

TV field service MANUAL

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- ADMIRAL
- AFFILIATED RETAILERS (ARTONE)
- AIMCEE (AMC)
- AIR KING
- AIR MARSHAL
- ALLIED PURCHASING
- ANDREA
- ARVIN
- AUTOMATIC

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TV field service MANUAL

VOL. 1

Edited by
HAROLD ALSBERG



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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 agc 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.

April, 1954
New York, N. Y.

H.A.

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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-

horizontal 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

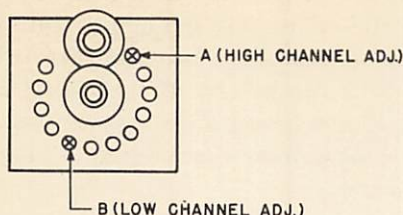


Fig. 1—Tuner oscillator adjustment No. 1.

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

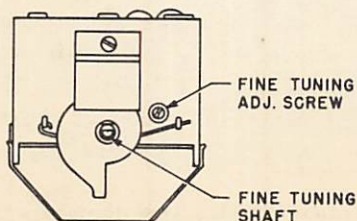


Fig. 2—Tuner oscillator adjustment No. 2.

blade, non-metallic screw driver (tuner alignment tool) in the 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.

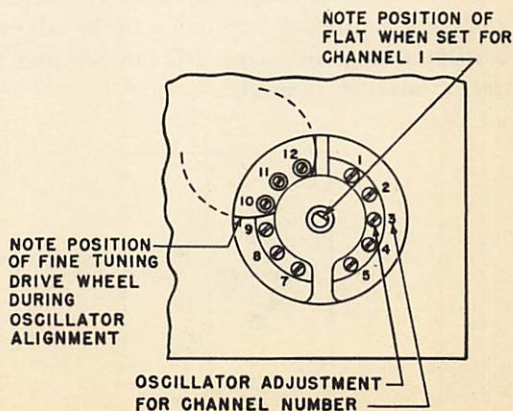
With the correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the fine tuning control. This may not necessarily be maximum sound output.

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.

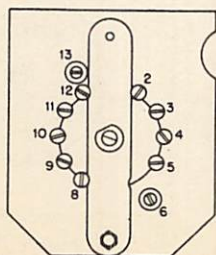


Fig. 4—Tuner oscillator adjustment No. 4.

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.

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*.

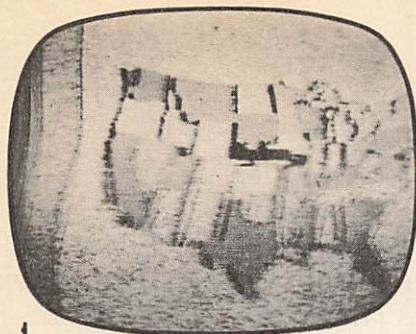
SYMPTOMS AND CAUSES OF FAULTY OPERATION

The numbered picture tube patterns on the following pages (re-produced 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.

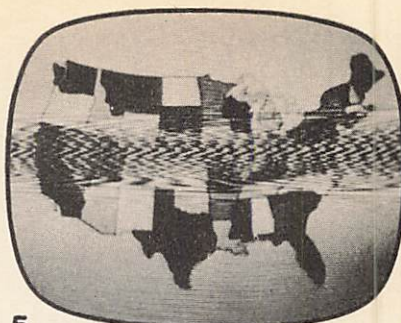
No. 1. Tuner Oscillator Mistuning. This picture condition is usually accompanied by a distorted or low sound output. A similar condition may be caused by a faulty antenna or antenna installation. Also check the following headings on the troubleshooting charts for the receiver on which the condition illustrated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

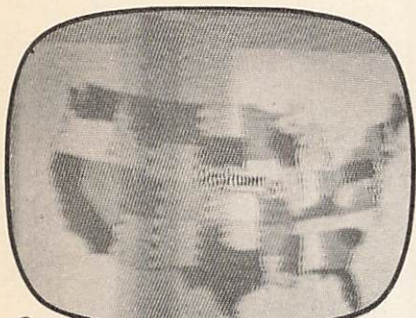


1



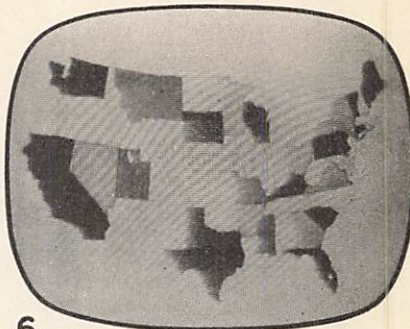
5

MAY MOVE UP OR DOWN



2

MAY MOVE SIDEWAYS

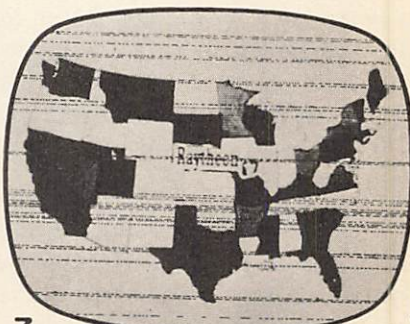


6



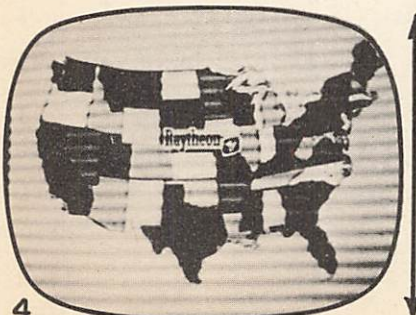
3

VARIES FROM STATION TO STATION



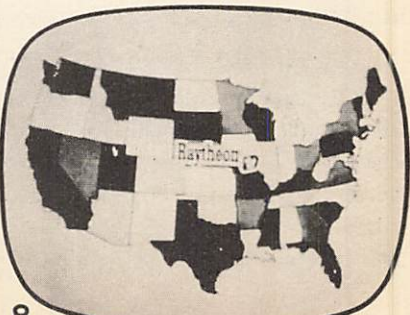
7

MOVES UP AND DOWN



4

MOVES UP OR 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.

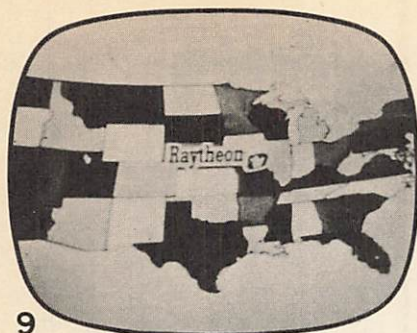
No. 5. A picture tube pattern like this is most commonly referred to as *Diathermy Interference*. The cause always lies outside the receiver, and is due to equipment such as X-ray units, commercial r-f heaters, ultra-violet equipment, fluorescent lights, teletype, etc. For the most effective reduction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

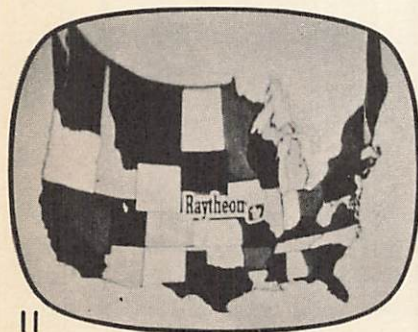
No. 9. Excessive Raster Width is a condition caused by a fault in the horizontal output circuit. It is important to bear in mind that



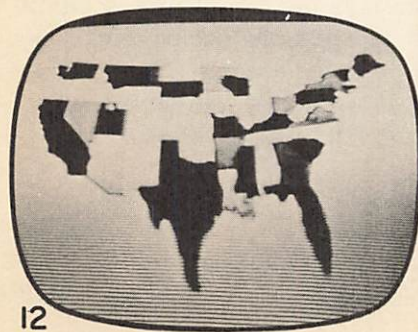
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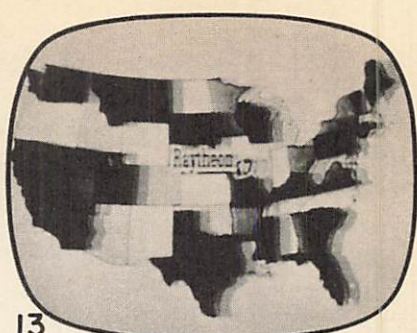
10



11

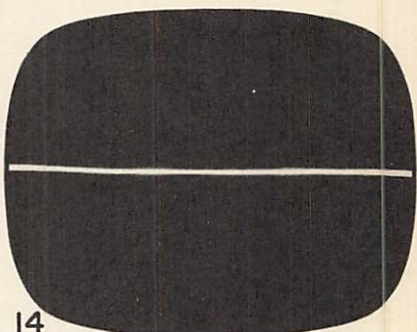


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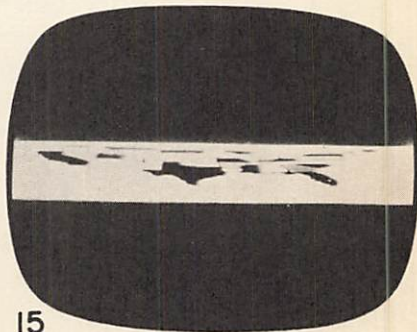


13

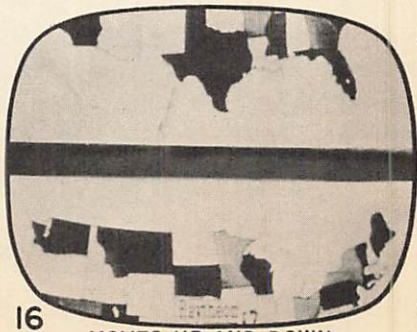
VARIABLES FROM STATION TO STATION



14



15



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.

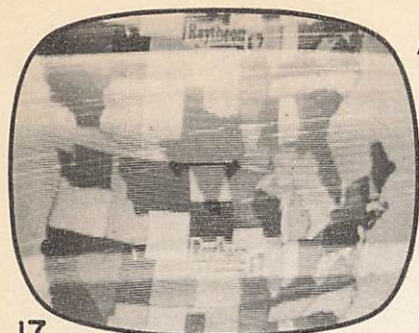
Nos. 11, 12. *Poor Vertical Linearity* is a condition wherein the picture is squeezed or stretched non-uniformly on the screen. This type of condition usually originates in the vertical oscillator or vertical output circuits. For correction, check the following headings on the troubleshooting charts 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.*

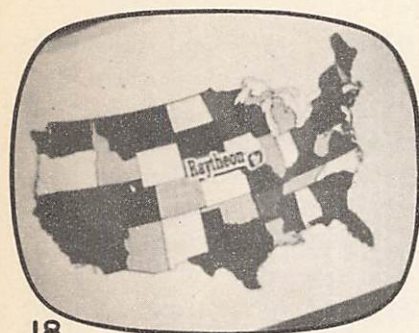


17

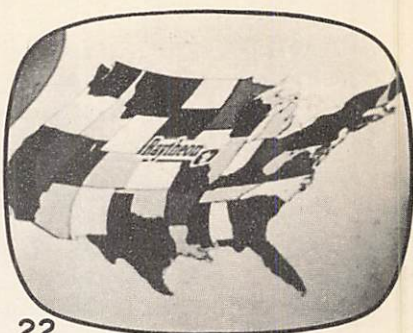
MOVES UP OR DOWN



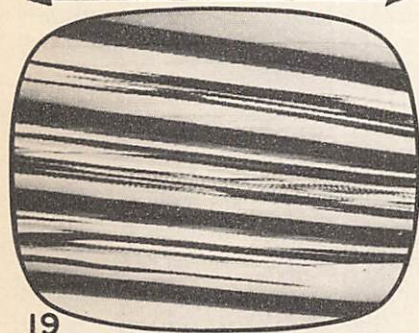
21



18

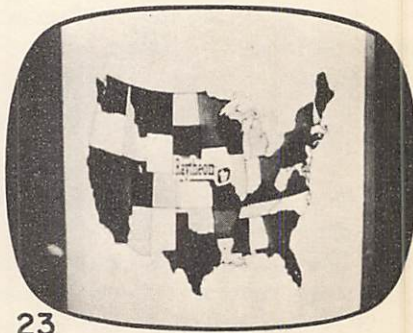


22

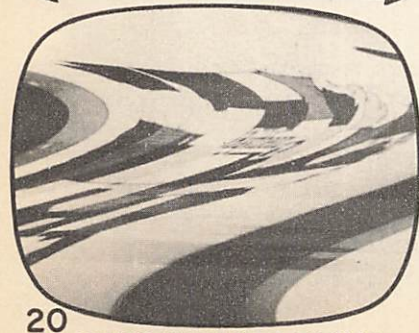


19

MOVES FROM SIDE TO SIDE

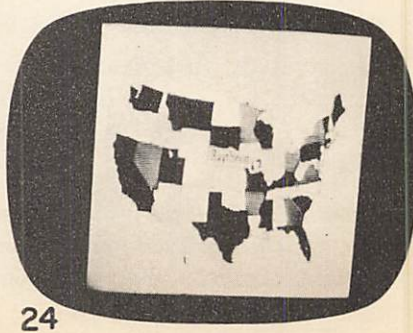


23



20

MOVES FROM SIDE TO SIDE



24

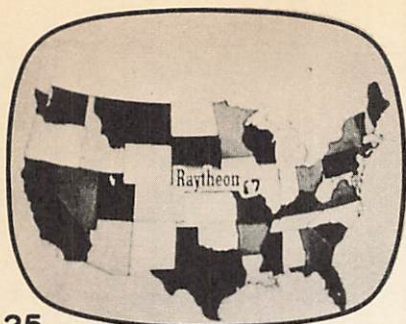
Sync OK heading on the troubleshooting charts. Poor vertical sync is generally caused by improper adjustment of the vertical hold control or a defect in the vertical oscillator, sync amplifier or sync clipper circuits. In receivers where an agc or a noise-gate control is incorporated, these adjustments 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*.

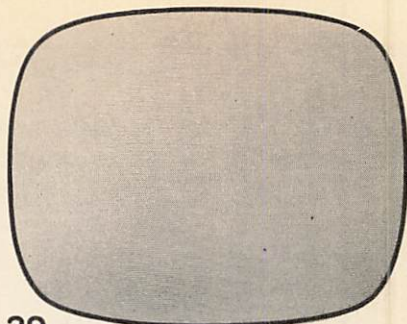
Nos. 19, 20. *Poor Horizontal Sync* is a condition which may be caused by the misadjustment of the horizontal oscillator controls. For correction, check the following headings in the troubleshooting chart for the receiver on which the condition exists: *No Hor. or Vert. Sync. - Pix Signal OK* or *No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

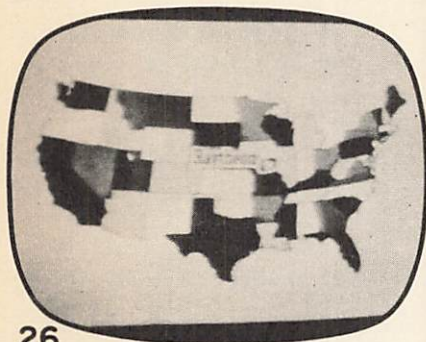
No. 22. *Horizontal Displacement* is an unstable horizontal hold condition. Very similar conditions hold true for patterns No. 19 and 20. Always check the adjustment of the horizontal oscillator controls. Also make certain that the noise gate and agc controls (when used) are correctly adjusted. For correction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



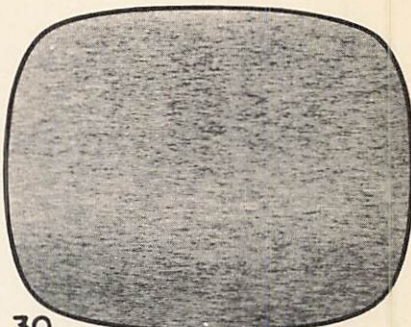
25



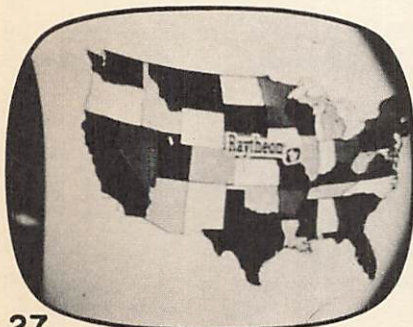
29



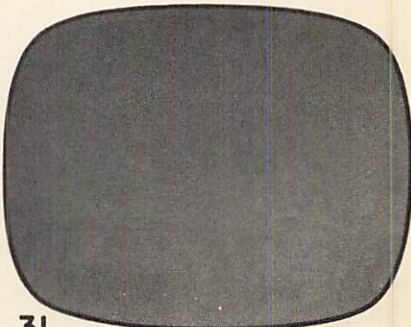
26



30



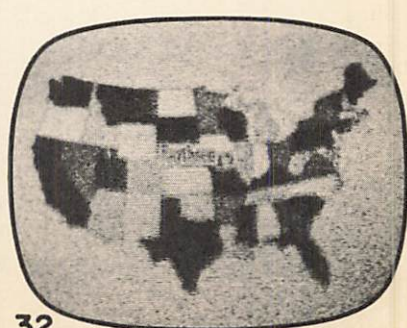
27



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.

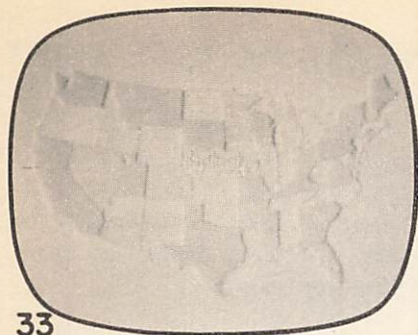
No. 24. *Insufficient Horizontal and Vertical Size* is sometimes caused by an incorrect horizontal drive control, horizontal size (width) control, horizontal linearity, vertical size (height) control, and vertical linearity control adjustments. Another source of such trouble may be the boosted B+ filter 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*.

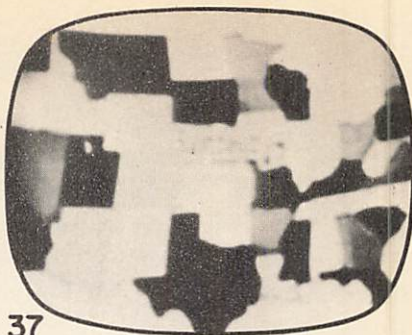
No. 26. See No. 15.

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*.

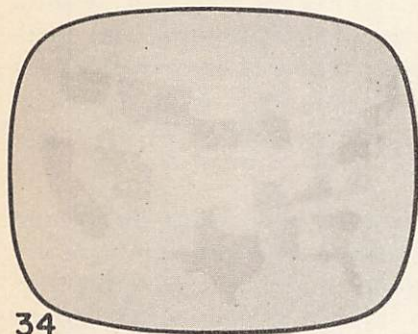
No. 29. When the picture tube is lit (raster is present) but *No Picture* can be seen, loss of video reaching the picture tube is indicated. This condition may be caused by a defect in the r-f, i-f, or video amplifiers. As a fast method to help localize the defective stage causing the trouble, observe 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



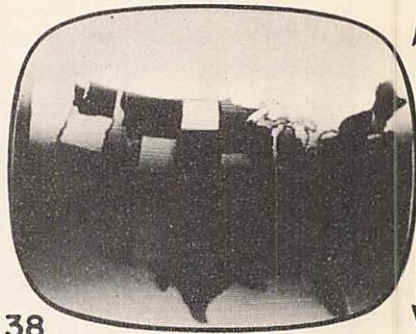
33



37

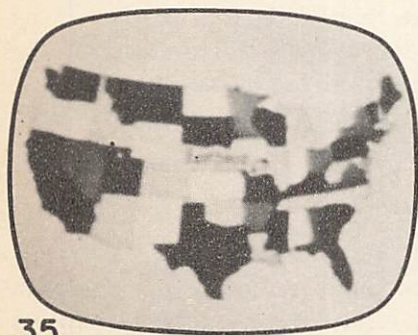


34

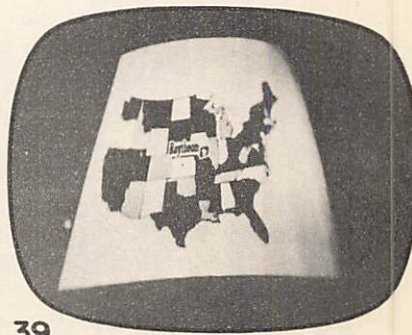


38

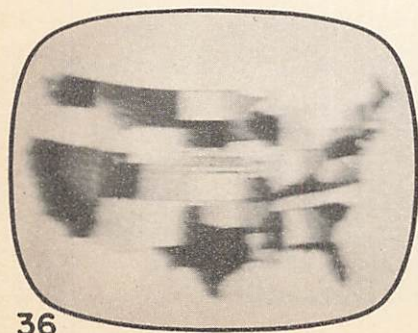
MAY MOVE UP OR DOWN



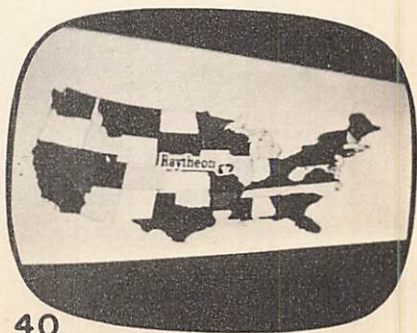
35



39



36



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.

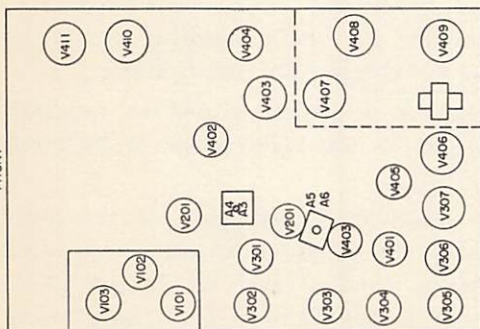
Insufficient Brightness is indicated by reduction of the overall illumination level of the picture or raster. The correct positioning of the ion trap should always be checked and the brightness control should also be checked (refer to the *Picture Tube Adjustment* procedure). Line and B+ voltages should 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.

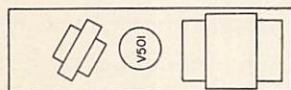
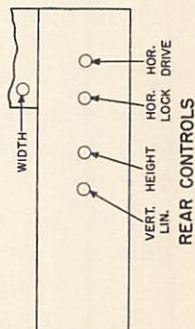
TUBE LIST

Symbol	Type	Circuit Function
V101	6X6	RF Amp.
V102	6X6	Detector
V103	6X6	Oscillator
V201	6AU6	1st Aud. IF
V202	6AL5	2nd Aud. IF
V203	6AL5	FM Det.
V204	6X77	Aud. Amp.
V301	6X4G	Aud. Amp.
V302	6AG5	1st Vid. IF
V303	6AG5	2nd Vid. IF
V304	6AU5	3rd Vid. IF
V305	6AL5	4th Vid. IF
V306	6AU6	Vid. Amp.
V307	6X4G	Vid. Det.
V308	6X4G	1st Picture tube
V401	6BA6	Sync. Separator
V402	6AU6	Sync. Inverter
V403A	6SN7GT	Sync. Discharge
V403B	6AL5	Hor. Sync. Disc.
V404	6AL5	Hor. Osc. Control
V405	6V6GT	Hor. Osc.
V406	6BG6G	Hor. Osc.
V407	1B3GT/	9 KV Rectifier
V408	8016	Damper
V409	5Y4G	Vert. Osc.
V410	6SN7GT	Vert. Sync.
V501	504G	High Voltage Rect.
V502	5Y3GT	Low Voltage Rect.

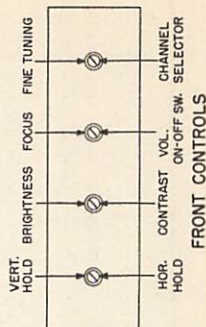
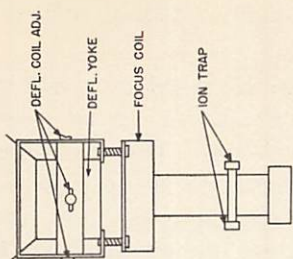
FRONT



TOP VIEW



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

NO RASTER - NO SOUND (31)
Power input circuit
V501, V502

NO RASTER - SOUND OK (31)
Brightness control
V308, V403, V404, V405, V406,
V407, V408, V409

HV trans., Hor. yoke, CRT connections
Check 0.001 and 0.00085 mf caps. connected to pin 2 of V403

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast control
V102, V103, V301, V302, V303,
V304, V305, V306, V307

Check Vid. Amp. peaking coils

POOR HOR. LIN.
Hor. Lin. and Drive controls
V403, V407, V409

Check 0.035 and 0.05 mf caps. connected to Hor. Lin. control

Hor. Out. Trans.

POOR VERT. LIN. (11, 12)
Vert. Signal Lin. controls
V410, V411

Check 0.1 and 0.05 mf caps. connected to pin 2 of V410

Vert. Out. Trans.

PIX JITTER SIDEWAYS
Hor. Hold and Freq. controls
V403, V404, V405, V406

Check 0.05 mf cap. connected through a 1K2 res. to pin 5 of V405

PIX JITTER UP AND DOWN (16, 17)
Contrast control
Vert. Hold control
V205, V410, V411

SMARED PIX (36)
Tuner fine tuning
Contrast control
V308, V403, V404, V405, V406,
V407, V408, V409

Focus coil intermittent open

INSUFFICIENT BRIGHTNESS
Brightness control
Hor. Drive control
V403, V407, V408, V501

Check 12K3 res. connected to pin 8 of V407

Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive, Width and Vert. Size controls
V407, V408

POOR PIX DETAIL (35)
Tuner fine tuning
Focus control
V301, V302, V303, V304, V305, V308

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

SOUND BARS IN PIX (4, 4, 4E)
Tuner fine tuning
V102, V103, V301, V302, V303, V304

Check IF and RF alignment

SNOW IN PIX (32)
V101, V102, V301, V302, V303, V304

Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
V101, V102, V103, V301, V302, V303, V304, V305, V306, V307

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
V102, V103, V301, V302, V303,
V304, V305, V306, V307, V308

Check Vid. Amp. and Det. peaking coils

VERT. BARS (21)
Hor. Hold and Freq. controls
V403, V404, V405, V406

Check 56 mfd mf cap. connected to terminals 1 and 2 of defl. yoke

Defl. yoke ringing

PIX BEWING (22)
Hor. Hold and Freq. controls
V403, V404, V405, V406

Check 0.005 mf cap. connected to pin 5 of V410

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
Tuner fine tuning
Contrast control
V101, V102, V103

RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Contrast control
V308, V403, V404, V405, V406,
V407, V408, V409

Focus coil intermittent open

HV trans.

NO RASTER, SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold and Freq. control
V403, V404, V405, V406

Check 0.005 mf cap. connected to pin 5 of V409

Check 0.02 mf cap. connected to pins 1 and 2 of V405

AUDIO HUM IN SOUND (8E)
V201, V202, V303, V204, V205

Check line transformers in V302 rectifier circuit

RASTER BLOOMING (37)
Hor. Drive control
V102, V103, V301, V302, V303, V304

Check 1 mfg res. connected in series with second anode lead

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Width control
V403, V407, V501

Check 0.001 mf cap. connected to pin 5 of V407

Hor. Out. Trans.

Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Size and Lin. controls
V410, V411, V501

Check 0.05 and 0.1 mf caps. connected to pin 2 of V410

Vert. Out. Trans.

Low line voltage

NO VERT. DEFL. (14)
V410, V411

Check 50 mf cap. connected to pin 8 of V411

Check 0.05 and 0.1 mf caps. connected to pin 2 of V410

Vert. Defl. yoke

Vert. Out. Trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
Vert. Hold control
V410, V411

Check 0.005 mf cap. connected between pins 2 and 5 of V410

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK (16, 17)
Contrast control
V403, V404, V405, V406

Check 0.05 mf cap. connected to pin 4 of V403

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold and Freq. control
V403, V404, V405, V406

Check 0.005 mf cap. connected to pin 5 of V409

Check 0.02 mf cap. connected to pins 1 and 2 of V405

AUDIO HUM IN SOUND (8E)
V201, V202, V303, V204, V205

Check line transformers in V302 rectifier circuit

DISTORTED SOUND (8D)
Tuner fine tuning
V102, V103, V301, V302, V303, V304, V205

Check 0.005 mf cap. connected to pin 5 of V205

Sound and Vid. IF alignment A3, A4, A1

Det. alignment A5 and A6

NO SOUND - PIX OK (8B)
Tuner fine tuning
Volume control
V201, V202, V203, V204, V205

Speaker open voice coil or defective connection

Sound and Vid. IF alignment A1, A3, A4

Det. alignment A5 and A6

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
Volume control
V102, V103, V301, V302, V303, V204, V205

Check sound system for loose connections

Speaker

Sound IF and Det. alignment A1, A3, A4, A5 and A6

NOISY SOUND - PIX OK
Volume Control
V201, V202, V303, V204, V205

Check sound system for loose connections

Speaker

Sound IF and Det. alignment A-1, A-3, A-4, A-5, A-6

INTERMITTENT SOUND - PIX OK
V201, V202, V303, V204, V205

Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V101	636	RF Amp.
V102	636	Converter
V201	6AU6	1st AF IF
V202	6AU6	2nd AF IF
V203	6AL5	FM Det.
V204	6377	AF Amp.
V301	6AG5	1st Vid. IF
V302	6AG5	2nd Vid. IF
V303	6AG5	3rd Vid. IF
V304	6AU6	4th Vid. IF
V305	6AL5	Vid. Amp.
V306	6AL5	Video Rect.
V308	109P4	Vid. Pix Tube
V401	6BA6	Sync Amp.
V402	6AU6	Sync Sep.
V403A	6SN7GT	Sync Inverter
V403B	6SN7GT	Hor. Discharge
V404	6AL5	Hor. Sync Disc.
V405	6X4	Hor. Osc. Control
V406	6Y6GT	Hor. Osc.
V407	6BG6G	Hor. Out.
V408	1B3GT/	9 KV Rect.
8016		
V409	5Y4G	Damper
V410	6X4	Vert. Osc.
V411	6Y6GT	Vert. Out.
V501	5U4G	HV Rect.
V502	5Y3GT	Low Voltage Rect.

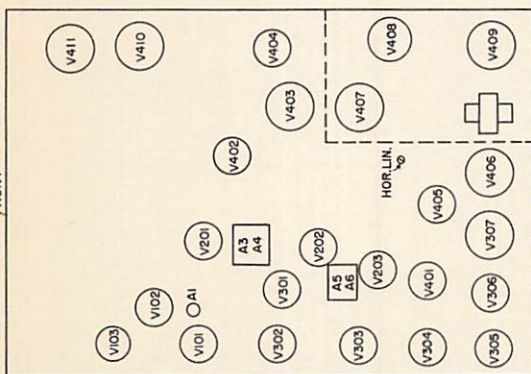
KEY VOLTAGES

B-plates of damper, V409 pins 4 and 6 390vdc
 Boosted B-1, cath. of damper, V409 450vdc
 Plates of Vert. Osc., V410 pin 2 450vdc
 pin 5 90vdc
 Plate of Vert. Out., V411 pin 3 110vdc
 Plate of Hor. Osc., V406 pin 3 300vdc
 Grid of Hor. Out., V407 pin 3 230vdc
 -9.5vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

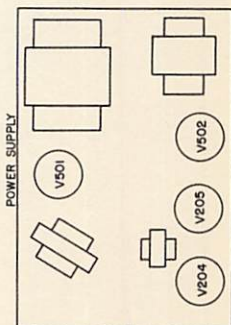
ADJUSTMENTS

For tuner oscillator adjustments, see
 TUNER OSC. ADJ. 2.
 TUNER OSC. ADJ. 3.

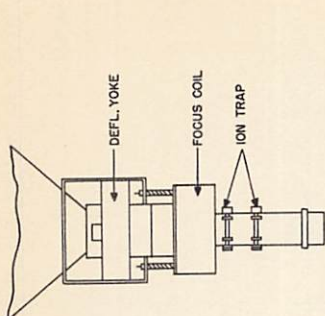
FRONT



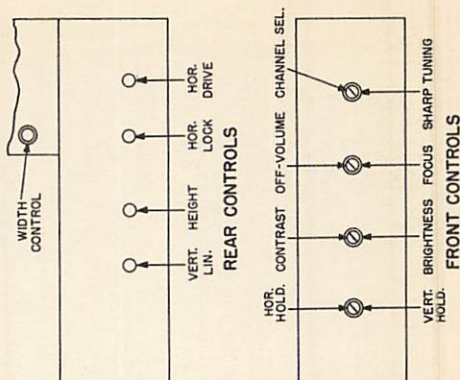
TOP VIEW



TOP VIEW



PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31)
Power input circuit
V501, V502

NO RASTER - SOUND OK (31)
V308, V403, V406, V407, V408,
V409, V501

Ion trap
HV Fuse M402
Brightness control
HV Trans., Hor. yoke, CRT connections
Check 0.005 mf cap. connected to pin 5
of V408

WEAK PIX - SOUND AND RASTER OK (34)

Tuner fine tuning
Contrast control
V401, V402, V403, V408, V502, V503,
V504, V505, V508, V507

POOR HOR. LIN.

Hor. Lin. and Drive controls
V403, V407, V409
Check 0.05 and 0.05 mf caps. con-
nected to pins 1 and 2 of V410
Hor. Out. Trans.

POOR VERT. LIN. (11, 12)

Vert. Lin. and Height controls
V410, V411
Check 0.05 and 0.05 mf caps. connected
to pin 2 of V410
Vert. Out. Trans.

PIX JITTER SIDEWAYS

Hor. Hold and Lock controls
V404, V405, V406, V407
Check 0.05 mf cap. connected through
C180 to pin 2 of V405
Check 0.01 mf cap. connected to pin 1
of V404

PIX JITTER UP AND DOWN (16, 17)

Vert. Hold control
V403, V404, V405, V406, V407,
V410, V411
Vert. Out. Trans.

SMEARED PIX (36)

Tuner fine tuning
V403, V404, V405, V406, V407,
V305, V306, V307
Check Vld. Amp. peaking coils (open)
IF and RF alignment

POOR PIX DETAIL (35)

Tuner fine tuning
V403, V404, V405, V406, V407, V301, V302, V303,
V304, V308
Focus control
Open focus coil
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)

Tuner fine tuning
Adjust A1 and A2 for min.
V103, V301, V302, V303, V304
IF and RF alignment

SNOW IN PIX (32)

V101, V102, V103, V301, V302,
V303, V304

Antenna and transmission line

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

V101, V102, V103, V301, V302,
V303, V304, V305, V306, V307

ENGRAVED EFFECT IN PIX (33)

Tuner fine tuning
V102, V103, V305, V306, V307
Check Vld. Amp. and Det. peaking coils

VERT. BARS (21)

Hor. Drive control
V403, V407, V409
Check 0.05 mf cap. connected to termi-
nals 1 and 2 of defl. yoke
Defl. yoke ringing

PIX BENDING (22)

Hor. Hold and Lock controls
V403, V404, V405, V406
Check 0.05 mf cap. connected to pin
5 of V410

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

Tuner fine tuning
V101, V102, V103
Check 0.05 mf cap. connected to pin 2
of V405
RF and IF alignment

INTERMITTENT RASTER - SOUND OK

V308, V403, V406, V407, V408,
V409, V501
Focus control (intermittent open)
Brightness control
HV Trans.

INSUFFICIENT BRIGHTNESS

Ion trap
Brightness control
HV Trans. (intermittent open)
V308, V407, V408, V501
Check 12KΩ res. connected to pin 8
of V407
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)

Height and Width control
Hor. Drive control
V403, V407, V408

RASTER BLOOMING (37)

Hor. Drive control
V308, V403, V407, V408, V501
Check 1 megΩ res. connected in series
with sec. anode lead

INSUFFICIENT RASTER WIDTH (23)

Hor. Drive and Width control
V403, V407, V501
Check 0.001 mf cap. connected to pin
5 of V404
Vert. Out. Trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)

Height control
V410, V411, V501
Check 0.05 and 0.1 mf caps. connected
to pin 2 of V410
Low line voltage

NO VERT. DEFL. (14)

V410, V411
Check 50 mf cap. connected to pin 8
of V410
Check 0.05 and 0.1 mf caps. connected
to pin 2 of V410
Vert. Defl. yoke
Vert. Out. Trans.

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

Vert. Hold control
V410, V411
Check 0.005 mf cap. connected between
pin 2 and 5 of V410

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

V305, V401, V402, V403
Check 0.05 mf cap. connected to pin 4
of V403

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

V403, V404, V405
Hor. Hold and Lock controls
Check 0.005 mf cap. connected to pin
5 of V406
Check 0.02 mf cap. connected to pins
1 and 2 of V405

AUDIO HUM IN SOUND (8E)

V201, V202, V203, V204, V205
Check filter capacitors in V502 re-
tifier circuit

DISTORTED SOUND (8D)

Tuner fine tuning
V102, V103, V201, V202, V203,
V204, V205
Check 0.005 mf cap. connected to
pin 5 of V202
Sound and Vld. IF alignment A1, A3, A4
Det. alignment (A5 and A6)

NO SOUND - PIX OK (8B)

Tuner fine tuning
V201, V202, V203, V204, V205
Speaker (open voice coil or defective
connection)
Sound and Vld. IF alignment A1, A3, A4
Det. alignment (A5 and A6)

WEAK SOUND - PIX OK (8C)

Tuner fine tuning
Volume control
V102, V103, V201, V202, V203,
V204, V205
Sound and Vld. IF alignment A1, A3, A4
Det. alignment (A5 and A6)

NOISY SOUND - PIX OK

Volume control
V201, V202, V203, V204, V205
Check sound system for loose con-
nections
Speaker
Sound IF and Det. alignment A1, A3,
A4, A5, and A6

INTERMITTENT SOUND - PIX OK

V201, V202, V203, V204, V205
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V101	6AG5	RF Amp, in AF4-2
V102	6X6	Oscillator, AF4-2
V103	6BH6	RF Amp, AF4-2
V104	6AG5	Mixer, AF4-2
V105	6X6	Mixer, AF4-2
V106	6X6	Mixer, in AF4-2
V107	6X6	Mixer, in AF4-2
V108	6X6	Mixer, in AF4-2
V109	6X6	Mixer, in AF4-2
V110	6X6	Mixer, in AF4-2
V111	6X6	Mixer, in AF4-2
V112	6X6	Mixer, in AF4-2
V113	6X6	Mixer, in AF4-2
V114	6X6	Mixer, in AF4-2
V115	6X6	Mixer, in AF4-2
V116	6X6	Mixer, in AF4-2
V117	6X6	Mixer, in AF4-2
V118	6X6	Mixer, in AF4-2
V119	6X6	Mixer, in AF4-2
V120	6X6	Mixer, in AF4-2
V121	6X6	Mixer, in AF4-2
V122	6X6	Mixer, in AF4-2
V123	6X6	Mixer, in AF4-2
V124	6X6	Mixer, in AF4-2
V125	6X6	Mixer, in AF4-2
V126	6X6	Mixer, in AF4-2
V127	6X6	Mixer, in AF4-2
V128	6X6	Mixer, in AF4-2
V129	6X6	Mixer, in AF4-2
V130	6X6	Mixer, in AF4-2
V131	6X6	Mixer, in AF4-2
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V433	6X6	Mixer, in AF4-2
V434	6X6	Mixer, in AF4-2
V435	6X6	Mixer, in AF4-2
V436	6X6	Mixer, in AF4-2
V437	6X6	Mixer, in AF4-2
V438	6X6	Mixer, in AF4-2
V439	6X6	Mixer, in AF4-2
V440	6X6	Mixer, in AF4-2
V441	6X6	Mixer, in AF4-2
V442	6X6	Mixer, in AF4-2
V443	6X6	Mixer, in AF4-2
V444	6X6	Mixer, in AF4-2
V445	6X6	Mixer, in AF4-2
V446	6X6	Mixer, in AF4-2
V447	6X6	Mixer, in AF4-2
V448	6X6	Mixer, in AF4-2
V449	6X6	Mixer, in AF4-2
V450	6X6	Mixer, in AF4-2
V451	6X6	Mixer, in AF4-2
V452	6X6	Mixer, in AF4-2
V453	6X6	Mixer, in AF4-2
V454	6X6	Mixer, in AF4-2
V455	6X6	Mixer, in AF4-2
V456	6X6	Mixer, in AF4-2
V457	6X6	Mixer, in AF4-2
V458	6X6	Mixer, in AF4-2
V459	6X6	Mixer, in AF4-2
V460	6X6	Mixer, in AF4-2
V461	6X6	Mixer, in AF4-2
V462	6X6	Mixer, in AF4-2
V463	6X6	Mixer, in AF4-2
V464	6X6	Mixer, in AF4-2
V465	6X6	Mixer, in AF4-2
V466	6X6	Mixer, in AF4-2
V467	6X6	Mixer, in AF4-2
V468	6X6	Mixer, in AF4-2
V469	6X6	Mixer, in AF4-2
V470	6X6	Mixer, in AF4-2
V471	6X6	Mixer, in AF4-2
V472	6X6	Mixer, in AF4-2
V473	6X6	Mixer, in AF4-2
V474	6X6	Mixer, in AF4-2
V475	6X6	Mixer, in AF4-2
V476	6X6	Mixer, in AF4-2
V477	6X6	Mixer, in AF4-2
V478	6X6	Mixer, in AF4-2
V479	6X6	Mixer, in AF4-2
V480	6X6	Mixer, in AF4-2
V481	6X6	Mixer, in AF4-2
V482	6X6	Mixer, in AF4-2
V483	6X6	Mixer, in AF4-2
V484	6X6	Mixer, in AF4-2
V485	6X6	Mixer, in AF4-2
V486	6X6	Mixer, in AF4-2
V487		

*Tubes not directly interchangeable.
*Alternate tubes used. Replace with

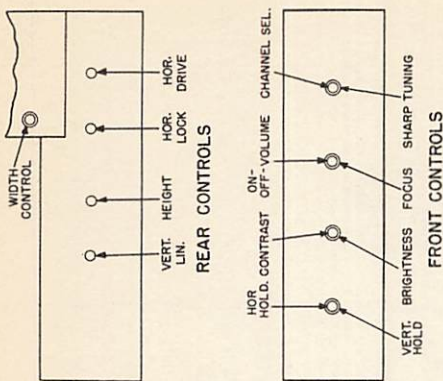
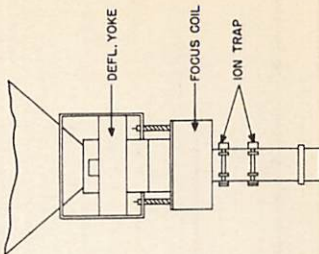
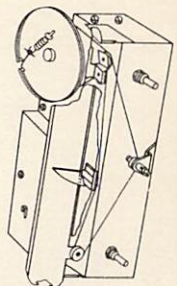
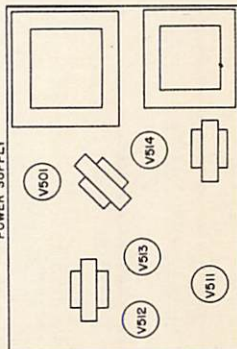
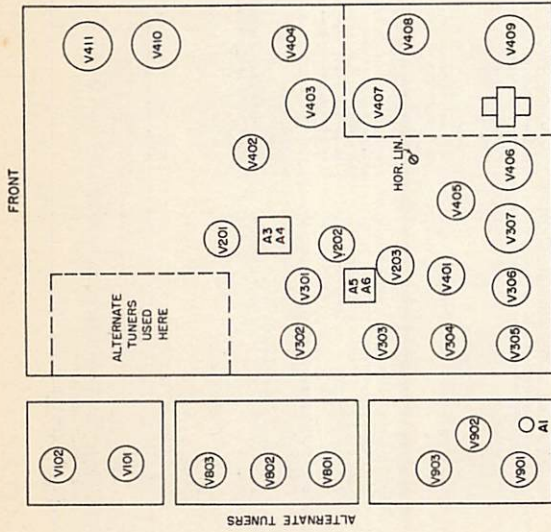
KEY VOLTAGES

B-, plate of damper, V409 pins 4 and 8	390vdc
Boosted B+, cath. of damper, V409	450vdc
Plates of Vert. Osc., V410 pin 2	80vdc
Plates of Vert. Osc., V410 pin 5	110vdc
Plate of Vert. Out., V411 pin 3	300vdc
Plate of Hor. Osc., V408 pin 3	220vdc
Grid of Hor. Out., V407 pin 5	-3.5vdc

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

ADJUSTMENTS

For the horizontal oscillator adjustment, see
HOR. OSC. ADJ.-3.
For the tuner oscillator adjustment, see
TUNER OSC. ADJ.-3 (tuner No. A1592).
TUNER OSC. ADJ.-2 (tuner No. 94C8-2).



NO RASTER - NO SOUND (31) Power input circuit V501, V514 Check Photo-TV-Radio Switch	NO RASTER - SOUND OK (31) TV Fuse M402 Biasing control Ion trap V408, V501 HV Trans., Hor. yoke, CRT connections Check 0.001 mf cap. connected to pin 5 of V403	NO SOUND - PIX OK (8B) Tuner fine tuning V501, V514 V201, V202, V203, V511, V512, V513 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment A1, A3, A4 Det. alignment (A5 and A6) WEAK SOUND - PIX OK (8C) Tuner fine tuning Volume control V102, V201, V202, V203, V511, V512, V513 Sound and Vid. IF alignment A1, A3, A4 Det. alignment A5 and A6 NOISY SOUND - PIX OK Volume and Tone control V201, V202, V203, V511, V512, V513 Check sound system for loose connections Speaker Sound IF and Det. alignment (A1, A3, A4, A5, A6) INTERMITTENT SOUND - PIX OK V201, V202, V203, V511, V512, V513 Poor connections in sound system
SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Adjust A1 and A2 for min. V102, V301, V302, V303, V304 IF and RF alignment	SNOW IN PIX (32) V101, V301, V302, V303, V304 V403, V404, V405 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V101, V102, V301, V302, V303, V304, V305, V306, V307	RASTER BLOOMING (37) Hor. Drive control V403, V404, V405 Check 1 megohm res. connected in series with sec. anode lead
ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control V102, V305, V306, V307 Check Vid. Det. and Amp. peaking coils	VERT. BARS (21) Hor. Drive control V403, V407, V409 Check 56 mmf cap. connected to terminals 1 and 2 of defl. yoke Defl. yoke ringing PIX BENDING (22) Hor. Hold and Lock controls V403, V404, V405, V406 Check 0.005 mf cap. connected to pin 5 of V410	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V403, V404, V405 Check 0.001 and 0.00088 mf caps. connected to pin 2 of V406 Hor. Out. Trans. Low line voltage
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V102, V301, V302, V303, V304, V305, V306, V307	POOR HOR. LIN. Hor. Lin. and Drive controls V403, V407, V409 Check 0.05 and 0.035 mf caps. connected to Hor. Lin. coil Hor. Out. Trans. POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V410, V411 Check 0.1 and 0.05 mf caps. connected to pin 2 of V410 Vert. Out. Trans.	INSUFFICIENT RASTER HEIGHT (15) Height control V410, V411, V501 Check 0.1 and 0.05 mf caps. connected to pin 2 of V410 Low line voltage NO VERT. DEF. (4) V410, V411 Vert. Defl. coil Vert. Out. Trans. Check 50 mf cap. connected to pin 8 of V411 Check 0.1 and 0.05 mf caps. connected to pin 2 of V410 NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Int. network Vert. Hold control V410, V411 Check 0.005 mf cap. connected between pins 2 and 5 of V410
PIX JITTER UP AND DOWN (16, 17) Vert. Hold control Contrast control V410, V411 Vert. Out. Trans.	PIX JITTER SIDEWAYS Hor. Hold and Lock controls V404, V405, V406, V407 Check 0.05 mf cap. connected through a 1K2 res. to pin 6 of V405 Check 0.01 mf cap. connected to pin 1 of V404	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V305, V401, V402, V403 Check 0.05 mf cap. connected to pin 4 of V403 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock controls V403, V404, V405 Check 0.005 mf cap. connected to pin 5 of V406 Check 0.02 mf cap. connected to pins 1 and 2 of V405
SMEARED PIX (36) Tuner fine tuning Contrast control V305, V306, V307 Check 0.001 mf cap. connected to pin 5 of V403 Check 12K2 res. connected to pin 8 of V407 Low line voltage	INTERMITTENT RASTER - SOUND OK V308, V403, V408, V407, V409, V409, V501 Focus coil intermittent Intermittent HV filter HV trans. INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive and Brightness controls V408, V407, V408, V501 Check 12K2 res. connected to pin 8 of V407 Low line voltage	AUDIO HUM IN SOUND (8E) V201, V202, V203, V511, V512, V513 DISTORTED SOUND (8D) Tuner fine tuning V102, V201, V202, V203, V511, V512, V513 Tuner fine tuning Sound and Vid. IF alignment A1, A3, A4 Det. alignment (A5 and A6)
POOR PIX DETAIL (35) Tuner fine tuning V102, V301, V302, V303, V304, V308 Focus control Fid and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and Width controls Hor. Drive control V403, V407, V408	

TUBE LIST

Symbol	Type	Circuit Function
V101	6AG5	RF Amp.
V201	6AU6	Osc. - Mixer
V202	6AU6	1st Sound IF
V203	6AL5	2nd Sound IF
V204	6AL5	Rat. Det.
V301	6AU6	1st Vid. IF
V302	6AU6	2nd Vid. IF
V303	6AU6	3rd Vid. IF
V304	6AU6	Vid. Det. - Limiter
V305	6AL5	AGC
V306	6AC7	Vid. Amp.
V307	6SN7GT	Plx Tube
V401	6SN7GT	Vert. Osc. & Sync.
V402	6K6GT	Int. Od.
V403	6X5GT	Sync. Sep.
V404	6AL5	Sync. Sep. & Clipper
V405	6SN7GT	Hor. Sync. Disc.
V406	6BG6G	Hor. Osc.
V407	6X5GT	Hor. Out.
V408	13X6GT	Rect.
V409	6X5GT	Damper
V501	6S27	AF Amp.
V502	6V6GT	AF Out.
V503	6X5GT	LV Rect.
V504	504G	HV Rect.
V511	6S27	AF Amp.
V512	6S27	Phase Inv.
V513	6K6GT	AF Out.
V514	6K6GT	AF Out.
V515	504G	HV Rect.
V516	6X5GT	LV Rect.

KEY VOLTAGES

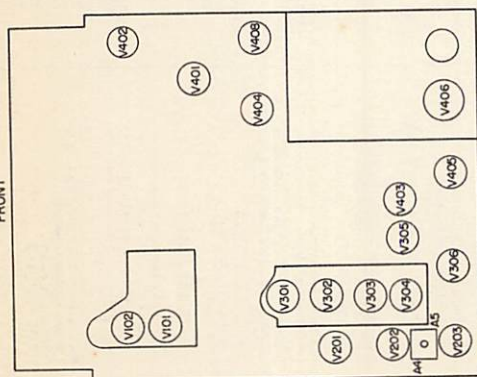
B+, plate of damper, V408 pin 5 300Vdc
 Boosted B+, cath. of damper, V408 pin 3 420Vdc
 Plate of Vert. Osc., V401 pin 2 250Vdc
 Plate of Hor. Osc., V406 pin 2 255Vdc
 Plates of Hor. Osc., V405 pin 2 100Vdc
 Grid of Hor. Out., V406 pin 5 -15Vdc

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

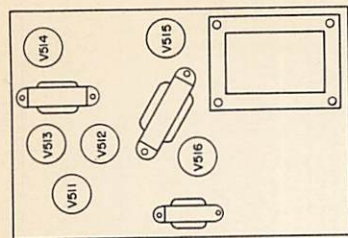
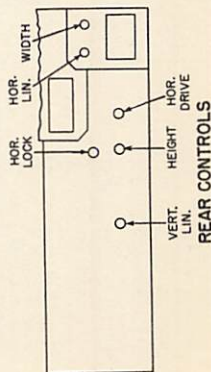
ADJUSTMENTS

For the horizontal oscillator adjustment, see HOR. OSC. ADJ.-3.
 For the vertical oscillator adjustment, see VERT. OSC. ADJ.-3 (tuner No. 4405-3).
 TUNER OSC. ADJ.-2 (tuner No. 4405-2).

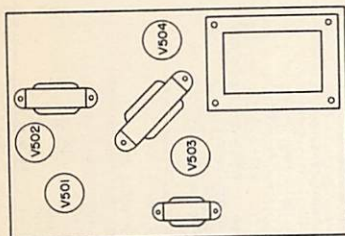
FRONT



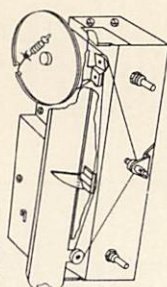
TOP VIEW



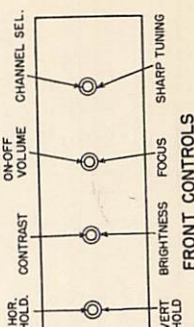
6 TUBE POWER SUPPLY



4 TUBE POWER SUPPLY



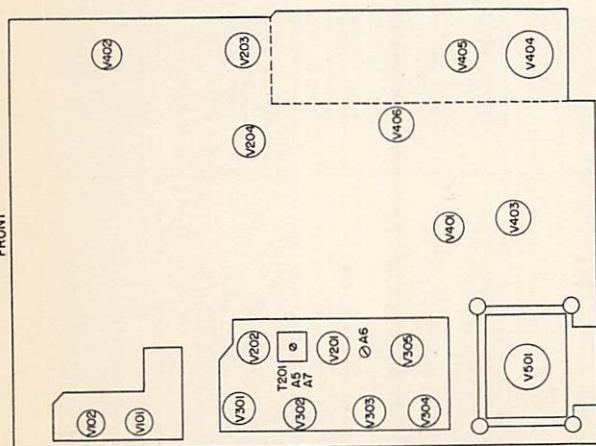
DRIVE CORD ASSEMBLY



FRONT CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V503, V504
- NO RASTER - SOUND OK (31)**
HV Trans. (M405)
Ion trap
V307, V405, V406, V407, V408, V409
HV Trans., Hor. yoke, CRT connections
Brightness control
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner line tuning
Contrast control
V102, V301, V302, V303, V304, V305, V306
- POOR HOR. LIN.**
Hor. Drive controls
V401, V402
Hor. Out. Trans.
Check 0.1 mf and 0.035 mf caps. connected to hor. lin. coil
- POOR VERT. LIN. (11, 12)**
V401, V402
Vert. Out. Trans.
Check 50 mf cap. connected to pin 8 of V402
- PIX JITTER SIDEWAYS**
Hor. Hold and Lock controls
V404, V405, V406
Check 0.05 mf cap. connected to pin 1 of V405
Check 4.7 megohm res. connected to junction of 2-100K Ω res. on V404 pin 1 and 2
- PIX JITTER UP AND DOWN (16, 17)**
V304, V305, V401
Vert. Hold control
- SMEARED PIX (36)**
Ion trap
Contrast control
V304, V305, V306
Check Vid. Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Ion trap
Focus control
V304, V305, V306
Check peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner line tuning
V101, V301, V302, V303, V304, V305, V306
Check alignment of A-1
IF and RF alignment
- SNOW IN PIX (32)**
V101, V102, V301, V302, V703
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V101, V102, V301, V302, V303, V304, V305, V306
- ENGRAVED EFFECT IN PIX (33)**
Tuner line tuning
Contrast control
V304, V305, V306, V307
- VERT. BARS (21)**
Hor. Drive control
V406, V408
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Lock controls
V304, V305, V404, V405, V406
Check 0.05 mf cap. connected to pin 1 of V405
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner line tuning
V101, V301, V302, V303, V305
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness control
V307, V404, V405, V409, V407, V408, V409
Ion trap
V406
In V406 in focus coil ckt.
HV Trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness controls
V307, V405, V407, V504
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Height, width and Hor. Drive controls
V406, V407
- RASTER BLOOMING (37)**
Hor. Drive control
V406, V407, V504, V307
Check 1 megohm res. in series with sec. anode lead
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width controls
V405, V406, V408, V504
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Height and Vert. Lin. controls
V401, V402, V504
Vert. Out. Trans.
Check 0.05 mf cap. connected to Red lead of Vert. Osc. Trans.
Low line voltage
- NO VERT. DEFL. (14)**
V401, V402
Check 0.1 mf cap. connected to pin 5 of V402
Vert. Defl. yoke
Vert. Out. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold control
Vert. Int. Network
Check grid leak res. of V401 pin 1
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V305, V401, V403
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
V404, V405, V406
Hor. Hold and Lock controls
- AUDIO HUM IN SOUND (8E)**
V201, V202, V203, V501, V502
- DISTORTED SOUND (8D)**
Tuner line tuning
V102, V201, V202, V303, V501, V502
Sound and Vid. IF alignment
Det. alignment A4, A5
- NO SOUND - PIX OK (8B)**
Tuner line tuning
V102, V201, V203, V501, V502, V503
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment
Det. alignment A4, A5
- WEAK SOUND - PIX OK (8C)**
Tuner line tuning
V201, V202, V203, V501, V502
Volume control
Sound and Vid. IF alignment
Det. alignment A4, A5
- NOISY SOUND - PIX OK**
Volume control
V201, V202, V203, V501, V502
Check sound system for loose connections
Speaker
Sound IF and Det. alignment A4, A5
- INTERMITTENT SOUND - PIX OK**
V201, V202, V203, V501, V502
Poor connections in sound system

FRONT



TUBE LIST

Symbol	Type	Circuit Function
V101	6AG5	RF Amp.
V102	6J6	Osc. and Mixer
V201	6AU6	Sound IF Amp.
V202	6AL5	Radio Rec. & Sound Amp. & Sync. Clip.
V203	6SN7GT	Sync. Out.
V204	6AS5	Sound Out.
V301	6AU6	1st IF Amp.
V302	6AU6	2nd IF Amp.
V303	6AU6	3rd IF Amp.
V304	6X4	Video Amp. & AGC
V305	6AU6	Video Amp.
V401	12AU7	Sync. Amp. & Sep.
V402	12AU7	Vert. Osc. & Out.
V403	6SN7GT	Hor. Osc. Cont.
V404	6BG6G	Hor. Osc.
V405	6X4	Rect. & Video Rect.
V406	6X4GT	Line Driver
V501	516G	L. V. Rect.
V502	12LP4	Picture Tube

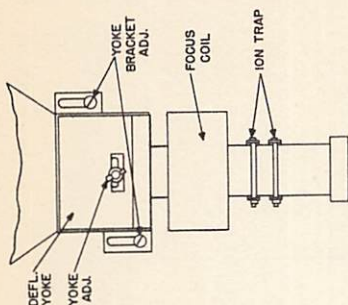
KEY VOLTAGES

B₁, plate of damper, V406 pin 5 375vdc
 Boosted B₁, cath. of damper, V406 pin 3 450vdc
 Plate of Vert. Osc., V402 pin 1 110vdc
 Plate of Vert. Osc., V402 pin 5 200vdc
 Plates of Hor. Osc. and Cont., V403 pin 5 200vdc
 Grid of Hor. Osc., V404 pin 5 pin 2 165vdc
 -5vdc

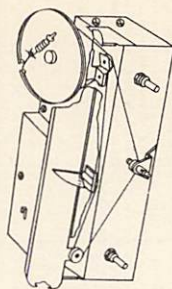
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

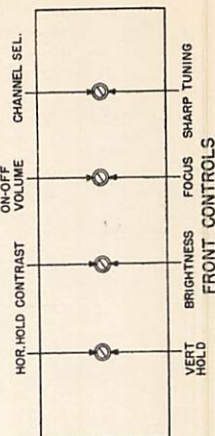
For the horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. For the tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



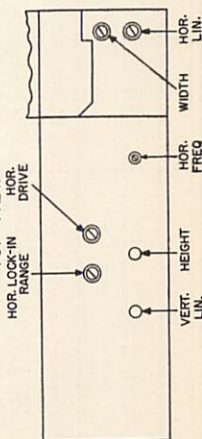
PICTURE TUBE ADJUSTMENTS



DRIVE CORD ASSEMBLY



TOP VIEW



REAR CONTROLS

VERT. LIN.
 VERT. HEIGHT
 HOR. FREQ.
 WIDTH
 HOR. LIN.

NO RASTER - NO SOUND (31)

Power input circuit
V501

Open focus coil

NO RASTER - SOUND OK (31)

Hor. Drive and Lin. controls
V301, V400, V406
V306, V403, V404, V405
Ion trap
HV trans., Hor. yoke, CRT connections

WEAK PIX - SOUND AND RASTER OK (34)

Tuner line tuning
V101, V102, V301, V302, V303
V304, V305
Contrast control

POOR HOR. LIN.

Hor. Drive and Lin. controls
V301, V400
Hor. Out. Trans.
Check 0.035 and 0.05 mf caps. connected to Hor. Lin. coil

POOR VERT. LIN. (11, 12)

Height and Vert. Lin. controls
V402, V403
Vert. Out. Trans.
Check 0.1 mf cap. connected to pin 7 of V402

PIX JITTER SIDEWAYS

Contrast control
Hor. Freq., Lock, in Range and Hold controls
V403, V404
Check 0.02 and 0.2 mf caps connected to pin 3 of V403

PIX JITTER UP AND DOWN (16, 17)

Vert. Hold control
V402
Tuner line tuning
Check 0.006 mf cap. connected to yellow lead of Vert. Osc. trans.

SMEARED PIX (36)

Tuner line tuning
Contrast control
V301, V302, V303, V304, V305
Check Vid. peaking coils
Check 0.1 mf cap. connected to pin 1 of V305
IF and RF alignment

POOR PIX DETAIL (35)

Tuner line tuning
Focus control
V102, V301, V302, V303, V305, V306
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)

Vertical line tuning
V301, V302, V303, V305, V101, V102
Check alignment of A6
IF and RF alignment

SNOW IN PIX (32)

V101, V102, V301, V302, V303
Antenna and transmission line

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

V101, V102, V301, V302, V303,
V304, V305, V306

ENGRAVED EFFECT IN PIX (33)

Contrast control
V102, V305, V306, V307
Check Vid. peaking coils

VERT. BARS (21)

Vertical line tuning
V403, V404
Defl. yoke ringing

PIX BENDING (22)

Hor. Hold, Lock and Freq. controls
V403, V404
Check 0.02 mf cap. connected to pin 1 of V403

WEAK OR NO PIX - SOUND WEAK -

RASTER OK (32C, 34C)
Tuner line tuning
V101, V102, V301, V302, V303, V304
Check Vid. peaking coils in plate ckt of V305
RF and IF alignment

INTERMITTENT RASTER - SOUND OK

Check V403, V406
Focus coil ckt (alternation open)
HV trans.

INSUFFICIENT BRIGHTNESS

Ion trap
Brightness and Hor. Drive controls
V403, V404, V405, V501
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)

Height, Width and Hor. Drive controls
V306, V404, V405

RASTER BLOOMING (37)

Hor. Drive control
V403, V404, V405, V501
470K series res. in sec. anode lead

INSUFFICIENT RASTER WIDTH (23)

Hor. Drive and Width controls
V403, V404, V501
Hor. Out. Trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)

Height and Vert. Lin. controls
V402, V501
Low line voltage

NO VERT. DEFL. (14)

Vert. Defl. yoke
Vert. Out. Trans.

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

Vert. Hold control
Vert. Int. Network
V402
Leaky 0.01 mf cap. in grid (#2) of V401

NO HOR. OR VERT. SYNC. -

PIX SIGNAL OK
V203, V401

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

Hor. Freq., Lock, Lock in range and Hold controls
V403, V404
Check 7.5 mmf feedback cap. from V403 to V401 Trans. to V403
Check 180 mmf cap. connected to pin 4 of V403

AUDIO HUM IN SOUND (8E)

V201, V202, V203, V204

DISTORTED SOUND (80)

Tuner line tuning
V102, V201, V202, V203, V204
Sound and Vid. IF alignment (A6)
Det. alignment (A5 and A7)

NO SOUND - PIX OK (8B)

Tuner line tuning
Volume control
V201, V202, V203, V204
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment (A6)
Det. alignment (A5 and A7)

WEAK SOUND - PIX OK (8C)

Tuner line tuning
Volume control
V201, V202, V203, V204
Sound and Vid. IF alignment (A6)
Det. alignment (A5 and A7)

NOISEY SOUND - PIX OK

V201, V202, V203, V204
Volume control
Check sound system for loose connections
Speaker
Sound IF and Det. alignment

SYNC. BUZZ IN SOUND (8E)

Tuner line tuning
V102, V201, V202
Contrast control
0.25 mf cap. in AGC Line to tuner
Sound IF and Det. alignment (A5, A6, A7)

INTERMITTENT SOUND - PIX OK

V201, V202, V203, V204
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V101	6AG5, or 6CB6	RF Amp.
V102	6AV6	Osc. & Mixer
V201	6AU6	1st Sound IF
V202	6AU6	2nd Sound IF
V203	6AL5	Rat. Det.
V204	6SQ7 or 6AU6	AF Amp.
V301	6AV6	AF Osc.
V302	6AU6	1st Vid. IF
V303	6AU6	2nd Vid. IF
V304	6AL5	3rd Vid. IF
V305	6AU6	Vid. Det. & Clamper
V401	6AG5	AGC Amp.
V402	6AC7	Pix Tube
V403	6AV6	Vert. Osc.
V404	6SN7GT	Sync. Inverter
V405	684	Vert. Out.
V406	12AU7	Sync. Sep. & Clipper
V407	6AL5	Hor. Sync. Disc.
V408	6AV6	Hor. Osc.
V409	6CD6G	Hor. Out.
V410	1B3GT	2nd Anode Rect.
V411	6W4GT	Damper
V501	5U4G	HV Rect.
V502	6AX5GT	LV Rect.

KEY VOLTAGES

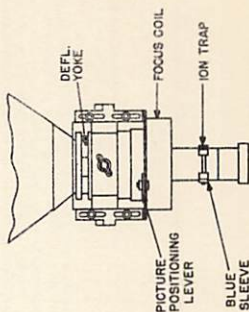
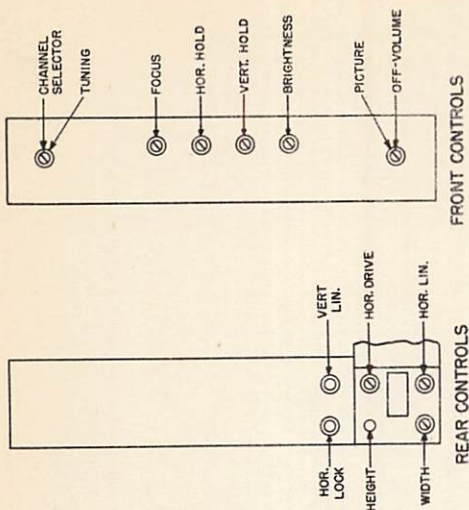
B+, plate of damper, V408 pin 5 350vdc
 Boosted B+, cath. of damper, V408 pin 3 450vdc
 Plate of Vert. Osc., V403 pin 2 460vdc
 Plate of Hor. Osc., V403 pin 9 350vdc
 Plate of 1st. Osc., V405 pin 2 350vdc
 Grid of Hor. Out., V406 pin 5 -15vdc

*Voltage varies with Vert. Hold and Height control setting.

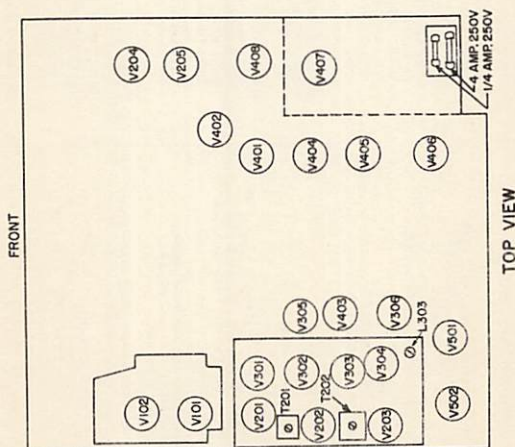
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

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



PICTURE TUBE ADJUSTMENTS



TOP VIEW

NO RASTER - NO SOUND (31) Hor. Lin. and Drive controls M503 (Line Fuse & Amps) V501	SNOW IN PIX (32) V101, V102, V201, V202 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Height control V401, V402, V501 Vert. Out. Trans. Check 0.1 mf cap. connected to pin 6 of V402 Low line voltage	NOISY SOUND - PIX OK V201, V202, V203, V204, V205 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment
NO RASTER - SOUND OK (31) HV Fuse (M401)	AC IN PIX (DARK HOR. BAR) (38) V303, V304, V305, V306	NO VERT. DEF. (14) V401, V402 Check 20 mf cap. connected to pin 2 of V402 Vert. Def. yoke Vert. Out. Trans.	AUDIO BUZZ IN SOUND Tuner fine tuning V203 Check 0.01 mf cap. connected to pin 1 of V204 Sound IF and Det. alignment
NO RASTER - SOUND AND RASTER OK (34) Tuner fine tuning V304, V305, V306, V407, V408 HV trans. - Hor. yoke, CRT connections Focus coil ckt open	ENGRAVED EFFECT IN PIX (33) Pix control V304, V305, V306 Feeding coils	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V401 Check 0.0047 mf cap. connected to yellow lead of Vert. Osc. Trans.	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204, V205 Poor connections in sound system
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V304, V305, V306, V407, V408 HV trans. - Hor. yoke, CRT connections Focus coil ckt open	VERT. BARS (21) V405, V406, V408 Hor. Drive control Defl. yoke ringing	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V401, V403	
POOR HOR. LIN. Hor. Lin. and Drive controls V405, V406, V408 HV trans. - Hor. yoke, CRT connections Check 0.05 and 0.07 mf caps. connected to Hor. Lin. coil	PIX BENDING (22) Hor. Hold and Lock controls V401, V402, V403 Check 0.047 mf cap. connected to pin 1 of V405	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock controls V401, V403 Check 0.047 mf cap. connected to pin 1 of V405	
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V401, V402 HV trans. - Hor. yoke, CRT connections Check 1 meg res. connected to pin 6 of V402	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) V101, V102, V301, V302, V305 RF and IF alignment	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204, V205 DETORTED SOUND (8D) Tuner fine tuning V201, V202, V203, V204, V205 Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	
PIX JITTER SIDEWAYS Hor. Hold and Lock controls V401, V402, V405, V408 Check 0.01 mf cap. connected to pins 5 and 7 of V404	INTERMITTENT RASTER - SOUND OK V307, V406, V407, V408 Brightness control HV trans.	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204, V205 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	
PIX JITTER UP AND DOWN (16, 17) V301, V402 Vert. Hold control Vert. Out. Trans.	INSUFFICIENT BRIGHTNESS Ion trap V307, V406, V407, V501 HV trans. - Hor. yoke, CRT connections Brightness control Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204, V205 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	
SMEARED PIX (36) Pix control V304, V305, V306 Check Vid. Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and Width controls V307, V406, V407 Hor. Drive control	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204, V205 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	
POOR PIX DETAIL (35) Focus control V304, V306 Check Vid. Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) V307, V406, V407 Check 470K res. connected in series with sec. anode lead Hor. Drive control	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204, V205 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	
SOUND BARS IN PIX (4A, 4E) V101, V102 Check L201, T303, L303 for alignment IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V405, V406, V501 Hor. Out. Trans. Check 330 mmf cap. connected to pin 8 of V405 Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204, V205 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T301; L201; T201 Det. alignment T202	

TUBE LIST

Symbol	Type	Circuit Function
V101	8AG5, 8BC5 or 61E	RF Amp.
V102	6AU6	Osc. & Mixer
V201	6X4	Sound IF
V202	6AL5	Ret. Det.
V203	6AV6 or V203	Sound Amp.
V204	6V6GT	Sound Out.
V301	6V3	1st IF
V302	6AU6 or V302	2nd IF
V303	6AG5	3rd IF
V304	6AU6	Vid. Det. & AGC
V305	6AL5	Vid. Amp.
V306	14CP4	pix Tube
V401A	6SN7GT	Vert. Osc.
V401B	6SN7GT	Sync. Clipper
V401C	854	Sync. Amp.
V403	12AU7 or 6SN7GT	Sync. Amp. & Sync Sep.
V404	6SN7GT	Hor. Osc. & Control
V405	6BD6GT	Hor. Out.
V406	6BD6GT	End Anode Rect.
V407	6BD6GT	End Anode Rect.
V408	6BD6GT	End Anode Rect.
V501	5U4G	Rect.

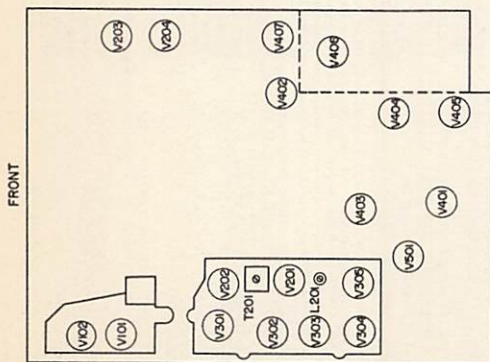
KEY VOLTAGES

B., plate of damper, V407 pin 5	245vdc
Boosted B., cath. of damper, V407	pin 3 400vdc
Plate of Vert. Osc., V401	pin 2 115vdc
Plate of Vert. Out., V402	pin 9 350vdc
Plates of A. F. C. and Hor. Osc. V404 pin 2	130vdc
	290vdc
Grid of Hor. Out., V405 pin 5	-18vdc

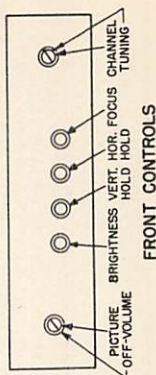
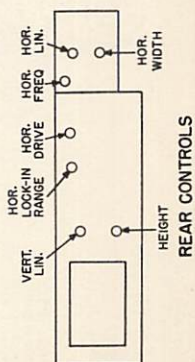
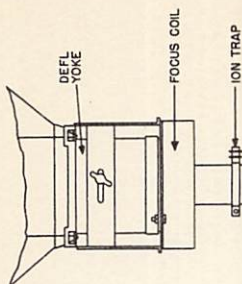
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

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



PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31) Power input circuit V501	AC IN PIX (DARK HOR. BAR) (36) V101, V102, V301, V302, V303, V304, V305	INSUFFICIENT RASTER HEIGHT (15) V401, V402, V405 Check 0.1 mf cap. connected to pin 6 of V402 Vert. Out. Trans. Low line voltage	NOISY SOUND - PIX OK V401, V402, V203, V204 Volume control Check for loose connections in sound system Speaker
NO RASTER - SOUND OK (31) HV Fuse (M401) Ion trap V306, V404, V405, V406, V407 HV Trans., Hor. yoke, CRT connections Check 0.1 mf cap. connected to pin 1 of V404	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning PIX control V304, V305, V306 Receiver overloading VERT. BARS (21) V404, V405 Hor. Drive Defl. yoke ringing Hor. Lock control Hor. Hold control V404, V405	NO VERT. DEF. (14) V401, V402 Check 0.1 mf cap. connected to pin 6 of V402 V402, V303, V304 Vert. Out. Trans.	SYNC. BUZZ IN SOUND (8E) pix control Tuner fine tuning Strong signal causes overloading Sound IF and Det. alignment L201, T201
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V101, V102, V301, V302, V303, V304, V305	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V101, V102, V301, V302, V303, V304 Check 0.1 mf cap. connected to pin 1 of V305 RF and IF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V401 Defective Int.	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204 poor connections in sound system
POOR HOR. LIN. Hor. Lin. control Hor. Drive control V405, V407 Hor. Out. Trans. Check 0.1 mf cap. connected to pin 1 to Hor. Lin. coil	INTERMITTENT RASTER - SOUND OK V101, V102, V301, V302, V303, V304 Check 0.1 mf cap. connected to pin 1 of V305 Brightness control HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Freq. and Hor. Lock controls Check 180 mmf cap. connected to pin 4 of V404 Check 0.01 mf cap. connected to C and D of T404 (Hor. Osc. Trans.)	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204 Signal pick up from vert. ckt.
PIX JITTER UP AND DOWN (16, 17) V401, V402 Vert. Hold control	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive control V405, V406, V501, V306 Brightness control Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Freq. and Hor. Lock controls Check 180 mmf cap. connected to pin 4 of V404 Check 0.01 mf cap. connected to C and D of T404 (Hor. Osc. Trans.)	DISTORTED SOUND (8D) Tuner fine tuning V302, V203, V304 Sound and Vid. IF alignment L-201 Det. alignment T-201
SMEARED PIX (36) Tuner fine tuning V304, V305 V401, V402 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and width control Hor. Drive control V405, V406	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Volume control Speakers (open voice coil or defective connections) Sound and Vid. IF alignment L-201 Det. alignment T-201	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204 Sound and Vid. IF alignment L-201 Det. alignment T-201
POOR PIX DETAIL (35) Tuner fine tuning Focus control V304, V305 IF and RF alignment	RASTER BLOOMING (37) V306, V405, V406 Hor. Drive control Check 1 megohm series res. in sec. anode lead	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Volume control Speakers (open voice coil or defective connections) Sound and Vid. IF alignment L-201 Det. alignment T-201	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204 Sound and Vid. IF alignment L-201 Det. alignment T-201
SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102 Check L201 for alignment IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive control V404, V405, V501 Hor. Out. Trans. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Volume control Speakers (open voice coil or defective connections) Sound and Vid. IF alignment L-201 Det. alignment T-201	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204 Sound and Vid. IF alignment L-201 Det. alignment T-201
SNOW IN PIX (32) Antenna and transmission line			

TUBE LIST

Symbol	Type	Circuit Function
V101	{ 6AG5, 6BC5 or 6CB6 }	RF Amp.
V102	6T6	Osc. & Mixer
V201	6AU6	Sound IF
V202	6AV6 or 6AQ5	Rad. Det.
V203	6SQ7	Sound Amp.
V204	6V6GT	Sound Out.
V301	6AU6	1st IF
V302	{ 6AG5, 6BC5 or 6CB6 }	2nd IF
V303	{ 6AG5, 6BC5 or 6CB6 }	3rd IF
V304	6AV6 or 6AQ5	Vid. Det. & AGC
V305	6AC6 or 6AH6	Vid. Amp.
V306	6AL5	PIK tube
V401A	6SN7GT	Vert. Osc.
V401B	6SN7GT	Sync Inverter
V402	6SA	Vert. Out.
V403	12L7 or 6SN7GT	Sync Sep. & Clipper
V404	{ 6AL5, 6H6 or 12H6 }	Sync Disc.
V405	6SN7GT	Hor. Osc.
V406	6H6 or 6BR6	Hor. Out.
V407	13X2T	2nd Anode Rect.
V408	6W4GT	Damper
V501	5U4G	Rect.

KEY VOLTAGES

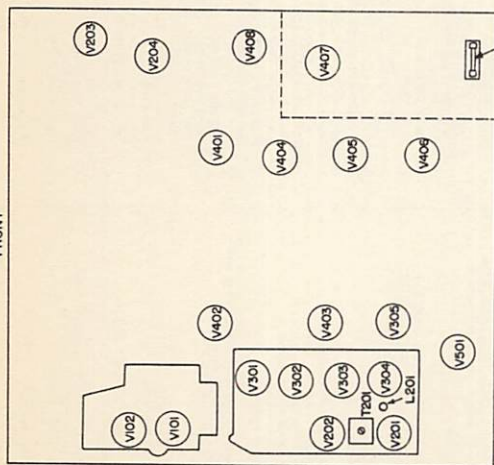
B+, plate of damper, V408 pin 5 250vdc
 Boosted B+, cath. of damper, V408 pin 3 400vdc
 Plate of Vert. Osc. V401 pin 2 100vdc*
 Plate of Vert. Out. V402 pin 9 390vdc*
 Plates of Hor. Osc. V405 pin 2 250vdc
 Grid of Hor. Out. V406 pin 5 -5vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

*Voltage varies with control settings.

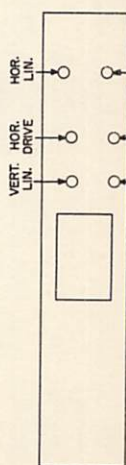
ADJUSTMENTS

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

FRONT



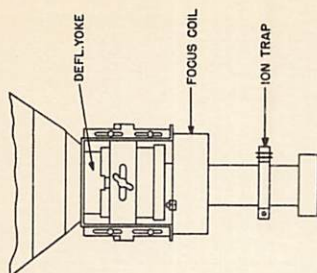
TOP VIEW



REAR CONTROLS

VERT. LIN. DRIVE
 HOR. LIN. DRIVE
 HOR. HEIGHT LOCK
 WIDTH

PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

OFF-VOLUME PICTURE
 BRIGHTNESS
 VERT. HOLD
 HOR. FOCUS
 CHANNEL TUNING

NO RASTER - NO SOUND (31) Power input circuit V501	SNOW IN PIX (32) Antenna and transmission line V101, V102, V301, V302, V303, V304, V305	INSUFFICIENT RASTER HEIGHT (15) Height control V401, V402 Vert. Out. Trans. Check 0.1 mF cap. connected to pin 6 of V402 Low line voltage	NOISY SOUND - PIX OK V201, V202, V203, V204 Volume control Check for loose connections in sound system Speaker
NO RASTER - SOUND OK (31) HV Fuse (M401) V404, V405, V406, V408, V407, V308 Ion trap Check 300 mF cap. connected to pin 2 of V404 and 4 of V405 HV trans., Hor. yoke, CRT connections	ENGRAVED EFFECT IN PIX (33) Tuner line tuning V304, V305	NO VERT. DEFL. (14) V401, V402 Check 0.1 mF cap. connected to pin 2 of V402 Vert. Defl. yoke Vert. Out. Trans.	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning Pix control V201, V202 Check 500 mF connected to pin 2 of V201 Sound IF and Det. alignment L201, T201
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V304, V305 V101, V102, V301, V302, V303, V304, V305 Pix control Open peaking coil	PIX BENDING (22) Hor. Lock and Hold controls V404, V405 Check 0.047 mF cap. connected to pin 1 of V405	NO VERT. SYNC. - HOR. SYNC. OK (16,17) Defective Int. Network Vert. Hold control	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204, V304 Poor connections in sound system
POOR HOR. LIN. Hor. Lin. and Drive controls V404, V405 Hor. Out. Trans. Check 0.02 and 0.047 mF cap. connected to Hor. Lin. coil	WEAK OR NO PIX - SOUND WEAK - RASTER OK Tuner fine tuning V101, V102, V301, V302, V303, V304 RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19,20) Hor. Lock and Hold controls V401, V404, V405 Check 12K res. connected to pin 5 and 7 of V404	
POOR VERT. LIN. (11,12) Vert. Lin. and Height controls V404, V405 Vert. Out. Trans. Check 0.047 mF cap. connected to pin 6 of V402	INTERMITTENT RASTER - SOUND OK V305, V404, V405, V406, V407, V408 Brightness control HV trans.	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204	
PIX JITTER SIDEWAYS Hor. Lock and Hold controls V401, V404, V405, V406	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive control V305, V406, V407 Brightness control Low line voltage	DISTORTED SOUND (8D) Tuner fine tuning V201, V202, V203, V204 Sound and Vid. IF alignment L201 Det. alignment T-201	
PIX JITTER UP AND DOWN (16,17) V401, V402 Vert. Hold control Vert. Out. Trans.	EXCESSIVE RASTER (PIX SIZE) (9,10) Height and Width controls V406, V407 Hor. Drive control V306, V406, V407 Hor. Drive control Check 470K series res. in sec. anode lead	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Volume control Speaker (open voice coil or defective check coil) Sound and Vid. IF alignment L201 Det. alignment T201	
WEAK PIX DETAIL (35) Focus control V304, V305 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V405, V406, V501 Hor. Out. Trans. Check 470 mF cap. connected to pin 5 of V405 Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204 Volume control Sound and Vid. IF alignment L201 Det. alignment T201	
SOUND BARS IN PIX (4A, 4E) V102 Check L201 for alignment IF and RF alignment			

TUBE LIST

Symbol	Type	Circuit Function
V101	6AG5	RF Amp.
V102	6BC6	Osc. and Mixer
V201	6AU6	Sound IF
V202	6AL5	Rad. Det.
V203	6X4	Rect. Amp.
V301	6V6GT	Sound Out.
V302	6AU6	1st IF
V303	6AU6	2nd IF
V304	6AG5	3rd IF
V305	6AU6	AGC (gated type)
V306	6AC7	Rect. Amp.
V401A	6SN7GT	Picture Tube
V401B	6SN7GT	Vert. Osc.
V402	6S4	Sync. Inverter
V403	12AU7	Vert. Out.
V404	6AL5	Sync. Sep. and Clip
V405	6X4	Sync. Disc.
V406	6SN7GT	Hor. Osc.
V407	183GT	Hor. Out.
V408	6W4GT	2nd Anode Rect.
V501	5U4G	Damper Rect.

KEY VOLTAGES

B+, plate of damper, V408 pin 5 285vdc
 B- of damper, V408 pin 3 40vdc
 Plate of rect. of damper, V501 pin 2 375vdc*
 Plate of Vert. Out., V402 pin 9 300vdc
 Plates of Hor. Osc., V405 pin 2 300vdc
 Grid of Hor. Out., V406 pin 5 180vdc
 Grid of Hor. Out., V406 pin 5 -30vdc

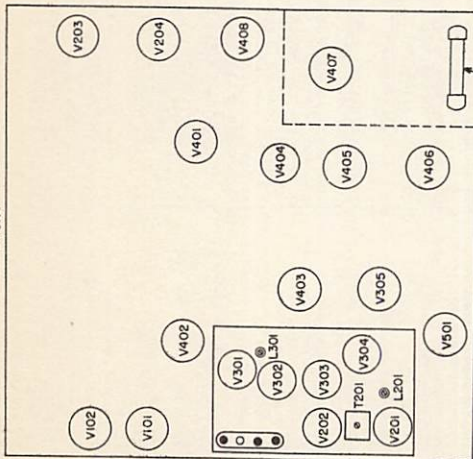
*Voltage varies with control settings.

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

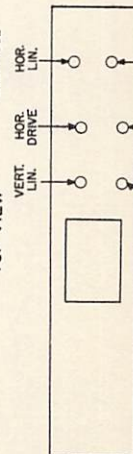
ADJUSTMENTS

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

FRONT

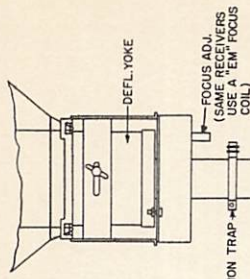


TOP VIEW

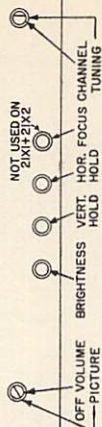


REAR CONTROLS

HOR. LOCK
 VERT. LIN.
 HOR. DRIVE
 HOR. LIN.
 WIDTH
 HEIGHT



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V501	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V301, V302, V303 Check L308 for alignment IF and RF alignment	RASTER BLOOMING (37) V306, V406, V407 Hor. Drive control Check F0K3D second anode series. res. Check HV Filter cap.	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204, V304 Volume control Speaker for voice cdl or defective connection Sound and Vid. IF alignment L201, L308 Det. alignment T201
NO RASTER - SOUND OK (31) HV Fuse (M401) M301 (IN64 crystal Vid. Det.) Check 330 mfd cap. connected to pin 5 of V405	SNOW IN PIX (32) V101, V102, V301, V302, V303, V304 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V101, V102, V301, V302, V303, V304, V305	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V405, V406, V501 Check 680 and 330 mfd caps. connected to pin 5 of V405 Hor. Drive control Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204, V304 Volume control Sound and Vid. IF alignment L201, L308 Det. alignment T201
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V101, V102, V301, V302, V303, V304, V305 M301 (IN64 crystal Vid. Det.) Pix control	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Pix control V304, V305, V306 Check 0.047 mfd cap. connected to pin 6 of V402 Check Vid. Det. and Amp. peaking coils	INSUFFICIENT RASTER HEIGHT (15) Height control V401, V402 Check 0.047 mfd cap. connected to pin 6 of V402 Vert. Out. Trans. Low line voltage	NOISY SOUND - PIX OK V201, V202, V203, V204, V304 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment L201, L308, T201
POOR HOR. LIN. Hor. Lin. and Drive controls V404, V405, V408 Check 0.02, 0.25 and 0.047 mfd caps. connected to Hor. Lin. control	VERT. BARS (21) Hor. Drive control Check Hor. Damping network connected to pins 1 and 2 in yoke Defl. yoke ringing	NO VERT. DEFL. (14) V401, V402 Check 0.047 mfd cap. connected to pin 6 of V402 Vert. Defl. yoke Vert. Out. Trans.	SYNC. BUZZ IN SOUND (8E) Pix control Tuner fine tuning V201, V202, V304 Check 6.8 mfd cap. connected to L201 Check Vid. Det. crystal M301 (IN64) Sound IF and Det. alignment L201, L308, T201
POOR VERT. LIN. (11, 12) Height control V401, V402 Vert. Out. Trans. Check 0.1 and 0.047 mfd caps. connected to pin 6 of V402	PIX BENDING (22) Hor. Lock control V404, V405 Check 0.047 mfd cap. connected to pin 1 of V405	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V304, V401, V405 Check 0.047 mfd cap. connected to pin 1 of V405 yellow lead of Vert. Osc. Trans.	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204, V304 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold control Hor. Lock control V401, V404, V405 Check 0.01 mfd cap. and 12K27 res. connected to pins 5 and 7 of V404	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V101, V102, V301, V302, V303, V304 Check Vid. Det. crystal M301 (IN64) Check Vid. Det. peaking coils RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Lock control V401, V404, V405 Check 0.01 mfd cap. and 12K27 res. connected to pins 5 and 7 of V404 Check 330 mfd cap. connected to pins 2 and 4 of V405	
PIX JITTER UP AND DOWN (16, 17) V401, V402 Vert. Hold control Check 0.0047 mfd cap. connected to pin 6 of V402 yellow lead of Vert. Osc. Trans.	INTERMITTENT RASTER - SOUND OK V401, V404, V405, V406, V407, V408 Brightness control HV Trans.	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204 DISTORTED SOUND (8D) Tuner fine tuning V202, V203, V204, V304 Tone control Sound and Vid. IF alignment L201, L308 Det. alignment T201	
SMEARED PIX (36) Tuner fine tuning Pix control V305, V304, M301 (IN64 crystal Vid. Det.) Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive control V306, V406, V407, V501 Brightness control Low line voltage		
POOR PIX DETAIL (35) Tuner fine tuning Focus control V301, V302, V303, V404, V305, V306 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and Width controls Ion trap V406, V407 Check Screen Grid resistors connected to pin 8 of V406		

TUBE LIST

Symbol	Type	Circuit Function
V101	6BK7 or 6BE7**	RF Amp.
V102	6AU6	Osc. and Mixer
V201	6AU6	Sound IF
V202	6AL5	Rat. Det.
V203	6AV6	(AM Det., AVC Sound Amp.
V204	6V6GT	1st AF
V301	6CB6	2nd IF
V302	6AG5	3rd IF
V303	12AU7	{Vid. Det. 1st Sound IF
V304	6AC7	Vid. Amp.
V305	6AU6	Picture Tube
V401A	6SN7GT	{Vert. Osc. Sync. Inv.
V402	6SA	Vert. Out.
V403	12AU7	Sync. Sep. & Clipper
V404	6AL5	Sync. Disc.
V405	6SN7GT	Hor. Osc.
V406	6X4	Rect.
V407	13SG7	2nd Anode Rect.
V408	6W4GT	Damper
V501	5U4G	Rect.
V701	6BE6	Converter (AM Radio)
V702	6BA6	IF Amp. (AM Radio)

*21EP4A in 22Y1 chassis, 20DP4 or 20CP4 in 22A2, 22A2A and 22M1 chassis.

**Tubes not directly interchangeable.

KEY VOLTAGES

B+, plate of damper, V408 pin 5 265vdc
 B1, cath. of damper, V408 pin 6 150vdc
 Plate of V401, V402 pin 2 375vdc**
 Plate of Vert. Out., V402 pin 9 300vdc
 Plates of Hor. Osc., V405 pin 2 180vdc
 Grid of Hor. Out., V406 pin 5 -30vdc

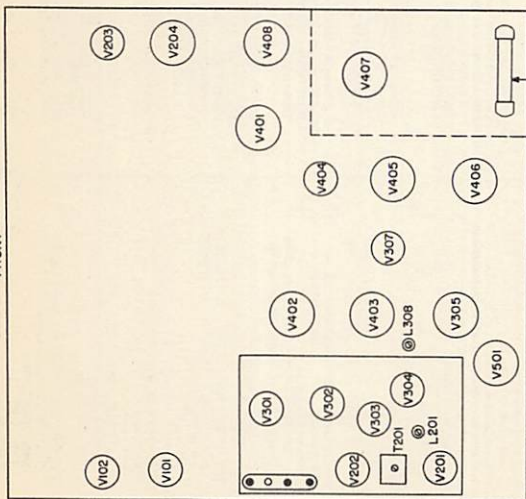
*Voltage varies with control settings.

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

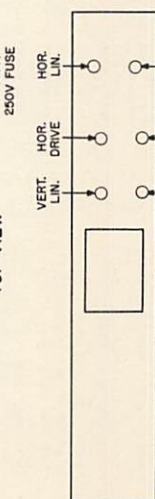
ADJUSTMENTS

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

FRONT



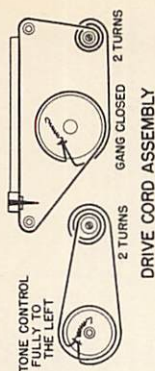
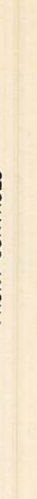
TOP VIEW



REAR CONTROLS



FRONT CONTROLS



- NO RASTER - NO SOUND (31)**
Power input circuit
V501
Check Fuse (M401)
NO RASTER - SOUND OK (31)
Brightnes control
HV Fuse (M401)
Ion trap
V306, V404, V405, V406, V407, V408
HV trans., Hor. yoke, CRT connections
Check 330 mmf caps. connected to pin 5 of V405
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Pix control
V101, V102, V301, V302, V303, V304, V305, V307
- POOR HOR. LIN.**
Hor. Lin. and Hor. Drive controls
V404, V405, V406, V408
Check 0.25, 0.02 and 0.047 mf caps. connected to Hor. Lin. coil
- POOR VERT. LIN. (11, 12)**
V401, V402
Check 0.1 and 0.047 mf caps. connected to pin 6 of V402
Vert. Out. Trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Lock controls
V307, V401, V404, V405
Check 0.01 mf and 125K res. connected to pins 5 and 7 of V304
- PIX JITTER UP AND DOWN (16, 17)**
Vert. Hold control
V401, V402
- SMEARED PIX (36)**
Picture control
V301, V302, V303, V304, V305, V307
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Picture fine tuning
Focus control
V304, V305, V307
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V102, V301, V302, V303
Check alignment of L208
IF and RF alignment
- NO RASTER - NO SOUND (31)**
Power input circuit
V501
Check Fuse (M401)
NO RASTER - SOUND OK (31)
Brightnes control
HV Fuse (M401)
Ion trap
V306, V404, V405, V406, V407, V408
HV trans., Hor. yoke, CRT connections
Check 330 mmf caps. connected to pin 5 of V405
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Pix control
V101, V102, V301, V302, V303, V304, V305, V307
- POOR HOR. LIN.**
Hor. Lin. and Hor. Drive controls
V404, V405, V406, V408
Check 0.25, 0.02 and 0.047 mf caps. connected to Hor. Lin. coil
- POOR VERT. LIN. (11, 12)**
V401, V402
Check 0.1 and 0.047 mf caps. connected to pin 6 of V402
Vert. Out. Trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Lock controls
V307, V401, V404, V405
Check 0.01 mf and 125K res. connected to pins 5 and 7 of V304
- PIX JITTER UP AND DOWN (16, 17)**
Vert. Hold control
V401, V402
- SMEARED PIX (36)**
Picture control
V301, V302, V303, V304, V305, V307
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Picture fine tuning
Focus control
V304, V305, V307
Check Vid. Det. and Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V102, V301, V302, V303
Check alignment of L208
IF and RF alignment
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive control
V101, V102, V301, V302, V303
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V101, V102, V301, V302, V303, V305, V307
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Pix control
V101, V102, V301, V302, V303, V305, V307
Check Vid. Amp. peaking coils connected to pin 3 of V305
- VERT. BARS (21)**
V401, V402, V408
Hor. Drive control
Check 47 mmf cap. and 1K res. connected to terminals 1 and 2 of defl. yoke
Defl. yoke ringing
PIX BENDING (22)
V403, V404, V405
Hor. Hold and Lock controls
Check 0.047 and 0.005 mf caps. connected to pin 1 of V405
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Pix control
V101, V102, V301, V302, V303, V304
Hor. and IF alignment
INTERMITTENT RASTER - SOUND OK
V306, V404, V405, V406, V407, V408
Brightnes control
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive control
Brightness control
V306, V406, V407, V501
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Height and Width controls
Hor. Drive control
V406, V407
- RASTER BLOOMING (37)**
Ion trap
Hor. Drive control
Check 4705K series res. in sec. anode lead
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Lock control
V404, V405, V406
Check 330 mmf cap. connected to pins 2 and 4 of V405
- AUDIO HUM IN SOUND (8E)**
V201, V202, V203, V204
- DISTORTED SOUND (8D)**
Tuner fine tuning
V202, V203, V204
Sound and Vid. IF alignment L201, L308
Det. alignment T201
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V201, V202, V203, V204
Volume control
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L201, L308
Det. alignment T201
- INSUFFICIENT RASTER HEIGHT (15)**
Height and Vid. Lin. controls
V201, V202, V203, V204
Check 0.1 mf cap. connected to pin 6 of V402
Vert. Out. Trans.
Low line voltage
- NO VERT. DEF. (14)**
V401, V402
Check 0.047 mf cap. connected to pin 6 of V402
Vert. Defl. yoke
Vert. Out. Trans. and Vert. Osc. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold control
V401, V402
Check Vert. Int. network
Check 0.0047 mf cap. connected to yellow lead of the Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V307, V401, V403
Check 0.02 mf cap. connected to pins 1 and 7 of V403
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Lock control
V404, V405, V406
Check 330 mmf cap. connected to pins 2 and 4 of V405
- AUDIO HUM IN SOUND (8E)**
V201, V202, V203, V204
- DISTORTED SOUND (8D)**
Tuner fine tuning
V202, V203, V204
Sound and Vid. IF alignment L201, L308
Det. alignment T201
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V201, V202, V203, V204
Volume control
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L201, L308
Det. alignment T201
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V201, V202, V203, V204, V304
Volume control
Sound and Vid. IF alignment L201, L308
Det. alignment T201
- NOISY SOUND - PIX OK**
V201, V202, V203, V204, V304
Volume control
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L201, L308
and T201
- SYNC. BUZZ IN SOUND (8E)**
Tuner fine tuning
V201, V202, V304
Pix control
Check 6.8 mmf cap. connected to pin 7 of V402
Check 500 mmf cap. connected to pin 2 of V202
Sound IF and Det. alignment L201, L308, and T201
- INTERMITTENT SOUND - PIX OK**
V201, V202, V203, V204, V304
Foot connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V101	6AC5, 6BC5, 6CB6, *6BQ7, or 6B6	RF Amp. Osc. and Mixer Sound IF Video Amp. Rat. Det. *6AV6 or 6SQ7
V102	6V8GT	Sound Amp. Sound Out.
V201	6AU6	1st IF
V202	*6AU6, 6AC5, or 6BC5	2nd IF
V203	*6AU6, 6AC5, 6BC5, or *6B5	3rd IF *6B5, or 6AC5, or AGC (grid type)
V304	6AC7	Video Amp. Picture Tube
V305	6SN7GT	Vert. Osc. *6A15
V401A	6B4	Vert. Out.
V401B	*12AU7 or 6SN7GT	Sync. Inv. *12AU7 or Sync. Sep. & Clipper
V402	6H6, or 12H6	Synd. Discrim.
V403	6SN7GT	Hor. Osc.
V404	6B4GT	Hor. Out.
V405	6B4GT	2-Phase Rect.
V406	6W4GT	Damper
V501	5U4G	Rect.
V701	6BE6	Converter (AM Radio)
V702	6BA6	IF Amp. (AM Radio)

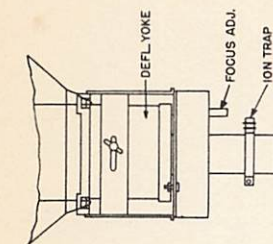
KEY VOLTAGES

B+, plate of damper, V406 pin 5 285vdc
 B-, cathode of damper, V406 pin 3 130vdc
 Plate of Vert. Osc., V401 pin 2 375vdc*
 Plate of Hor. Osc., V405 pin 2 300vdc
 Grid of Hor. Out., V405 pin 5 185vdc
 *Voltage varies with control settings.

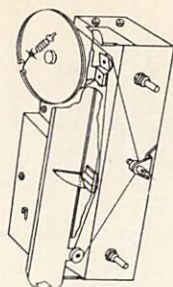
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

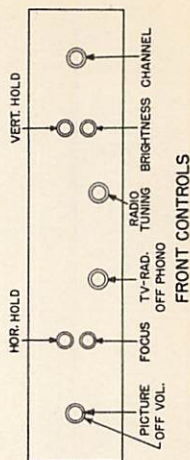
For the horizontal oscillator adjustment, see HOR. OSC. ADJ-1. For the tuner oscillator adjustment, see TUNER OSC. ADJ-2.



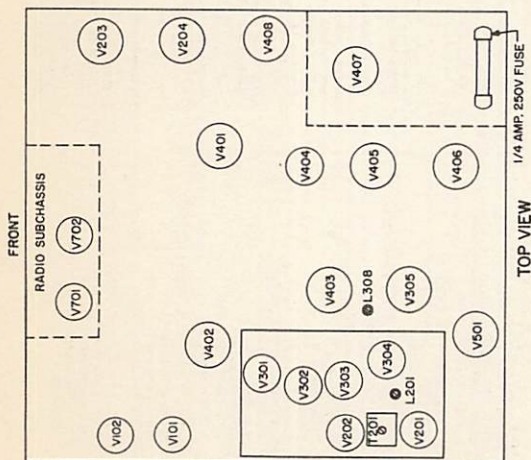
PICTURE TUBE ADJUSTMENTS



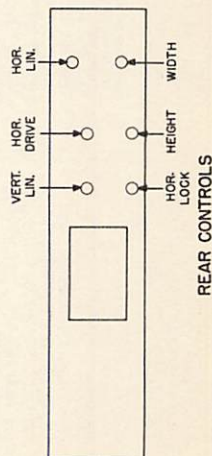
DRIVE CORD ASSEMBLY



FRONT CONTROLS



TOP VIEW



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V501	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204, V304 Volume control Speaker (check voice coil or defective connection) Sound and Vid. IF alignment L201, L308 Det. alignment T201
NO RASTER - SOUND OK (31) Brightness control HV Fuse (M401) Ion trap V306, V405, V406, V407, V408 HV trans., Hor. yoke, CRT connections Check 330 and 680 mfd caps. connected to pin 9 of V405	WEAK SOUND - PIX OK (8C) Tuner fine tuning V201, V202, V203, V204, V304 Volume control Sound and Vid. IF alignment L201, L308 Det. alignment T201
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Pix control V101, V102, V301, V302, V303, V304 Check Vid. Det. crystal (1N64) Check Vid. Det. crystal (1N64)	NOISY SOUND - PIX OK V201, V202, V203, V204, V304 Volume and Tone controls Check for loose connections in sound system Speaker
POOR HOR. LIN. Hor. Lin. and Drive controls V404, V405, V408 Check 0.25; 0.02 and 0.047 mf caps. connected to Hor. Lin. coil V401, V402	SYNC BUZZ IN SOUND (8E) Tuner fine tuning Pix control V201, V202 Check Vid. Det. crystal (1N64) Check 0.01 mf and 12KΩ res. connected to pins 5 and 7 of V404
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V401, V402 Check 0.1 and 0.047 mf caps. connected to pin 6 of V402 Vert. Out. Trans.	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204, V304 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold and Lock controls V304, V401, V404, V405 Check 0.01 mf and 12KΩ res. connected to pins 5 and 7 of V404	
PIX JITTER UP AND DOWN (16, 17) Vert. Hold control V401, V402 Vert. Out. Trans.	
SMEARED PIX (36) Tuner fine tuning Pix control V301, V302, V303, V304, V305 Check Vid. Det. crystal (1N64) Check Vid. Det. and Amp. peaking coils IF and RF alignment	
POOR PIX DETAIL (35) Tuner fine tuning Focus control V304, V305 Check Vid. Det. crystal (1N64) Hor. Lin. and Drive controls IF and RF alignment	
NO RASTER - NO SOUND (31) Power input circuit V501	HAIRY BLOOMING (37) Hor. Drive control V306, V406, V407 Check 470KΩ series res. in sec. anode lead
NO RASTER - SOUND OK (31) Brightness control HV Fuse (M401) Ion trap V306, V405, V406, V407, V408 HV trans., Hor. yoke, CRT connections Check 330 and 680 mfd caps. connected to pin 9 of V405	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width control V406, V405, V501 Check 330 and 680 mfd caps. connected to pin 9 of V405 Low line voltage
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Pix control V101, V102, V301, V302, V303, V304 Check Vid. Det. crystal (1N64) Check Vid. Det. crystal (1N64)	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. controls V401, V402 Check 0.1 mf cap. connected to pin 6 of V401 Vert. Out. Trans. Low line voltage
POOR HOR. LIN. Hor. Lin. and Drive controls V404, V405, V408 Check 0.25; 0.02 and 0.047 mf caps. connected to Hor. Lin. coil V401, V402	NO VERT. DEFL. (14) V401, V402 Check 0.047 mf cap. connected to pin 6 of V402 Vert. Defl. yoke Vert. Out. Trans.
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V401, V402 Check 0.1 and 0.047 mf caps. connected to pin 6 of V402 Vert. Out. Trans.	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold control V401, V402 Check Vid. Det. network Check 0.0047 mf cap. connected to yellow lead of Vert. Osc. trans.
PIX JITTER SIDEWAYS Hor. Hold and Lock controls V304, V401, V404, V405 Check 0.01 mf and 12KΩ res. connected to pins 5 and 7 of V404	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V401, V402, V403 Check 0.02 mf cap. connected to pins 1 and 7 of V403
PIX JITTER UP AND DOWN (16, 17) Vert. Hold control V401, V402 Vert. Out. Trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock controls V401, V405, V406 Check 330 and 680 mfd caps. connected to pins 2 and 4 of V405
SMEARED PIX (36) Tuner fine tuning Pix control V301, V302, V303, V304, V305 Check Vid. Det. crystal (1N64) Check Vid. Det. and Amp. peaking coils IF and RF alignment	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204
POOR PIX DETAIL (35) Tuner fine tuning Focus control V304, V305 Check Vid. Det. crystal (1N64) Hor. Lin. and Drive controls IF and RF alignment	DISTORTED SOUND (8D) Tuner fine tuning V202, V303, V204 Tone control Sound and Vid. IF alignment L201, L308 Det. alignment T201

TUBE LIST

Symbol	Type	Circuit Function
V101	6BZ7 or 6BC5	RF Amp.
V102	6AB6	Osc. and Mix.
V201	6AV6	Ratio Det., AVC, AM Det., AVC, and/or Sound Amp.
V202	6AL5	Sound Out.
V203	6CB6	1st IF Amp.
V204	6CB6	2nd IF Amp.
V301	6CB6	3rd IF Amp.
V302	6CB6	Vert. Osc.
V303	6AL5	Vid. Det., AGC
V304	6CB6	Vid. Amp.
V305	6CB6	Picture Tube
V401	12AU7	Sync. Sec., Sync. Clip.
V402	6B4	Vert. Out.
V403	6SN7GT	Hor. Osc. and Control
V404	6BQ6GT	Hor. Out.
V405	1B3GT	HV Rect.
V406	6AX4GT	Damper
V407	6X4GT	Rect.
V701	6BE6	1st AF Osc.
V702	6BE6	2nd AF Osc. (AM Radio)
V703	6BA6	IF Amp. (AM Radio)

KEY VOLTAGES

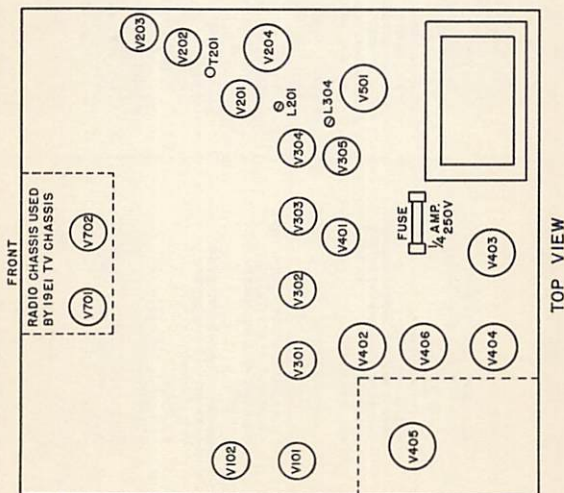
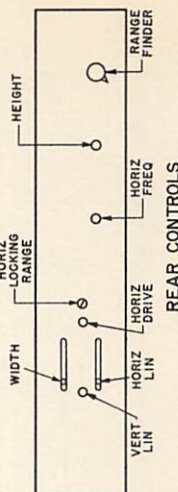
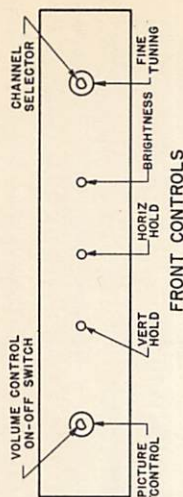
B+, Plate of damper, V406 pin 3 200dc
 Booted B+, cath. of damper, V406 pin 5 470dc
 Plate of Vert. Out., V403 pin 1 470dc
 Plate of V403 pin 9 440dc
 Plate of Hor. Osc. and Cont., V403 pin 5 180dc
 Grid of Hor. Out., V404 pin 5 200dc
 Grid of Hor. Out., V404 pin 5 -24dc

*Voltage varies with control settings.

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

ADJUSTMENTS

For the horizontal oscillator adjustment, see
 OSCILLATOR ADJUSTMENT.
 For the vertical oscillator
 adjustment, see TUNER OSC. ADJ-2.



TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, or 6BC5	1st Vid. IF Amp.
V2	6CH6	2nd Vid. IF Amp.
V3	6CH6	3rd Vid. IF Amp.
V4	6CH6	Vid. Amp.
V5	150P4, 160P4, 17BP4, 19DP4, 19DP4, 20GP4, or 20BP4	Picture Tube
V6	25L6	AF Out. Amp.
V7	6BN6	Gated Beam Disc.
V8	12AU7	Sync. Clip. and Split. and D. Phase Det.
V9	6AL5	Vert. Osc.
V10	12AU7	Vert. Out. Amp.
V11	25L6	Hor. Sweep Osc.
V12	6SN7	Hor. Sweep Out. Amp.
V13	25BQ6	H. V. Rect.
V14	1B3G	Hor. D. Phase Det.
V15	6XW 4	RF Amp.
V16	6XW 4	Osc. Mixer
V17	SR300	Selen. Rect. 300 ma
1N64	1N64	Crystal Vid. Det.

KEY VOLTAGES

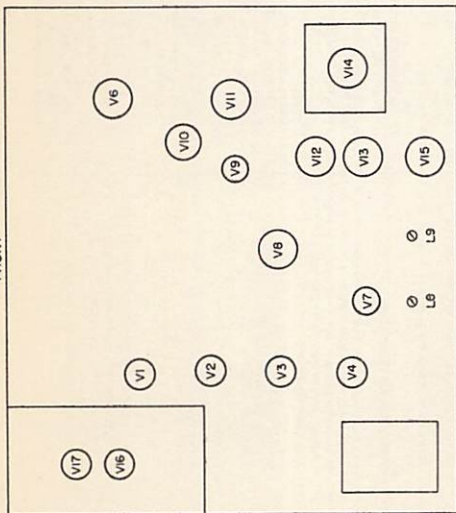
B+, plate of damper, V15 pin 5 240dc
 Bored, cath. of damper, V15 pin 6 240dc
 Plate of V1, V11 pin 6 80dc
 Plate of Vert. Osc., V11 pin 3 220dc
 Plates of Hor. Osc., V12 pin 2 300dc
 pin 5 150dc
 Grid of Hor. Out., V13 pin 3 -35dc

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

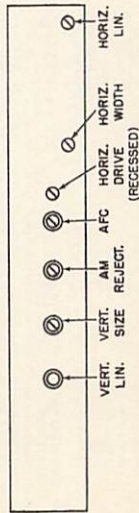
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. For tuner oscillator adjustment, see TUNER OSC. ADJ.-4.

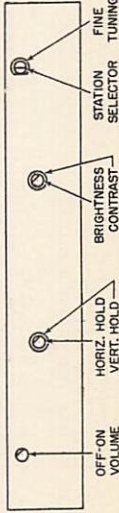
FRONT



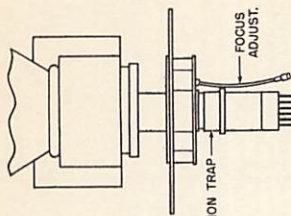
TOP VIEW



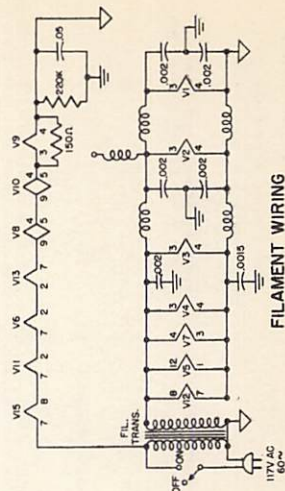
REAR CONTROLS



FRONT CONTROLS



PICTURE TUBE ADJUSTMENTS



FILAMENT WIRING

NO RASTER - NO SOUND* (31)
Power input circuit
FE-4 (1.5 Amps, Slow Blo Fuse)
Selenium Rectifiers

NO RASTER - SOUND OK* (31)
V5, V6, V7, V12, V15, V14, V15
Ion trap
Brightness control
HV trans., Hor. yoke, CRT connections

WEAK PIX - SOUND AND RASTER OK* (34)
V1, V2, V3, V4, V6, V17
Vid. Det. crystal (IN64)
Contrast control

POOR HOR. LIN.*
V12, V13, V14
Check the 4.3K res. connected to pin 4 of V13
Check the 2-0.03 mf caps. connected to Hor. Lin. control

POOR VERT. LIN.* (11,12)
V10, V11
Check 0.05 mf cap. connected to pin 5 of V11
Vert. Out. Trans.

PIX JITTER SIDEWAYS*
Automatic Freq. and Hold controls
V8, V9, V12
Check 0.01 mf cap. and 27K res. connected to pins 1 and 2 of V9

PIX JITTER UP AND DOWN (16,17)
V8, V10, V11
Vert. Hold control
Vert. Out. Trans.
Check 4700 mmf cap. connected to pin 3 of V11

SMEARED PIX* (36)
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V6, V17
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL* (35)
V4, V17
Vid. Det. crystal (IN64)
Check 0.01 mf cap. connected lead going to pin 11 of V5 (CRT)
IF and RF alignment

SOUND BARS IN PIX* (4A, 4E)
V4, V7
Contrast control
AM-Rejection control
Check alignment of L-6 and L-2
IF and RF alignment

SNOW IN PIX* (32)
V1, V2, V3, V4, V16, V17
Antenna and transmission line

AC IN PIX (DARK HOR. BAR)* (38)
V1, V2, V3, V4, V16, V17
ENGRAVED EFFECT IN PIX* (33)
V17
Tuner fine tuning

CONTRAST CONTROL
Vid. Det. crystal (IN64)
Check Vid. Det. and Amp. peaking coils

VERT. BARS* (21)
Hor. Drive control
V13, V15
Hor. Out. Trans.
Defl. yoke ringing

PIX BENDING* (22)
Automatic Freq. and Hold controls
V9, V12, V13
Check 0.05 and 0.005 mf caps. connected to pin 1 of V12

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
Tuner fine tuning
V1, V2, V3, V4, V16, V17
Contrast control
Vid. Det. crystal (IN64)
RF and IF alignment

INTERMITTENT RASTER - SOUND OK*
Brightness control
V5, V6, V9, V12, V13, V14, V15
HV trans.

INSUFFICIENT BRIGHTNESS*
Ion trap
V5, V6, V13, V14
Hor. Drive and Brightness control
Low line voltage

EXCESSIVE RASTER (PIX SIZE)* (9, 10)
Width control
V13, V14
Check 6.2K res. connected to pin 4 of V13

RASTER BLOOMING* (37)

Check 600K res. in series with sec. anode lead

Hor. Drive control

INSUFFICIENT RASTER WIDTH* (23)

Hor. Drive control

Check 620 mmf cap. connected to pin 5 of V12

Check 270K res. connected to pin 5 of V12

Low line voltage

Check Selenium Rectifiers

INSUFFICIENT RASTER HEIGHT (15)

Vert. Size control

V10, V11

Check the 0.05 mf cap. connected to pin 5 of V11

Check 4700 mmf cap. connected to pin 3 of V11

Low line voltage

NO VERT. DEFL.* (14)

V10, V11

Check coil coupling caps. in Vert. Osc. circuit

Vert. Out. Trans.

Vert. Defl. yoke

Vert. Out. Trans.

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

V6, V10, V11

Check 270K res. connected to pin 2 of V11

Check 0.005 mf cap. connected to terminal 2 of Vert. Int. Coupler

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

Contrast control

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

Automatic Freq. and Hold controls

V9, V12, V13

Check 330 mmf cap. connected to pins 2 and 4 of V12

AUDIO HUM IN SOUND* (8E)

V4, V6, V7

DEFORMED SOUND* (8D)

Vid. Det. crystal (IN64)

Contrast and AM Rejection controls

V4, V6, V7, V17

Sound and Vid. IF alignment L2, L6

Det. alignment L9

NO SOUND - PIX OK* (89)

Tuner fine tuning

Automatic Freq. and Hold controls

V6, V7, V17

Speaker (open voice coil or defective connection)

Sound and Vid. IF alignment L2, L6

Det. alignment L9

WEAK SOUND - PIX OK* (8C)

Tuner fine tuning

AM Rejection and Volume controls

V6, V7, V17

Vid. Det. crystal (IN64)

Sound and Vid. IF alignment L2, L6

Det. alignment L9

NOISY SOUND - PIX OK*

AM-Rejection and Volume controls

V6, V7, V17

Check for loose connections in sound system

Speaker

Sound IF and Det. alignment L2, L6, L9

SYNC. BUZZ IN SOUND* (8E)

Tuner fine tuning

V4, V7

Contrast and AM-Rejection controls

Sound IF and Det. alignment L2, L6, L9

INTERMITTENT SOUND - PIX OK*

Volume control

V6, V7

Poor connections in sound system

*The filaments of tubes V8, V9, V10, V11, V13 and V15 are series connected. When any of these filaments open, all other tubes will also become in operation.

TUBE LIST

Symbol	Type	Circuit Function
V1	6AC5	AF Amp.
V2	6Y8	Rat. Det.
V3	6AU6	Rat. Det. Driver
V4	6AU6	1st Vid. IF Amp.
V5	6AU6	2nd Vid. IF Amp.
V6	6AU6	3rd Vid. IF Amp.
V7	6AC5	1st AF Amp. and AGC
V8	6AC5	Vid. Amp.
V9	12AU7	DC Rest., Sync. Clip., Sync. Amp.
V10	10BP4, or 12LP4	Kinescope tube
V11	6AL5	Hor. Base Det.
V12	6X4	Vert. Base Det.
V13	6SN7	Vert. Sweep. Osc. and Vert. Sweep Out.
V14	6SN7	Hor. Sweep. Osc.
V15	6BG6G	Hor. Sweep Out.
V16	1B3/8016	H. V. Rect.
V17	5Y4	Hor. Damp.

Tubes in R-F Tuner not included.

KEY VOLTAGES

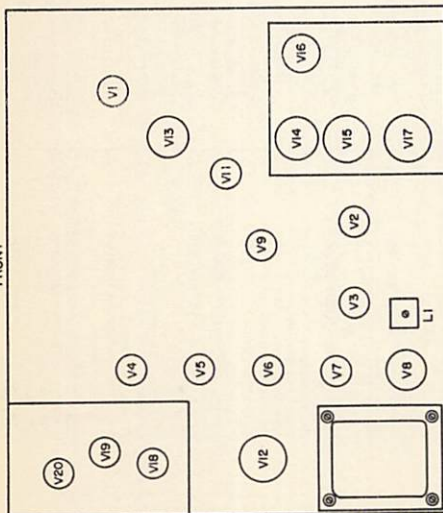
B+, plate of damper, V17 pin 5	340vdc
Boosted B-, cath. of damper, V17 pin 3	410vdc
Plate of Vert. Osc., V13 pin 2	100vdc
Plate of Vert. Osc., V13 pin 5	250vdc
Plate of Hor. Osc., V14 pin 2	245vdc
Grid of Hor. Osc., V14 pin 5	100vdc
Grid of Hor. Out., V15 pin 5	-10vdc

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

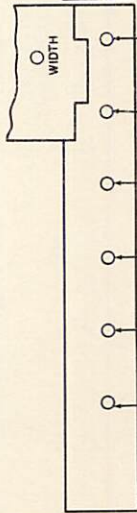
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. For tuner oscillator adjustment, see TUNER OSC. ADJ.-4.

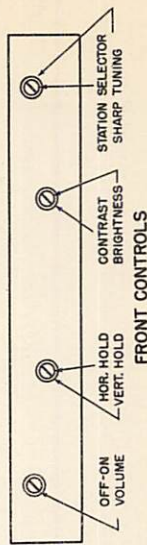
FRONT



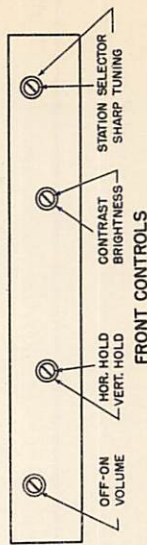
TOP VIEW



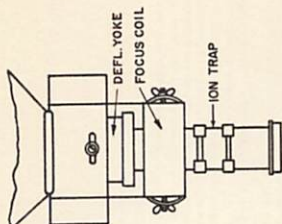
REAR CONTROLS



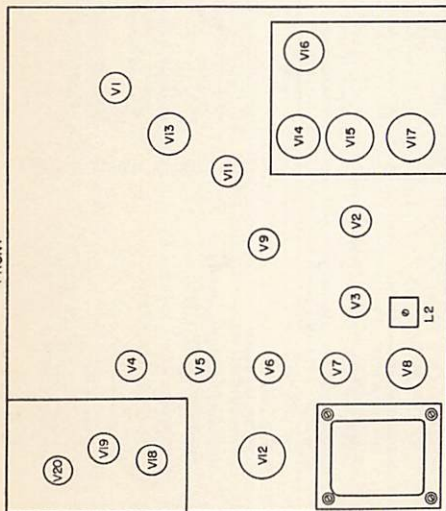
FRONT CONTROLS



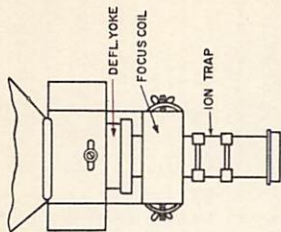
PICTURE TUBE ADJUSTMENTS



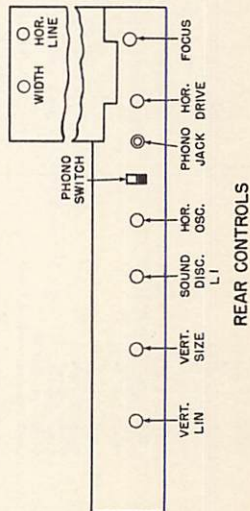
FRONT



PICTURE TUBE ADJUSTMENTS



TOP VIEW



REAR CONTROLS

FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AQ5	AF. Amp.
V2	6X8	Rat. Det.
V3	6AU6	Rat. Det. Driver
V4	6AU6	1st Vid. IF Amp.
V5	6AU6	2nd Vid. IF Amp.
V6	6AU6	3rd Vid. IF Amp.
V7	6AL5	Vid. Det. & AGC
V8	6X4	Rect. & Sync.
V9	12AU7	DC Filter & Sync. Amp.
V10	10BP4 or 12LP4	Pls. Tube
V11	6AL5	Hor. Phase Det.
V12	5Y4	Power Rect. & Vert. Sweep Osc.
V13	6SN7	Vert. Sweep Out.
V14	6SN7	Hor. Sweep Osc.
V15	6BQ6	Hor. Sweep Out.
V16	1B3/8016	HV Rect.
V17	6X4	Rect. & Sync.
V18	6BH6	RF Amp.
V19	6AG5	Mixer
V20	6J8	Osc.

KEY VOLTAGES

B+, plate of damper, V17 pin 5	340vac
Boosted B+, cath. of damper, V17 pin 3	480vac
Plate of Vert. Osc., V13 pin 2	120vac
Plate of Vert. Out., V13 pin 5	420vac
Plates of Hor. Osc., V14 pin 2	300vac
Grid of Hor. Out., V15 pin 5	140vac
	-17vac

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

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. For tuner oscillator adjustments, see TUNER OSC. ADJ.-4.

NO RASTER - NO SOUND (31) Power input circuit V12 Check B - Filter network TV-Photo Switch NO RASTER - SOUND OK (31) Brightness control HV-Fuse (3/8 Amp) Ion trap V10, V11, V14, V15, V16, V17 HV trans., Hor. yoke, CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V20 Check 0.1 mf cap. connected to green lead (pin 2) of CRT (V10) POOR HOR. LIN. Hor. Drive and Lin. controls V15, V17 Check 0.1 and 0.25 mf caps. connected to Hor. Lin. control Hor. Out. Trans. POOR VERT. LIN. (11, 12) V13 Check 0.25 and 0.1 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Out. Trans. PIX JITTER SIDEWAYS Hor. Hold control A. F. C. coil adj. V11, V14, V15 Check 0.01 mf cap. and 27KΩ res. connected to pins 1 and 2 of V11 PIX JITTER UP AND DOWN (16, 17) Vert. Hold control Contrast control V9, V13 Check 0.05 mf cap. connected to pin 1 of V13 SMARED PIX (36) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V20 Check V14, V15, and Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus control V4, V5, V6, V7, V8 Check V14, V15, and Amp. peaking coils IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V4, V5, V6, V7, V8, V20 Contrast control Check alignment of L2 IF and RF alignment SNOW IN PIX (32) V4, V5, V6, V18, V19, V20 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (39) V4, V5, V6, V7, V8, V18, V19, V20 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V20 Check Vid. Det. and Amp. peaking coils VERT. BARS (21) Hor. Drive control V15, V17 Check 56 mf cap. connected to defl. yoke Defl. yoke flanging PIX BENDING (22) Hor. Hold control A. F. C. coil adj. Check 0.05 and 0.005 mf caps. connected to pin 1 of V14 WEAK OR NO PIX - SOUND WEAK - RASTER OK Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V18, V19, V20 RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightness control V10, V11, V14, V15, V16, V17 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V12, V15, V16 Check 12KΩ res. connected to pin 4 of V15 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Vert. Size controls V12, V15, V16 RASTER BLOOMING (37) Hor. Drive control V10, V12, V15, V16 Check 680KΩ res. connected in series with sec. anode lead	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V12, V15, V17 Check 820 and 220 mf caps. connected to pins of V14 Low line voltage INSUFFICIENT RASTER HEIGHT (15) Vert. Lin. and Size controls V14, V15, 25 mf cap. connected to pin 4 of V13 Low line voltage NO VERT. DEFL. (14) V13 Check 0.25 and 0.1 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Defl. yoke Vert. Out. Trans. and Vert. Osc. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V8, V9, V13 Check 0.05 mf cap. connected to pin 1 of V13 Vert. Hold control Vert. Int. Network NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V8, V9, V13 Check 0.01 mf cap. connected to pin 7 of V9 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and A. F. C. coil adj. V11, V14, V15 Check 33KΩ cap. connected to pins 2 and 4 of V14 AUDIO HUM IN SOUND (8E) V1, V2, V3, V8 DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V8, V20 Check 0.02 mf cap. connected to pin 7 of V1 Sound and Vid IF alignment L2 Det. alignment L1 NO SOUND - PIX OK (8B) Tuner fine tuning Volume control V1, V2, V3, V8 Speaker (open voice coil or defective connection) Sound and Vid IF alignment L2 Det. alignment L1	WEAK SOUND - PIX OK (8C) Tuner fine tuning Volume control V1, V2, V3, V8, V20 Sound and Vid IF alignment L2 Det. alignment L1 NOISY SOUND - PIX OK V1, V2, V3, V8 Volume control Check sound system for loose connections Speaker Sound IF and Det. alignment L1, L2 SYNC. BUZZ IN SOUND (8E) Tuner fine tuning Contrast control V2, V3, V8, V20 Sound IF and Det. alignment L1, L2 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
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TUBE LIST

Symbol	Type	Circuit Function
V1	6AQ5	A.F. Amp.
V2	6X8	Rect.
V3	6AU6	Pat. Det., Driver
V4	6AU6	1st Vid. IF Amp.
V5	6AU6	2nd Vid. IF Amp.
V6	6AU6	3rd Vid. IF Amp.
V7	6AL5	Vid. Det., and AGC
V8	6AC6	1st Rect., Sync.
V9	12AU7	2nd Rect., Sync. Clipper, & Sync. Amp.
V10	16CP4, or 16DP4	Kinescope Tube
V11	6AL5	Hor. Phase Det.
V12	6X8	Power Rect.
V13	6SN7	V. Sweep Osc. & Vert. Sweep Out.
V14	6SN7	Hor. Sweep Osc.
V15	6BG6G	Hor. Sweep Out.
V16	1B3/8016	H. V. Rect.
V17	6X8	Hor. Damp.
V18	6BM6	1st A.F. Amp.
V19	6AG5	Mixer
V20	6J6	Osc.

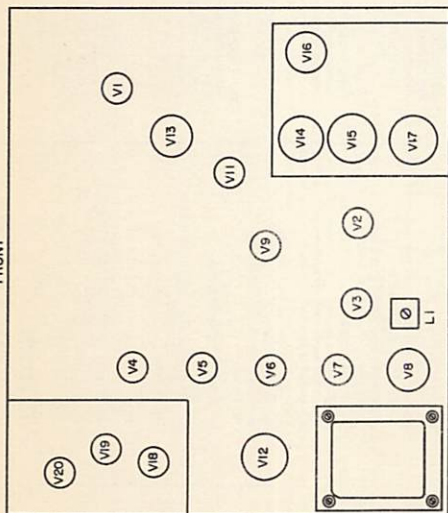
KEY VOLTAGES

B+, Plate of damper, V17 pin 5 350dc
 B-1, Cath. of damper, V17 pin 3 400dc
 Plate of Vert. Osc., V13 pin 2 200dc
 Plate of Vert. Out., V13 pin 5 400dc
 Plates of Hor. Osc., V14 pin 2 245dc
 pin 5 100dc
 Grid of Hor. Out., V15 pin 5 -10dc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

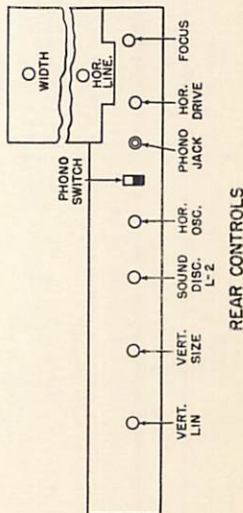
ADJUSTMENTS

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

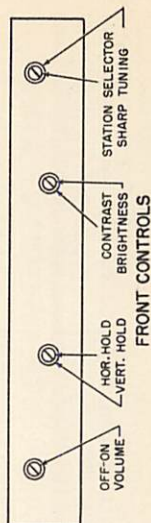
FRONT



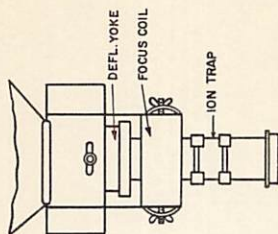
TOP VIEW



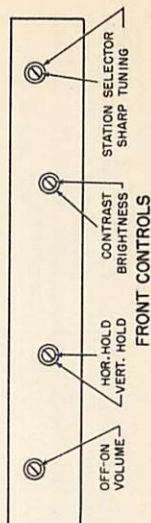
REAR CONTROLS



PICTURE TUBE ADJUSTMENTS

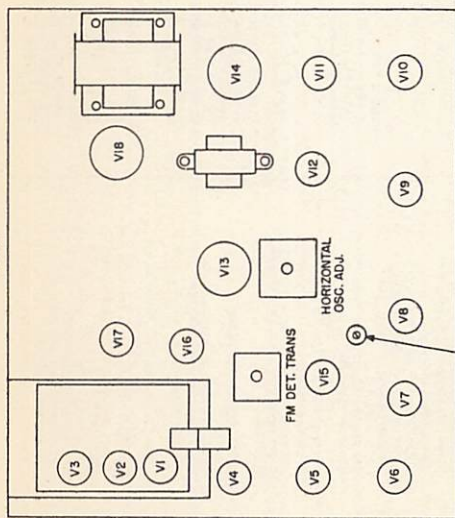


FRONT CONTROLS

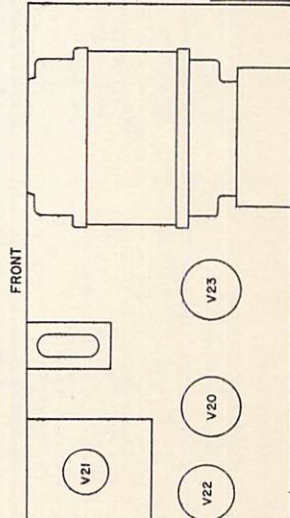


NO RASTER - NO SOUND (31) Power input circuit O12, Focus control ckt. Check B - Filter caps. NO RASTER - SOUND OK (31) HV Fuse (1/4 Amp) Ion trap V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18 HV Trans., Hor. yoke, CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18 Check 0.1 and 0.25 mf caps. connected to green lead (pin 2) of CRT (V10) POOR HOR. LIN. Hor. Lin. and Drive controls V14, V15, V17 Check 0.25 and 0.1 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Out. Trans. POOR VERT. LIN. (11, 12) Hor. Lin. and Size controls V13 Check 0.25 and 0.1 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Out. Trans. PIX JITTER SIDEWAYS Hor. Osc. and Hold controls V11, V12, V13, V14, V15, V16, V17, V18 Check 0.1 and 0.25 mf caps. connected to pins 1 and 2 of V11 PIX JITTER UP AND DOWN (16, 17) Vert. Hold control Contrast control Check 0.005 mf cap. connected to pin 1 of V13 SMEARED PIX (36) Tuner fine tuning Contrast control V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18 Check V14 Det. and Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus control V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18 Check V14 Det. and Amp. peaking coils IF and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Check alignment of Sound Take Off coil (L2) IF and RF alignment SNOW IN PIX (32) V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 ENGRAVED EFFECT IN PIX (33) Contrast control V7, V8, V18, V19, V20 Check V14 Det. and Amp. peaking coils VERT. BARS (21) Hor. Drive control V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Defl. yoke razing PIX BENDING (22) Contrast control Hor. Osc. and Hold controls V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Check 0.1 and 0.005 mf caps. connected to pin 1 of V14 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18 RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightness control V10, V11, V14, V15, V16, V17, V18 Focus control ckt. (intermittent open) HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V10, V12, V14, V15, V16, V18 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Contrast control V15, V16, V18 RASTER BLOOMING (37) Hor. Drive control V10, V14, V15, V16, V18 Check 2 magnet res. between plate of V18 and pin 1 of V10 INSUFFICIENT RASTER WIDTH (23) Tuner fine tuning Size controls V12, V14, V15 Check 820 and 220 mf caps. connected to pin 5 of V14 Low line voltage INSUFFICIENT RASTER HEIGHT (15) V12, V13 Sound and Lin. controls Check 0.25 mf cap. connected to pin 4 of V13 Low line voltage NO VERT. DEFL. (14) V12, V13 Check 0.25 and 0.1 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Defl. yoke Vert. Out. Trans. and Vert. Osc. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold control Vert. Int. Network V9, V12 Check 0.005 mf cap. connected to pin 1 of V13 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V9, V11 Check 0.01 mf cap. connected to pin 7 of V9 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. and Hold controls V11, V14, V15 Check 330 mf cap. connected to pins 2 and 4 of V14 AUDIO HUM IN SOUND (8E) V1, V2, V3 Tuner fine tuning DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V20 Contrast control Check 0.02 mf cap. connected to pin 5 of V14 Sound and Vid. IF alignment L2 Det. alignment L1 NO SOUND - PIX OK (8B) Tuner fine tuning Volume control V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Speaker (only voice coil or defective connection) Sound and Vid. IF alignment L2 Det. alignment L1 WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Volume control Sound and Vid. IF alignment L2 Det. alignment L1 NOISY SOUND - PIX OK V1, V2, V3, V7 Volume control Check lead system for loose connections Speaker Sound IF and Det. alignment L1 and L2 SYNC. BUZZ IN SOUND (8E) Tuner fine tuning V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15, V16, V17, V18, V19, V20 Sound IF and Det. alignment L1 and L2 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system	
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FRONT



TOP VIEW



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V1	6BH6	RF Amp.
V2	6AC5	Mixer
V3	12AT7	Osc.
V4, 5, 6, 7, 9, 15, 17	6AU6	1st, 2nd, 3rd, 4th IF Amp., 1st AF Amp. and AF Amp.
V8, 12, 10	6AL5	Vid. Det., Sync. Disc. and FM Det.
V10	6AQ5	2nd Vid. Amp.
V11	12AU7	Sync. Sep., DC Restorer, and Phase Inverter
V13, 14	6SN7GT	Hor. Osc. and Vert. Osc. & Amp.
V18	6K6GT	AF Out.
V19	10BP4	Kinescope
V20	6BD6G	Hor. Amp.
V21	6X4	Rectifier
V22	5Y4G	Reaction Scanning
V23	5U4G	L. V. Rect.

* Some tuners use a 6C4

+ Some sets will use a type 6V6GT

Some sets will use a type 6SN7GT

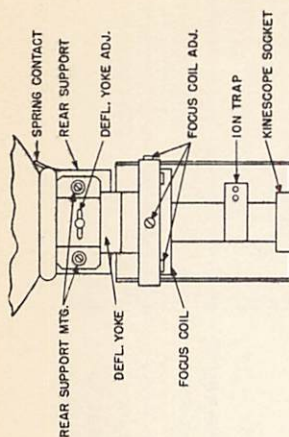
KEY VOLTAGES

B+, plate of damper, V22 pins 4 and 6	390vdc
Boosted B+, cath. of damper, V22 pins 6 and 2	450vdc
Plate of Vert. Osc., V14 pin 2	300vdc
Plate of Vert. Out., V14 pin 5	360vdc
Plates of Hor. Osc., V13 pin 2	122vdc
pin 5	340vdc
Grid of Hor. Out., V20 pin 5	-0.6vdc

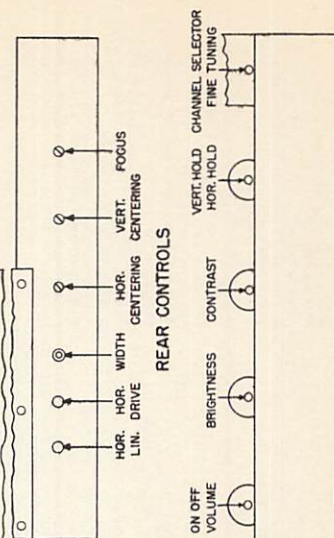
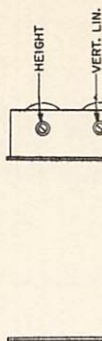
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. For tuner oscillator adjustment, see TUNER OSC. ADJ.-4.



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

NO RASTER - NO SOUND (31)

Power input circuit
Check all chassis interconnecting plugs

NO RASTER - SOUND OK (31)

HV Fuse (1/4 Amps)
Brightness control
Pin trap
V1, V2, V3, V4, V5, V6, V7, V8, V9, V10
HV trans., Hor. yoke, CRT connections

WEAK PIX - SOUND AND RASTER OK (34)

Tuner fine tuning
Contrast control
V4, V5, V6, V7, V8, V9, V10

POOR HOR. LIN.

Hor. Drive and Lin. controls
V20, V22
Check 0.05 mf and 0.1 mf cap. connected to Hor. Lin. control

POOR VERT. LIN. (11,12)

Vert. Lin. and Height controls
V14
Check 2.2 megohm res. connected to pin 4 of V14

PIX JITTER SIDEWAYS

Hor. Hold control
Hor. Osc. Adj.
V12, V13, V19
Check 0.02 mf and 0.005 mf cap. connected to pin 1 of V12

PIX JITTER UP AND DOWN (16,17)

Vert. Hold control
V11, V14

SMEARED PIX (36)

Tuner fine tuning
Contrast control
V3, V4, V5, V6, V7, V8, V9, V10
Check 0.05 mf cap. connected to pin 1 of V9

Check 0.05 mf cap. connected to pin 1 of V10
IF and RF alignment

POOR PIX DETAIL (35)

Tuner fine tuning
Focus control
V4, V5, V6, V7, V8, V9, V10
Check Vid. Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)

Tuner fine tuning
Antenna circuit
V1, V2, V3, V4, V5, V6, V7
Check alignment of Limiter Grid Adj.
IF and RF alignment

SNOW IN PIX (32)

V1, V2, V4, V5, V6, V7
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)

V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11

ENGRAVED EFFECT IN PIX (33)

Contrast control
V4, V5, V6, V7, V8, V9, V10
Check Vid. Amp. peaking coils

VERT. BARS (21)

Vert. Hold control
V10, V12, V19
Check 470 ohm res. connected to pin 5 of V20

DEF. YOKE RINGING

Check 2.2 megohm res. connected to pin 5 of V20
PIX BENDING (22)
Contrast and Hor. Hold controls
Hor. Osc. Adj.
V12, V13, V20

WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)
Tuner fine tuning
Contrast control
V1, V2, V4, V5, V6, V7, V8, V9
RF and IF alignment

INTERMITTENT RASTER - SOUND OK

Brightness control
V12, V13, V19, V20, V21, V22
HV trans.

INSUFFICIENT BRIGHTNESS

Brightness and Hor. Drive controls
V19, V20, V21, V23
Check 4700 ohm res. connected to pin 8 of V20

LOW LINE VOLTAGE

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive, Height and Width controls
V20, V21

RASTER BLOOMING (37)

Hor. Drive control
V12, V13, V20, V21, V23
Check 1 megohm res. in sec. anode lead

INSUFFICIENT RASTER WIDTH (23)

Hor. Drive and Width controls
V13, V20, V23
Check cathode peaking network
(4700 ohm res. and 390 mmf cap.) connected to pin 2 of V13
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)

Hor. Drive and Height controls
V14, V20
Check 0.1 mf cap. connected to Red lead of Vert. Out. trans.
Low line voltage

NO VERT. DEFL. (14)

Check 0.25 mf cap. connected to Red lead of Vert. Out. trans.
Vert. Defl. yoke
Vert. Out. Trans.

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

Vert. Hold control
Vert. Int. Network
V11, V14
Check 4700 mmf cap. connected to pin 1 of V14

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

Check 0.25 mf cap. connected to pin 3 of V11

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

Hor. Drive and Osc. Adj.
V12, V13, V20
Check 330 mmf cap. connected to pin 5 and 1 of V13

AUDIO HUM IN SOUND (8E)

V15, V16, V17, V18
Tuner fine tuning

DISTORTED SOUND (8D)

V2, V15, V16, V17, V18
Sound and Vid. IF alignment (Limiter Grid Adj.)
Det. alignment

NO SOUND - PIX OK (8B)

Tuner fine tuning
V15, V16, V17, V18
Volume control

Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment (Limiter Grid Adj.)
Det. alignment

WEAK SOUND - PIX OK (8C)

Tuner fine tuning
V2, V15, V16, V17, V18
Volume control
Sound and Vid. IF alignment (Limiter Grid Adj.)
Det. alignment

NOISY SOUND - PIX OK

V15, V16, V17, V18
Volume control
Check sound system for loose connections
Speaker
Sound IF and Det. alignment

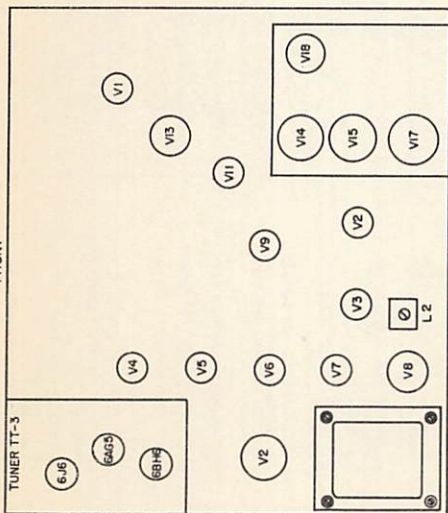
SYNC. BUZZ IN SOUND (8E)

Tuner fine tuning
Contrast control
V2, V9, V15, V16
Sound IF and Det. alignment

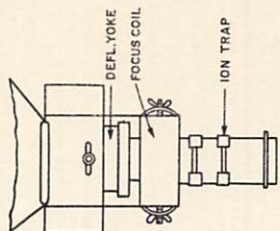
INTERMITTENT SOUND - PIX OK

V15, V16, V17, V18
Poor connections in sound system

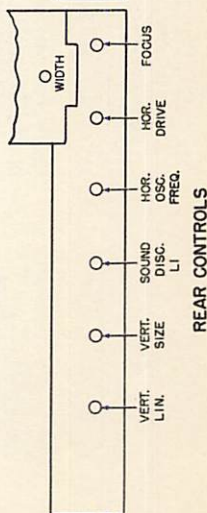
FRONT



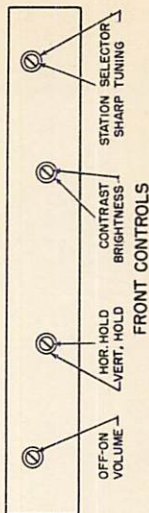
TOP VIEW



PICTURE TUBE ADJUSTMENTS



REAR CONTROLS



FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AQ5	AF Amp.
V2	8T8	Rat. Del.
V3	6AU6	Rat. Del. Driver
V4	6AU6	1st Vid. IF Amp.
V5	6AR5	2nd Vid. IF Amp.
V6	6AR5	3rd Vid. IF Amp.
V7	6AL5	Vid. Del. & AGC
V8	6AC7	Vid. Amp.
V9	12AU7	DC Rest., Sync
V10	10BP4 or 6X4	Clipper & Sync Amp.
V11	6AL5	Hor. Phase Det.
V12	5U4G	Power Rect.
V13	6SN7	Vert. Sweep Osc. & Vert. Sweep Out.
V14	6SN7	Hor. Sweep Osc.
V15	9BG6G	Hor. Sweep Out.
V16	6X4	HV Rect.
V17	5V4	Hor. Damper

KEY VOLTAGES

B+, plate of damper, V17 pin 5	340vdc
Grid of Hor. Osc., V11 pin 3	100vdc
Plate of Vert. Osc., V13 pin 2	100vdc
Plate of Vert. Osc., V13 pin 5	200vdc
Plates of Hor. Osc., V14 pin 2	245vdc
Grid of Hor. Osc., V14 pin 5	100vdc
Grid of Hor. Osc., V15 pin 5	-10vdc

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

ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-1. For tuner oscillator adjustments, see TUNER OSC. ADJ.-4.

NO RASTER - NO SOUND (31) Power input circuit V12 Open focus coil ckt.	SNOW IN PIX (32) Check tuner tubes V4, V5, V6 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (36) Check tuner tubes V4, V5, V6, V7, V8 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control Check Vid. Amp. peaking coils V4, V5, V6, V7, V8, V10 VERT. BARS (21) Hor. Drive control V14, V15, V17 Defl. yoke ringing	INSUFFICIENT RASTER HEIGHT (15) Vert. Lin. and Size controls V12, V13 V1, V2, V3 Low line voltage NO VERT. DEFL. (14) V13 Check plate load resistor of V13 Osc. sec. Vert. Defl. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold control Vert. Int. Network V9, V13 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V9 Check 0.01 cap. in grid ckt (#7) of V9 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold Freq. and Phase controls V10, V11, V14, V15, V16, V17 Check 0.05 mf cap. connected to junction of pin 1 and 2 of V11 AUDIO HUM IN SOUND (8E) V1, V2, V3 Tuner fine tuning DISTORTED SOUND (8D) V1, V2, V3 Sound and Vid. IF alignment L-2 Det. alignment L-1 NO SOUND - PIX OK (8B) V1, V2, V3 Tuner fine tuning Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-2 Det. alignment L-1 WEAK SOUND - PIX OK (8C) Tuner fine tuning Check tuner tubes V1, V2, V3 Volume control Sound and Vid. IF alignment L-2 Det. alignment L-1 NOISY SOUND - PIX OK Volume control V1, V2, V3 Check sound system for loose con- nections Speaker Sound IF and Det. alignment
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control Check tuner tubes V4, V5, V6, V7, V8 POOR HOR. LIN. Hor. Drive controls V15, V17 Check 0.035 mf and 0.1 mf cap. con- nected to Lin. coil POOR VERT. LIN. (11, 12) Vert. Lin. and Size controls V10, V11, V14, V15, V16, V17 Check 0.1 mf and 0.25 mf connected to Blue lead of Vert. Osc. trans. PIX JITTER SIDEWAYS Hor. Hold and Freq. controls Check 0.05 mf cap. connected to pin 1 of V14 PIX JITTER UP AND DOWN (16, 17) Vert. Hold control Contrast control V13 SMEARED PIX (36) Tuner fine tuning Contrast control V7, V8 Check 0.1 mf cap. connected to pin 2 of V10 IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus control V6, V7, V8 Check Vid. Amp. peaking coils IF and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Check tuner tubes V4, V5, V6, V7, V8 Check alignment of L-2 IF and RF alignment	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast control Check tuner tubes V4, V5, V6, V7, V8 RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightness control V10, V11, V14, V15, V16, V17 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V10, V12, V15, V16 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width controls V14, V15, V16 VERT. SIZE CONTROL V14, V15, V16 RASTER BLOOMING (37) Hor. Drive control V10, V12, V15, V16 Check 1 megohm series res. in sec. anode lead INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V12, V14, V15 Low line voltage	

SYNC. BUZZ IN SOUND (8E)

Tuner fine tuning
Contrast control
V4, V5, V6
Sound IF and Det. alignment L1, L2INTERMITTENT SOUND - PIX OK
V1, V2, V3
Poor connections in sound system

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	6BA6	3rd Sound IF Amp.
V107	6AL5	Sound Dect.
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 Dect. and DC Rest.
V115	6AG5	1st Vid. Amp.
V116	6K6GT	2nd Vid. Amp.
V117	6EP4	Kinescope
V118	6SR7	Sync. Sep.
V119	6SR7	Sync. Sep.
V120	6SN7GT	2nd Sync. Amp. and Hor. Discharge
V121	6J5	Vert. Sweep Osc. and Discharge
V122	6K6GT	Vert. Sweep Out.
V123	6AL5	Hor. Sweep Osc.
V124	6K6GT	Hor. Sweep Out.
V125	6AC7	Hor. Sweep Osc. Con.
V126	6BG6G	Hor. Sweep Out.
V127	1B3GT/	
V128	8016	H. V. Rect.
V129	5Y4G	Hor. Reaction Scan
V130	504G	Power Supply Rects.

KEY VOLTAGES

B₊, plate of damper, V128 pins 4 and 6 275vdc
 B₋, cathode of damper, V128 pin 8 350vdc
 Plate of Vert. Osc., V123 pin 3 180vdc
 Plate of Vert. Out., V122 pin 3 180vdc
 Plate of Hor. Osc., V125 pin 3 190vdc
 Grid of Hor. Out., V126 pin 5 -113vdc

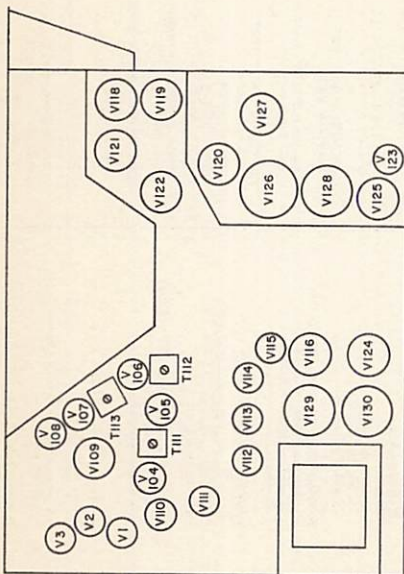
*Voltage varies with control settings.

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

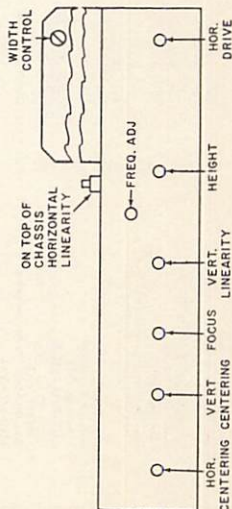
ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-3. (In this section, the zonal frequency and phase controls are known as the horizontal discriminator adjustments.) For tuner discriminator adjustment, see TUNER OSC. ADJ.-3.

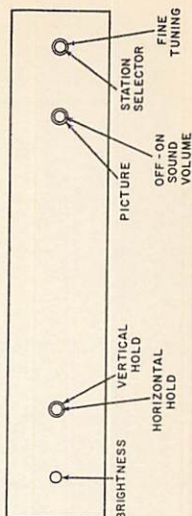
FRONT



TOP VIEW

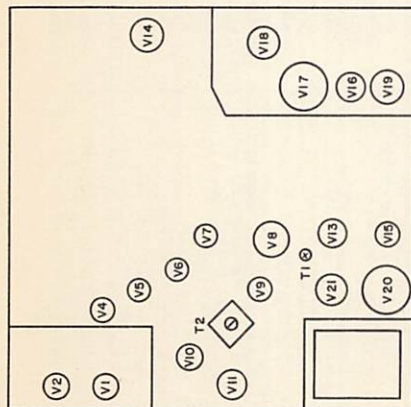


REAR CONTROLS



NO RASTER - NO SOUND (31) Power input circuit V129, V130	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V1, V2, V3, V110, V111, V112, V113 Check alignment of T2 (Top), T103 (Top), IF and RF alignment	FASTER BLOOMING (37) Hor. Drive control V117, V120, V126, V127, V129, V130 Check 1 megohm res. connected in series with sec. anode lead	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T2, T111, T112 Det. alignment T113 WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V3, V104, V105, V106, V107, V108, V109 Volume control Sound and Vid. IF alignment T2, T111, T112 Det. alignment T113 NOISY SOUND - PIX OK V104, V105, V106, V107, V108, V109 Volume control Check sound system for loose con- nections Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
NO RASTER - SOUND OK (31) Brightness control V123, V124, V125, V126, V127, V128 Ion trap HV trans., Hor. yoke, CRT connections	SNOW IN PIX (32) V1, V2, V3, V110, V111, V112 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive control V120, V124, V129, V130 Check 1000 and 680 mhf caps. con- nected to pin 5 of V120 Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V2, V3, V110, V111, V112, V113, V114, V115, V116	AC IN PIX (DARK HOR. BAR) (36) V1, V2, V3, V110, V111, V112, V113, V114, V115, V116 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Hor. Drive control V121, V122, V129, V130 Check 0.1 and 0.05 mhf caps. connected to red lead of Vert. Osc. Trans. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
POOR HOR. LIN. Hor. Lin. and Drive controls V121, V122, V123, V124, V125, V126 Check 10 mhf el. cap. in primary ckt of Vert. Out. Trans. Check sawtooth capacitor	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V110, V111, V112, V113, V114, V115, V116 Pix control Check Vid. Amp. peaking coils for opens V110, V111, V112, V113, V114, V115, V116 VERT. BARS (21) Hor. Drive control V125, V126 Check 50 mhf cap. connected to defl. yoke Defl. yoke ringing PIX BENDING (22) Hor. Disc. Adj. and Hor. Hold controls V123, V124, V125, V126 Check 0.05 mhf cap. connected through a 500h res. to pin 4 of V124	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold control V121, V122 Vert. Defl. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold control V121, V122 Vert. Defl. yoke Vert. Out. Trans. NO HOR. OR VERT. SYNC. - PIX OK (18) V110, V119, V120 Check 0.05 mhf cap. connected to pin 1 of V120 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold control V121, V122 Hor. Disc. Adj. V120, V123, V124, V125 Check 0.05 mhf cap. in grid ckt of V124 AUDIO HUM IN SOUND (8E) V104, V105, V106, V107, V108, V109	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
PIX JITTER SIDWAYS Hor. Lin. and Drive controls V121, V122, V123, V124, V125, V126 Check 82 mhf mica cap. connected to "B" of Hor. Disc. trans.	PIX JITTER UP AND DOWN (16, 17) Pix control V121, V122 Vert. Hold control V123, V124 Check 4700 mhf cap. connected to pin 5 of V121	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold control V121, V122 Hor. Disc. Adj. V120, V123, V124, V125 Check 0.05 mhf cap. in grid ckt of V124 AUDIO HUM IN SOUND (8E) V104, V105, V106, V107, V108, V109	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
PIX JITTER UP AND DOWN (16, 17) Pix control V121, V122 Vert. Hold control V123, V124 Check 4700 mhf cap. connected to pin 5 of V121	SMOURED PIX (36) Tuner fine tuning V114, V115, V116 Check coupling cap. of Vid. Amps. Check grid load resistors, IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive control V117, V120, V126, V127, V129, V130 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive control Width and Height controls V126, V127	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system
POOR PIX DETAIL (35) Tuner fine tuning V110, V111, V112, V113, V115, V116 Check Vid. Amp. peaking coils Check Vid. Amp. coupling caps. IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning V110, V111, V112, V113, V115, V116 Check Vid. Amp. peaking coils Check Vid. Amp. coupling caps. IF and RF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold control V121, V122 Hor. Disc. Adj. V120, V123, V124, V125 Check 0.05 mhf cap. in grid ckt of V124 AUDIO HUM IN SOUND (8E) V104, V105, V106, V107, V108, V109	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V105, V106, V107, V108, V109 Volume control Speaker Sound IF and Det. alignment T2, T111, T112 INTERMITTENT SOUND - PIX OK V104, V105, V106, V107, V108, V109 Poor connections in sound system

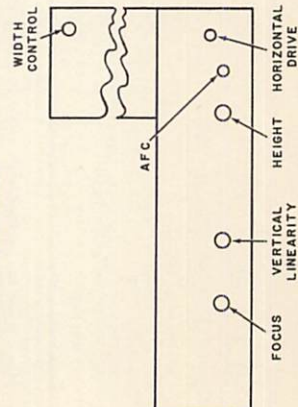
FRONT



TUBE LIST

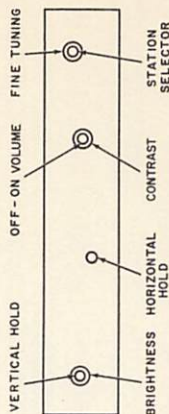
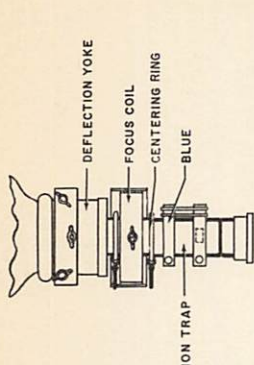
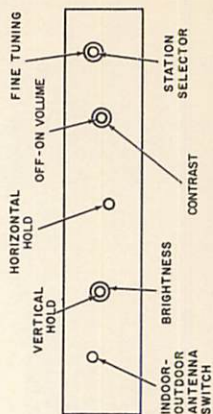
Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6X6	Osc.-Mixer
V3	6AU6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	Detector and AGC
V6	6AL5	Vid. Det. and AGC
V7	6AC7	Vid. Amp.
V8	6AU6	Rat. Det. Driver
V9	6T8	Rat. Det. and 1st AF
V10	6V6GT	AF Out.
V11	6X4	Kinescope
V12	12L6	Kinescope
V13	12AU7	D.C. Rest. Sync.
V14	6SN7	Clipper, Sync. Amp.
V15	6AL5	Vert. Sweep Osc. and Phase Splitter
V16	12AU7	Vert. Sweep Amp.
V17	6BG6G	Hor. Sweep Osc.
V18	1B3-8016	Hor. Sweep Out.
V19	6W4	H.V. Rect.
V20	504G	Hor. Dumper
V21	6X5GT	Mod. V. Rect. L.V. Rect.

TOP VIEW



REAR CONTROLS

PICTURE TUBE ADJUSTMENTS

FRONT CONTROLS
TABLE MODELFRONT CONTROLS
CONSOLE MODEL

KEY VOLTAGES

B ₁ , plate of dumper, V19 pin 5	340vdc
Boosted B ₁ , cath. of dumper, V19 pin 3	420vdc
Plate of Vert. Osc., V14 pin 2	98vdc
Plate of Vert. Out., V14 pin 5	350vdc
Plates of Hor. Osc., V16 pin 1	240vdc
Grid of Hor. Out., V17 pin 6	240vdc
Grid of Hor. Out., V17 pin 5	-8.8vdc

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

ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as the Horizontal Frequency Control.)
For tuner oscillator adjustment, see TUNER OSC. ADJ.-1.

NO RASTER - NO SOUND (31) Power input circuit Check all fuses in power supply V20, V21	SNOW IN PIX (32) Check tuner tubes V4, V5, V6 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) Check tuner tubes V4, V5, V6, V7, V8, V13	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V16, V17, V20 Check 500 mfd cap. connected to pin of V16 Hor. Out. Trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V9, V10, V11 Volume control Sound IF and Det. alignment T-1 Det. alignment T-2
NO RASTER - SOUND OK (31) Brighness control V12, V15, V16, V17, V18, V19 Ion trap HV Trans., Hor. yoke, CRT connections	ENGRAVED EFFECT IN PIX (33) Contra. line tuning V4, V5, V6, V7, V8 Check tuner tubes Check Vid. Amp. peaking coils VERT. BARS (21) Check 100k res. connected to pin 5 of V17 Defl. yoke ringing	INSUFFICIENT RASTER HEIGHT (15) Vert. Lin. and Height controls V14, V15 Check 0.1 mf cap. connected to sec. of Vert. Osc. trans. Vert. Out. Trans. Low line voltage	NOISY SOUND - PIX OK V9, V10, V11 Volume control Check sound system for loose connec- tions Speaker Sound IF and Det. alignment
WEAK PIX - SOUND AND RASTER OK (34) Contra. line tuning Check tuner tubes V4, V5, V6, V7, V8	PIX BENDING (22) Check 500k res. connected to pin 6 of V14 Check 0.01 mf cap. connected to pin 6 of Hor. Out. Trans.	NO VERT. SYNC. - HOR. SYNC. OK (16,17) Vert. Lin. and Height controls V13, V14 Check 0.01 mf cap. connected to pin 2 of V13	INTERMITTENT SOUND - PIX OK V9, V10, V11 Poor connections in sound system
POOR HOR. LIN. Hor. Drive control V16, V17, V19 Check 0.25 mf cap. connected to pin 3 of V19	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contra. line tuning Check tuner tubes V4, V5, V6, V7, V8 RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V13 Check 0.01 mf cap. connected to pin 2 of V13	POOR CONNECTIONS IN SOUND SYSTEM V9, V10, V11 Poor connections in sound system
POOR VERT. LIN. (11,12) Vert. Lin. and Size controls V14 Check 500k res. connected to pin 6 of V14 Check 0.01 mf cap. connected to pin 4 of V14 Vert. Out. Trans.	INTERMITTENT RASTER - SOUND OK Brighness control V12, V15, V16, V17, V18, V19 HV Trans.	NO VERT. SYNC. - VERT. SYNC. OK (19,20) Hor. Hold and AFC controls V15, V16, V17 Check 0.1 mf cap. connected to pin 1 of V16	INTERMITTENT SOUND - PIX OK V9, V10, V11 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold and AFC controls V15, V16, V17 Check 0.001 mf cap. connected to pin 1 of V15	INSUFFICIENT BRIGHTNESS Ion trap Brighness and Hor. Drive controls V12, V17, V18, V20 Low line voltage	AUDIO HUM IN SOUND (8E) V9, V10, V11	POOR CONNECTIONS IN SOUND SYSTEM V9, V10, V11 Poor connections in sound system
PIX JITTER UP AND DOWN (16,17) Vert. Hold and Contra. controls V13, V14 Check 4700 mfd cap. connected to pin 1 of V14	EXCESSIVE RASTER (PIX SIZE) (9,10) Hor. Drive, Width and Height controls V17, V18 Check 2.2K res. connected to pin 8 of V17 Check 75K res. connected to 5 and 3 of V19	DISORTED SOUND (8D) Tuner fine tuning V2, V9, V10, V11 Sound and Vid. IF alignment T-1 Det. alignment T-2	NOISY SOUND - PIX OK V9, V10, V11 Volume control Check sound system for loose connec- tions Speaker Sound IF and Det. alignment
POOR PIX DETAIL (35) Tuner fine tuning Focus control V4, V5, V6, V11 Check Vid. Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) Hor. Drive control V12, V17, V18, V20 Check 1 megohm series res. in sec. anode lead	NO SOUND - PIX OK (8B) Tuner fine tuning V9, V10, V11 Volume control Speaker (open voice coil or defective connections) Sound and Vid. IF alignment T-1 Det. alignment T-2	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V9, V10, V11 Volume control Sound IF and Det. alignment T-1 Det. alignment T-2
SOUND BARS IN PIX (4A, 4E) V4, V5, V6, V7, V8 Check tuner tubes IF and RF alignment T-1			

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6CH6	RF Amp.
V2	6J6	RF Converter
V4	6AU6 or 6BC5	1st IF Amp.
V5	6AU6	2nd IF Amp.
V6	6AU6	2nd IF Amp.
V7A	1/2 6AL5	Vid. Amp.
V7B	1/2 6AL5	AGC Diode
V8A	1/2 12BH7	1st Vid. Amp.
V8B	1/2 12BH7	2nd Vid. Amp.
V9	6AU6	Rad. Det. Driver
V10A	6AL5	Rad. Det.
V11	12X2	AF Amp.
V12	18RP4	AF Amp.
V13A	1/2 12BH7	DC Rest. & Sync. Clipper
V13B	1/2 12BH7	Sync. Amp. & Phase Splitter
V14A	1/2 12BH7	Vert. Sweep Osc.
V14B	1/2 12BH7	Vert. Sweep Out.
V15	6AL5	Vert. Phase Inverter
V16	12BH7	Hor. Sweep Osc.
V17	6BQ6	Hor. Sweep Out.
V18	1X2	HY Rect.
V19	6W4	Hor. Dumper
V20	6X4	Power Supply Rect.
V21	6SQ7	AF Amp.

KEY VOLTAGES

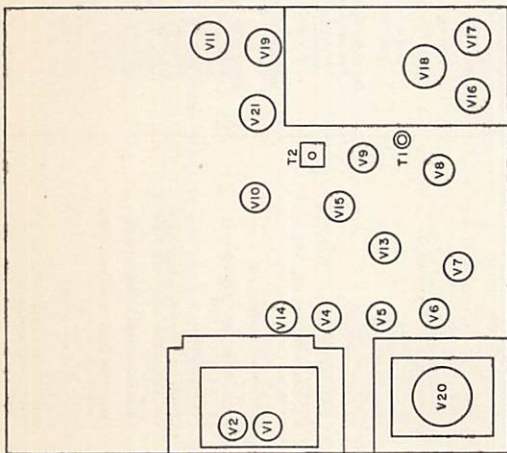
B ₁ , plate of dumper, V19 pin 5	275vdc
Boosted B ₁ , cath. of dumper, V19 pin 3	450vdc
Plate of Vert. Osc., V14 pin 6	35vdc
Plate of Vert. Out., V14 pin 2	400vdc
Plates of Hor. Osc., V16 pin 1	150vdc
pin 6	100vdc
Grid of Hor. Out., V17 pin 5	-0.2vdc

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

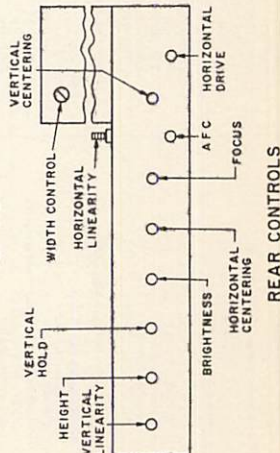
ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as the Automatic Frequency Control.)
For tuner oscillator adjustments, see TUNER OSC. ADJ.-1.

FRONT

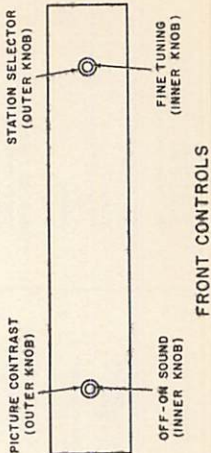
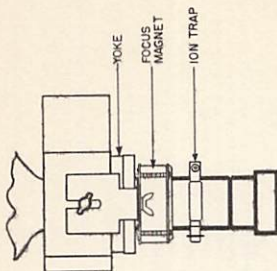


TOP VIEW



REAR CONTROLS

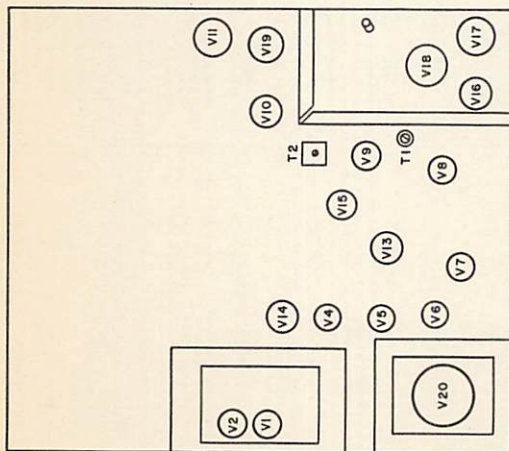
PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

NO RASTER - NO SOUND (31) Power input circuit Check A - Filter caps. Check B - Filter caps.	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V1, V4, V5, V9 Check for alignment IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and width control V16, V17, V20 Check 0.05 mf cap. connected to pin 6 of V16 Hor. Out. Trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V16, V17, V20 Volume control Sound and Vid. IF alignment T1 Det. alignment T2
NO RASTER - SOUND OK (31) Brightness control V15, V16, V17, V18, V19, V20 Hor. yoke, CRT connections Focus coil ch open	SNOW IN PIX (32) V1, V2, V4, V5, V6 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (3B) V1, V2, V4, V5, V6, V7, V8	INSUFFICIENT RASTER HEIGHT (15) V16, V17, V20 Check 0.02 and 0.05 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Out. Trans. Low line voltage	NORSE SOUND - PIX OK Tuner fine tuning V16, V17, V20 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment T1 and T2
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V2, V4, V5, V6, V7, V8, V20 Contrast control	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V1, V4, V20 Peaking coils	NO VERT. DEFL. (14) V14 Check 0.02 and 0.05 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Defl. yoke Vert. Out. Trans. and Vert. Osc. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V13, V14 Vert. Int. Vert. Hold control Check 4700 mmf cap. connected to pin 1 of V14 Yellow or green lead of Vert. Osc. Trans.	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning V16, V17, V20 Volume control Sound IF and Det. alignment T1 and T2
POOR HOR. LIN. V16, V17, V19 Check 0.05 and 0.1 mf caps. connected to Hor. Lin. coil Hor. Out. Trans.	PIX BENDING (22) Automatic Freq. control V15, V16, V17 Check 0.05 and 0.1 mf caps. connected to pin 2 of V16	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V8, V13 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Automatic Freq. control V13, V15, V16 Check 390 mmf cap. connected to pins 1 and 7 of V16	INTERMITTENT SOUND - PIX OK V8, V10, V11, V21 Volume control Poor connections in sound system
PIX JITTER SIDWAYS Automatic Freq. control Contrast control V15, V16, V17 Check 0.005 mf cap. connected to pins 5 and 6 of V15 Check 0.005 (1 caps. connected in series with 0.005 mf cap. to pins 5 and 7 of V15	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V4, V5, V6, V7, V8 RF and IF alignment	AUDIO HUM IN SOUND (8E) V9, V10, V11, V21 DISTORTED SOUND (8D) Tuner fine tuning V2, V9, V10, V11, V21 Check 0.05 mf cap. connected to pin 1 of V10 Sound and Vid. IF alignment T1 Det. alignment T2	
PIX JITTER UP AND DOWN (16, 17) V14 Hold control Check 4700 mmf cap. connected to green or yellow lead of Vert. Osc. Trans.	INTERMITTENT RASTER - SOUND OK V12, V15, V16, V17, V19 Brightness control HV trans.	NO SOUND - PIX OK (8B) Tuner fine tuning V9, V10, V11, V21 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T1 Det. alignment T2	
SMEARED PIX (36) Tuner fine tuning Tuner control V16, V17, V20 Check 0.05 mf cap. connected to pin 1 of V8 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and width control V17, V14, V18 Hor. Drive		
POOR PIX DETAIL (35) Tuner fine tuning V8, V20 Check Vid. Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) Hor. Drive control V17, V18 Check 1 megohm res. connected in series with second anode lead		

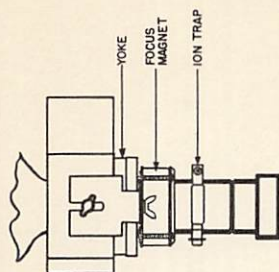
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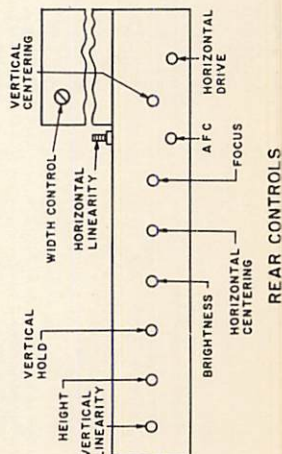
TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6CB8	RF Amp.
V2	6CB8	RF Converter
V3	6AU6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	3rd IF Amp.
V6	6AL5	Vid. Det.
V7	6AL5	AGC Diode
V8	6CB8	1st Vid. Amp. (700-1-1)
V9	1/2 12BH7	1st Vid. Amp. (700-1-2)
V10	1/2 12BH7	2nd Vid. Amp. (700-1-3)
V11	6X4	Rect. Det.
V12	6X4	Rect. Det.
V13	6X4	Rect. Det.
V14	6X4	Rect. Det.
V15	6X4	Rect. Det.
V16	6X4	Rect. Det.
V17	6X4	Rect. Det.
V18	6X4	Rect. Det.
V19	6X4	Rect. Det.
V20	6X4	Rect. Det.

PICTURE TUBE ADJUSTMENTS



TOP VIEW



KEY VOLTAGES

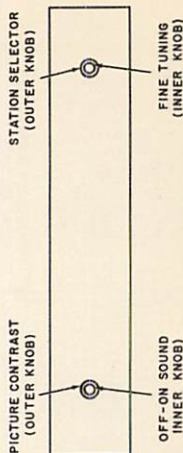
B ₊ , plate of damper, V19 pin 5	275vdc
Boosted B ₊ , cath. of damper, V19 pin 3	450vdc
Plate of Vert. Osc., V14 pin 1	95vdc
Plate of Vert. Osc., V14 pin 6	400vdc
Plate of Hor. Osc., V16 pin 1	150vdc
Plate of Hor. Osc., V16 pin 6	150vdc
Grid of Hor. Osc., V17 pin 5	-0.2vdc

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

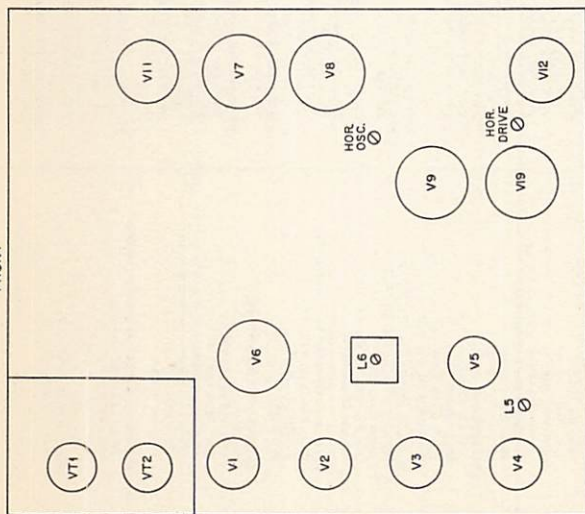
ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as the Automatic Frequency Control.)
For tuner oscillator adjustments, see TUNER OSC. ADJ.-1.

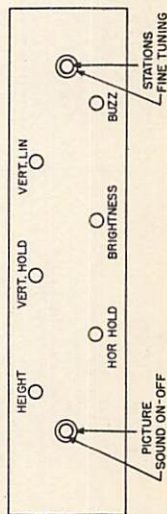
FRONT CONTROLS



FRONT



TOP VIEW



FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
VT1	6J6	RF Osc.
VT2	6CB6	RF Amp.
V1, V2	6X4	Rectifier
V3	6CB6	IF Amp.
V4	6BA6	Vid. Amp.
V5	6BN6	Limiter-Disc.
V6	25L6	AF Out.
V7A	12SN7	Sync. Clipper
V7B	12SN7	Sync. Limiter
V8	12SN7	Hor. Osc.
V9B	25BQ6	Hor. Amp.
V10	25W4	Hor. Damping
V11	12BH7	Vert. Osc. - Amp.
V12	1X2A	H. V. Rect.
	17BP4A	Picture Tube

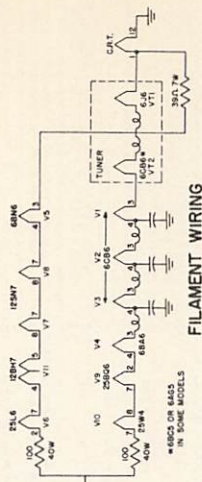
KEY VOLTAGES

B+, plate of damper, V10 pin 5	135vdc
Boosted B+, cath. of damper, V10 pin 3	285vdc
Plate of Vert. Osc., V11 pin 6	30vdc
Plate of Vert. Osc., V11 pin 1	260vdc
Plate of Hor. Osc., V9 pin 1	140vdc
Grid of Hor. Osc., V9 pin 5	-100vdc

(All voltages are measured with a VTVM 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.



FILAMENT WIRING

NO RASTER - NO SOUND (31)
Power input circuit
Check IF tubes light
Open filament in any tube will not permit any tube to light of flame string

NO RASTER - SOUND OK* (31)
Brightness control
V8, V9, V10, V12

WEAK PIX - SOUND AND RASTER OK* (34)
Tuner fine tuning
Contrast control
V11, V4, V1, V2, V3
Vid. Det. crystal (1N64)

POOR HOR. LIN.*
Hor. Drive control
V7, V9, V10
Check 0.25 mf cap. connected to pin 3 of V10
Hor. Out. Trans.

POOR VERT. LIN.* (11,12)
Vert. Lin. and Height controls
V11
Check 0.1 mf cap. connected to pin 2 of V11
Vert. Out. Trans.

PIX JITTER SIDEWAYS*
Hor. Osc. Adj. (Synchroguide)
V8, V7, V9
Check 0.005 mf cap. connected to pin 4 of V7

PIX JITTER UP AND DOWN* (16,17)
V8, V11
Vert. Hold control
Check 0.1 mf cap. connected to pin 2 of V11
Check 0.002 mf cap. connected through 100KΩ res. to 5 of V11
Vert. Out. Trans.

SMEARED PIX* (36)
Tuner fine tuning
Contrast control
Vid. Det. crystal
V4, V7, V11
Check Vid. Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL* (35)
Tuner fine tuning
Brightness control
V4
Vid. Det. crystal (1N64)
IF and RF alignment

SOUND BARS IN PIX* (4A, 4E)
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V5, V7, V11
IF and RF alignment

SNOW IN PIX* (32)
V11, V7, V1, V2, V3
Antenna and transmission line
AC IN PIX (DARK HOR. BAR)* (38)
V1, V2, V3, V4, V7, V11, V12

ENGRAVED EFFECT IN PIX* (33)
Tuner fine tuning
V7, V1, V4
Contrast control
Check Vid. Amp. peaking coils

VERT. BARS* (21)
Hor. Drive control
V7, V9, V10
Check 36 mf cap. connected to contrast control
Defl. yoke ringing

PIX BENDING* (22)
Hor. Osc. Adj. (Synchroguide)
V8, V7, V9
Check 2-0.05 mf caps. connected to pin 6 of V7

WEAK OR NO PIX - SOUND WEAK - RASTER OK* (32C, 34C)
Tuner fine tuning
V11, V7, V1, V2, V3, V4
Contrast control
Vid. Det. crystal (1N64)
RF and IF alignment

INTERMITTENT RASTER - SOUND OK*
Brightness control
V7, V8, V9, V10, V12
CRT
HV trans.

INSUFFICIENT BRIGHTNESS*
Ion trap
V8, V9, V12
Hor. Drive and Brightness controls
Check 0.1 mf cap. connected to pin 4 of V12
Low line voltage

EXCESSIVE RASTER (PIX SIZE)* (9,10)
Height and Hor. Drive controls
V9, V12

RASTER BLOOMING* (37)
Hor. Drive control
V12, V9
Check 470KΩ res. in HV lead
CRT

INSUFFICIENT RASTER WIDTH* (23)
Hor. Drive control
V7, V8, V9
Check 390 and 1000 mf caps. connected to terminal "D" of Hor. Osc. Trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT* (15)
Height and Vert. Lin. controls
V11
Check 0.1 mf cap. connected to pin 2 of V11
Check 0.05 mf cap. connected through 82KΩ res. to pin 6 of V11
Low line voltage

NO VERT. DEFL.* (14)
V11
Check 0.1 mf cap. connected to pin 2 of V11
Check 0.05 mf cap. connected through 82KΩ res. to pin 6 of V11
Vert. Defl. yoke
Vert. Out. Trans.

NO VERT. SYNC. - HOR. SYNC. OK* (16,17)
V8, V11
Vert. Int.
Vert. Hold control
Check 0.002 mf cap. connected through 100KΩ res. to pin 5 of V11

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK*
V4, V7, V8
Contrast control

NO HOR. SYNC. - VERT. SYNC. OK* (19,20)
Hor. Osc. Adj. and Hold controls
V7, V8, V9
Check 220 mf cap. connected to pin 4 of V7
Check 0.01 mf cap. connected to terminal "D" of Hor. Osc. Trans.

AUDIO HUM IN SOUND (8E)
V5, V6

DISTORTED SOUND* (80)
Tuner fine tuning
Vid. Det. crystal (1N64)
Contrast and Buzz controls
V4, V5, V6
Check 0.005 mf cap. connected to Volume control

NO SOUND - PIX OK* (8B)
Tuner fine tuning
Contrast and Buzz controls
V5, V6, V7, V11
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L5
Det. alignment L6

WEAK SOUND - PIX OK* (8C)
Tuner fine tuning
Contrast, Buzz and Volume controls
V5, V6, V7, V11
Sound and Vid. IF alignment L5
Det. alignment L6

NOISY SOUND - PIX OK*
Volume control
V5, V6
Check for loose connections in sound system
Speaker

SYNC. BUZZ IN SOUND* (8E)
Sound IF and Det. alignment L5 and L6
Tuner fine tuning
Buzz and Contrast controls
V4, V5
Sound IF and Det. alignment L5 and L6

INTERMITTENT SOUND - PIX OK*
Volume and Buzz controls
V5, V6, V7, V11
Poor connections in sound system
Assuming filaments of all tubes are lit, if either string does not light look for tube with open filament.

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6J6	Osc. - Mixer
V3	6CB6	1st Vid. IF Amp.
V4	6AU6	2nd Vid. IF Amp.
V5	6AU6	3rd Vid. IF Amp.
V6	6AV6	Detector & AGC
V7	6AC7	Vid. Amp.
V8	6AU6	4.5 Mc Amp.
V9	6T8	Rat. Det. & AF Amp.
V10	6V6	AF Out. Tube
V11	12AU7	Sync. Splitter-Amp. & Horiz. Osc. Det.
V12	6AL5	Horiz. Osc.
V13	6SN7	Horiz. Osc. & Vert. Out.
V14	6SN7	Vert. Osc. & Vert. Out.
V15	6J5	Aux. Vert. Out.
V16	6EG6	Horiz. Out.
V17	6W4	Damper
V18	1B3	HV Rect.
V19	6X4	Power Rect.
V20	504	Phk Tube

KEY VOLTAGES

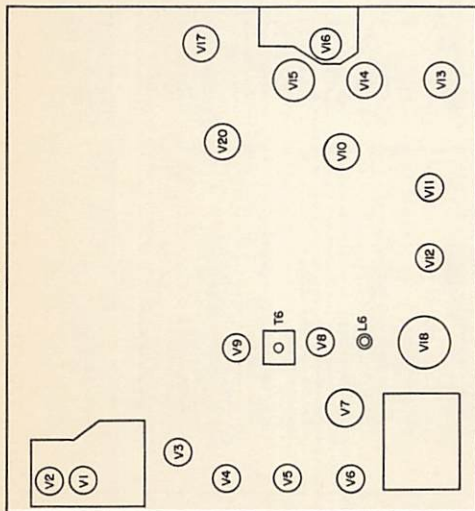
B+, plate of damper, V14 pin 5 350vdc
 Boosted B+, cath. of damper, V14 pin 3 570vdc
 Plate of Vert. Osc., V17 pin 2 120vdc
 Plate of Vert. Out., V17 pin 5 450vdc
 Plates of Hor. Osc., V13 pin 3 340vdc
 Plate of Hor. Out., V15 pin 6 340vdc
 Grid of Hor. Out., V15 pin 5 -15vdc

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

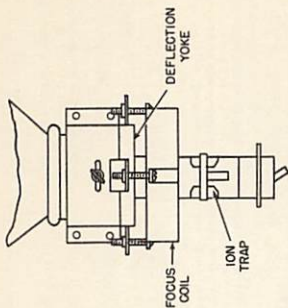
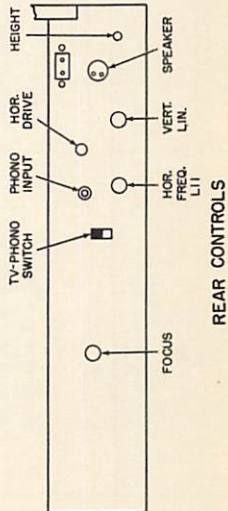
ADJUSTMENTS

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

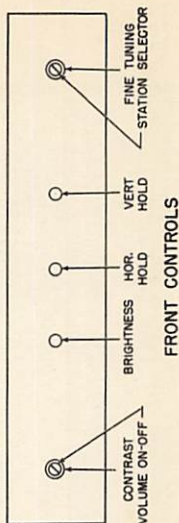
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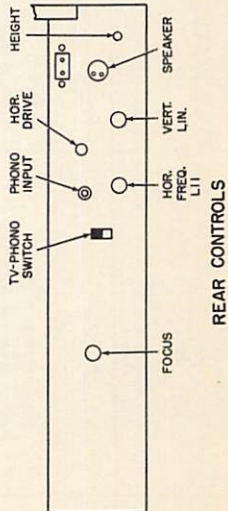
TOP VIEW



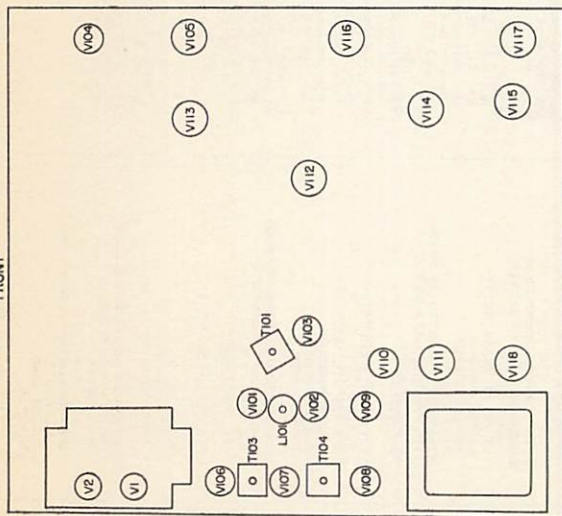
PICTURE TUBE ADJUSTMENTS



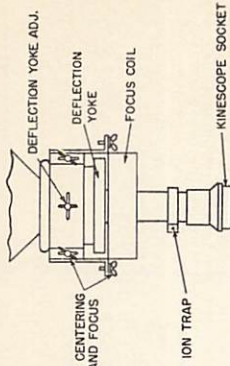
REAR CONTROLS



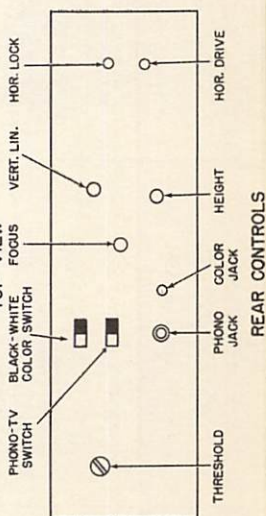
FRONT



PICTURE TUBE ADJUSTMENTS

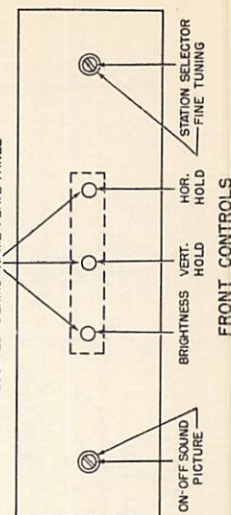


TOP VIEW



REAR CONTROLS

LOCATED BEHIND NAME PLATE PANEL



FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, or	RF Amp.
V2	6AC6, or	RF Osc. and Conv.
V101	6AC5, or	1st Sound IF Amp.
V102	6CB6	2nd Sound IF Amp. (Limiter)
V103	6AL5	Sound Disc.
V104	6AV6	1st AF Amp.
V105	6AV6	AF Osc.
V106	6AG5, or	1st Pix IF Amp.
V107	6AG5, or	2nd Pix IF Amp.
V108	6AG5, or	3rd Pix IF Amp.
V109	6CB6	Pix 2nd Det. & AGC
V110	6AG5, or	1st Vid. Amp.
V111	6K6	2nd Vid. Amp.
V112	6SN7	Sync. Amp & Sep.
V113	6BL7	Vert. Osc. and Vert. Out.
V114	6SN7	Horiz. and Sweep Osc.
V115	6BG6G	Hor. Sweep Out.
V116	1B3GT	H. V. Rect.
V117	6AX4GT or 6W4	Damper
V118	6X4	Rectifier
V119	20CT4	Rectifier
V120	24AB4	Picture Tube

KEY VOLTAGES

B+, plate of damper, V117 pin 5	250vdc
Boosted B+, cath. of damper, V117 pin 3	640vdc
Plate of Vert. Osc., V113 pin 2	85vdc
Plate of Vert. Out., V113 pin 5	320vdc
Plates of Hor. Osc. and Control, V114 pin 5	280vdc
Grid of Hor. Out., V115 pin 5	95 to 120vdc
(All voltages are measured with a VTVM between the tube pins and chassis.)	-280vdc

ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-2. (In this case, horizontal frequency and lock controls are known as the Hor. Osc. Adj.-Synchronizer.)
For tuner oscillator adjustments, see TUNER OSC. ADJ.-2.

NO RASTER - NO SOUND (31) Power input circuit V118 Check B- Filter circuit	SOUND BARS IN PIX (4A, 4E) Tuner line tuning Sound Trap alignment T-104 alignment V2, V106, V107, V108 IF and RF alignment	RASTER BLOOMING (37) V115, V116 CRT Brightness control Check 1 mfd series res. in sec. anode lead	DEFORMED SOUND (8D) Tuner fine tuning V2, V103, V104, V105 Threshold control Check 0.01 mfd cap. connected to pin 5 of V105 Sound and Vid. IF alignment T103, L101 Det. alignment T101
NO RASTER - SOUND OK (31) Brightness control Ion trap HV trans., Hor. yoke, CRT connections Focus coil ckt. open	SNOW IN PIX (32) V1, V2, V106, V107, V108 Threshold control Antenna and Transmission line	INSUFFICIENT RASTER WIDTH (25) Hor. Drive and width controls V114, V115, V118 Check 0.00039 and 0.002 mfd caps. connected to pin "D" of Hor. Osc. Trans. Hor. Out. Trans. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V101, V102, V103, V104, V105 Volume control Speaker (open voice coil or defective) Sound and Vid. IF alignment T103, L101 Det. alignment T101
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V2, V107, V108, V109, V110, V111	AC IN PIX (DARK HOR. BAR) (38) V2, V106, V107, V108, V109, V110, V111	INSUFFICIENT RASTER HEIGHT (16) Height and Vert. Lin. controls V113, V118 Check 0.1 mfd cap. connected to pin 4 of V113 Vert. Out. Trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V101, V102, V103, V104, V105 Volume control Sound and Vid. IF alignment T103, L101 Det. alignment T101
POOR HOR. LIN. Hor. Drive controls V114, V115, V117 Check 0.027 and 0.035 mfd caps. connected to Hor. Lin. coil	ENGRAVED EFFECT IN PIX (33) Tuner line tuning Contrast and Threshold controls V109, V110, V111 Vid. Det. and Amp. peaking coils VERT. BARS (21) Hor. Drive control V113 Check 51 mfd cap. connected between 1 and 2 terminals in Defl. yoke Defl. yoke ringing	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V112, V113 Check 0.05 mfd cap. connected through 10KΩ Defl. yoke 2 of V115 Vert. Defl. yoke Vert. Out. Trans.	NOISY SOUND - PIX OK V101, V102, V103, V104, V105 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment T101, T103, and L101
PIX JITTER SIDEWAYS Hor. Adj. (Synchroguide) Hor. Hold and Lock. controls Threshold control V114, V115 Check 0.002 mfd cap. connected to pin 1 of V114	PIX BENDING (22) Hor. Adj. (Synchroguide) Hor. Hold and Lock. controls Threshold control V114, V115 Check 0.002 mfd cap. connected to pin 1 of V114 Check 180 mfd cap. connected to pin 4 of V114	NO VERT. SYNC. - VERT. SYNC. OK (19, 20) V112, V113 Check 0.01 mfd cap. connected to pin 1 of V112 No HOR. OR VERT. SYNC. - PIX SIGNAL OK Threshold control V110, V112 Check 0.01 mfd cap. connected to pin 1 of V112	INTERMITTENT SOUND - PIX OK V101, V102, V103, V104, V105 Volume control Poor connections in sound system
PIX JITTER UP AND DOWN (16, 17) V113 Vert. Hold and Threshold controls Check 4700 mfd cap. connected to pin 1 of V115 Vert. Out. Trans.	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning V1, V2, V106 Threshold control RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK Threshold control V110, V112 Check 0.01 mfd cap. connected to pin 1 of V112	
SMOARED PIX (35) Tuner fine tuning Contrast and Threshold controls V109, V110, V111 Check Vid. Det. and Amp. peaking coils Check 0.05 mfd cap. connected to pin 1 of V110 IF and RF alignment	INSUFFICIENT BRIGHTNESS Hor. Drive control Threshold and Brightness controls V115, V116, V118 Check 3K2 res. connected to pin 8 of V115 through a 47Ω res. Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. Adj. (Synchroguide) Hor. Hold and Hor. Lock controls V114 Check 180 mfd cap. connected to pin 4 of V114 Check 0.01 mfd cap. connected between terminals C and D of Hor. Osc. trans.	
POOR PIX DETAIL (35) Tuner line tuning Focus control V110, V111, CRT Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and width controls Hor. Drive control V115, V116	AUDIO HUM IN SOUND (8E) V101, V102, V103, V104, V105	

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6AR5	RF Amp.
V2	6CE5	Mixer & Osc.
V3	6CB6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	Video Amp.
V6	6AU6	Video Amp.
V7	6AR5	1st AF Amp. & Rat.
V8	6AR5	AF Out.
V9	6K8GT	Vert. Out.
V10	6AU6	Sync. Limiter
V11A	1/2 6SN7GT	Sync. Clipper
V11B	1/2 6SN7GT	Vert. Osc.
V12	{ 12LP4A 12BP4A 18BP4A }	Pix Tube
V13	5U4G	Low Voltage Rect.
V14	6SN7GT	Hor. Osc. & Phase Det.
V15	6BQ6GT	Hor. Out.
V16	6W4GT	Regenerative Damper
V17	18XGT	HY Rect.

KEY VOLTAGES

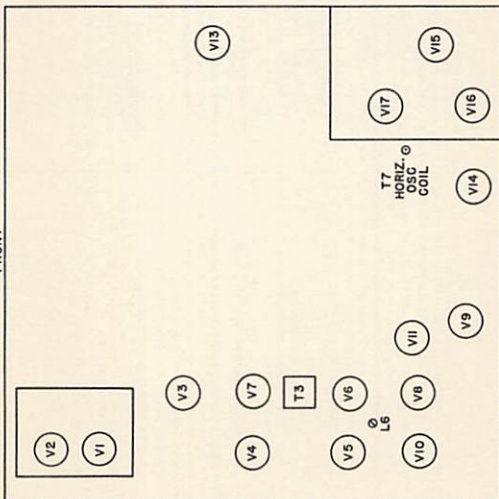
B ₁ , plate of damper, V16 pin 5	320vdc
Booster B ₂ , cath. of damper, V16 pin 3	440vdc
Plate of Vert. Osc., V11 pin 5	120vdc
Plate of Vert. Out., V9 pin 3	400vdc
Plate of Hor. Osc., V14 pin 5	187vdc
Grid of Hor. Out., V15 pin 5	-1.4vdc

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

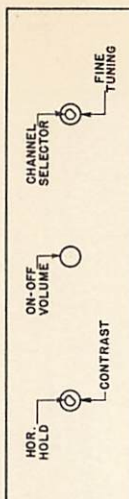
ADJUSTMENTS

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

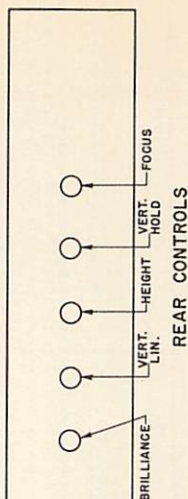
FRONT



TOP VIEW



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V13 NO RASTER - SOUND OK (31) HV Fuse (0.15 Amp. Slo-Blo) V12, V14, V15, V16, V17 HV trans., Hor. yoke, CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V2, V3, V4, V5 Check Vid. Det. crystal (1N60) POOR HOR. LIN. Hor. Drive control V15, V16 Check 2-7000Ω res. connected in series to pin 4 of V15 Check .05 mfd cap. connected to pin 7 of Hor. Out. Trans. POOR VERT. LIN. (11, 12) Hor. Osc. and Hold controls V9, V11 Check .05 mfd cap. connected to pin 2 of V11 PIX JITTER SIDEWAYS Hor. Osc. and Hold controls V11, V14, V15 Check .05 mfd cap. connected to pin 2 of V11 PIX JITTER UP AND DOWN (16, 17) Vert. Hold and Contrast controls V5, V9, V11 SMEARED PIX (36) Tuner fine tuning Contrast control Check Vid. Det. crystal (1N60) V2, V3, V4, V5 Check 0.05 mfd cap. connected to pin 1 of V5 IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus and contrast controls V3, V4, V5, V12 Check .05 mfd cap. connected to pin 1 of V5 Check Vid. Det. crystal (1N60) IF and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V1, V2, V3, V4, V5 Check alignment of L-6 and L-9 Check Vid. Det. crystal (1N60) IF and RF alignment	SNOW IN PIX (32) V1, V3, V4 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control Check Vid. Amp. crystal (1N60) V3, V4, V5 Check for open peaking coils VERT. BARS (21) Hor. Drive control V15, V16 Check 150μmf cap. in plate circuit V15, V16 Defl. yoke ringing PIX BENDING (22) Hor. Osc. and Hold controls V10, V14, V15 Check 100μmf cap. connected to pin 8 of V15 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast control V2, V6, V7, V8 Check Vid. Det. crystal (1N60) RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightness control V12, V14, V15, V16, V17 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V12, V13, V15, V17 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height controls V15, V17 RASTER BLOOMING (37) Ion trap Brightness and Hor. Drive controls V12, V13, V15, V17 Check the 2-680KΩ series res. in sec. anode lead INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V12, V13, V15, V17 Low line voltage	INSUFFICIENT RASTER HEIGHT (15) Vert. Lin. and Height controls V9, V11 Vert. Out. Trans. Check 680KΩ res. connected to pin 5 of V11 Low line voltage NO VERT. DEFL. (14) V9, V11 Open Vert. Height control Vert. Defl. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR SYNC. OK (16, 17) Vert. Hold control V9, V11 No HOR. OR VERT. SYNC. - PIX SERIAL OK Check Vid. Det. crystal (1N60) V10, V11 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. and Hold controls V10, V14, V15 AUDIO HUM IN SOUND (8E) V6, V7, V8 DISTORTED SOUND (8D) Tuner fine tuning V2, V6, V7, V8 Sound IF and Vid. IF alignment L-6 and L-9 Det. alignment L-9 NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-6 Det. alignment L-9 WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V6, V7, V8 Volume control Sound and Vid. IF alignment L-6 Det. alignment L-9 NOISY SOUND - PIX OK V6, V7, V8 Volume control Check sound system for loose connections Speakers Sound IF and Det. alignment L-6 and L-9	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning Contrast control V2, V6, V7 Sound IF and Det. alignment L-6 and L-9 INTERMITTENT SOUND - PIX OK V6, V7, V8 Poor connections in sound system
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TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, 6CB8, 6BC5, 6AK5	RF Amp. Mixer and Osc. 1st IF Amp. 2nd IF Amp. Detector Rat. Det. Driver 1st AF Amp. and Rat. Det.
V2	6J6	AF Out.
V3	6X5	Vert. Out.
V4	6X5	Sync. Limiter
V5	6AU6	1/2 6SN7GT Vert. Osc.
V6	6AU6	1/2 6SN7GT Vert. Osc.
V7	6T8	Picture Tube
V8	6AS5	L. V. Rect.
V9	6K6GT	Hor. Osc. and Phase Det.
V10	6X5	Hor. Out.
V11	6X5	Hor. Out.
V12	6SN7GT	H. V. Rect.
V13	6U4G	Hor. Rect.
V14	6SN7GT	Hor. Rect.
V15	6X5	Hor. Rect.
V16	6K6GT	Hor. Rect.
V17	6K6GT	H. V. Rect.

KEY VOLTAGES

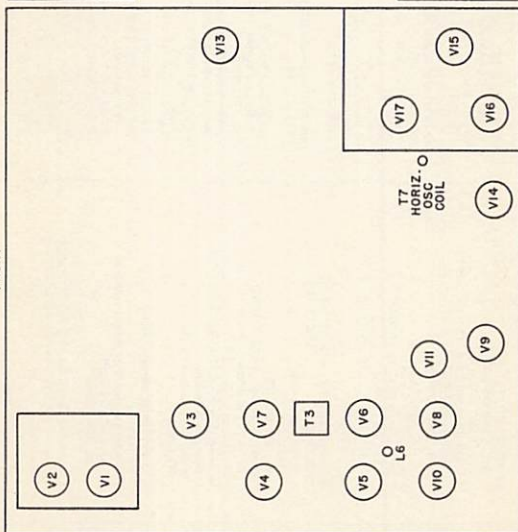
B ₊ , plate of damper, V16 pin 5	320vdc
Boosted B ₊ , cath. of damper, V16 pin 3	440vdc
Plate of Vert. Osc., V11 pin 5	120vdc
Plate of Vert. Osc., V9 pin 3	400vdc
Plate of Hor. Osc., V14 pin 5	197vdc
Grid of Hor. Osc., V13 pin 5	-1.4vdc

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

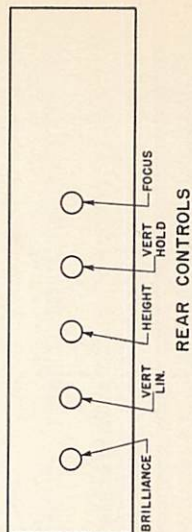
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as Hor. Osc. Coil Adj.)
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.

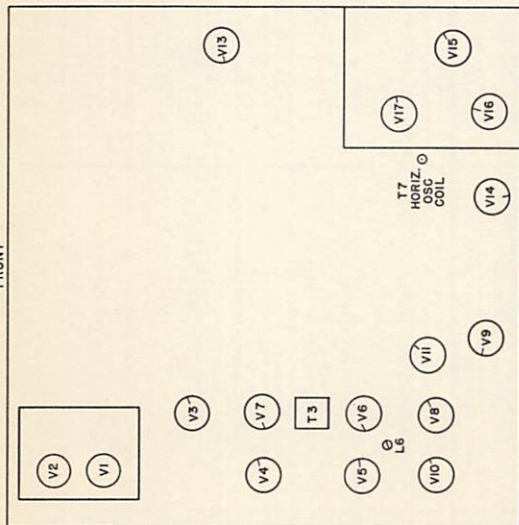
FRONT



TOP VIEW

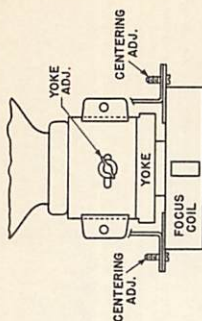


FRONT



TOP VIEW

PICTURE TUBE ADJUSTMENTS



TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, 6CB6, 6BC5 or 6AK5	RF Amp.
V2	6X6	Mixer & Osc.
V3	6AV6	1st AF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	Vid. Amp.
V6	6AU6	Rat. Det. Driver
V7	6BT8	1st AF Amp. & Rat. Det.
V8	6AS5	2nd AF Amp.
V9	6X6GT	Vid. Osc.
V10	6AU6	Syn. Limiter
V11A	1/2 6SN7GT	Syn. Clipper
V11B	1/2 6SN7GT	Vert. Osc.
V12	504G	Plx Tube
V13	504G	LV Rect.
V14	6SN7GT	Hor. Osc. & Phase Adj.
V15	6BQ6GT	Hor. Out.
V16	6W4GT	Regenerative Damper
V17	1B3GT	HV Rect.

KEY VOLTAGES

B+, plate of damper, V16 pin 5	340vdc
Boosted B+, cath. of damper, V16 pin 3	440vdc
Plate of Vert. Osc., V11 pin 5	420vdc
Plate of Hor. Osc., V14 pin 5	420vdc
Grid of Hor. Osc., V14 pin 5	197vdc
Grid of Hor. Out., V15 pin 5	-1.4vdc

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

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as the Hor. Osc. Coil Control.)
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.

FOCUS
HEIGHT
VERT. HOLD
VERT. LIN.

REAR CONTROLS

HOR. HOLD
VOLUME ON-OFF SW.
CHANNEL SELECTOR
BRIGHTNESS
FINE TUNING

FRONT CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V13	SNOW IN PIX (32) V1, V2, V8 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6, V12	INSUFFICIENT RASTER HEIGHT (15) V9, V11, V15 C24 leaky or open Vert. Out. Trans. C25 1000 pf cap. connected to pin 4 of V11 Low line voltage	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning Contrast control V9, V11 Sound IF and Det. alignment L-6 and T-3 V6, V7, V8 INTERMITTENT SOUND - PIX OK Poor connection in sound system
NO RASTER - SOUND OK (31) Ion trap V12, V14, V15, V16, V17 HV trans., Hor. yoke, CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V1, V2, V3, V4, V5, V8 X1 (1N60 crystal Vid. Det.) Contrast control Check 0.2 mf cap. connected to pin 11 of V12 (CRT)	ENGRAVED EFFECT IN PIX (33) Contrast control V9, V11 X1 (1N60 crystal Vid. Det.) VERT. BARS (21) V15, V16 Hor. Drive control Defl. yoke ringing PIX BENDING (22) Hor. Osc. coil V11, V14 Check 27 mmf cap. connected to pin 1 of V14	NO VERT. DEFL. (14) V9, V11 V28 shorted Vert. Out. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V9, V11 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V8, V10, V11 X1 (1N60 Vid. Det.) NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold Ion trap V11, V14	
POOR HOR. LIN. Hor. Drive V14, V15, V16 Hor. Out. Trans. Check 0.2 mf cap. connected to pin 3 of V16	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V9, V11 X1 (1N60 crystal Vid. Det.) RF and IF alignment	AUDIO HUM IN SOUND (8E) V6, V7, V8 DISTORTED SOUND (8D) Tuner fine tuning V6, V7, V8 Sound and Vid. IF alignment L-6 Det. alignment T-3 NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-6 Det. alignment T-3 WEAK SOUND - PIX OK (8C) Tuner fine tuning V6, V7, V8 Volume control Sound and Vid. IF alignment L-6 Det. alignment T-3 NOISY SOUND - PIX OK V6, V7, V8 X1 (1N60 crystal Vid. Det.) Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment L-6 and T-3	
POOR VERT. LIN. (11, 12) Vert. Lin. control Vert. Height control V9, V11 Vert. Out. Trans. PIX JITTER SIDEWAYS Hor. Hold control Hor. Osc. coil V11, V14, V15 Check 47 mmf cap. connected to pin 2 of V11	INTERMITTENT RASTER - SOUND OK V11, V14, V15, V16, V17 Brightness control HV trans. INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive control V12, V13, V15, V17 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) V15, V17	NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-6 Det. alignment T-3 WEAK SOUND - PIX OK (8C) Tuner fine tuning V6, V7, V8 Volume control Sound and Vid. IF alignment L-6 Det. alignment T-3 NOISY SOUND - PIX OK V6, V7, V8 X1 (1N60 crystal Vid. Det.) Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment L-6 and T-3	
POOR PIX DETAIL (35) Ion trap V5 Check Vid. Amp. peaking coils IF and RF alignment SOUND BARS IN PIX (4A, 4E) V2, V5, V8 Check L-6 alignment IF and RF alignment	RASTER BLOOMING (37) V12, V15, V16, 60K res. in series with the sec. anode lead Hor. Drive control INSUFFICIENT RASTER WIDTH (23) Hor. Drive control V12, V14, V15 Hor. Out. Trans. Check 1200 mmf cap. connected to Hor. Osc. trans. (T-7) Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-6 Det. alignment T-3 WEAK SOUND - PIX OK (8C) Tuner fine tuning V6, V7, V8 Volume control Sound and Vid. IF alignment L-6 Det. alignment T-3 NOISY SOUND - PIX OK V6, V7, V8 X1 (1N60 crystal Vid. Det.) Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment L-6 and T-3	

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	1st I.F. Amp.
V2	6CB6	2nd I.F. Amp.
V3	6CB6	3rd I.F. Amp.
V4	6AC7	Vid. Amp.
V5	6X4	Rectifier
V6	6AC5	Audio Out.
V7	6T8	FM Det. and 1st Aud.
V8	6AU6	Sound I.F.
V9	6SN7GT	Vert. Blocking Osc.
V10	6AL5	Phase Det.
V11	62A7	Sync Limiter
V12	6BD6	Hor. Osc.
V13	6BD6	Hor. Out.
V14	6BD6	Diode Dumper
V15	6AX4	R.F. Amp.
V16	6AX4	Osc. and Mixer
V17	6AX4	Vert. Out.
V18	684	Rect.
V19	684	H.V. Rect.
V20	684	H.V. Rect.

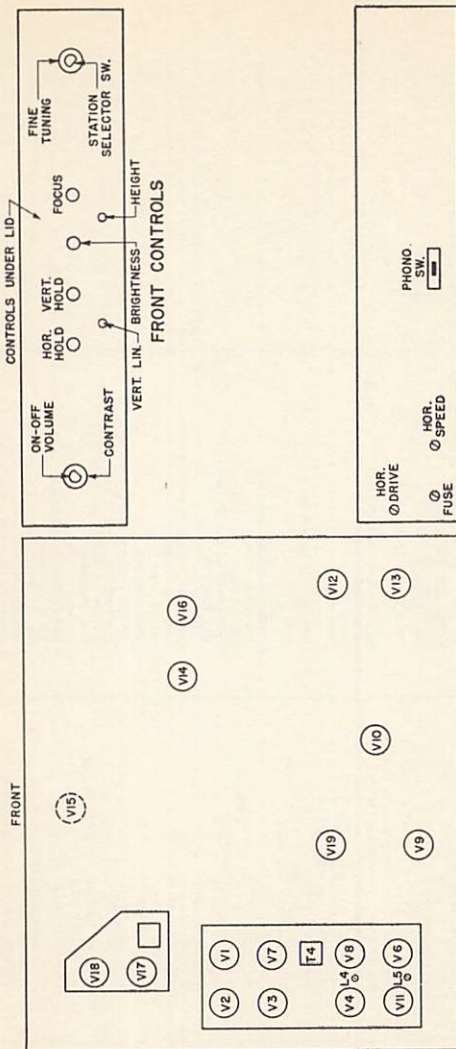
KEY VOLTAGES

B+, plate of damper, V16 pin 5	375vdc
Boosted B+, cath. of damper, V16 pin 3	540vdc
Plate of Vert. Osc., V9 pin 2	375vdc
Grid of Vert. Osc., V9 pin 5	375vdc
Plates of Vert. Osc., V13 pin 2	250vdc
Plates of Hor. Osc., V13 pin 2	150vdc
Grid of Hor. Out., V14 pin 5	-17vdc

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

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as the Hor. Osc. Coil Control.)
For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



TOP VIEW

REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit Line fuse (5 Amps) Mains switch V12	NO RASTER - SOUND OK (31) HV Fuse (.25 Amps) V13, V14, V15, V16 Ion trap Contrast control HV trans., Hor. yoke, CRT connections	SNOW IN PIX (32) V1, V2, V3, V21 Vid. Det. (IN64 crystal) Antenna and transmission line V1, V2, V3, V17, V18 AC IN PIX (DARK HOR. BAR) (38) ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V1, V2, V3, V4, V18, V20, V21 VERT. BARS (21) Hor. Drive control V13, V14, V16 Ded. yoke ringing PIX BENDING (22) Hor. Hold and Osc. controls V10, V13, V14 WEAK OR NO PIX - SOUND WEAK - RASTER OK tuning (32C, 34C) V1, V2, V3, V4, V17, V18 Vid. Det. crystal IN64 RF and IF alignment	NO VERT. DEFL. (14) V9, V19 Shorted .0047 cap. on Yellow lead of Vert. Out. Trans. Vert. Det. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V9, V19 Vert. Hold control Vert. Int. couple PIX SIGNAL OK NO HOR. OR VERT. SYNC. - V10, V11 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) V10, V13, V14 Hold controls RF and IF alignment Check 0.05 mfd cap. connected to pin 1 of V13 AUDIO HUM IN SOUND (8E) V6, V7, V8 DISTORTED SOUND (8D) Tuner fine tuning V6, V7, V8, V18 Vid. Det. crystal (IN64) Sound and Vid. IF alignment L-6 Det. alignment T-4 NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-6 Det. alignment T-4 WEAK SOUND - PIX OK (8C) Tuner fine tuning V6, V7, V8, V18 Volume control Sound and Vid. IF alignment L-6 Det. alignment T-4 NOISY SOUND - PIX OK V6, V7, V8, V18 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning Vid. Det. crystal (IN64) V7, V8 Sound IF and Det. alignment L-6, T-4 INTERMITTENT SOUND - PIX OK V6, V7, V8 Poor connections in sound system
POOR RASTER - SOUND AND RASTER OK (34) Tuner fine tuning V1, V2, V3, V4 Contrast control Vid. Det. (IN64 crystal)	POOR HOR. LIN. Hor. Lin. and Drive control V13, V14, V16 Hor. Out. Trans. POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V9, V19 Vert. Out. Trans. Check 3.3 meg res. on pin 5 of V9 PIX JITTER SIDEWAYS Hor. Hold and Osc. controls V10, V13, V14 PIX JITTER UP AND DOWN (16, 17) Check for loose connections in Vert. circuit V9, V11, V19 SMEARED PIX (36) Tuner fine tuning Contrast control V1, V2, V3, V4 Sound and Vid. IF alignment POOR PIX DETAIL (35) Tuner fine tuning Vid. Det. (IN64 crystal) Vid. Det. (IN64 crystal) Check for open Vid. Amp. peaking coil Focus control IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V12, V13, V14 CRT Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width controls Height control V14, V15 RASTER BLOOMING (37) Hor. Drive control V12, V13, V14, V15 CRT Increased res. of sec. anode series res. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V13, V14 Hor. Out. Trans. Low line voltage INSUFFICIENT RASTER HEIGHT (15) Hor. Drive and Height controls V9, V12, V18 Vert. Out. Trans. Low line voltage		
POOR RASTER - SOUND AND RASTER OK (34) Tuner fine tuning V1, V2, V3, V4 Contrast control Vid. Det. (IN64 crystal)	POOR HOR. LIN. Hor. Lin. and Drive control V13, V14, V16 Hor. Out. Trans. POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V9, V19 Vert. Out. Trans. Check 3.3 meg res. on pin 5 of V9 PIX JITTER SIDEWAYS Hor. Hold and Osc. controls V10, V13, V14 PIX JITTER UP AND DOWN (16, 17) Check for loose connections in Vert. circuit V9, V11, V19 SMEARED PIX (36) Tuner fine tuning Contrast control V1, V2, V3, V4 Sound and Vid. IF alignment POOR PIX DETAIL (35) Tuner fine tuning Vid. Det. (IN64 crystal) Vid. Det. (IN64 crystal) Check for open Vid. Amp. peaking coil Focus control IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive controls V12, V13, V14 CRT Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width controls Height control V14, V15 RASTER BLOOMING (37) Hor. Drive control V12, V13, V14, V15 CRT Increased res. of sec. anode series res. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V13, V14 Hor. Out. Trans. Low line voltage INSUFFICIENT RASTER HEIGHT (15) Hor. Drive and Height controls V9, V12, V18 Vert. Out. Trans. Low line voltage		

TUBE LIST

Symbol	Type	Circuit Function
V1	6J6	RF
V2	6J6	Osc.
V3	6AG5	Mod.
V4	6AK5	1st Vid. IF
V5	6AG5	2nd Vid. IF
V6	6AG5	3rd Vid. IF
V7	6AG5	4th Vid. IF
V8	1N34, 1N60	Vid. Det.
V9	6AU6	1st Vid.
V10	6K6GT	Vid. Out.
V11	6C4	DC Rect., Sync.
V12	6SN7GT	Ion. Sync. Sep., Vert. Osc.
V13	6AL5	Hor. Sync., Phase Det.
V14	6K6GT	Hor. Osc.
V15	6AC7	Hor. Osc. Control
V16	6SN7GT	Hor. Form.
V17	6SN7GT	Hor. Form.
V18	6BG6G	Hor. Out.
V19	6W4CT	Hor. Damping
V20	6BA6	1st Sound IF
V21	6BA6	2nd Sound IF
V22	6AU6	3rd Sound IF
V23	6BA6	4th Sound IF
V24	6S17	AM Mod.
V25	6S17	AM 2nd Det., AVC, 1st Audio
V26	6V6G	Audio Out.
V27	1B6G	High-Volt. Rect.
V28	1B6G	High-Volt. Rect.
V29	5U4G	Low " "
V30	5U4G	Low " "
V31	19AP4 or 19AP4	Picture Tube

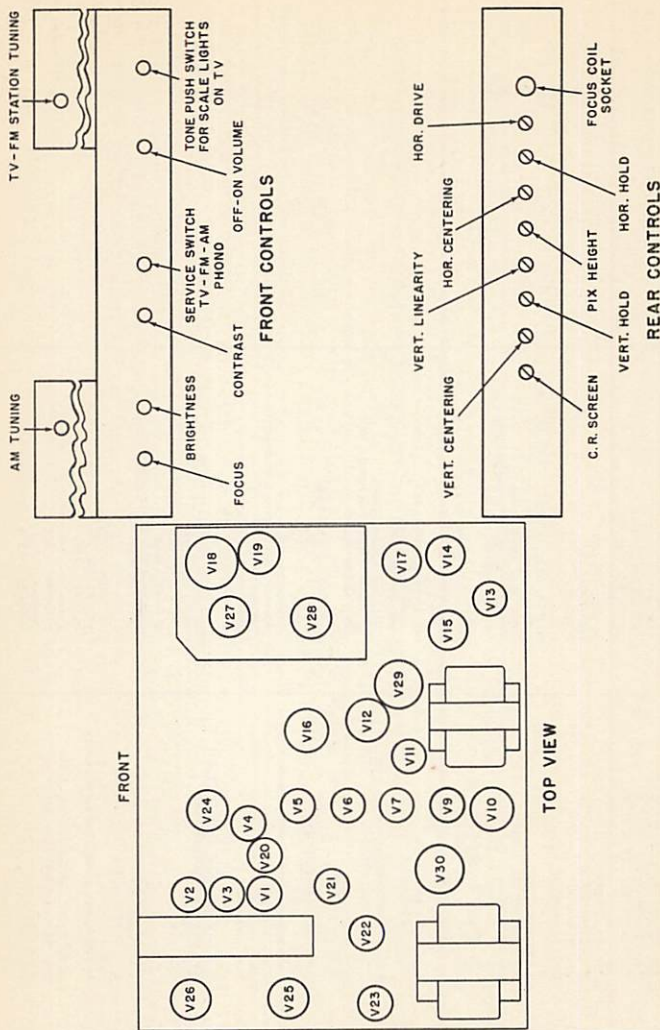
KEY VOLTAGES

B ₁ plate of damper, V15 pin 5	370vdc
Boosted B ₁ , cath. of damper V19	pin 3 520vdc
Plate of Vert. Osc., V12	pin 3 120vdc
Plates of Vert. Out., V16	pin 2 330vdc
Plate of Hor. Osc. V14	pin 3 240vdc
Plate of Hor. Osc. Con., V15	pin 8 280vdc
Grid of Hor. Out., V18 pin 5	-23vdc

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

ADJUSTMENTS

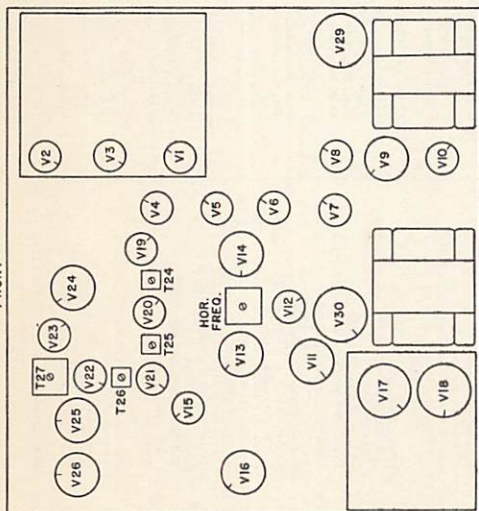
For horizontal oscillator adjustment, see HOR. OSC. ADJ. -3.



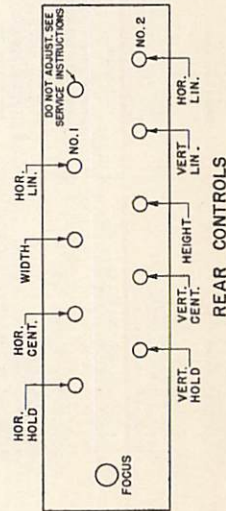
TUBE LIST

Symbol	Type	Circuit Function
V1	6J6	RF Amp.
V2	6J6	Osc.
V3	6AG5	Mod.
V4	6AG5	1st Vid. IF
V5	6AG5	2nd Vid. IF
V6	6AG5	Vid. Det.
V7	6AL5	1st Vid. Amp.
V8	6AL5	Vid. Out.
V9	6K5GT	DC Rest., Sync.
V10	6C4	Sep. and Clip.
V11	6SN7GT	Hor. Sync. and Sp.
V12	6AL5	Hor. Sync. Disc.
V13	6K5GT	Hor. Osc. Control
V14	6AC7	Hor. Osc.
V15	6J6	Vert. Osc.
V16	6K5GT	Vert. Out.
V17	6K5GT	Hor. Det.
V18	6AG5	Hor. Det.
V19	6BA6	1st Sound IF
V20	6BA6	2nd Sound IF
V21	6BA6	3rd Sound IF
V22	6BA6	4th Sound IF
V23	6AL5	Ret. Det.
V24	6AL5	Rect. and Filter
V25	6SC7	AM Det., AVC, 1st Audio Amp.
V26	6V6GT	Audio Out.
V27	6V6G	RF Osc. (H-V Supply)
V28	1B3	H.V. Rect. " "
V29	1D4G	Low-Volt. Rect.
V30	5Y4G	" "
V31	12LP4 or 12LP4	Picture tube

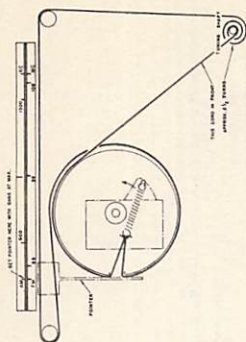
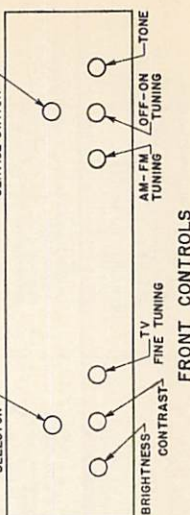
FRONT



TOP VIEW



DRIVE CORD ASSEMBLY

TV-AM-FM-PHONO
SERVICE SWITCH

FRONT CONTROLS

NO RASTER - NO SOUND (31)
 Power supply circuit
 V20, V29

NO RASTER - SOUND OK (31)
 Brightness control
 V11, V12, V14, V17, V18, V27,
 V28, V31
 Ion
 HV trans., Hor. yoke, CRT connec-
 tions

WEAK PIX - SOUND AND RASTER OK (34)
 Tuner line tuning
 V14, V15, V16, V17, V18, V19
 Contrast control

POOR HOR. LIN.
 Hor. Lin. and Drive controls
 V11, V17, V18
 Hor. Freq. and Phase controls
 V11, V12, V13, V14, V15, V16, V17, V18, V19
 Check 0.05 mfd mica cap. in plate
 ext (2) of V11

POOR VERT. LIN. (11, 12)
 Vert. Lin. and Height controls
 V15, V16
 Check 0.05 mfd cap. connected to pin
 2 of V15

PIX JITTER SIDEWAYS
 Hor. Hold, Freq. and Phase controls
 V12, V13, V14, V17
 Check 60 mfd mica cap. connected to
 "E" of T22

PIX JITTER UP AND DOWN (16, 17)
 Contrast control
 V15, V16
 Vert. Hold control

SMEARED PIX (36)
 Tuner line tuning
 Contrast control
 V7, V8, V9, V10
 Check coupling caps. between V7 and
 V8, V8 and V9, and V9 and V31
 IF and RF alignment

POOR PIX DETAIL (35)
 Tuner line tuning
 Focus control
 V4, V5, V6, V7
 Check Vid. Amp. peaking coils
 IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
 Tuner line tuning
 V1, V2, V3, V4, V5, V6, V7
 Check alignment of T15 and T16 (Top)
 IF and RF alignment

SNOW IN PIX (32)
 V1, V2, T24, V4, V5, V6, V7
 Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
 V1, V2, V3, V4, V5, V6, V7, V8, V9
 ENGRAVED EFFECT IN PIX (33)
 Tuner line tuning
 Contrast control
 V4, V5, V6, V7, V8, V9, V31
 Check Vid. Amp. peaking coils

VERT. BARS (21)
 V11, V17, V18
 Defl. yoke tracing
 PIX BENDING (22)
 Hor. Drive control
 Hor. Freq., Hold and Phase controls
 V11, V12, V13, V14, V15, V16, V17

WEAK OR NO PIX - SOUND WEAK -
 RASTER OK (32C, 34C)
 Tuner line tuning
 V1, V2, V3
 Contrast control
 RF and IF alignment

INTERMITTENT RASTER - SOUND OK
 Brightness control
 V11, V12, V13, V14, V17, V18, V27
 V28, V31
 HV trans.

INSUFFICIENT BRIGHTNESS
 Ion trap
 Brightness and Hor. Drive controls
 V27, V28, V29, V30, V31
 Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
 Hor. Drive, Width and Height controls
 V11, V17, V27, V28

RASTER BLOOMING (37)
 Hor. Drive control
 V11, V17, V27, V28, V29, V30, V31

INSUFFICIENT RASTER WIDTH (23)
 Hor. Drive and Width controls
 V11, V17, V27, V28, V29, V30
 Hor. Drive control (T23)
 Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
 Vert. Lin. and Height controls
 V15, V16, V29, V30
 Vert. Out. Trans.
 Low line voltage

NO VERT. DEFL. (14)
 V1, V2, V4, V5, V6, V7
 Vert. Defl. yoke
 Vert. Out. Trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
 Vert. Int. Network
 Vert. Hold control
 V15

NO HOR. OR VERT. SYNC. -
 PIX SIGNAL OK
 V10, V11

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
 Hor. and Phase controls
 V11, V12, V13, V14, V15, V16, V17, V18, V19
 Check 0.05 mfd cap. in grid ext of V14
 Check 60 mfd mica cap. connected to
 "E" of T22

AUDIO HUM IN SOUND (8E)
 V19, V20, V21, V22, V23, V25, V26

DISTORTED SOUND (8D)
 Tuner line tuning
 V3, V19, V20, V21, V22, V23, V25
 Tone control
 Sound IF alignment T24, T25, T26
 Det. alignment T27

NO SOUND - PIX OK (8B)
 Tuner line tuning
 V19, V20, V21, V22, V23, V25
 Volume control
 Speaker (open voice coil or defective
 connection)
 Sound IF alignment T24, T25, T26
 Det. alignment T27

WEAK SOUND - PIX OK (8C)
 Tuner line tuning
 V2, V3, V19, V20, V21, V22, V23, V25
 Volume control
 Sound and Vid. IF alignment T24, T25,
 T26
 Det. alignment T27

NOISY SOUND - PIX OK
 V19, V20, V21, V22, V23, V25
 Tone and Volume control
 Check for loose connections in sound
 system
 Speaker
 Sound IF and Det. alignment

INTERMITTENT SOUND - PIX OK
 V19, V20, V21, V22, V23, V25
 Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF
V2	6AB6	Osc.
V3	6AK5	Mixer
V4	6CB6	1st Vid. IF
V5	6CB6 or 6AG5	2nd Vid. IF
V6	6AG5 or 6AC6	3rd Vid. IF
V7	6AL5	Vid. Det., Delay
V8	6AU6	Diode
V9	12AU6	1st Vid. Out. - DC
V10	6SN7GT	Rect.
V11	6SN7GT	Sync. Out. - Vert. Osc.
V12	6SN7GT	Hor. Amp.
V13	6SN7GT	Hor. Osc.
V14	6CD6G	Hor. Out.
V15	6W4	Damper
V16	6X4	Rect.
V17	11B3	HV Rect.
V18	6BA6	1st Sound IF
V19	6AU6	Driver
V20	6AL5	Rad. Det.
V21	6SQ7	1st AF
V22	6X4	AF Out.
V23	6X4	Rect.
V24	504G	LV Rect.

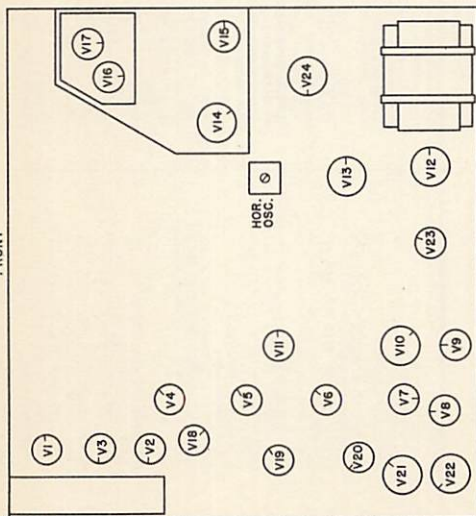
KEY VOLTAGES

B+, plate of damper, V15 pin 5 350vdc
 Boosted B+, cath. of damper, V15 pin 3 50vdc
 Plate of V11 pin 1 150vdc
 Plate of V11 pin 9 410vdc
 Plate of V11 pin 2 220vdc
 Plate of Hor. Osc. and Cont., V13 pin 2 220vdc
 Grid of Hor. Out., V14 pin 5 -2.8vdc
 (All voltages are measured with a VTVM
 between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-2. (In this case, the horizontal lock control is known as the horizontal lock range control.)
 For vertical oscillator adjustments, see VERT. OSC. ADJ.-2. (In this case, the vertical lock control is known as the locking control.)

FRONT

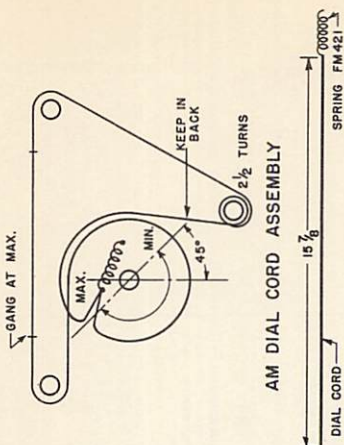


TOP VIEW

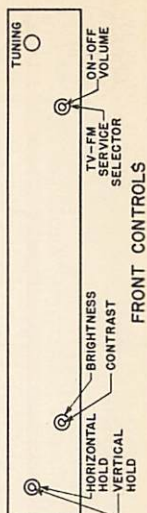
SWITCH MUST BE IN
 METROPOLITAN POSITION
 FOR HIGH SIGNAL AREAS



REAR CONTROLS



AM DIAL CORD ASSEMBLY



NO RASTER - NO SOUND (31)
Lower output circuit
Check photo-TV-FM switch
V23, V24

NO RASTER - SOUND OK (31)
Brightness control
Ion trap

V1, V2, V4, V5, V6, V7, V8, V9
HV trans., Hor. yoke, CRT connections
V14, V15, V16, V17, V25

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast control

V2, V3, V5, V6, V7, V8, V9
Poor Hor. Lin.

Hor. Lin. and Drive controls
V14, V16

Check 0.03 mf and 0.1 mf cap. connected to Hor. Lin. coil
Hor. Out. Trans.

POOR VERT. LIN. (11, 12)
Vert. Lin. and Height controls
V10, V11

Check 1 megohm res. connected to pin 6 of V11
Vert. Out. Trans.

PIX JITTER SIDEWAYS
Hor. Hold, Locking, Freq. and Wave-
form controls

V12, V13, V14
Check 2000 mmf cap. connected to pin 4 of V13

Check 250 mmf cap. connected to pin 1 of V13

PIX JITTER UP AND DOWN (16, 17)
Vert. Hold and Contrast controls
V10, V11

MEASURED PIX (36)
Tuner fine tuning
Contrast control

V2, V4, V5, V6, V7, V8, V9
Check 0.1 mf cap. connected to pin 1 of V8

Check 0.05 mf cap. connected to pin 1 of V9

IF and RF alignment

POOR PIX DETAIL (35)
Tuner fine tuning
Focus control

V2, V4, V5, V6, V7, V8, V9
Check V14, V15, V16, V17, V25
IF and RF alignment

Check V14, V15, V16, V17, V25
IF and RF alignment

Check V14, V15, V16, V17, V25
IF and RF alignment

Check V14, V15, V16, V17, V25
IF and RF alignment

Check V14, V15, V16, V17, V25
IF and RF alignment

Check V14, V15, V16, V17, V25
IF and RF alignment

SOUND BARS IN PIX (4, 4E)
Tuner fine tuning
V1, V2, V4, V5, V6, V7
Check alignment of all traps in PIX
IF system

IF and RF alignment

SNOW IN PIX (32)
V1, V2, V4, V5, V6
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V4, V5, V6, V7, V8, V9

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast control

V2, V4, V5, V6, V7, V8, V9
Check Vid. Amp. peaking coils

VERT. BARS (21)
Hor. Drive control
V14, V16

Defl. yoke fingering

PIX BENDING (22)
Hor. Hold, Locking, Freq. and Wave-
form controls

V12, V13, V14
Check 0.01 mf cap. connected across points "C" and "D" of the Hor. Osc. trans.

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

Contrast control
V1, V2, V3, V4, V5
RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Vert. Hold and Contrast controls
V12, V13, V14, V15, V16, V17, V25
HV trans.

INSUFFICIENT BRIGHTNESS
Ion trap

Brightness and Hor. Drive controls
V14, V15, V16, V17, V25
Check all resistors connected to pin 8 of V14

Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive, Width and Height controls
V14, V16, V17

RASTER BLOOMING (37)
Hor. Drive control
V14, V16, V17, V23, V24, V25
Check 4-470K res. connected to the plate cap of V17

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Width controls
V14, V23, V24
Check 0.005 mf cap. connected to point "D" of Hor. Osc. trans.

Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Lin. and Height controls
V10, V11, V21, V22
Check 0.005 mf cap. connected to lead of Vert. Osc. trans.

Low line voltage

NO VERT. DEFL. (14)
V10, V11
Check 0.01 mf cap. connected to pin 6 of V11

Vert. Defl. Yoke
Vert. Out. Trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
Vert. Hold control
V10, V11, V21, V22
Check 0.005 mf cap. connected to pin 4 of V10

NO HOR. OR VERT. SYNC. -
PIX SIGNAL OK
Check 0.01 mf cap. connected to pin 2 of V10

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold, Locking, Freq. and Wave-
form controls

V12, V13, V14
Check 250 mmf cap. connected to pin 6 of V12

AUDIO HUM IN SOUND (8E)
Check all resistors connected to pin 1 of V18, V19, V20, V21, V22

DISTORTED SOUND (8D)
Tuner fine tuning
V1, V2, V4, V5, V18, V19, V20, V21, V22

Sound and Vid. IF alignment
Det. alignment

NO SOUND - PIX OK (8B)
Tuner fine tuning
V18, V19, V20, V21, V22
Volume control

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

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V2, V3, V4, V5, V18, V19, V20, V21, V22

Volume control
Sound and Vid. IF alignment
Det. alignment

NOISY SOUND - PIX OK
V18, V19, V20, V21, V22
Volume control

Check and adjust system for loose connections
Speakers

INTERMITTENT SOUND - PIX OK
V18, V19, V20, V21, V22
Post connections in sound system

TUBE LIST

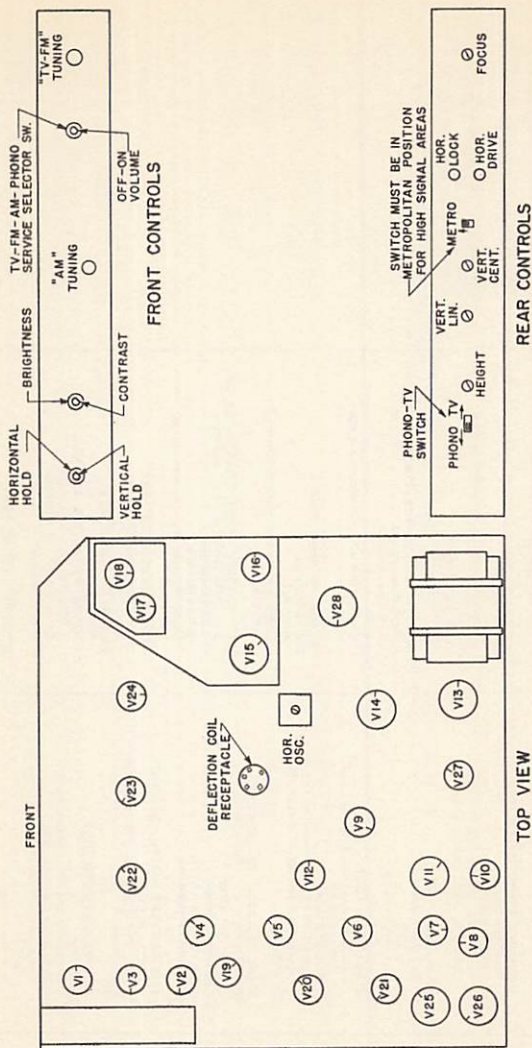
Symbol	Type	Circuit Function
V1	6CB6	RF
V2	6J8 or 6AB4	Osc.
V3	6AK5	Mixer
V4	6CB6	1st Vid. IF
V5	6CB6 or 6AB4	2nd Vid. IF
V6	6CB6 or 6AB4	3rd Vid. IF
V7	6AL5	Vid. Det. - Delay
V8	6AU6	Diode
V9	6AL5	1st Vid.
V10	6AL5	2nd Vid.
V11	6SN7GT	Sync. Sep. - Vert. Osc.
V12	6SN7GT	Vert. Out.
V13	6SN7GT	Hor. Amp.
V14	6SN7GT	Hor. Osc. - Control
V15	6X4	Hor. Out.
V16	6X4	Hor. Out.
V17	1B3G	HV Rect.
V18	1B3G	HV Rect.
V19	6BA6	1st Sound IF
V20	6AU6	Driver
V21	6AL5	Rat. Det.
V22	6AL5	AM Modulator
V23	6BA6	AM RF
V24	6SQ7	AM 2nd Dtt. AVC
V25	6SQ7	1st AF
V26	6K5GT	AF Out.
V27	6X4	Low Voltage Rect.
V28	5U4G	Low Voltage Rect.

KEY VOLTAGES

B₁ plate of damper, V16 pin 5 350vdc
 B₂ cath. of damper, V16 pin 3 470vdc
 Plate of Vert. Osc., V11 pin 5 85vdc
 Plate of Vert. Out., V12 pin 5 390vdc
 Plates of Hor. Osc. and Cont., V14 pin 2 190vdc
 pin 5 95vdc
 Grid of Hor. Out., V15 pin 5 -4.5vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ. 2. For the adjustment of the horizontal lock control, see the Waveform Control, and the horizontal lock range control is known as the Locking Control.)



TOP VIEW

REAR CONTROLS

- NO RASTER - NO SOUND (31)**
Input cable disconnected
Check Pix and TV-PM switch
V23, V24
- NO RASTER - SOUND OK (31)**
Brightness control
Ion trap
V14, V15, V16, V17, V25
HF trans., Hor. yoke, CIT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
- POOR HOR. LIN.**
Hor. Lin. and Drive controls
V14, V16
Check 0.03 mf and 0.1 mf cap. connected to Hor. Lin. coil
Hor. Out. Trans.
- POOR VERT. LIN. (11, 12)**
V10, V11
Check 1 meg Ω res. connected to pin 6 of V11
Hor. Out. Trans.
- PIX JITTER SIDEWAYS**
Hor. Hold, Locking, Freq. and Wave-form controls
V12, V13, V14
Check 2000 mmf cap. connected to pin 1 of V13
Check 250 mmf cap. connected to pin 1 of V13
- PIX JITTER UP AND DOWN (16, 17)**
Vert. Hold and Contrast controls
V10, V11
- SMEARED PIX (36)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
Check 0.1 mf cap. connected to pin 1 of V8
Check 0.05 mf cap. connected to pin 1 of V9
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus control
V14, V15, V16, V17
Check Vid. and Defl. yoke
IF and RF alignment
- SOUND BARS IN PIX (4, 4, E)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7
Check alignment of all traps in PIX
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V4, V5, V6
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V6, V7, V8, V9
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
Check Vid. Amp. peaking coils
- VERT. BARS (21)**
V10, V11
Defl. yoke control
V14, V16
- PIX BENDING (22)**
Hor. Hold, Locking, Freq. and Wave-form controls
V10, V11
Check 0.01 mf cap. connected across points "C" and "D" of the Hor. Osc. trans.
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V5
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Ion trap
V12, V13, V14, V15, V16, V17, V25
HF trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
V14, V16, V23, V24, V25
Check 250 mmf resistors connected to pin 8 of V14
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Width and Height controls
V14, V16, V17
- RASTER BLOOMING (37)**
Hor. Drive control
V14, V16, V17, V23, V24, V25
Check 4-470K Ω res. connected to the plate cap of V17
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width controls
V14, V23, V24
Check 1000 mmf cap. connected to pin 8 of Hor. Osc. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Lin. and Height controls
V10, V11, V23, V24
Check 0.01 mf cap. connected to Red lead of Hor. Osc. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V10, V11
Check 0.1 mf cap. connected to pin 6 of V11
Vert. Defl. Yoke
Vert. Out. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold control
V10, V11
Check 0.005 mf cap. connected to pin 4 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V10, V12
Check 0.01 mf cap. connected to pin 2 of V10
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold, Locking, Freq. and Wave-form controls
V12, V13, V14
Check 250 mmf cap. connected to pin 6 of V12
- AUDIO HUM IN SOUND (8E)**
V18, V19, V20, V21, V22
- DISTORTED SOUND (8D)**
Tuner fine tuning
V2, V3, V4, V5, V18, V19, V20, V21, V22, V24
IF alignment
Sound and Vid. IF alignment
Det. alignment
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V18, V19, V20, V21, V22
Volume control
Speaker (check voice coil or defective connection)
Sound and Vid. IF alignment
Det. alignment
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V2, V3, V4, V5, V18, V19, V20, V21, V22
Volume control
Speaker and Vid. IF alignment
Det. alignment
- NOISY SOUND - PIX OK**
V18, V19, V20, V21, V22
Volume control
Check sound system for loose connections
Speakers
Sound IF and Det. alignment
- INTERMITTENT SOUND - PIX OK**
V18, V19, V20, V21, V22
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB8	RF Amp.
V2	6AT6 or 6AR5	Osc.
V3	6AR5	Mixer
V4	6CB8	1st Vid. IF
V5	6CB8 or 6AG5	2nd Vid. IF
V6	6AG5 or 6AR5	3rd Vid. IF
V7	6AG5	Vid. Det.
V8	6AL5	1st Vid. Amp.
V9	12AU7	DC Rest. & Vid. Out.
V10	6SN7	Vert. Osc.
V11	6SA	Vert. Out.
V12	6SN7	Hor. Amp.
V13	6SN7	Hor. Osc. & Control
V14	6CD6G	Hor. Defl.
V15	6CD6G	Dist. Defl.
V16	1B3	HV Rect.
V17	6BA6	1st Sound IF
V18	6AU6	Driver
V19	6AL5	Rat. Det.
V20	6SQ7	1st AF Amp.
V21	6CD6G	2nd AF Amp.
V22	50G4T	Low Voltage Rect.
V23		Pix Tube

KEY VOLTAGES

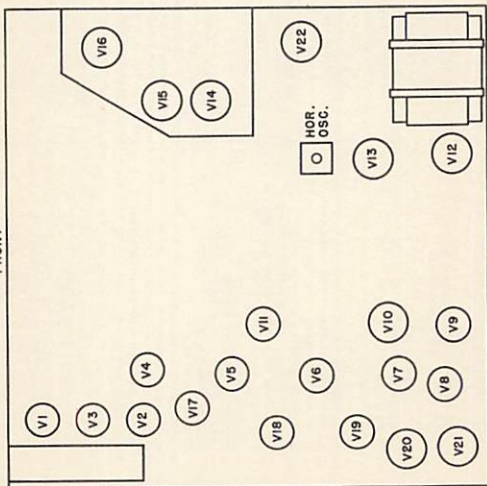
B+, plate of damper, V16 pin 5	370vdc
Plate of V1, V16 pin 3	440vdc
Plate of Vert. Osc., V10 pin 5	120vdc
Plate of Vert. Out., V11 pin 9	300vdc
Plates of Hor. Osc. and Cont., V13 pin 2	230vdc
pin 5	80vdc
Grid of Hor. Out., V14 pin 5	-5.8vdc

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

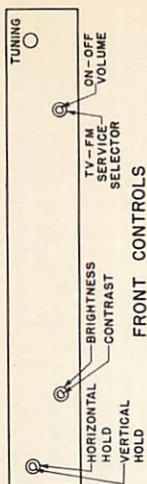
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. In this case, the horizontal oscillator is adjusted as the Waveform Control, and the horizontal locking range control as the Locking Control.)

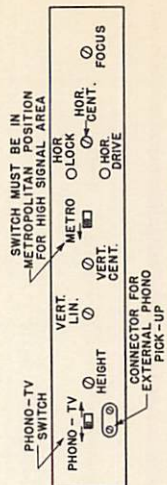
FRONT



TOP VIEW

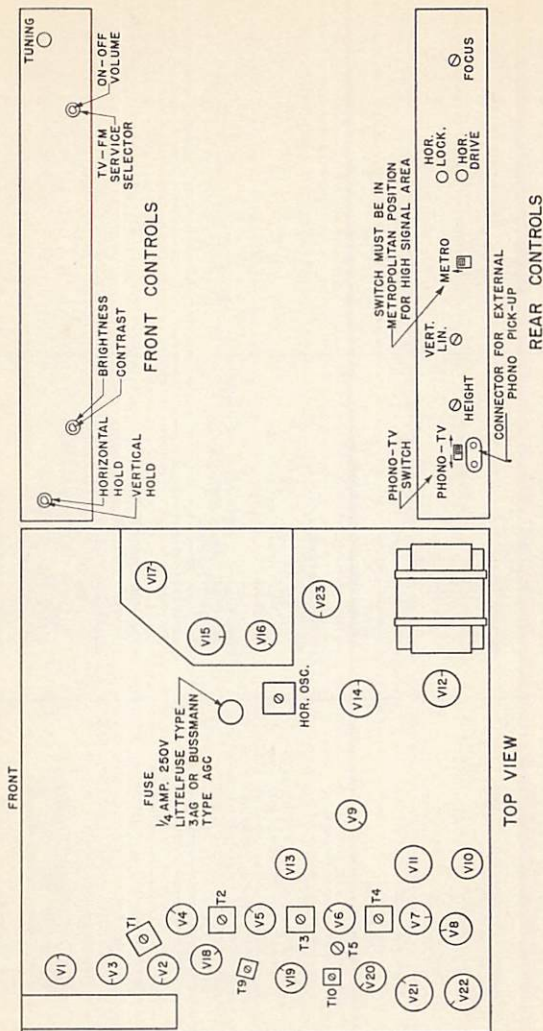


FRONT CONTROLS



REAR CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
Check Photo. TV-FM Switch
V22
- NO RASTER - SOUND OK (31)**
Brightness control
Ion trap
V13, V14, V15, V16, V23
HV trans., Hor. yoke, CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
- POOR HOR. LIN.**
Hor. Lin. and Drive controls
V2, V4, V5, V6, V7, V8, V9
Check 0.03 mfd and 0.05 mfd cap connected to Hor. Lin. coil
Hor. Out. Trans.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Height controls
V10, V11, V12
Check 1 meg G res. connected to pin 6 of V11
Vert. Out. Trans.
- PIX JITTER SIDEWAYS**
Hor. Hold, Locking, Freq. and Waveform controls
V12, V13, V14
Check 2000 mfd cap connected to pin 4 of V13
Check 250 mfd cap connected to pin 1 of V13
- PIX JITTER UP AND DOWN (16, 17)**
Vert. Hold and Contrast controls
V10, V11
- SMEARED PIX (36)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
Check 0.1 mfd cap connected to pin 1 of V8
Check 0.05 mfd cap connected to pin 1 of V9
- IF and RF alignment**
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus control
V2, V4, V5, V6, V7
Check Vid. Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7
Check alignment of all traps in Pix IF system
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V3, V4, V5, V6
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (30)**
V1, V2, V3, V4, V5, V6, V7, V8, V9
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast control
V2, V4, V5, V6, V7, V8, V9
Check Vid. Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive control
V14, V16
Defl. yoke ringing
- PIX BENDING (22)**
Hor. Hold, Locking, Freq. and Waveform controls
V12, V13, V14
Check 0.01 mfd cap connected across points "C" and "D" of Hor. Osc. trans.
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V5, V17
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness control
V13, V14, V15, V16, V23
HV trans.
- INSUFFICIENT BRIGHTNESS**
Tuner fine tuning
Contrast control
Hor. Drive and Brightness controls
V14, V15, V22, V23
Check 30K res. connected to pin 8 of V14
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Width and Height controls
V14, V15
- RASTER BLOOMING (37)**
Hor. Drive control
V14, V15, V22, V23
Check Vid. Amp. series res. in second anode lead
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width controls
V14, V22
Check 300 mfd cap connected to point "D" of Hor. Osc. trans.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Lin. and Height controls
V10, V11, V22
Check 0.08 mfd cap connected to red lead of Vert. Osc. trans.
Low line voltage
- NO VERT. DEFL. (14)**
V10, V11
Check 0.1 mfd cap connected to pin 6 of V11
Vert. Out. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold control
Vert. Int. Network
V10
Check 0.005 mfd cap connected to pin 4 of V10
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V10, V12
Check 0.01 mfd cap connected to pin 2 of V10
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold, Locking, Freq. and Waveform controls
V12, V13, V14
Check 250 mfd cap connected to pin 6 of V12
- AUDIO HUM IN SOUND (8E)**
V17, V18, V19, V20, V21
- DISTORTED SOUND (8D)**
Tuner fine tuning
V2, V3, V4, V5, V17, V18, V19, V20, V21
Sound and Vid. IF alignment
Det. alignment
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V17, V18, V19, V20, V21
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment
Det. alignment
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V2, V4, V5, V17, V18, V19, V20, V21
Sound and Vid. IF alignment
Det. alignment
- NOISY SOUND - PIX OK**
V17, V18, V19, V20, V21
Video section
Check sound system for loose connections
Speaker
Sound IF and Det. alignment
- INTERMITTENT SOUND - PIX OK**
V17, V18, V19, V20, V21
Poor connections in sound system



Symbol	Type	Circuit Function
V1	6CB6	RF
V2	6B6	Osc.
V3	6CB6	Mixer
V4	6CB6	1st Vid. IF
V5	6CB6	2nd Vid. IF
V6	6CB6	3rd Vid. IF
V7	6AL5	Vid. Det. Delay
V8	6AU6	Diode
V9	6AU6	1st Id.
V10	6AU6	AGC
V11	12AU7	Vid. Out. DC Rest.
V12	6SN7GT	Inter-Sync Sep.
V13	6SN7GT	Vert. Osc.
V14	6X4	Vert. Out.
V15	6SN7GT	Hor. Osc. & Con.
V16	6BQ5GT	Hor. Out.
V17	6W4GT	Damper
V18	6BQ5GT	1st Sound IF
V19	6AU6	Driver
V20	6AL5	1st Det.
V21	6SQ7	1st AF
V22	6SQ7	AF Out.
V23	504G	500K
V24		Pk Tube

KEY VOLTAGES

B., plate of damper, V16 pin 5	270vdc
Boosted B., cath. of damper, V16 pin 3	480vdc
Plate of Vert. Osc., V11 pin 5	150vdc
Plate of Vert. Osc., V11 pin 9	430vdc
Plate of Hor. Osc., V13 pin 2	105vdc
Plate of Hor. Osc., V14 pin 2	135vdc
Grid. of Hor. Out., V15 pin 5	76vdc
	-19vdc

(All voltages are measured with a VTVM between the tube pin and chassis. Function Switch on "VTVM".)

ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-2. (In this case, the horizontal frequency and lock controls are known as the Hor. Osc. Adj.—Syncroguide, and the horizontal lock range control is known as Locking Control.)

NO PASTER - NO SOUND (31) Tuner input circuit V23 Check B+ Filter caps.	SOUND BARS IN PIX (4A, 4E) Tuner line tuning Sound trap alignment (T1, T2, T3, T4, T5) V3, V4, V5, V6 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width control V14, V15, V23 Check 0.001 mf cap. connected to terminal 'D' of Hor. Osc. Trans. Hor. Out. Trans. Low line voltage	NO SOUND - PIX OK (88) Tuner line tuning V2, V18, V19, V20, V21, V22 Volume control Sync. and Det. connections Sound and Vid. IF alignment T9 Det. alignment T10
NO RASTER - SOUND OK (31) Brightness control V12, V14, V15, V16, V17, V24 F-1 (HV Fuse) HV trans., Hor. yoke, CRT connections	SNOW IN PIX (32) V1, V2, V3, V4, V5, V6 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Red. Defl. Lin. controls V11, V13, V23 Check 0.1 mf cap. connected to pin 6 of V13 Vert. Out. Trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner line tuning V2, V3, V4, V19, V20, V21, V22 Volume control Sound and Vid. IF alignment T9 Det. alignment T10
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V3, V6, V7, V8, V9, V10 Contrast control	AC IN PIX (DARK HOR. BAR) (38) V12, V3, V4, V5, V6, V7, V8, V9, V10	NO VERT. DEFL. (14) V11, V13 Check 0.1 and 0.08 mf caps. connected to red lead of Vert. Osc. Trans. Vert. Defl. yoke Vert. Out. Trans.	NOISY SOUND - PIX OK V14, V19, V20, V21, V22 Volume control Check for loose connections in the sound system Speaker Sound IF and Det. alignment T9 and T10
POOR HOR. LIN. Hor. Lin. and Drive controls V14, V15, V16 Check 0.05 mf cap. connected to pin 3 of Hor. Out. Trans.	ENGRAVED EFFECT IN PIX (33) Contrast control V2, V7, V8, V9, V10 Check Vid. Det. and Amp. peaking coils	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V11, V13 Check 0.005 mf cap. connected to pin 4 of V11 Vert. Int. Vert. Hold control	INTERMITTENT SOUND - PIX OK Volume control V2, V3, V18, V19, V20, V21, V22 Poor connections in sound system
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V11, V13 Check 0.1 mf cap. connected to pin 4 of V13 Vert. Out. Trans.	VERT. BARS (21) V15, V16 Check 60 mf cap. connected across terminals 3 and 2 of defl. yoke Defl. yoke ringing	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V7, V9, V11, V12 Check 250 mf cap. connected to pin 8 of V10	
PIX JITTER SIDEWAYS Hor. Osc. Adj. (Synchroguide) Hor. Hold and Locking controls V12, V14 Check 2000 mf cap. connected to pin 4 of V14	PIX BENDING (22) Hor. Osc. Adj. (Synchroguide) Hor. Hold and Locking controls V12, V14 Check 200 mf cap. connected to pin 4 of V14	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. Adj. (Synchroguide) Hor. Hold and Locking controls V11, V12, V14 Check 250 mf cap. connected to pin 1 of V14 Check 0.01 mf cap. connected between terminals 'C' and 'D' of Hor. Osc. Trans.	
PIX JITTER UP AND DOWN (16, 17) V11, V13 Vert. Hold control Check 0.005 mf cap. connected to pin 4 of V11 Vert. Out. Trans.	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning V1, V2, V3, V4, V5, V9 RF and IF alignment	AUDIO HUM IN SOUND (8E) V19, V20, V21, V22	
SMEARED PIX (36) Tuner fine tuning V7, V8, V9, V10 Contrast control V2, V3, V4, V5, V6, V7, V8, V9, V10 IF and RF alignment	INTERMITTENT RASTER - SOUND OK V12, V14, V15, V16, V17 HV trans.	DISTORTED SOUND (8D) Tuner line tuning V2, V3, V18, V19, V20, V21, V22 Check 0.005 mf cap. connected to pin 5 of V22 Sound and Vid. IF alignment T9 Det. alignment T10	
POOR PIX DETAIL (35) Tuner fine tuning V8, V9, V10, V24 Focus control IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive control Brightness control V9, V10, V17, V23 Low line voltage	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive control Height and Width control V12, V14, V15, V16, V17 Check 8K res. connected to pin 8 of V15	
	RASTER BLOOMING (37) V22, V23, V24 Check HV Filter caps.		

TUBE LIST

Symbol	Type	Circuit Function
V1	6CH6	RF Amp.
V2	6J6	Osc.
V3	6AK5	Mixer
V4	6CH6	1st Vid. IF
V5	6CH6	2nd Vid. IF
V6	6CH6	3rd Vid. IF
V7	6AL5	Vid. Det. - Delay
V8	6AU6	Diode
V9	6AU6	1st Vid. Amp.
V10	12AU6	AGC Out. - VC Rect. - Sync Sep.
V11	6SN7GT	Inter-Sync Sep. - Vert. Osc.
V12	6SN7GT	Hor. Amp.
V13	6SN7GT	Vert. Osc. & Control
V14	6BA6GT	Hor. Osc.
V15	6BA6GT	Hor. Osc.
V16	6W4	Damper
V17	1B3	RV Rect.
V18	6BA6	1st Sound IF
V19	6AU6	Driver
V20	6AL5	Pat. Det. - A.P. Amp.
V21	6SN7GT	AF Out.
V22	6K8GT	LV Rect.
V23	5Y4G	LV Rect.
V24	201P4	Pix Tube

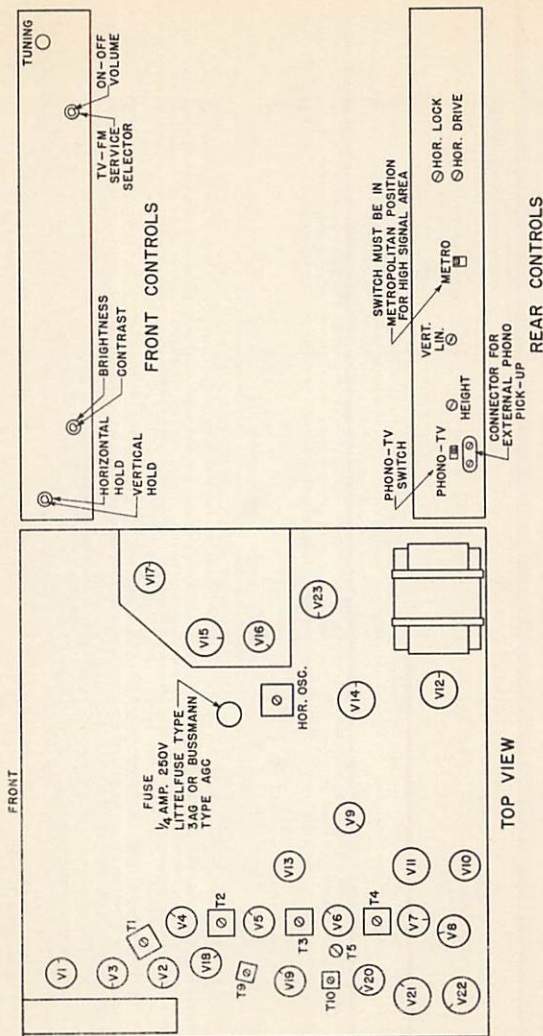
KEY VOLTAGES

B+	plate of damper, V16 pin 5	270vdc
Boosted B+	cath. of damper, V16 pin 3	440vdc
Plate of Vert. Osc.	V11 pin 5	170vdc
Plate of Vert. Osc.	V13 pin 9	380vdc
Plate of Hor. Osc.	V14 pin 2	125vdc
Grid of Hor. Osc.	V15 pin 5	-110vdc

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

ADJUSTMENTS

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



TOP VIEW

- NO RASTER - NO SOUND (31)**
 No input circuit
 V23
 Photo-TV-Switch
- NO RASTER - SOUND OK (31)**
 V12, V14, V15, V16, V17, V24
 Brightness control
 E-1 (HV Fuse)
 HV trans., Hor. yoke, CRT connections
 Check 0.002 and 0.00082 mf caps. connected to terminal D of Hor. Osc. trans.
- WEAK PIX - SOUND AND RASTER OK (34)**
 Tuner fine tuning
 V5, V6, V7, V8, V9, V10
 Contrast control
- POOR HOR. LIN.**
 Hor. Drive Adj.
 Check 0.03 mf cap. connected to pins 5 of V18
 Hor. Out. Trans.
- POOR VERT. LIN. (11,12)**
 Vert. Lin. and Height controls
 Hor. Hold and Hor. Locking controls
 Check 0.1 and 0.08 mf caps. connected to red lead of Vert. Osc. trans.
- PIX JITTER SIDEWAYS**
 Hor. Osc. Adj. (Synchroguide)
 Hor. Hold and Hor. Locking controls
 Check 0.03 and 1.0 mf caps. connected to pin 6 of V14
 Check 2000 mmf cap. connected to pin 4 of V14
- PIX JITTER UP AND DOWN (16,17)**
 V11, V13
 Vert. Hold control
 Check 0.005 mf cap. connected to pin 4 of V11
 Vert. Out. Trans. and Vert. Osc. Trans.
- SMEARED PIX (36)**
 Tuner fine tuning
 Contrast control
 V3, V4, V5, V6, V7, V8, V9, V10
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- POOR PIX DETAIL (35)**
 Tuner fine tuning
 V8, V9, V10, V24
 Check Vid. Det. and Amp. peaking coils
 IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
 Tuner fine tuning
 Sound and Vid. Det. and Amp. peaking coils
 V3, V4, V5, V6, V7
 IF and RF alignment
- SNOW IN PIX (3,2)**
 V1, V2, V3, V4, V5, V6, V9
 Antenna and transmission line
 V9, V10
- AC IN PIX (DARK HOR. BAR) (38)**
 V1, V2, V3, V4, V5, V6, V7, V8, V9, V10
- ENGRAVED EFFECT IN PIX (33)**
 Tuner fine tuning
 Contrast control
 V2, V3, V4, V5, V6, V7, V8, V9, V10
 Check 0.05 mf cap. connected to pin 2 of V10
 Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
 Hor. Drive control
 V15, V16
 Check 60 mmf and 1KΩ res. connected between pins 2 and 3 of defl. yoke
 Defl. yoke fringing
- PIX BENDING (22)**
 Hor. Osc. Adj. (Synchroguide)
 Hor. Hold and Locking control
 V11, V13
 Check 250 mmf cap. connected to pin 1 of V14
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
 Tuner fine tuning
 V1, V2, V3, V4, V5, V9
 Contrast control
 Metro-Fringe Switch
 RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
 Brightness control
 V14, V14, V15, V16, V17
 HV trans.
- INSUFFICIENT BRIGHTNESS**
 Ion trap
 Hor. Drive and Brightness controls
 V9, V10, V15, V17
 Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9,10)**
 Height and Width control
 V15, V17
 Check 8KΩ res. connected to pin 4 of V15
- RASTER BLOOMING (37)**
 Hor. Drive control
 V15, V17, V21, V24
- INSUFFICIENT RASTER WIDTH (23)**
 Hor. Drive and Width control
 V14, V15, V23
 Check 0.002 and 0.00082 mf caps. connected to terminal D of Hor. Osc. trans.
 Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
 Height and Vert. Lin. controls
 V11, V13, V23
 Check 0.1 mf cap. connected to pin 6 of V13
 Low line voltage
- NO VERT. DEF. (14)**
 V11, V13
 Vert. Defl. yoke
 Vert. Out. Trans. and Vert. Osc. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16,17)**
 V11, V13
 Vert. Hold control
 Check 0.005 mf cap. connected to pin 4 of V11
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
 V7, V9, V11, V12
 Check 0.01 mf cap. connected to pin 2 of V11
- NO HOR. SYNC. - VERT. SYNC. OK (19,20)**
 Hor. Osc. Adj. (Synchroguide)
 Hor. Hold and Hor. Lock controls
 V11, V12, V14
 Check 250 mmf and 150KΩ res. connected to pin 1 of V14
- AUDIO HUM IN SOUND (8E)**
 V19, V20, V21, V22
- DISTORTED SOUND (8D)**
 Tuner fine tuning
 V2, V3, V18, V19, V20, V21, V22
 Check 0.005 mf connected to pin 5 of V22
 Sound and Vid. IF alignment T2, T9
 Det. alignment T10
- NO SOUND - PIX OK (8F)**
 Tuner fine tuning
 V2, V18, V19, V20, V21, V22
 Volume control
 Speaker (open voice coil or defective capacitor)
 Sound and Vid. IF alignment T2, T9
 Det. alignment T10
- WEAK SOUND - PIX OK (8C)**
 Tuner fine tuning
 V2, V3, V18, V19, V20, V21, V22
 Volume control
 Speaker (open voice coil or defective capacitor)
 Sound and Vid. IF alignment T2, T9
 Det. alignment T10
- NOISY SOUND - PIX OK**
 Volume control
 Speaker (loose connections in sound system)
- INTERMITTENT SOUND - PIX OK**
 V2, V3, V18, V19, V20, V21, V22
 Volume control
 Poor connections in sound system

NO RASTER - NO SOUND (31)

Power supply circuit
V27, V28

NO RASTER - SOUND OK (31)

Brightness control
V12, V13, V14, V16, V17,
V18, V19, V29

Ion trap
HV trans., Hor. yoke, CRT connections

WEAK PIX - SOUND AND RASTER OK (34)

Tuner fine tuning
Contrast control
V2, V3, V4, V5, V6, V7, V8, V9

POOR HOR. LIN.

Hor. Lin. and Drive controls
V16, V17, V18

Check 0.035 mfd and 0.05 mfd cap.
connected to lin. coil

POOR VERT. LIN. (11,12)

Vert. Lin. and Pix Height controls
V11, V15

Check both 0.1 mfd caps connected to
pin 5 of V11

PIX JITTER SIDEWAYS

Hor. Hold, Freq. and Phase controls
V12, V13, V14, V16, V17

Check 60 mmf mica cap connected to
"E" of T8

PIX JITTER UP AND DOWN (16,17)

Contrast control
V11, V15

Vert. Hold control
V18, V19

SMEARED PIX (36)

Tuner fine tuning
Contrast control
V7, V8, V9, V10

Check coupling caps between V7 and
V8; V8 and V9; and also between
V9 and V29

IF and RF alignment

POOR PIX DETAIL (35)

Tuner fine tuning
Focus control
V4, V6, V7

Check vid. amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)

Tuner fine tuning
V1, V2, V3, V4, V5, V6

Check alignment of T1 and T2 (Top)
IF and RF alignment

SNOW IN PIX (32)

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

AC IN PIX (DARK HOR. BAR) (36)

V1, V2, V3, V4, V5, V6, V7, V8, V9

ENGRAVED EFFECT IN PIX (33)

Tuner fine tuning
Contrast control
V4, V5, V6, V7, V8, V9, V29

Check vid. amp. peaking coils

VERT. BARS (21)

Hor. Drive control
V17, V18

PIX BENDING (22)

Hor. Freq., Hold and Phase controls
V12, V13, V14, V16, V17

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

Tuner fine tuning
Contrast control
V1, V2, V3, V4

RF and IF alignment

INTERMITTENT RASTER - SOUND OK

Brightness control
V12, V13, V14, V16, V17,
V18, V19, V29

HV trans.

INSUFFICIENT BRIGHTNESS

Ion trap
Brightness and Hor. Drive controls
V7, V8, V9, V10, V29

C.R. Screen control
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)

Hor. Drive, Pix Width and Pix
Height controls
V17, V19

RASTER BLOOMING (37)

Hor. Drive control
V17, V18, V21, V28, V29

Check 680K series res. in sec.
anode lead

INSUFFICIENT RASTER WIDTH (23)

Hor. Drive and Pix Width controls
V16, V17, V27, V28

Hor. Out. Trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)

Vert. Lin. and Pix Height controls
V11, V15, V27, V28

Vert. Out. Trans.
Low line voltage

NO VERT. DEFL. (14)

V11, V15
Vert. Defl. yoke
Vert. Out. Trans.

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

V11, V15
Vert. Int. Network
Vert. Hold control

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

V10, V11

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

Hor. Hold, Freq. and Phase controls
V12, V13, V14, V16, V17

Check 0.05 mfd cap in grid ckt of V14
Check 60 mmf mica cap connected to
"E" of T8

AUDIO HUM IN SOUND (8E)

V20, V21, V22, V23, V25, V26

DISTORTED SOUND (8D)

Ion trap
V3, V20, V21, V22, V23, V25, V26

Tone control
Sound IF alignment T1, T10, T11

Det. alignment T12

NO SOUND - PIX OK (8B)

Tuner fine tuning
V20, V21, V22, V23, V25, V26

Volume control
Speaker (check voice coil or defective
connection)

Sound IF alignment T1, T10, T11

Det. alignment T12

WEAK SOUND - PIX OK (8C)

Tuner fine tuning
Volume control
V2, V3, V20, V21, V22, V23, V25, V26

Sound IF alignment T1, T10, T11
Det. alignment T12

NOISY SOUND - PIX OK

V20, V21, V22, V23, V25, V26

Volume and Tone controls
Check sound system for loose
connections

Speaker

Sound IF and Det. alignment

INTERMITTENT SOUND - PIX OK

V20, V21, V22, V23, V25, V26

Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6BK7	RF Amp.
V2	6AR5	Mixer-Osc.
V3	6X6	Video IF
V4	6CB6	Video IF
V5	6CB6	Video IF
V6	6CB6	Video IF
V7	6CL6	Vid. Out. Amp.
V8	6AU6	Sync. Lim. Amp.
V9	6AU6	AGC Sup. Noise Clip.
V10	6SN7	Sync. Det. Vert. Osc.
V11	6SN7	Sync. Det. Vert. Osc.
V12	6SA	Vert. Out.
V13	6AU6	1st Sound IF
V14	6AU6	2nd Sound IF
V15	6AL5	Ratio Detector
V16	6SN7	Hor. Osc. and AFC
V17	6SN7	Hor. Osc.
V18	6CD6	Damper
V19	6BE6	AM Modulator
V20	6BE6	AM IF Amp.
V21	6BA6	AM 2nd Det., AVC
V22	6AU6	1st Aud. Amp.
V23	6K5GT	Audio Out.
V24	5Y4G	Low-Volt. Rect.
V25	5U4G	Low-Volt. Rect.
V26	21AP4	Picture Tube

KEY VOLTAGES

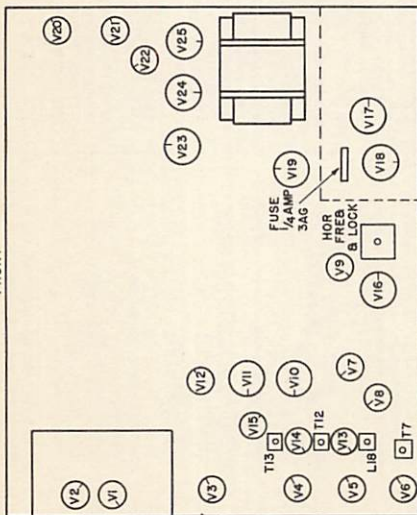
B+, plate of damper, V19 pin 5 250dc
 Screen grid of damper, V19 pin 3 450dc
 Plate of Vert. Osc., V11 pin 5 140dc
 Plate of Vert. Out., V12 pin 9 430dc
 Plates of Hor. Osc. and Cont., V16 pin 2 110dc
 pin 5 45dc
 Grid of Hor. Out., V18 pin 5 -5dc

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

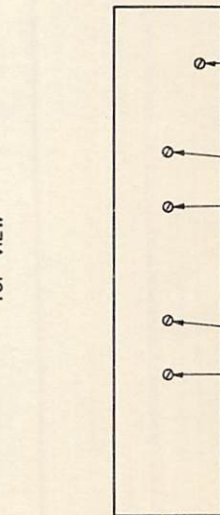
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. (In this case, the horizontal oscillator is adjusted by the potentiometer as the Hor. Osc. Adj.-Sync. range, and the horizontal locking range control is known as the Horizontal Lock Control.)

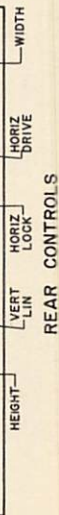
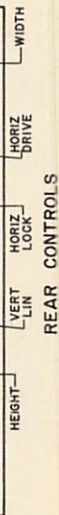
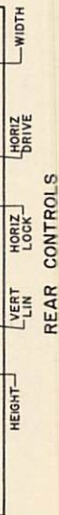
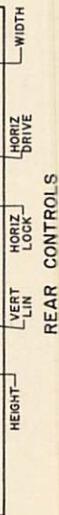
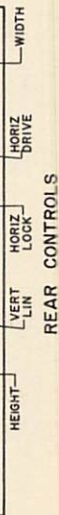
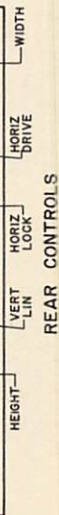
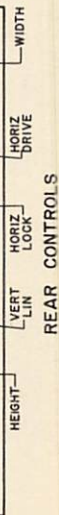
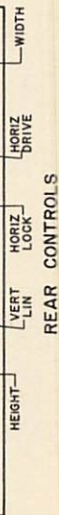
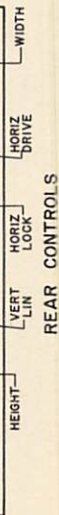
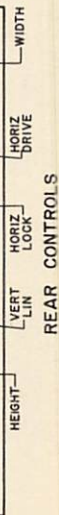
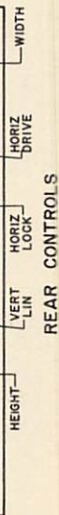
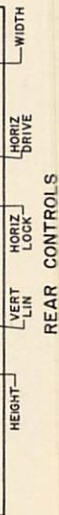
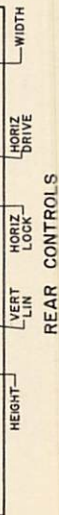
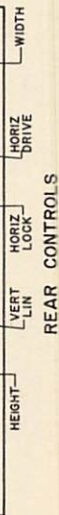
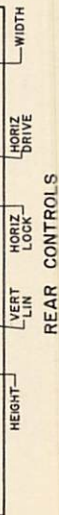
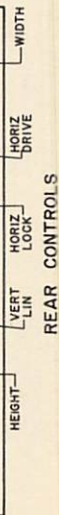
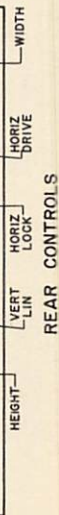
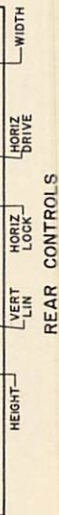
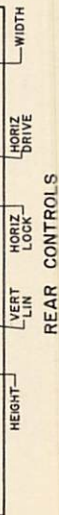
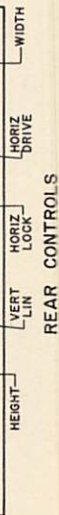
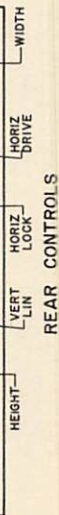
FRONT



TOP VIEW



REAR CONTROLS



NO RASTER - NO SOUND (31)
Power input circuit
V24, V25

NO RASTER - SOUND OK (31)
Brightness control
HV fuse (1/4 Amp. Type GJK)
Ion trap
V16, V17, V18, V19, V26

WWEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast control
V2, V3, V4, V5, V6, V7, V10
Check Vid. Det. xtal X1 (1N64)

POOR HOR. LIN.
Hor. Drive control
V18, V19
Check 0.25 mf cap. connected to Width coil

POOR VERT. LIN. (11, 12)
Vert. Lin. and Height
V11, V12

PIX JITTER SIDEWAYS
Hor. Hold, Freq. Lock and Lock-in Range
controls
V403, V404

Check 2,000 mm1 ca
of V16
SMFARED PIX (36)

Tuner fine tuning
Contrast control
V3, V4, V5, V6, V7, V9, V10
Check Vid. Det. xtal (1N54)
Check Vid. Amp. and Det. peaking coils
IF and RF alignment

POOR PIX DETAIL (3)
Tuner fine tuning
V2 V3 V4 V5 V6

Check Vid. Det. xtal (1N64)
Check Vid. Amp. and Det. peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
Check alignment of 4.5 mc trap in grid lead
of CRT
IF and RF alignment

SNOW IN PIX (32)
V1, V2, V3, V4, V5,
Antenna and transm

AC IN PIX (DARK HOR. BAR) (36)
V1. V2. V3. V4. V5. V6. V7. V9. V10

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning

Check Vid. Amp. and Det. peaking coils
Check Vid. Det. xtal (1N64)
V2, V3, V4, V5, V6, V7
Contrast Control

VERT. BARS (21)
Hor. Drive control
V18. V19

Check 1-k res. and 60 mmf cap. connected to terminals 3 and 2 of yoke
Defl. yoke ringing

PIX BENDING (22)
Hor. Hold, Freq. Lock and Lock-in Range
controls
V403. V404

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

Contrast control
V2, V3, V4, V5, V6, V9, V10
Check Vid. Det. xtal X1 (1N64)
RF and IF alignment

INTERMITTENT RASTER - SOUND OK
Brightness control
V16, V17, V18, V19, V26

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive c
V17, V18, V19, V24, V25, V2
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive, Width and Height controls
V17, V18
Check 0.1-mf cap. and 18-k res. connec-
to pin 8 of V18

RASTER BLOOMING (37)
Hor. Drive control
V17. V18. V19. V24. V25.

Check the HV filter cap.
Check the 470-k res. connected to the HV filter cap.

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Width controls
V17, V18, V19, V24, V25
Check 500 and 1,200 mmf caps. connec-
tion to terminal "D" of the hor. osc. tra-
nsformer.
Low line voltage

Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Vert. Height and Lin. controls

Check 0.08 and 0.1 mf caps. connected to
Red lead of the vert. osc. trans.
Low line voltage

NO VERT. DEFL. (14)
V11, V12

the Red lead of the vert osc. trans.

NO VERT. SYNC. - HOR. SYNC. OK (16,17)
Vert. Hold control
Vert. Int. Network

Check 5,000 mmf cap. connected to pin 4 of V11

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V8, V9, V10, V11

NO HOR. SYNC - VERT. SYNC. OK (19, 20)
Hor. Hold, Freq, Lock and Lock Range
controls

Check 250 mmf cap. connected to pin 1 of
V16

AUDIO HUM IN SOUND (8E)
V13, V14, V15, V22, V23

Tuner fine tuning
V2 V12 V14 V15 V22

Tone control
Check 0.05 mf cap. connected to pin 5 of V23
Sound and Vid. IF alignment L-18, T-12
Det. alignment T-13

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V2. V13. V14. V15. V22. V23.

Vol. control
Speaker (open voice coil or defective connection)
Sound and Vld. IF alignment L-18 T-12

Det. alignment T-13

V13, V14, V15, V22, V23
Vol. and tone controls
Check sound system for loose connections

Sound IF and Det. alignment L-18, T-12,
T-13

SYNC. BUZZ IN SOUND (8E)
Tuner fine tuning

V2, V9, V10, V13, V14
Check Vld. Det. xtal X1 (1N64)
Sound IF and Det. alignment L-18, T-12,
T-13

INTERMITTENT SOUND - PIX OK
V13, V14, V15, V22, V23

2001 connections in sound systems

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Sound IF Amp.
V2	6AU6	2nd Sound IF Amp.
V3	6AL5	Sound Discrim.
V4	6AG5	1st AF Amp.
V5	6AG5	2nd Pix IF Amp.
V6	6AG5	3rd Pix IF Amp.
V7	6AG5	4th Pix IF Amp.
V8	6AG5	Sine Limiter
V9	6AL5	1st Vlt. Amp.
V10	6AL5	2nd Vlt. Amp.
V11	12AU7	AGC Amp.
V12	6SN7GT	Vert. Sweep Osc.
V13	6SN7GT	AGC Rect.
V14	6SN7GT	1st Sync. Sep.
V15	6K8GT	2nd Sync. Sep.
V16	6SN7GT	Vert. Sweep Con.
V17	6K8GT	Hor. Sweep Con.
V18	6K8GT	Hor. Sweep Out.
V19	6W4GT	H. V. Rect.
V20	5U4G	Damper
V21	10BP4	Power Supply Rect.
V22	12LP4	Picture Tube
V23	6AB5	RF Amp.
V24	6AG5	Conv.
V25	5U4G	Power Supply Rect.
V26	1B5GT/8016	(15" only) H. V. Rect.

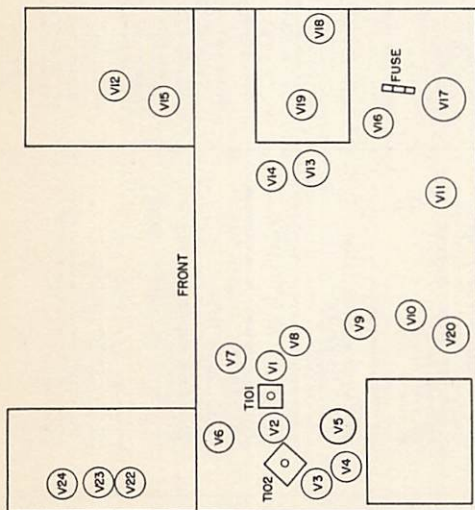
KEY VOLTAGES

B ₁ , Plate of damper, V19 pin 5	250vdc
B ₂ , B ₃ , B ₄ , Cath. of damper, V19 pin 3	322vdc
Plate of Vert. Osc., V12 pin 2	30 to 90vdc
Plate of Vert. Out., V15 pin 3	195vdc
Plates of Hor. Osc. and Cont., V16 pin 5	54vdc
Grid of Hor. Out., V17 pin 5	70 to 30vdc
	-112vdc

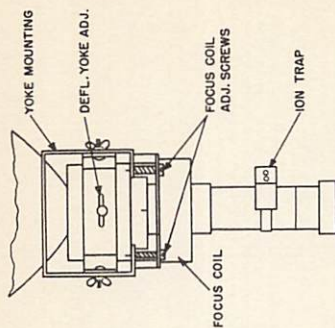
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

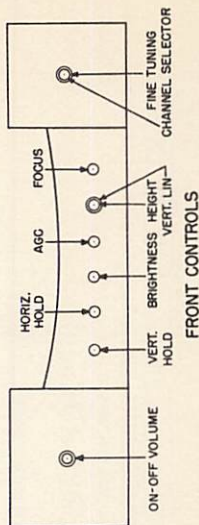
For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. (In this case the horizontal lock control is known as the Blocking Waveform Adjustment.)



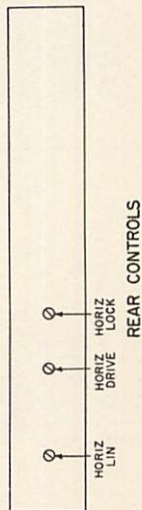
TOP VIEW



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V20	SNOW IN PIX (32) V6, V7, V8, V9, V22, V23, V24 A.G.C. threshold control Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Vert. Lin. and Height controls V12, V13, V16 A.G.C. threshold control Check 0.047 mfd cap. connected to Red lead of Vert. Osc. trans. Low line voltage	NOISY SOUND - PIX OK V1, V2, V3, V4, V5 Volume control Check lead and system for loose con- nections Speaker Sound IF and Det. alignment
NO RASTER - SOUND OK (31) HV Fuse (0.25 Amps) Brightness control Ion trap V17, V18, V19, V21 Check V17, V18, V19, V21 HV trans. Hor. yoke, CRT connections	AC IN PIX (DARK HOR. BAR) (38) V6, V7, V8, V9, V10, V11, V12, V13, V22, V23, V24 ENGRAVED EFFECT IN PIX (33) A.G.C. threshold and Pix controls V8, V9, V10, V11, V12, V13 Check Vid. Amp. peaking coils	NO VERT. DEFL. (14) V12, V13 Check 0.1 mfd cap. connected to pin 5 of V15 Defl. yoke Vert. Out. Trans.	INTERMITTENT SOUND - PIX OK V1, V2, V3, V4, V5 Poor connections in sound system
WEAK PIX - SOUND AND RASTER OK (34) Tuner and fine tuning Pix and A.G.C. threshold controls V6, V7, V8, V9, V10, V11, V22, V23	PIX BENDING (22) Hor. Hold, Locking range, Freq. and Waveform controls V12, V13, V16, V17 A.G.C. threshold control	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Lin. and Height controls V12, V14, V15 A.G.C. threshold control	
POOR HOR. LIN. Hor. Lin. and Drive controls V17, V19 Check 0.033 mfd and 0.047 mfd cap. connected to Lin. coil	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V6, V7, V8, V22, V23, V24 A.G.C. threshold control V12, V13 RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX OK (16, 17) Hor. Hold, Locking range, Freq. and Waveform controls V12, V13, V16, V17 Check 0.033 mfd and 0.047 mfd cap. connected to pin 3 of V16	
PIX JITTER SIDWAYS Hor. Hold, Locking range, Freq. and Waveform controls V12, V13, V16, V17	INTERMITTENT RASTER - SOUND OK Brightness control V16, V17, V18, V19, V21 HV trans.	AUDIO HUM IN SOUND (8E) V1, V2, V3, V4, V5	
PIX JITTER UP AND DOWN (16, 17) Pix and A.G.C. threshold controls V12, V13, V16	INSUFFICIENT BRIGHTNESS Brightness and Hor. Drive controls V17, V18, V20, V21 Low line voltage	DISTORTED SOUND (8D) Check alignment V1, V2, V3, V4, V5, V22, V23 Sound and Vid. IF alignment T106 Top only; T101 Det. alignment T102	
SMEARED PIX (36) Tuner fine tuning Pix and A.G.C. threshold controls V6, V7, V8, V9, V10, V11, V12, V13, V16, V17 Check Vid. Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height controls V17, V18 RASTER BLOOMING (37) Hor. Drive control V17, V18, V20, V21 sec. anode lead	NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3, V4, V5 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T106 Top only; T101 Det. alignment T102	
POOR PIX DETAIL (35) Tuner fine tuning Focus control V17, V18, V19 A.G.C. threshold control IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V17, V20 Hor. Out. Trans. Check 220 mfd cap. connected to pin 5 of Hor. Osc. trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V4, V5, V22, V23 Volume control Sound and Vid. IF alignment T106 Top only; T101 Det. alignment T102	
SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V6, V7, V8, V9, V10, V11, V22, V23, V24 Check V17, V18, V19, V21 IF and RF alignment T104 Top; T106 Top; T108 Top; T109 Top			

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	Sound I. F. Amp.
V2A	6T8	Sound Disc.
V2B	6X4	1st Aud. Amp.
V3	6AS5	1st Pix I. F. Amp.
V4	6CB6	2nd Pix I. F. Amp.
V5	6CB6	3rd Pix I. F. Amp.
V6	6CB6	AGC Rect.
V7A	6AL5	D-C Rest.
V7B	6AU6	Vid. Amp.
V8	6A4	Syn. Sec.
V9A	12AU7	Syn. Sec.
V9B	6X4	Vert. Osc.
V10A	6SN7GT	Vert. Osc.
V10B	6SN7GT	Hor. AFC
V11A	6AV6GT	Hor. Osc.
V11B	6AV6GT	Hor. Osc.
V12	6X4	H. V. Rect.
V13	5Y3GT	Power Supply Damp.
V14	8AP4	Pix Tube
V15	6CB6	RF Amp.
V16	6CB6	Osc. Mixer
V17	6J6	
V18		

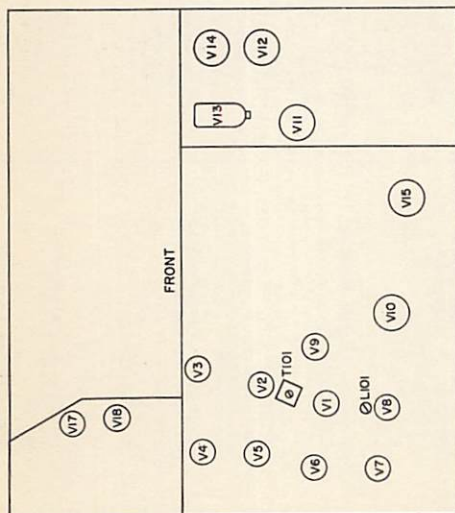
KEY VOLTAGES

B+, plate of damper, V14 pin 5	285dc
Boosted B+, cath. of damper, V14 pin 3	420dc
Plate of Vert. Osc., V10 pin 5	28dc
Plate of Vert. Osc., V10 pin 2	400dc
Plate of Hor. Osc. and Cont., V11 pin 2	210dc
Grid of Hor. Osc., V12 pin 1	130dc
Grid of Hor. Osc., V12 pin 1	88dc

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

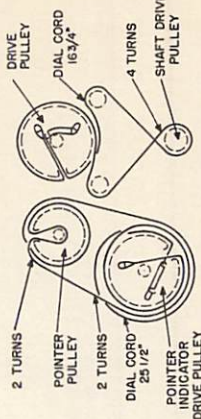
ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. (In this case the horizontal lock control is known as the Blocking Waveform Adjustment.)

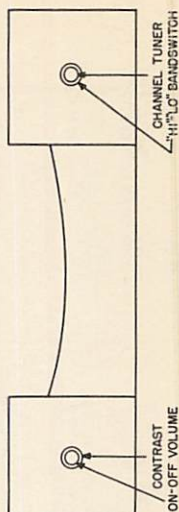


TOP VIEW

PICTURE TUBE ADJUSTMENTS



DRIVE CORD ARRANGEMENT

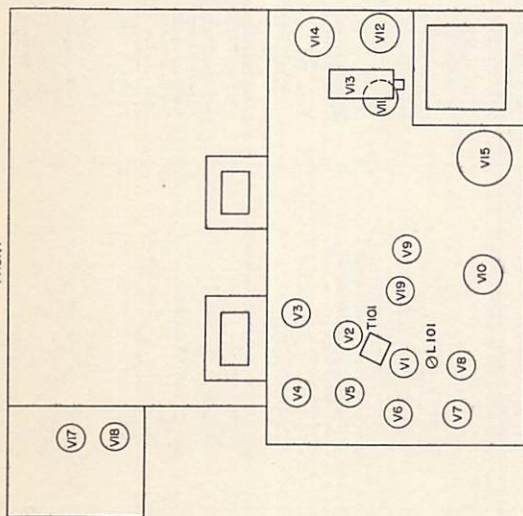


REAR CONTROLS

FRONT CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V15	SOUND BARS IN PIX (4, 4E) Tuner fine tuning V4, V5, V6, V7, V8, V17, V18 Check Vid. Det. crystal (1N64) IF and RF alignment L-101	INSUFFICIENT RASTER WIDTH (23) Hor. Drive control V1, V2, V3, V18 Check 0.0015 mF cap. connected to point "D" of Hor. Osc. trans. Hor. Out. Trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V18 Volume control Sound and Vid. IF alignment L-101 Det. alignment T101 NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment
NO RASTER - SOUND OK (31) Brightness control Ion trap V11, V12, V13, V14, V16 HV trans., Hor. yoke, CRT connections Check 0.22 mF cap. connected to pin 11 of V16 (CMT)	SNOW IN PIX (32) V4, V5, V6, V7, V8, V17, V18 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V4, V5, V6, V7, V8, V17, V18	INSUFFICIENT RASTER HEIGHT (15) Bright. Vert. Ltn. controls V10, V15 Check 0.033 mF cap. connected to pin 1 of V10 Vert. Out. Trans. Low line voltage	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V17, V18 Check Vid. Det. crystal (1N64) POOR HOR. LIN. Hor. Drive control V12, V14 Check 0.1 mF cap. connected to pin 3 of V14	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V4, V5, V6, V7, V8, V18 Check Vid. Amp. peaking coils VERT. BARS (21) Hor. Drive control Check 3300 res. connected to pin 1 of V12 Defl. yoke ringing	NO VERT. DEFL. (14) Check 0.001 mF cap. connected to pin 4 of V10 Vert. Defl. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V9, V10 Vert. Hold control Vert. Int. Network	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V10 Check 2.7K Ω res. connected to pin 3 of V10 Check 0.033 mF cap. connected to pin 1 of V10	PIX BENDING (22) Hor. Hold, Lock, Freq. and Wave- form controls V7, V8, V9, V11, V12 Vid. Det. crystal (1N64)	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V7, V9 Check peaking coils connected to pin 5 of V8 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Lock, Freq. and Waveform controls V11, V12 Check 180 mF cap. connected to pin 1 of V11	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold, Lock, Freq. and Wave- form controls V11, V12 Check 0.0022 mF cap. connected to pin 1 of V11 Check 150 mF cap. connected to Hor. Lock control	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V17, V18 Vid. Det. crystal (1N64) RF and IF alignment	AUDIO HUM IN SOUND (8E) V1, V2, V3 Tuner fine tuning V1, V2, V3, V18 Sound and Vid. IF alignment L-101 Det. alignment T101 NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T101	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
PIX JITTER UP AND DOWN (16, 17) Contrast and Vert. Hold controls V10 Check .001 mF cap. connected to pin 4 of V10	INTERMITTENT RASTER - SOUND OK Brightness control V11, V12, V13, V14, V16 HV trans.	DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V18 Sound and Vid. IF alignment L-101 Det. alignment T101 NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T101	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
SMOARED PIX (36) Tuner fine tuning Contrast control V4, V5, V6, V7, V8 Vid. Det. crystal (1N64) Check 0.1 mF cap. connected to pin 1 of V8 IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap HV trans. and Hor. Drive controls V11, V12, V13, V14, V16 Check 1.5K Ω res. connected to pin 8 of V12 Low line voltage	AUDIO HUM IN SOUND (8E) V1, V2, V3 Tuner fine tuning V1, V2, V3, V18 Sound and Vid. IF alignment L-101 Det. alignment T101 NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T101	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system
POOR PIX DETAIL (35) Tuner fine tuning Contrast control V4, V5, V6, V7, V8, V16, V18 Check Vid. Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) V12, V13 Drive control V12, V13 RASTER BLOOMING (37) Hor. Drive control V12, V13, V15, V16	DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V18 Sound and Vid. IF alignment L-101 Det. alignment T101 NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T101	NOISY SOUND - PIX OK V1, V2, V3 Volume control Check sound system for loose connections Sound IF and Det. alignment L-101, T101 INTERMITTENT SOUND - PIX OK V1, V2, V3 Poor connections in sound system

FRONT



TOP VIEW

TUBE LIST

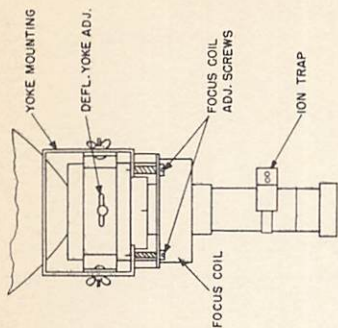
Symbol	Type	Circuit Function
V1	6AU6	4.5 Mc IF Amp.
V2	6AL5	Rat. Det.
V3	6BF5	AF Out.
V4	6CB6	1st Pk IF
V5	6CB6	2nd Pk IF
V6	6CB6	3rd Pk IF
V7	6CB6	4th Pk IF
V8	6AH6	Vid. Amp.
V9	12AU7	Sync Amp. - Sync Sep.
V10	6SN7GT	Vert. Osc. - Vert. Out.
V11	6SN7GT	AFC-Hor. Osc.
V12	6AY5GT	Hor. Out.
V13	6X4	Full Rect.
V14	6W4GT	Power Rect.
V15	5U4G	Pix Tube
V16	12LP4A	RF Amp.
V17	6CB6	RF Amp.
V18	6J6	Osc. - Mixer
V19	12AU7	1st AF Amp. - Sync Clipper

KEY VOLTAGES

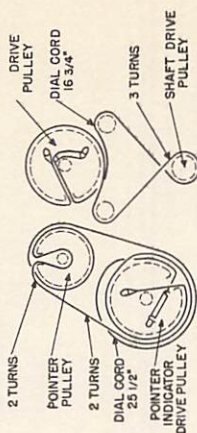
B₊ plate of 6AU6, V14 pin 5 275dc
 Boosted B₊ cathode of 6AU6, V14 pin 3 410dc
 Plate of Vert. Osc., V10 pin 5 28dc
 Plate of Vert. Out., V10 pin 2 410dc
 Plate of Hor. Osc. and Cont., V11 pin 2 225dc
 pin 5 160dc
 Grid of Hor. Out., V12 pin 5 -47dc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

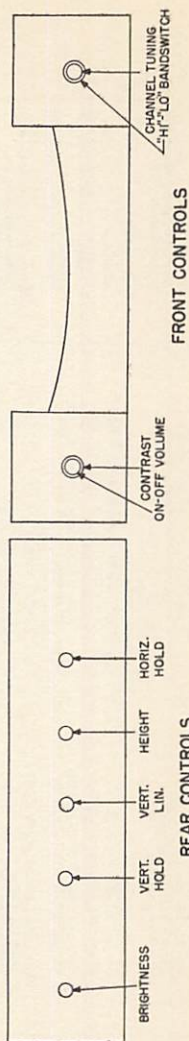
For horizontal oscillator adjustment, see HOR. OSC. ADJ. section of the Horizontal Lock Control is known as the Blocking Waveform Adjustment.)



PICTURE TUBE ADJUSTMENTS



DRIVE CORD ARRANGEMENT

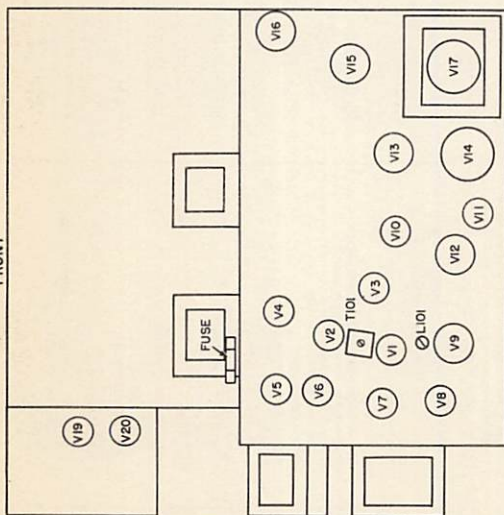


FRONT CONTROLS

REAR CONTROLS

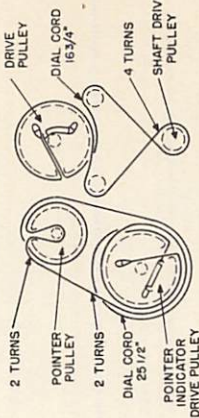
NO RASTER - NO SOUND (31) Power input circuit V15	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V8 Check L120 for alignment Check L101 for alignment IF and RF alignment	RASTER BLOOMING (37) V12, V13, V16 Hor. Drive control	WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V16, V19 Volume control Sound and Vid. IF alignment L-101 Det. alignment T-101 NOISY SOUND - PIX OK V1, V2, V3, V16, V19 Volume control Check for loose connections in sound system
NO RASTER - SOUND OK (31) V11, V12, V13, V14, V16 Ion trap HV Fuse (1/4 Amp) "Phono"-TV Switch HV trans., Hor. yoke, CRT connections	SNOW IN PIX (32) V4, V5, V6, V7, V17, V18 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and width controls V11, V12, V15 Hor. Out. Trans. Check 0.001 res. connected to pin 8 of V12 Low line voltage	WEAK PIK - SOUND AND RASTER OK (34) V11, V12, V13, V14, V16, V17, V18 Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Contrast control
WEAK PIK - SOUND AND RASTER OK (34) V11, V12, V13, V14, V16, V17, V18 Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Contrast control	AC IN PIX (DARK HOR. BAR) (38) V4, V5, V6, V7, V8, V17, V18 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) V8 Check Vid. Amp. peaking coils	INSUFFICIENT RASTER HEIGHT (15) Height control V10, V15 Hor. Out. Trans. Check 0.033 mF cap. connected to pin 1 of V10 Low line voltage NO VERT. DEFL. (14) V10 Vid. Defl. yoke Vert. Out. Trans.	POOR HOR. LIN. Hor. Drive control V11, V12, V14 Check 0.1 mF cap. connected to pin 3 of V14
POOR VERT. LIN. (11, 12) V10, V11, V12, V13, V14, V15 Vid. Lin. and Height controls V10 Vert. Out. Trans. Check 2.2 megohm res. connected to pins 1 and 4 of V12	PIK BENDING (22) Hor. Hold and Lock controls Hor. Osc. Adj. (Synchroguide) V11, V12, V19 Check 180 mmf cap. connected to pin 1 of V11	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V10, V19 Vert. In. Network Vert. Hold control	POOR VERT. DETAIL (35) Tuner fine tuning Contrast control Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Check Vid. Amp. peaking coils IF and RF alignment
PIK JITTER SIDWAYS Hor. Hold and Lock controls Hor. Osc. Adj. (Synchroguide) V11, V12, V19	WEAK OR NO PIK - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V4, V5, V6, V7, V8, V17, V18 Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) V11, V19 Hold and Lock controls Hor. Osc. Adj. (Synchroguide) Check 0.01 mF cap. connected to terminals C and D of Hor. Osc. trans.	INTERMITTENT SOUND - PIX OK V1, V2, V3, V19 Volume control Poor connections in sound system
PIK JITTER UP AND DOWN (16, 17) V10, V19 Vert. Hold control Vert. Out. Trans.	INTERMITTENT RASTER - SOUND OK V11, V12, V13, V14 Contrast control HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) V11, V19 Hold and Lock controls Hor. Osc. Adj. (Synchroguide) Check 0.01 mF cap. connected to terminals C and D of Hor. Osc. trans.	INTERMITTENT SOUND - PIX OK V1, V2, V3, V19 Volume control Poor connections in sound system
SMOURED PIK (36) Tuner fine tuning Contrast control Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Check Vid. Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap V12, V13, V15 Vid. Defl. yoke control Hor. Drive control Low line voltage	DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V18, V19 Volume and Contrast controls Sound and Vid. IF alignment L-101 Det. alignment T-101	INTERMITTENT SOUND - PIX OK V1, V2, V3, V19 Volume control Poor connections in sound system
POOR PIK DETAIL (35) Tuner fine tuning Contrast control Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Check Vid. Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and Width controls V12, V13 Hor. Drive control	NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3, V19 Volume control Speaker (open voice coil or defective Sound and Vid. IF alignment L-101 Det. alignment T-101	INTERMITTENT SOUND - PIX OK V1, V2, V3, V19 Volume control Poor connections in sound system

FRONT

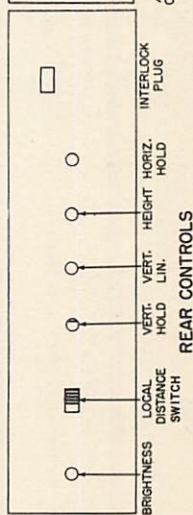


TOP VIEW

PICTURE TUBE ADJUSTMENTS



DRIVE CORD ARRANGEMENT



FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	4.5 Mc IF Amp.
V2	6AL5	Rectifier
V3	12AU7	1st AF Amp. - Sync
V4	6BF5	Clipper
V5	6CB6	1st Pix IF
V6	6CB6	2nd Pix IF
V7	6CB6	3rd Pix IF
V8	6CB6	4th Pix IF
V9	6AC7	Vid. Amp.
V10	12AU7	Sync Amp. - Sync Sep.
V11	6C4	Vert. Osc.
V12	6SN7GT	Vert. Out.
V13	6SN7GT	AFC - Hor. Osc.
V14	6SN7GT	Hor. Out.
V15	12AU7	HV Rect.
V16	6W4GT	Damper
V17	504G	Power Rect.
V18	16KP4A	Pix Tube
V19	6CB6	RF Amp.
V20	6J6	Osc. - Mixer

KEY VOLTAGES

B+, plate of damper, V16 pin 5 275vdc
 Boosted B+, cath. of damper, V16 pin 3 500vdc
 Plate of Vert. Osc., V11 pins 1 and 5 55vdc
 Plate of Vert. Out., V12 pins 2 and 5 38vdc
 Plate of Hor. Osc. and Cont., V13 pins 1 and 5 180vdc
 Grid of Hor. Out., V14 pin 5 0vdc

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

ADJUSTMENTS

For the horizontal oscillator adjustment, see HOR. OSC. ADJ.-2. (In this case the horizontal lock control is known as the Blocking Waveform Adjustment.)

NO RASTER - NO SOUND (31) Power input circuit V19	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V9, V18 Check L101 for alignment Check Vid. Det. crystal (IN64) IF and RF alignment	RASTER BLOOMING (37) V14, V15, V19 Hor. Drive control Check 900mV cap. connected to terminal D of the Hor. Osc. trans. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V13, V14, V19 Hor. Out. Trans. Check 0.0015 mF connected to terminal D of Hor. Osc. trans. Low line voltage	NOISY SOUND - PIX OK V1, V2, V3, V4, V18 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment SYNC. BUZZ IN SOUND (8E) Tuner fine tuning V1, V2, V9 Volume control AGC Rect. crystal (IN64) Sound IF and Det. alignment L101, T101
WEAK PIX-SOUND AND RASTER OK (34) Tuner fine tuning V9, V18, V19, V20 "Phono" - "TV" Switch HV trans., Hor. yoke, CRT connections WEAK PIX-SOUND AND RASTER OK (34) Tuner fine tuning V9, V18, V19, V20 Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Contrast control	SNOW IN PIX (32) V5, V6, V7, V8, V17, V18 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V5, V6, V7, V8, V9, V17, V18 Tuner fine tuning Vid. Det. crystal (IN64) Contrast control ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64); V9 Check 0.01 mF cap. connected to pin 11 of V18 (CRT)	INSUFFICIENT RASTER HEIGHT (15) Height control V11, V12, V19 Hor. Out. Trans. Check 0.01 mF cap. connected to Red lead of Vid. Osc. trans. Low line voltage NO VERT. DEFL. (14) V11, V12 Check 100 mF cap. connected to pins V13, V14, V18 Vid. Det. crystal (IN64) Vert. Defl. yoke Vert. Out. Trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V3, V11, V12 Vert. BH. Vert. Hold NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V3, V9, V10 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) V3, V9, V10 Hor. Hold and Lock control Hor. Osc. Adj. (Syneregulide) RF and IF alignment Check 0.01 mF cap. connected to terminals C and D of Hor. Osc. trans. AUDIO HUM IN SOUND (8E) V1, V2, V3, V4	INTERMITTENT SOUND - PIX OK V1, V2, V3, V4 Volume control Check for loose connections in sound system Poor connections in sound system
POOR HOR. LIN. Hor. Drive control V11, V12 Hor. Out. Trans. Check 0.1 mF cap. connected to pin 3 and 8 of V16 POOR VERT. LIN. (11, 12) Vert. In. and Lin. controls V11, V12 Vert. Out. Trans. Check 2.2 megohm res. connected to pins 1 and 4 of V12 PIX JITTER SIDEWAYS Hor. Hold and Lock controls V3, V13, V14 A.G.C. Rect. crystal (IN64) Check 0.0022 mF cap. connected to pin 4 of V13 PIX JITTER UP AND DOWN (16, 17) V12 Vert. Hold Vert. Out. Trans.	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V9, V18, V19 Contrast control Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) RF and IF alignment INTERMITTENT RASTER - SOUND OK V1, V2, V3, V4 Brightness control HV trans. INSUFFICIENT BRIGHTNESS Ion trap V14, V15, V19, V20 Bk. Grid and Hor. Drive control Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and width controls V14, V15 Hor. Drive control	DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V4, V18 Volume and Contrast controls Bk. Grid and RF alignment L-101 Det. alignment T-101 NO SOUND - PIX OK (8B) Ion trap V1, V2, V3, V4 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T-101	
SMEARED PIX (36) Tuner fine tuning Contrast control Vid. Det. crystal (IN64) A.G.C. crystal (IN64) Check Vid. Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning V9, V18 Vid. Det. crystal (IN64) A.G.C. Rect. crystal (IN64) Check Vid. Amp. peaking coils IF and RF alignment			

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Sound IF
V2	6AU6	2nd Sound IF
V3	6AU6	Limiter
V4	6AL5	Disc.
V5	6AV5	1st AF Amp.
V6	6Y6G	AF Out.
V7	6CB8	1st Pix IF
V8	6CB8	2nd Pix IF
V9	6CB8	3rd Pix IF
V10	6BA6	4th Pix IF
V11	6AL5	2nd Det. - Sync Limiter
V12	6AC7	Vid. Amp.
V13	6AV5	AGC Cath. Follower
V14	6AU6	AGC Tube
V15	6AV5	Sync Sep.
V16	6AV5	Linearity
V17	6SN7GT	Hor. - Vert. Osc.
V18	6SN7GT	Vid. Out.
V19	6AL5	Hor. Disc.
V20	6SN7GT	Hor. Osc.
V21	6CD5G	Hor. Out.
V22	1B5	HV Rect.
V23	5Y4	Power Rect.
V24	16KP4A	Pix Tube
V25	6J6	Osc. - Mixer
V26	6AK5	RF Amp.

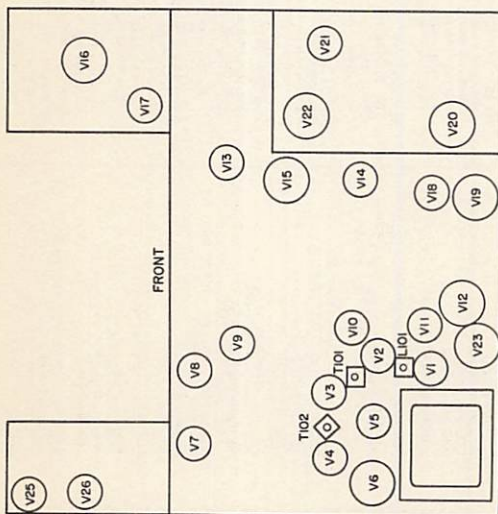
KEY VOLTAGES

B+	plate of damper, V22 pin 5	280vdc
Boosted B+	cath. of damper, V22 pin 3	400vdc
Plate of Vert. Osc.	V16 pin 2	60vdc
Plate of Vert. Out.	V17 pin 9	350vdc
Plates of Hor. Osc.	V19 pin 2	260vdc
Grid of Hor. Out.	V20 pin 5	170vdc
	V20 pin 3	-15vdc

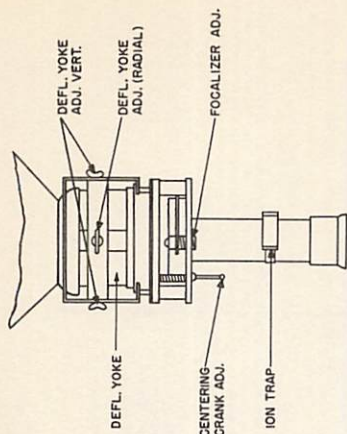
(All Voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

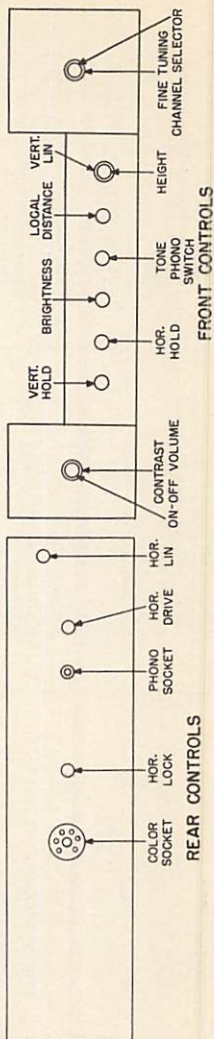
For the horizontal oscillator adjustment see HOR. OSC. ADJ.-1. For the tuner oscillator adjustment see TUNER OSC. ADJ.-1.



TOP VIEW

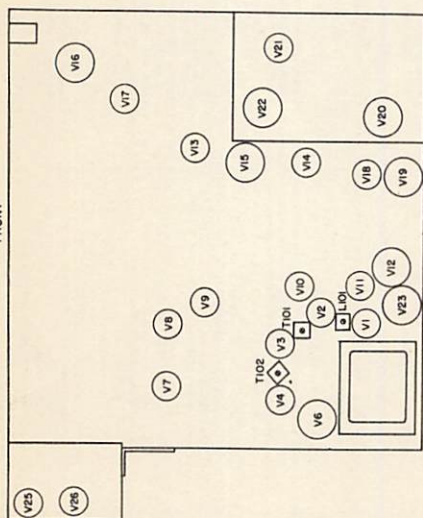


PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31) Power input circuit V23	SNOW IN PIX (32) V13, V14, V25, V26 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) V16, V17, V20, V23 Vert. Out. Trans. Check 0.047 connected to Red lead of the Vert. Osc. trans. Low line voltage	SYNC. BUZZ IN SOUND (8E) V1, V2, V3, V13, V14 Sound IF and Det. alignment L108; L101; T101; T102
NO RASTER - SOUND OK (31) HV Fuse (1/4 Amps) Ion trap V16, V19, V20, V21, V22, V24 HV trans., Hor. yoke, CRT connections	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Control V11, V12, V13, V14	NO VERT. DEF. (14) V16, V17 Check 80 mfd cap. connected to pin 2 and 6 of V17 Vert. Defl. yoke Vert. Out. Trans.	INTERMITTENT SOUND - PIX OK V1, V2, V3, V4, V5, V6 Volume control Poor connections in sound system
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V7, V8, V9, V10, V11, V12, V13, V14 Contrast control	WEAK OR NO PIX - SOUND WEAK - (32C, 34C) Raster OK V7, V8, V9, V10, V11, V13, V14, V25 "Local" and "Distance" switch RF and IF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V16, V17 Vert. Int. Vert. Hold control	
POOR HOR. LIN. Hor. Lin. and Drive controls V19, V20, V22 Hor. Out. Trans. Check 0.1 and .068 mfd caps. connected to Hor. Lin. coil	WEAK OR NO PIX - SOUND OK (32C, 34C) Raster OK V7, V8, V9, V10, V11, V13, V14, V25 "Local" and "Distance" switch RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V15, V14, V15, V16, V18	
POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V16, V17 Vert. Out. Trans. Check 0.047 mfd cap. connected to Red lead of Vert. Osc. trans.	INTERMITTENT RASTER - SOUND OK Brightness control V18, V19, V20, V21, V22 HV trans.	AUDIO HUM IN SOUND (8E) V1, V2, V3, V4, V5, V6	
PIX JITTER SIDEWAYS Hor. Lock and Hold controls V18, V19, V20 Check 0.047 mfd cap. connected to pin 1 of V19	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive and Brightness controls V19, V20, V21, V23, V24 Low line voltage	DEFORMED SOUND (8D) Tuner fine tuning V16, V17, V18, V19, V25 Tone control Sound and Vid. IF alignment L108; L101; T101 Det. alignment T102	
PIX JITTER UP AND DOWN (16, 17) V16, V17 Vert. Hold Vert. Out. Trans.	EXCESSIVE RASTER (PIX SIZE) (9, 10) Tuner fine tuning Height and Width controls V20, V21 Hor. Drive control	NO SOUND - PIX OK (8A) Tuner fine tuning V1, V2, V3, V4, V5, V6 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L108; L101; T101 Det. alignment T102	
SMOARED PIX (36) Tuner fine tuning Contrast control V11, V12, V13, V14 Check peaking coils of Vid. Amp. IF and RF alignment	RASTER BLOOMING (37) V20, V21, V24 Check 330 series res. in sec. anode lead Hor. Drive control	NOISY SOUND - PIX OK V1, V2, V3, V4, V5, V6 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment	
POOR PIX DETAIL (35) Tuner fine tuning V11, V12 Focus Adj. Check Vid. Amp. peaking coils IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width controls V18, V19, V23 Hor. Out. Trans. Check 330 mfd cap. connected to pin 5 of V19 Low line voltage		
SOUND BARS IN PIX (4A, 4E) V11, V13, V14 L108 alignment IF and RF alignment			

FRONT



TOP VIEW

Symbol	Type	Circuit Function
V1	6AU6	1st Sound IF
V2	6AU6	2nd Sound IF
V3	6AU6	1st AF Amp.
V4	6AU6	2nd AF Amp.
V5	6AV6	1st Pix IF
V6	6CB6	2nd Pix IF
V7	6CB6	3rd Pix IF
V8	6CB6	4th Pix IF
V9	6CB6	5th Pix IF
V10	6CB6	6th Pix IF
V11	6CB6	7th Pix IF
V12	6AC7	Vid. Amp.
V13	6AV6	AGC Cath. Follower
V14	6AU6	AGC Tube
V15	12AU7	Sync Sep.-Sync Clipper
V16	6SN7GT	Sync Splitter-Vert. Osc.
V17	6X4	Vert. Out.
V18	6X4	Hor. Out.
V19	6SN7GT	Hor. Osc.
V20	6CD6	Hor. Out.
V21	1B3GT	HV Rect.
V22	6VAGT	Damper
V23	504G	Power Rect.
V24	6X4 or 6X4A	504G or Pix Tube
V25	6J6	Osc. - Mixer
V26	6AK5	RF Amp.

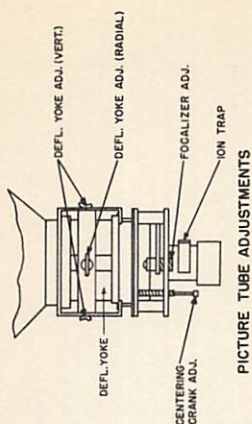
KEY VOLTAGES

B+, plate of damper, V22 pin 5	280vdc
B-, plate of damper, V22 pin 6	400vdc
Plate of Vert. Osc., V16 pin 3	60vdc
Plate of Vert. Out., V17 pin 9	350vdc
Plate of Hor. Osc., V19 pin 2	280vdc
Grid of Hor. Out., V20 pin 5	170vdc
Grid of Hor. Out., V20 pin 5	-15vdc

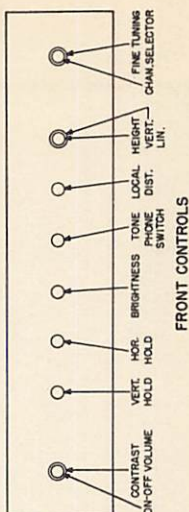
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

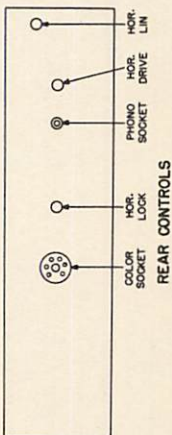
For the horizontal oscillator adjustment, see HOR. OSC. ADJ. section. For the vertical oscillator adjustment, see TUNER OSC. ADJ. section.



PICTURE TUBE ADJUSTMENTS

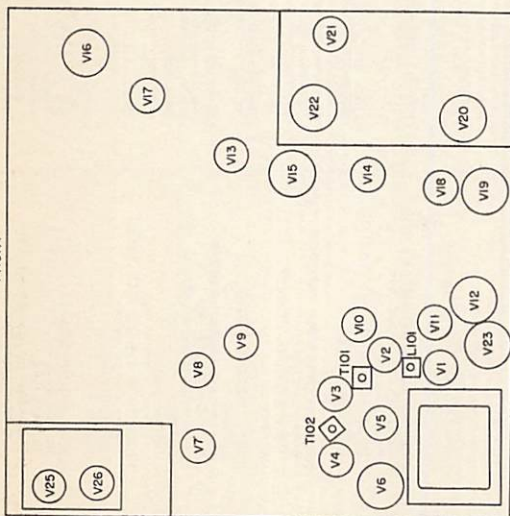


FRONT CONTROLS

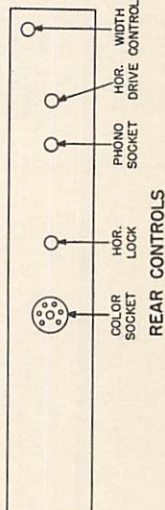


REAR CONTROLS

FRONT



TOP VIEW



TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Sound IF
V2	6AU6	2nd Sound IF
V3	6AU6	Limiter
V4	6AL5	Disc.
V5	6AV6	1st AF Amp.
V6	6AV6	2nd AF Amp.
V7	6CB6	1st Pix IF
V8	6CB6	2nd Pix IF
V9	6CB6	3rd Pix IF
V10	6BA6	4th Pix IF
V11	6AL5	2nd Det. - Sync Limiter
V12	6AC7	Vid. Amp.
V13	6AV6	AGC Cath. Follower
V14	6AU6	Sync Sep-Sync Clipper
V15	12AU7	Sync Splitter-Vert. Osc.
V16	6SN7GT	Vert. Out.
V17	684	Hor. Disc.
V18	6AL5	Hor. Osc.
V19	6SN7GT	Hor. Out.
V20	6AV6	HF Rect.
V21	1B3GT	Power Rect.
V22	6W4GT	Damper
V23	5U4G	Power Rect.
V24	21AP4	Pix Tube
V25	6J6	Osc. - Mixer
V26	6AK5	RF Amp.

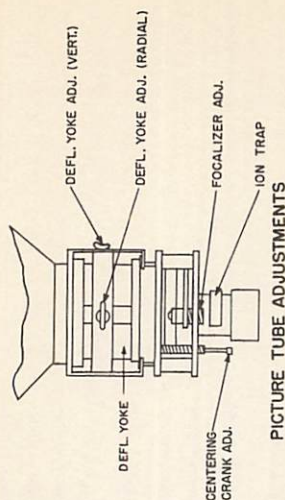
KEY VOLTAGES

B+, plate of damper, V22 pin 5	200vdc
Boosted B+, cath. of damper, V22 pin 3	475vdc
Plate of Vert. Osc., V15 pin 2	60vdc
Plate of Vert. Out., V17 pin 9	430vdc
Plate of Hor. Osc., V19 pin 2	100vdc
Grid of Hor. Out., V20 pin 5	-10vdc

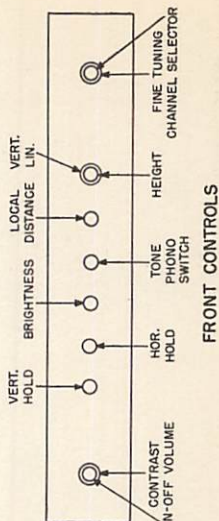
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

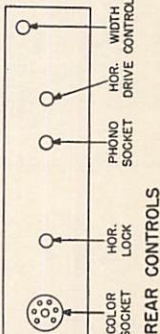
For the horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. For the tuner oscillator adjustment, see TUNER OSC. ADJ.-1.



PICTURE TUBE ADJUSTMENTS

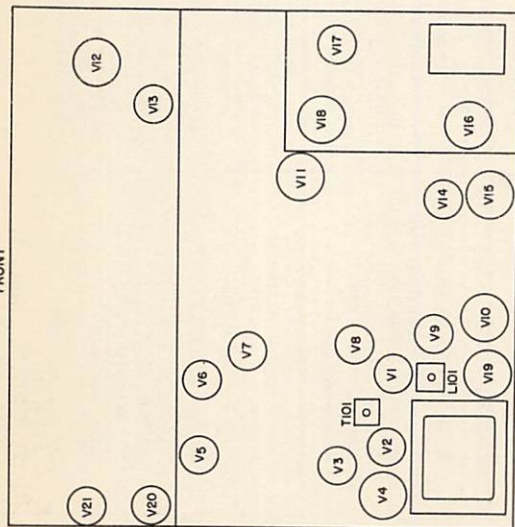


FRONT CONTROLS

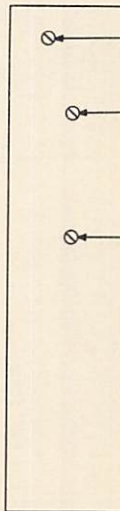


REAR CONTROLS

FRONT



TOP VIEW

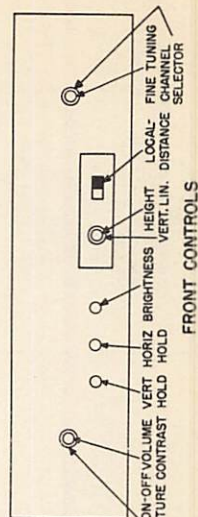


REAR CONTROLS

HORIZ.
LOCK

HORIZ.
DRIVE

WIDTH
CONTROL



FRONT CONTROLS

ON-OFF VOLUME

PICTURE CONTRAST

VERT. HOLD

HORIZ. BRIGHTNESS

HEIGHT

LOCAL-
DISTANCE

CHANNEL
SELECTOR

FINE TUNING

TUBELIST

Symbol	Type	Circuit Function
V1	6AU6	Limiter
V2	6AL5	1st AF Det.
V3	6AV6	1st AF Amp.
V4	6V6GT	AF Out.
V5	6CB6	1st Pix IF
V6	6CB6	2nd Pix IF
V7	6CB6	4th Pix IF
V8	6BA6	4th Pix IF
V9	12AU7	1st Sound IF - 2nd Vid. Det.
V10	6AC7	Vid. Amp.
V11	12AU7	Sync Amp. - Sync Sep.
V12	6SN7GT	Sync Splitter-Vert. Osc.
V13	684	Vert. Out.
V14	6AL5	Hor. Disc.
V15	6SN7GT	Hor. Osc.
V16	6BQ6GT	Hor. Out.
V17	1B3GT	HV Rect.
V18	6X4	Damper
V19	594GT	RF Rect.
V20	6BQ7	RF Amp.
V21	6J6	Osc. - Mixer
V22	17HP4A	Pix Tube

KEY VOLTAGES

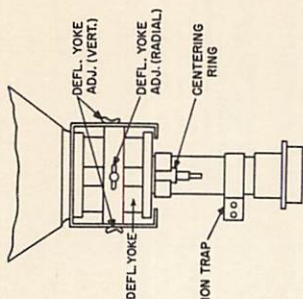
B+, plate of damper, V18 pin 5	300vdc
Plate of V1, cath. of damper, V18 pin 3	150vdc
Plate of V2, cath. of V1, V13 pin 2	310vdc
Plate of V3, cath. of V2, V13 pin 9	470vdc
Plate of Hor. Osc., V15 pin 2	270vdc
Grid of Hor. Osc., V16 pin 5	180vdc
Grid of Hor. Out., V16 pin 5	-0.6vdc

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

ADJUSTMENTS

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

PICTURE TUBE ADJUSTMENTS



- NO RASTER - NO SOUND (31)**
Power input circuit
Check B, filter caps.
- NO RASTER - SOUND OK (31)**
Ion trap
Brightness control
HV trans., Hor. yoke, CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10
Contrast control
Check 0.1 mf cap. connected to pin 4 of V10
- POOR HOR. LIN.**
Hor. Drive control
V15, V16, V18
Check 0.047 and 0.1 mf caps. connected to pin 5 of V18
Hor. Out. Trans.
- POOR PIX - LIN. (11, 12)**
Vert. Lin. and Height controls
V12, V13
Check 0.1 mf cap. and 2.2 megohm res. connected to pin 5 of V13
Vert. Out. Trans.
- PIX JITTER SIDWAYS**
Hor. Hold and Lock controls
V14, V15, V16
Check 0.047 and 0.01 mf caps. connected to pin 5 of V15
Check 0.01 mf cap. connected to pins 5 and 7 of V14
- PIX JITTER UP AND DOWN (16, 17)**
V12, V13
Vert. Hold
Vert. Occ. and Output Trans.
Vert. Int. Network
- SMEARED PIX (36)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21
Contrast control
Check 0.01 mf cap. connected to pins 5 and 7 of V14
- POOR PIX DETAIL (35)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21, V22
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10
Check L111 for alignment
IF and RF alignment
- SNOW IN PIX (32)**
V5, V6, V7, V8, V9, V20, V21
Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38)
V6, V7, V8, V9, V10, V20, V21
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10
Local and distance switch
Check V1d. Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive control
V5, V6, V7, V8
Check 82 ohm and 10K res. damping network in yoke
Defl. yoke ringing
- PIX BENDING (22)**
V12, V13, Hold and Lock controls
V5, V6, V7, V8, V9, V10
Check 0.047 and 0.01 mf caps. connected to pin 1 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V20, V21
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness control
V10, V15, V16, V17, V18
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness controls
V14, V15, V19
Check 270K res. connected to pin 4 of V16
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Height and width controls
V16, V17
Hor. Drive control
Raster blooming (37)
V16, V17, V22
- POOR PIX DETAIL (35)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21, V22
IF and RF alignment
- NO RASTER - NO SOUND (31)**
Power input circuit
Check B, filter caps.
- NO RASTER - SOUND OK (31)**
Ion trap
Brightness control
HV trans., Hor. yoke, CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10
Contrast control
Check 0.1 mf cap. connected to pin 4 of V10
- POOR HOR. LIN.**
Hor. Drive control
V15, V16, V18
Check 0.047 and 0.1 mf caps. connected to pin 5 of V18
Hor. Out. Trans.
- POOR PIX - LIN. (11, 12)**
Vert. Lin. and Height controls
V12, V13
Check 0.1 mf cap. and 2.2 megohm res. connected to pin 5 of V13
Vert. Out. Trans.
- PIX JITTER SIDWAYS**
Hor. Hold and Lock controls
V14, V15, V16
Check 0.047 and 0.01 mf caps. connected to pin 5 of V15
Check 0.01 mf cap. connected to pins 5 and 7 of V14
- PIX JITTER UP AND DOWN (16, 17)**
V12, V13
Vert. Hold
Vert. Occ. and Output Trans.
Vert. Int. Network
- SMEARED PIX (36)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21
Contrast control
Check 0.01 mf cap. connected to pins 5 and 7 of V14
- POOR PIX DETAIL (35)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21, V22
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10
Check L111 for alignment
IF and RF alignment
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and width controls
V15, V16, V19
Check 270K res. connected to pin 4 of V16
Check 270 and 330 mmf caps. connected to pin 5 of V15
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Height control
V12, V13, V19
Check 0.1 mf cap. connected to pin 6 of V13
Vert. Out. Trans.
Low line voltage
- NO VERT. DEFL. (14)**
V12, V13
Check 0.047 mf cap. connected to Red and Black pins of Defl. trans.
Vert. Defl. yoke
Vert. Out. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
V12, V13 Network
Vert. Int. Network
Check 0.047 and 0.0015 mf caps. connected to yellow lead of Vert. Occ. trans.
- NO HOR. OR VERT. SYNC. - PICTURE OK (18, 19)**
V11, V12, V14
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
V12, V14, V15
Hor. Hold and Lock control
Check 330 mmf cap. connected to pins 2 and 4 of V15
- AUDIO HUM IN SOUND (8E)**
V1, V2, V3, V4, V9
- DISTORTED SOUND (8D)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Speaker
Sound and Vid. IF alignment L101
Det. alignment T101
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V1, V2, V3, V4, V9
Volume control
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L101
Det. alignment T101
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Speaker
Sound and Vid. IF alignment L101
Det. alignment T101
- NOISY SOUND - PIX OK**
V1, V2, V3, V4, V9
Volume control
Speaker
Check for loose connections in sound system
Sound IF and Det. alignment L101, T101
- SYNC. BUZZ IN SOUND (8E)**
V1, V9, V10
Contrast control
"Local" and "Distance" switch
Sound IF and Det. alignment L101, T101
- INTERMITTENT SOUND - PIX OK**
V1, V2, V3, V4, V9
Volume control
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Sound IF
V2	6AU6	2nd Sound IF
V3	6AL5	Rat. Det.
V4	6AT5	1st AF Amp.
V5	6AC5	AF Out.
V6	6AU6	1st Pix IF
V7	6AT5	2nd Pix IF
V8	6CB6	3rd Pix IF
V9	6CB6	4th Pix IF
V10	6AU6	1st Vid. Amp.
V11	12AX7	Noise Inv. - AGC
V12	6AQ5	Cath. Follower
V13	12AU6	2nd Vid. Amp.
V14	6SN7	Synch. Sep. - Vert. Osc.
V15	6B4	Vert. Out.
V16	6AU6	Keyed AGC Amp.
V17	6AL5	Hor. Sync. Disc.
V18	6AT5	Hor. Osc.
V19	6BQ5	HV Rect.
V20	1B3	Damper
V21	6V3	Power Rect.
V22	5U4	Power Rect.
V23	21MP4	Pix Tube
V24	6X4	Rect. - Mixer
V25	6BQ5	Osc. - Mixer
V26	8T6	

KEY VOLTAGES

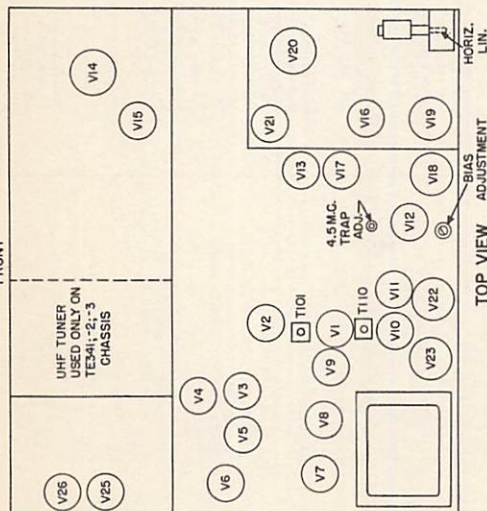
B+	Plate of damper, V21 pins 2, 7, 9	300dc
450dc	Screen grid of Hor. Osc., V18 pin 2	
120dc	Plate of Vert. Osc., V14 pin 2	
445dc	Plate of Vert. Out., V15 pin 9	
150dc	Plate of Hor. Osc., V18 pin 2	
240dc	pin 5	
-5dc	Grid of Hor. Out., V19 pin 5	

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

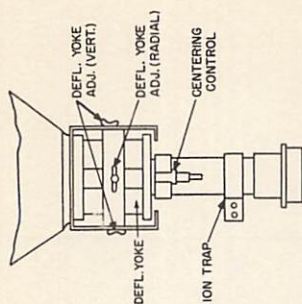
ADJUSTMENTS

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

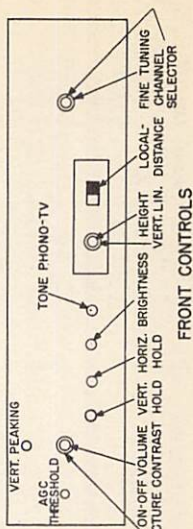
FRONT



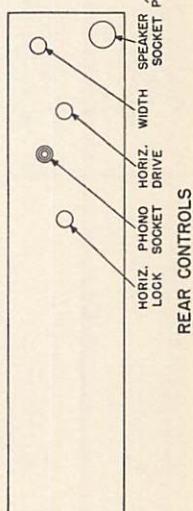
TOP VIEW



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V23	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and width controls V18, V19, V21, V23 Hor. Drive trans. Check 700 mfd cap. connected to pin 5 of V19 through a 470 res. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V4, V5, V11, V16, V26 Sound and Vid. IF alignment T101, T110 Det. alignment T102
NO RASTER - SOUND OK (31) Brightness control Ion trap HV Fuse (1/4 Amps) V17, V18, V19, V20, V21, V24 HV trans., Hor. yoke, CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning A.G.C. threshold and Bias controls V6, V7, V8, V9, V10, V11, V16	SNOW IN PIX (32) V6, V7, V8, V9, V11, V16, V25, V26 A.G.C. and Bias controls Antenna and transmission line AC IN PIX (DARK HOR, BAR) (38) V6, V7, V8, V9, V11, V16, V25, V26 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning A.G.C. threshold and Bias controls Vid. Det. (IN64 crystal in T109) V6, V7, V8, V9, V11, V12, V16 Check Vid. peaking coils	NOISY SOUND - PIX OK V1, V2, V3, V4, V5 Check sound system for loose connections Volume control Speaker Sound IF and Det. alignment T110, T101, T102 SYNC BUZZ IN SOUND (8E) A.G.C. threshold and Bias controls V10, V11, V16 Sound IF and Det. alignment T101, T102, T110 INTERMITTENT SOUND - PIX OK V1, V2, V3, V4, V5 Poor connections in sound system
POOR HOR. LIN. Hor. Drive controls V18, V19, V21 Hor. Out. Trans. Check 0.047 mf cap. connected to pin 5 of V19 through a 470 res. POOR VERT. LIN. (11, 12) Vid. Det. (IN64 crystal in T109) Vid. Out. Trans. Check 100 mf cap. connected to pin 2 of V15 Check 0.1 mf cap. connected to pin 6 of V15 PIX JITTER SIDEWAYS Hor. Hold and Lock controls A.G.C. threshold control V11, V16, V17, V18, V19 Check 0.01 mf cap. connected to pins 6 and 7 of V17 PIX JITTER UP AND DOWN (16, 17) A.G.C. threshold control V11, V13, V14, V16 Vid. Det. (IN64 crystal in T109) A.G.C. threshold and Bias controls RF and IF alignment INTERMITTENT RASTER - SOUND OK V16, V17, V18, V19, V20, V21, V24 Brightness control HV trans. INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive and Brightness controls V16, V18, V19, V20, V22, V23, V24 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height controls V19, V20 RASTER BLOOMING (37) Hor. Drive control V16, V19, V20, V22, V23, V24 Check series res. in sec. anode lead	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) A.G.C. threshold control V11, V13, V14, V16 A.G.C. threshold and Bias controls NO HOR. OR VERT. SYNC. - PIX OK (16, 17) A.G.C. threshold control V11, V13, V14, V16 A.G.C. threshold and Bias controls NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock controls A.G.C. threshold control V11, V13, V14, V16 Check 120K3 res. connected to pin 2 of V18 AUDIO HUM IN SOUND (8E) V1, V2, V3, V4, V5 Tuner fine tuning DISTORTED SOUND (8D) V1, V2, V3, V4, V5, V11, V16, V26 A.G.C. threshold control Sound and Vid. IF alignment T110, T101 Det. alignment T102 NO SOUND - PIX OK (8B) Tuner fine tuning V1, V2, V3, V4, V5 Volume control Speaker (check voice coil or defective connection) Sound and Vid. IF alignment T101, T110 Det. alignment T102	

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	Limiter
V2	6AL5	Ratio Det.
V3	6AV6	1st AF Amp.
V4	6CB6	2nd Pix IF Amp.
V5	6CB6	3rd Pix IF Amp.
V6	6CB6	4th Pix IF Amp.
V7	6BA6	2nd Det. and AGC
V8	12AU7	1st Sound IF Amp.
V9	6AC7	Sync. Amp. & Sync. Sep.
V10	6SN7GT	Sync. Splitter
V11	6SN7GT	Vert. Osc.
V12	6SN7GT	Hor. Osc.
V13	6SN7GT	Hor. Osc.
V14	6BQ6GT	H.V. Rect.
V15	6BQ6GT	Damper
V16	6BQ6GT	Power Rect.
V17	6BQ6GT	Osc. - Mixer
V18	6BQ6GT	RF Amp.
V19	6BQ6GT	Picture Tube
V20	6BQ6GT	UHF Osc.
V21	6BQ6GT	UHF IF Amp.
V22	6AF4	UHF Osc.
V23	6BQ6GT	UHF IF Amp.
V24	6BQ6GT	UHF IF Amp.

KEY VOLTAGES

B+, plate of damper, V18 pin 5 250vdc
 Screened V1, each of damper, V19 pin 3 400vdc
 Plate of Hor. Osc., V12 pin 5 425vdc
 Plate of Vert. Osc., V11 pin 6 425vdc
 Plates of Hor. Osc., V15 pin 2 270vdc
 pin 5 175vdc
 Grid of Hor. Out., V16 pin 5 -29vdc

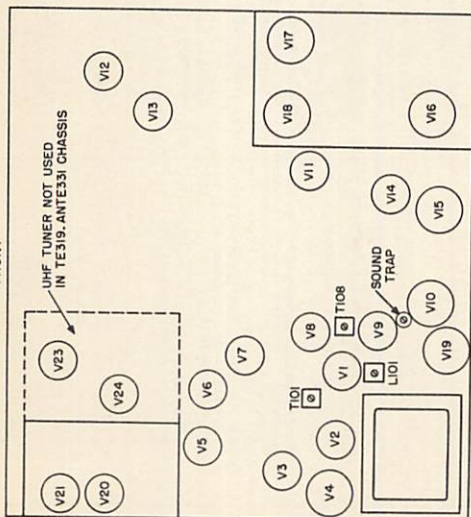
*Voltage varies with control settings.

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

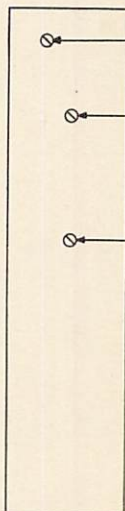
ADJUSTMENTS

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

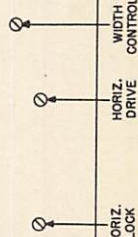
FRONT



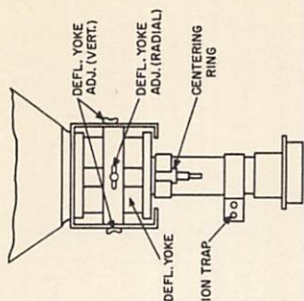
TOP VIEW



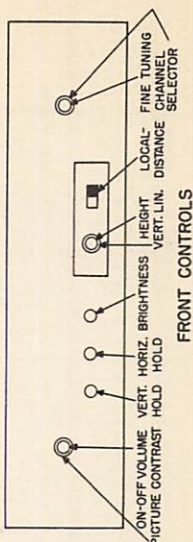
REAR CONTROLS



REAR CONTROLS



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

- NO RASTER - NO SOUND (31)**
Power input circuit
V19
Check B- Filters
- NO RASTER - SOUND OK (31)**
HV Fuse (1/4 Amp)
Brightness control
Ion trap
V14, V15, V16, V17, V18, V22
HV trans., Hor. yoke, CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast control
V5, V6, V7, V8, V9, V21
- POOR HOR. LIN.**
Hor. Drive control
V15, V16, V18
Check 0.047 mf cap. connected to pin 2 of V2
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Height controls
V12, V13
Check 0.1 and 0.047 mf caps. connected to red lead of Vert. Osc. Trans.
- PIX JITTER SIDEWAYS**
Hor. Hold and Lock controls
V9, V14, V15, V16
Check 0.01 mf cap. and 12K Ω res. connected to pins 5 and 7 of V14
- PIX JITTER UP AND DOWN (16, 17)**
Vert. Hold control
V11, V12
Check 0.0047 mf cap. connected to yellow lead of Vert. Osc. Trans.
- SMEARED PIX (36)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Contrast control
Check Vid. Amp. peaking coils
Check 0.1 mf cap. connected to pin 4 of V10
- POOR PIX DETAIL (35)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
V5, V6, V7, V8, V9
Readjust L111
Contrast control
IF and RF alignment
- SNOW IN PIX (32)**
V5, V6, V7, V8, V9, V20, V21
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V5, V6, V7, V8, V9, V10, V20, V21
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V21
- CONTRAST CONTROL**
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive control
V14, V15, V16
Dial. yoke ringing
- PIX BENDING (22)**
Hor. Hold and Lock controls
V14, V15, V16
Check 0.047 mf and 0.0047 mf caps. connected to pin 1 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V5, V6, V7, V8, V9, V10, V20, V21
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness control
V14, V15, V16, V17, V18, V22
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive controls
V15, V16, V17, V19, V22
Check 3-22K Ω res. connected to pin 4 of V16
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Height controls
V16, V17
- RASTER BLOOMING (37)**
Hor. Drive control
V15, V16, V17, V19, V22
Check 3-22K Ω res. connected in series with sec. anode lead
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width controls
V15, V16, V17, V19
Check 270 and 330 mmf caps. connected to pin 5 of V15
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Height and Vert. Lin. controls
V1, V2, V3, V4, V9, V21
Check 0.1 mf cap. connected to pin 6 of V13
Check 100 mmf cap. connected to pin 2 of V13
Low line voltage
- NO VERT. DET. (14)**
V12, V13
Check 0.1 and 0.047 mf cap. connected to red lead of Vert. Osc. Trans.
- VERT. DET. YOKE**
Vert. Out. Trans. and Vert. Osc. Trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold control
V12, V13
Check 0.0047 and 0.0015 mf caps. connected to yellow lead of Vert. Osc. Trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V9, V11, V12
Check 0.047 mf cap. connected to pin 2 of V11
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Lock controls
V14, V15, V16
Check 330 mmf cap. connected to pins 2 and 4 of V16
- AUDIO HUM IN SOUND (8E)**
V1, V2, V3, V4, V9
- DEFORMED SOUND (8D)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Check 0.01 mf cap. connected to pin 5 of V4
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V1, V2, V3, V4, V9
Volume control
Speaker (open voice coil or defective connection)
Sound and Det. IF alignment
Det. alignment T101
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V1, V2, V3, V4, V9, V21
Volume control
Sound and Vid. IF alignment
Det. alignment T101
- NOISY SOUND - PIX OK**
V1, V2, V3, V4, V9
Check sound system for loose connections
- VOLUME CONTROL**
Volume control
Speaker
Sound IF and Det. alignment
- SYNC. BUZZ IN SOUND (8E)**
Tuner fine tuning
V1, V9, V10
Check 500 mmf cap. connected to pin 2 of V2
- INTERMITTENT SOUND - PIX OK**
V1, V2, V3, V4, V9
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6J6	RF Osc. & Mixer
V3	6AU6	1st Vid. IF Amp.
V4	6AU6	2nd Vid. IF Amp.
V5	6AL5	3rd Vid. IF Amp.
V6	6AL5	Vid. Det.
V7	12AU7	1st & 2nd Vid. Amp.
V8	6SH7	Rat. Det. Driver
V9	6AL5	Rat. Det.
V10	6SH7	1st AF
V11	6X4	AF Amp.
V12	6X4	Hor. Sweep Osc.
V13	6AU5	Hor. Sweep Out.
V14	1B3	H.V. Rect.
V15	6W4	Hor. Damp.
V16	6AL5	Hor. Phase Det.
V17	12AU7	Sync. Amp.
V18	6J5	DC Amp. Splitter
V19	6BL7	Vert. Sweep Osc.
V20	5U4	Vert. Sweep Out.
V21	17BP4A	L.V. Rect.
	17BP4	Fix Tube
	10BP4	
	16BP4	
	or	
	16TP4	

KEY VOLTAGES

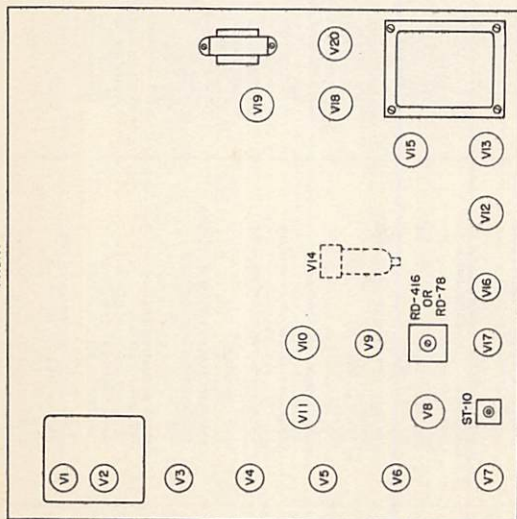
B+, plate of damper, V15 pin 5	360vdc
Biased B+, cath. of damper, V15 pin 3	460vdc
Plate of Rect. Sec., V14 pin 2	340vdc
Plate of Vert. Out., V19 pins 2 and 5	140vdc
Plate of Hor. Osc., V12 pin 2	280vdc
pin 5	105vdc
Grid of Hor. Out., V13 pin 1	-3vdc

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

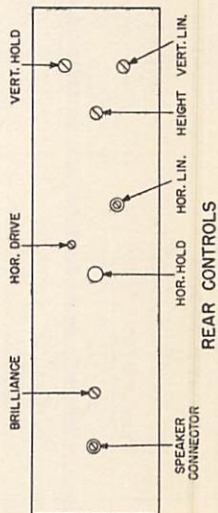
ADJUSTMENTS

For horizontal oscillator adjustments, see HOR. OSC. ADJ.-1. (This receiver does not use a horizontal frequency and hold control. Only horizontal hold control is used.) For horizontal oscillator adjustments, see TUNER OSC. ADJ.-2.

FRONT



TOP VIEW



REAR CONTROLS

SPEAKER
CONNECTOR

HOR.-HOLD HOR. LIN.

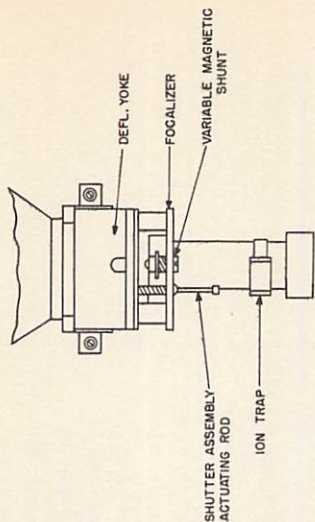
HEIGHT VERT. LIN.

VERT. HOLD

HOR. DRIVE

BRILLIANCY

PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

CONTRAST
OFF-ON VOLUME

STATION SELECTOR
FINE TUNING

NO RASTER - NO SOUND (31) Poor input circuit V20	SNOW IN PIX (32) V1, V2, V3, V4, V5 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) V12, V13, V14 Check 250 and 500 mfd caps. connected to pin 5 of V12 Hor. Out. Trans. Low line voltage	NO SOUND - PIX OK (88) Tuner fine tuning V8, V9, V10, V11 Volume control Speaker (open voice coil or defective connection) Sound and Vid. IF alignment ST-10 Det. alignment RD-116 or RD-7B
NO RASTER - SOUND OK (31) Brightness control V12, V13, V14, V15, V16, V21 HV trap Hor. yoke, CRT connections Check 250 and 500 mfd caps. connected to pin 5 of V12	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6, V7, V11, V17 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast control V2, V3, V4, V5, V7 Check Vid. Det. and Amp. peaking coils	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. controls V18, V19, V20 Check 0.1 mfd cap. connected to blue lead of Vert. Osc. Trans. Low line voltage	WEAK SOUND - PIX OK (8c) Tuner fine tuning V2, V6, V8, V9, V10, V11, V17 Volume control Sound and Vid. IF alignment ST-10 Det. alignment RD-116 or RD-7B
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control V2, V3, V4, V5, V6, V7, V11	VERT. BARS (21) Hor. Drive control V13, V14 Check 50 mfd cap. connected to terminals 1 and 2 of defl. yoke Defl. yoke ringing	NO VERT. DEFL. (14) V18, V19 Check 0.1 and 0.05 mfd caps. connected to blue lead of Vert. Osc. Trans. Vert. Defl. yoke Vert. Out. Trans.	NOISY SOUND - PIX OK V2, V6, V8, V9, V10, V11 Volume control Check for loose connections in sound system Speaker Sound IF and Det. alignment ST-10; RD-116 or RD-7B
POOR HOR. LIN. Hor. Lin. and Drive controls V12, V13, V15 Check 2-0.1 and 0.05 mfd caps. connected to Hor. Lin. Drive control Hor. Out. Trans.	PIX BENDING (22) V12, V13, V16, V17, V11 Check 0.1 and 0.005 mfd caps. connected to pin 1 of V12	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V11, V17, V18, V19 Vert. Hold control Vert. Int. network Check 0.005 mfd cap. connected to pin 5 of V18	SYNC. BUZZ IN SOUND (8E) Tuner fine tuning V2, V6, V8, V9, V10, V11 Contrast control Check 500 mfd cap. connected to pin 7 of V9 Sound IF and Det. alignment ST-10; RD-116 or RD-7B
PIX JITTER SIDEWAYS Hor. Hold control V11, V12, V13 Check 0.005 mfd cap. and 4700 res. connected to pins 3 and 7 of V16	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) V1, V2, V3, V4, V5, V6, V7 Tuner fine tuning Contrast control Check 0.05 mfd cap. connected to pin 7 of V7 RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V7, V11, V16, V17 Check 0.1 mfd cap. connected to pin 8 of V17	INTERMITTENT SOUND - PIX OK V2, V6, V8, V9, V10, V11 Volume control Poor connections in sound system
PIX JITTER UP AND DOWN (16, 17) V11, V17, V18, V19 Vert. Hold control Vert. Out. Trans. and Vert. Osc. Trans.	INTERMITTENT RASTER - SOUND OK Brightness control V12, V13, V14, V15, V16 HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold control V7, V11, V12, V13, V16 Check 250 mfd cap. connected to pins 2 and 4 of V12 Check 220K and 270K res. connected to pin 5 of V12	
SMOORED PIX (35) Tuner fine tuning Contrast control V2, V6, V7, V11 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Hor. Drive control Brightness control V12, V13, V14, V20, V21 Low line voltage	AUDIO HUM IN SOUND (8E) V7, V8, V9, V10, V11, V17 DISTORTED SOUND (8D) Tuner fine tuning V2, V6, V8, V9, V10, V11, V17 Check 0.02 mfd cap. connected to pins 5 of V11 Sound and Vid. IF alignment ST-10 Det. alignment RD-116 or RD-7B	
POOR PIX DETAIL (35) Tuner fine tuning V3, V4, V5, V7, V21 Check Vid. Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height and Hor. Drive controls V13, V14		
POOR PIX BLOOMING (37) Hor. Drive control V13, V14, V20, V21 Check 4700K res. in series with sec. anode lead	RASTER BLOOMING (37) Hor. Drive control V13, V14, V20, V21 Check 4700K res. in series with sec. anode lead		
SOUND BARS IN PIX (4A, 4E) V2, V3, V4, V5, V7 Check alignment of ST-10 IF and RF alignment			

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