58 μ f cap. connected to yoke terminal 1.
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V15, V18
Check 0.005 and 0.05 μ f caps. connected to pin 1 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V11, V12, V13, V14, V22
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V16, V17, V22
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive con.
Hor. and Vert. Size con.
V12, V13, V14, V22
Check 0.05 μ f cap. and 17.5k Ω res. connected to pin 8 of V12
- RASTER BLOOMING (37)**
Hor. Drive con.
V12, V13, V14, V16, V17, V22
Check HV Filter cap.
Check 100k Ω res. connected to HV Filter cap.

FRONT



TOP VIEW



TUBE LIST

Symbol	Type	Circuit Function
V1	6BQ7 or 6XK7	RF Amp.
V2	6X4	Rectifier
V3	6CB6	1st Vid. IF Amp.
V4	6CB6	2nd Vid. IF Amp.
V5	6CB6	3rd Vid. IF Amp.
V6	6AL5	Vid. Det. -AGC
V7	6AG7 or 6AV6	Vid. Out.
V8	6AV6	Vid. Out.
V9	12A17	Sync. Sep. -Sync. Clipper
V10	6AL5	Hor. Phase Det.
V11	6SN7GT	Hor. Osc. & Discharge
V12	6CD6G	Hor. Out.
V13	6W4GT	Damper
V14	6SN7GT	High Volt. Rect.
V15	6SN7GT	High Volt. Rect.
V16	5U4G	Low Volt. Rect.
V17	5U4G	Low Volt. Rect.
V18	6SN7	Vert. Osc. -Sync. Inv.
V19	6K6GT	Audio Out.
V20	6X4	Rectifier
V21	6AL6	Radio Amp. -Lat. Det.
V22	20CP4 or Picture Tube	Radio Amp. -Lat. Det.
V23	24AP4	Radio Amp. -Lat. Det.

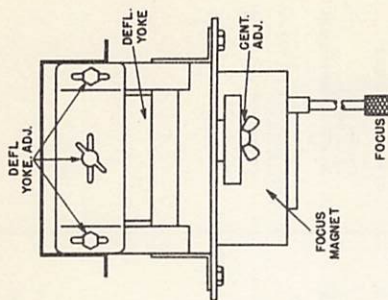
KEY VOLTAGES

B+, plate of damper, V13 pin 5	340 vdc
Boosted B+, cath. of damper, V13 pin 3	540 vdc
Plate of Vert. Osc., V18 pin 5	155 vdc
Plate of Vert. Out., V15 pin 9	450 vdc
Plate(s) of Hor. Osc., V11 pin 2	360 vdc
Grid of Hor. Out., V12 pin 5	182 vdc
Grid of Hor. Out., V12 pin 5	-16 vdc

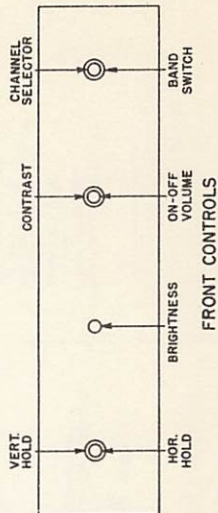
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1.
For vertical oscillator adjustment, see TUNER OSC. ADJ.-2.

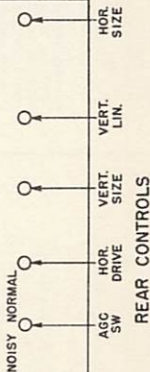


PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

(IN CERTAIN MODELS, CHASSIS IS MOUNTED VERTICALLY)

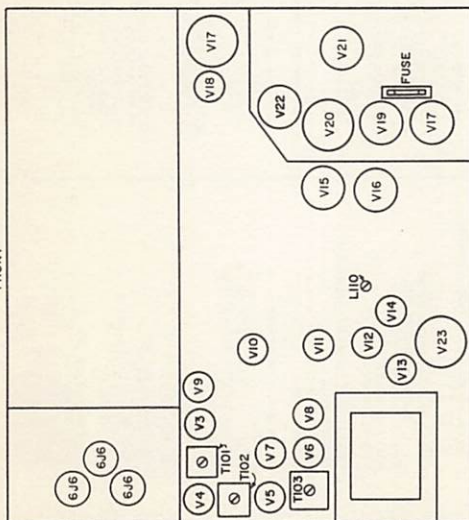


REAR CONTROLS

(IN CERTAIN MODELS, CHASSIS IS MOUNTED VERTICALLY)

- NO RASTER - NO SOUND (31)**
V16, V17
Power input circuit
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse F-1 (0.25 Amps.)
V1, V2, V3, V4, V5, V6, V7, V8
V11, V12, V13, V14, V22
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V16, V17
AGC Switch
V1, V3, V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13, V14, V15, V16, V17, V18
V19, V20, V21
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
Hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
Check 100 μ f Elec. cap. connected to pin 2 of V15
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.01 μ f cap. connected to pins 5 and 7 of V10
- PIX JITTER UP & DOWN (16, 17)**
Brightness and Contrast con.
AGC Switch
V9, V15, V18
- SMEARED PIX (36)**
Tuner fine tuning
V16, V17
V19, V20, V21
Contrast con.
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Focus con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
V1, V3, V4, V5, V6, V7
Check adjustment of L-12
IF and RF alignment
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V19, V20, V21
Speaker
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V16, V17
V19, V20, V21
AGC Switch
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- NOISY SOUND - PIX OK**
V19, V20, V21
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-12, L-13 and L-16, L-17
- SYNC BUZZ IN SOUND**
Tuner fine tuning
V7, V20, V21
Contrast con.
Sound IF and Det. alignment L-12, L-13 and L-16, L-17
- INTERMITTENT SOUND - PIX OK**
V19, V20, V21
Peer connections in sound system
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V1, V2, V3, V4, V5, V6, V7
Check 270 μ f caps. connected to pin 5 of V11
Hor. Out. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
Vert. Out. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V15, V18
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Int. network
V9, V15, V18
Check 0.005 μ f cap. connected to Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V18
Check 0.02 μ f cap. connected to pin 7 of V9
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 330 μ f cap. connected to pin 4 of V11
- AUDIO HUM IN SOUND (8E)**
V19, V20, V21
- DEFORMED SOUND (8D)**
Tuner fine tuning
V3, V19, V20, V21
Check 0.02 μ f cap. connected to pin 5 of V19
Sound and Vid. IF alignment L-12, L-13
Det. alignment L-16, L-17
- SNOW IN PIX (32)**
AGC Switch
V1, V3, V4, V5, V6, V7
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V5, V4, V5, V6, V7, V8
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V3, V4, V5, V6, V7, V8, V22
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V12, V13
Check 43 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.005 and 0.05 μ f caps. connected to pin 1 of V11
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V1, V3, V4, V5, V6, V7
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness and Freq. con.
V11, V12, V13, V14, V22
Hor. Out. trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V15, V16, V17, V22
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Freq. con.
Hor. and Vert. Size con.
V12, V13, V14, V22
Check 39k Ω res. connected to pin 8 of V12
- RASTER BLOOMING (37)**
Hor. Drive and Freq. con.
V11, V12, V13, V14, V16, V17, V22
Check HV Filter cap.
Check 100k Ω res. connected to HV Filter cap.
- NO RASTER - NO SOUND (31)**
V16, V17
Power input circuit
- NO RASTER - SOUND OK (31)**
Brightness con.
Check HV Fuse F-1 (0.25 Amps.)
V1, V2, V3, V4, V5, V6, V7, V8
V11, V12, V13, V14, V22
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V16, V17
AGC Switch
V1, V3, V4, V5, V6, V7, V8
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13, V14, V15, V16, V17, V18
V19, V20, V21
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
Hor. Lin. coil
Hor. Out. trans.
- POOR VERT. LIN. (11, 12)**
Vert. Size and Lin. con.
V15, V16, V17, V18
Check 0.05 and 0.1 μ f caps. connected to Vert. Osc. trans.
Check 100 μ f Elec. cap. connected to pin 2 of V15
Vert. Out. trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Freq. con.
V10, V11, V12
Check 0.01 μ f cap. connected to pins 5 and 7 of V10
- PIX JITTER UP & DOWN (16, 17)**
Brightness and Contrast con.
AGC Switch
V9, V15, V18
- SMEARED PIX (36)**
Tuner fine tuning
V16, V17
V19, V20, V21
Contrast con.
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Focus con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
V1, V3, V4, V5, V6, V7
Check adjustment of L-12
IF and RF alignment

FRONT



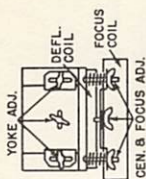
TOP VIEW

TUBE LIST

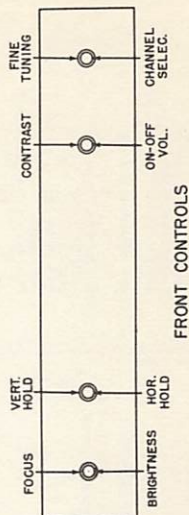
Symbol	Type	Circuit Function
Tuner	6J6	RF Amp.
	6J7	Conv.
	6J8	Osc.
V3	6AU6	1st Sound IF Amp.
V4	6AU6	2nd Sound IF Amp.
V5	6AU6	3rd Sound IF Amp.
V6	6AL5	Sound Discr.
V7	6AV6	1st Audio & Bias Clamp.
V8	6AR5	Audio Out.
V9	6AG5	1st Picture IF Amp.
V10	6AG5	2nd Picture IF Amp.
V11	6AG5	3rd Picture IF Amp.
V12	6AG5	4th Picture IF Amp.
V13	6AL5	Vid. Det.
V14	12AU7	Vid. Amp.
V15	6SN7GT	AGC Amp. - Limiter
V16	6SN7GT	AGC Rect. - 1st Sync. Sep.
V17	6SN7GT	Sync. Amp. - 1st Sync. Sep.
V18	6SN7GT	Sync. Amp. - 2nd Sync. Sep.
V19	6SN7GT	Hor. Osc. - Vert. Ad.
V20	6BQ6G	Hor. Osc. - Hor. Cor.
V21	1B3GT	HV Rect.
V22	5W4GT	Damper
V23	504G	Rect.
V24	12LP4A	Picture Tube

ADJUSTMENTS

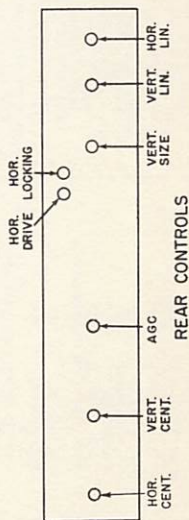
For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2.
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS



REAR CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V23
- NO RASTER - SOUND OK (31)**
Brightens control
Check HV Fuse (0.25 Amps.)
Ion trap
V9, V10, V11, V12, V24
V19, V20, V21, V22, V24
HV Trans. Hor. yoke CRT connections
WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast con.
Check tuner tubes
AGC con.
V9, V10, V11, V12, V13, V15
V15, V16, V17, V18
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V20, V22
Check 0.022 and 0.047 μ f caps. connected to Hor. Lin. Coil
Hor. Out. Trans.
- POOR VERT. LIN. (11, 12)**
V18
Vert. Size and Lin. con.
Check 0.047 and 0.22 μ f caps. connected to red lead of Vert. Osc. Trans.
Check 56 μ f cap. connected to yoke terminals 1 and 3
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Lock con.
Hor. Osc. Adj.
AGC con.
V15, V16, V17, V19
Check 0.022 μ f caps. connected to pin 3 of V16
- PIX JITTER SIDWAYS**
Hor. Hold and Lock con.
Hor. Osc. Adj.
Check 0.022 μ f cap. connected to pin 1 of V19
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold and Contrast con.
AGC con.
V15, V16, V17, V18
- SMEARED PIX (36)**
Tuner fine tuning
Contrast and AGC con.
V9, V10, V11, V12, V13, V14, V15
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V9, V10, V11, V12, V13
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- EXCESSIVE RASTER (PIX SIZE) (6, 10)**
Hor. Drive con.
Hor. and Vert. size con.
V20, V21, V22, V24
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V20, V21, V22, V23, V24
Low line voltage
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
AGC con.
Check tuner tubes
V9, V10, V11, V12, V13, V14, V15, V24
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V20, V22
Check 56 μ f cap. connected to yoke terminals 1 and 3
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Lock con.
Hor. Osc. Adj.
AGC con.
V15, V16, V17, V19
Check 0.022 μ f caps. connected to pin 3 of V16
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
AGC con.
Tuner fine tuning
Check tuner tubes
V9, V10, V11, V12, V13, V15
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V15, V20, V21, V22, V24
Hor. Out. Trans.
- NOISY SOUND - PPK OK (8B)**
Tuner fine tuning
V3, V4, V5, V6, V7, V8
Vol. con.
Speaker (open voice coil or defective)
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103
- WEAK SOUND - PPK OK (8C)**
Tuner fine tuning
Vol. and AGC con.
Check sound system for loose connections
V3, V4, V5, V6, V7, V8
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103
- NOISY SOUND - PPK OK**
Vol. con.
V3, V4, V5, V6, V7, V8
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-101, T-102, and T-103
- INTERMITTENT SOUND - PPK OK**
V3, V4, V5, V6, V7, V8
Poor connections in sound system
- RASTER BLOOMING (37)**
Hor. Drive con.
V20, V21, V22, V23, V24
Check HV Filter cap.
Check 1 Meg Ω Res. connected to HV Filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V20, V22, V23
Check 390 μ f and 0.0022 μ f caps. connected to Hor. Osc. Trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size and Lin. con.
V15, V23
Check 0.047 and 0.22 μ f caps. connected to red lead of Vert. Osc. Trans.
Vert. Out. Trans.
Low line voltage
- NO VERT. DEFL. (14)**
V18
Check 0.047 and 0.22 μ f caps. connected to red lead of Vert. Osc. Trans.
V.O.T. and Vert. Osc. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. int. network
AGC con.
V15, V17
Check 4700 μ f cap. connected to pin 1 of V18
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
VGC con. V17
V18
Check 0.047 μ f cap. connected to pin 1 of V17
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Lock con.
Hor. Osc. Adj.
V15, V16
Check 180 μ f cap. connected to pin 4 of V19
- AUDIO HUM IN SOUND (8E)**
V3, V4, V5, V6, V7, V8
- DISTORTED SOUND (8D)**
Tuner fine tuning
Check tuner tubes
V3, V4, V5, V6, V7, V8
Check 0.047 μ f cap. connected to pin 1 of V8
Sound and Vid. IF alignment T-101, T-102
Det. alignment T-103

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