

TV field service MANUAL

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TV field service MANUAL

VOL. 2

Edited by
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PREFACE

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

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

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

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

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

July, 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-

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

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

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

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

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

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

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

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

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

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

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

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

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

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

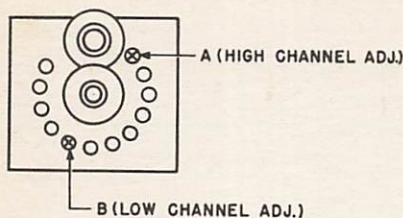


Fig. 1—Tuner oscillator adjustment No. 1.

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

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

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

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

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

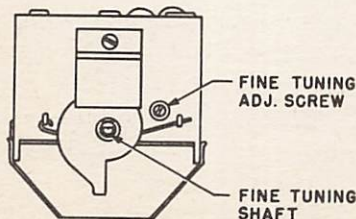


Fig. 2—Tuner oscillator adjustment No. 2.

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

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

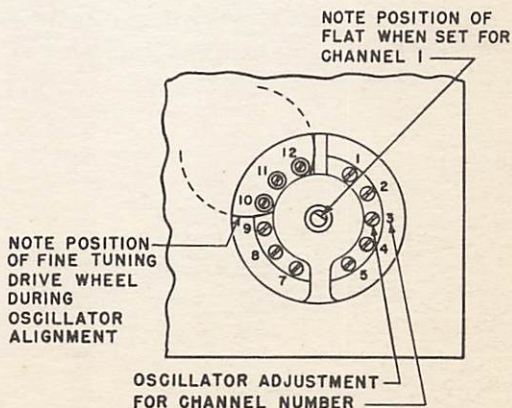
With the correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the fine tuning control. This may not necessarily be maximum sound output.

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

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

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

Fig. 3—Tuner oscillator adjustment No. 3.



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

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

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

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

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

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

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

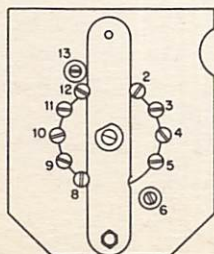


Fig. 4—Tuner oscillator adjustment No. 4.

AGC Control

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

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

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

Picture Tube Adjustments

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

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

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

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

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

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

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

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

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

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

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

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

Filament Wiring

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

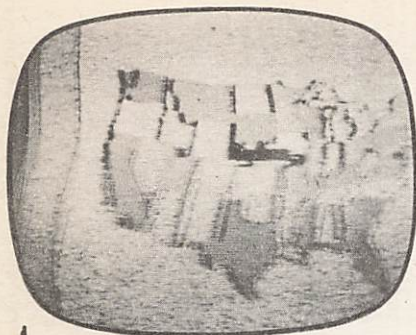
SYMPTOMS AND CAUSES OF FAULTY OPERATION

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

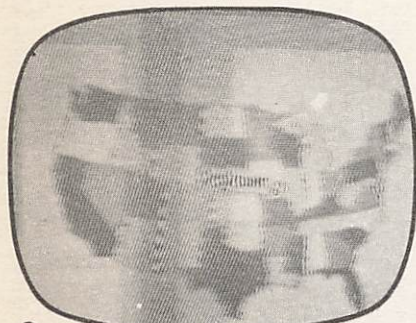
No. 1. Tuner Oscillator Mistuning. This picture condition is usually accompanied by a distorted or low sound output. A similar condition may be caused by a faulty antenna or antenna installation. Also check the following headings on the troubleshooting charts for the receiver on which the condition illustrated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



2

MAY MOVE SIDE WAYS



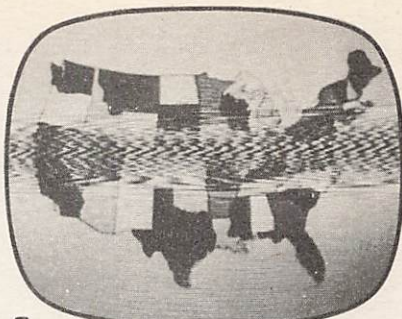
3

VARIES FROM STATION TO STATION



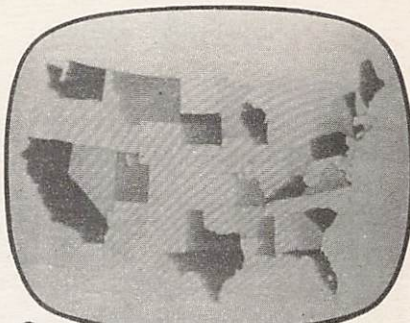
4

MOVES UP OR DOWN



5

MAY MOVE UP OR DOWN



6



7

MOVES UP AND DOWN



8

AVERAGE PICTURE

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

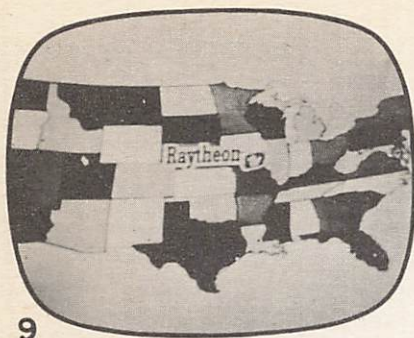
No. 5. A picture tube pattern like this is most commonly referred to as *Diathermy Interference*. The cause always lies outside the receiver, and is due to equipment such as X-ray units, commercial r-f heaters, ultra-violet equipment, fluorescent lights, teletype, etc. For the most effective reduction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

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

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

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

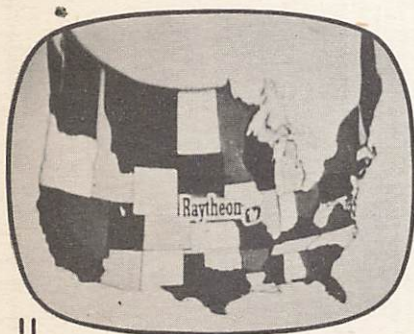
No. 9. Excessive Raster Width is a condition caused by a fault in the horizontal output circuit. It is important to bear in mind that



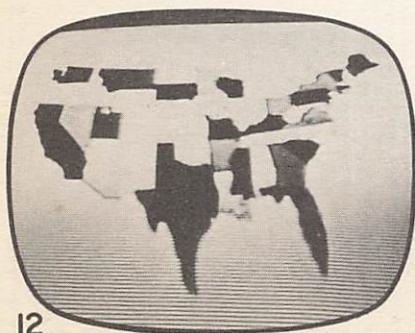
9



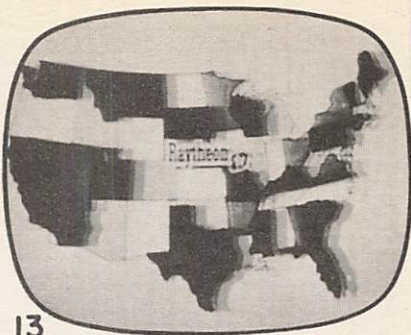
10



11

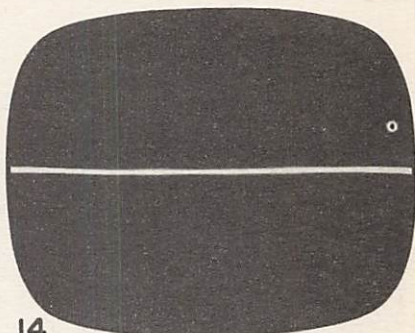


12

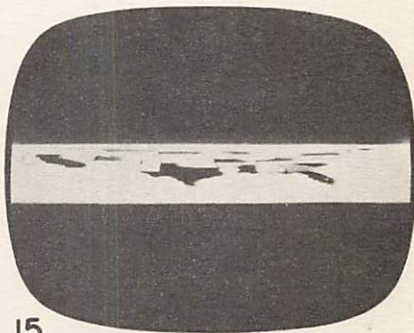


13

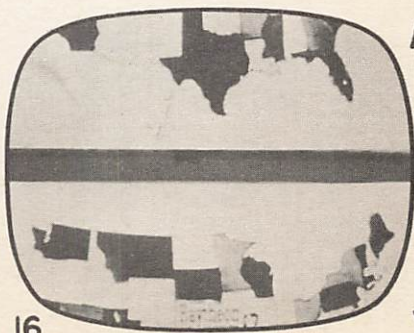
VARIES FROM STATION TO STATION



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.

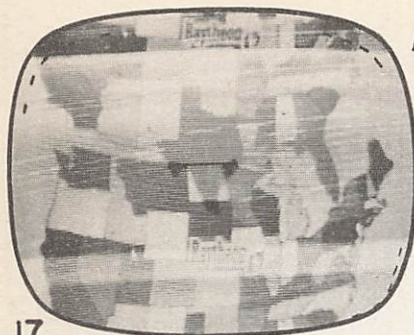
Nos. 11, 12. *Poor Vertical Linearity* is a condition wherein the picture is squeezed or stretched non-uniformly on the screen. This type of condition usually originates in the vertical oscillator or vertical output circuits. For correction, check the following headings on the troubleshooting charts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

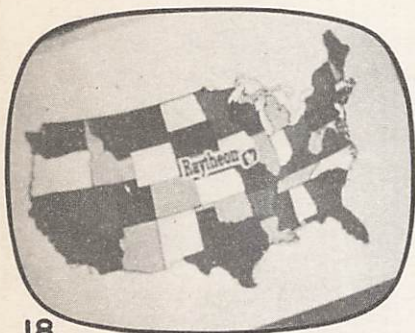


17

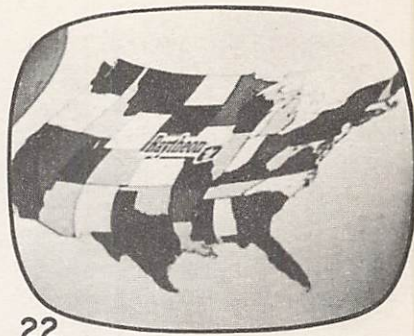
MOVES UP OR DOWN



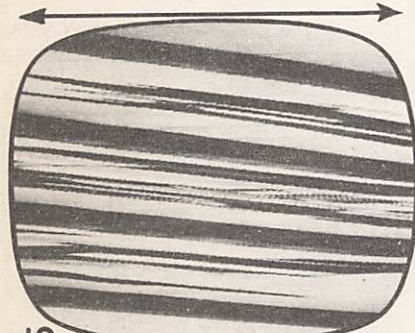
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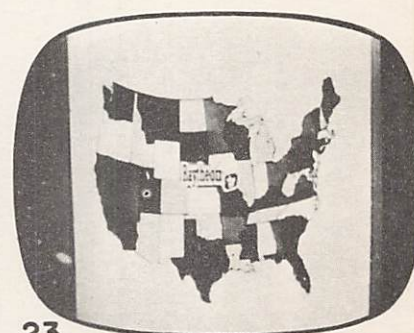


22



19

MOVES FROM SIDE TO SIDE

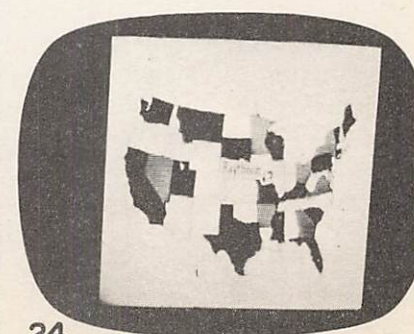


23



20

MOVES FROM SIDE TO SIDE



24

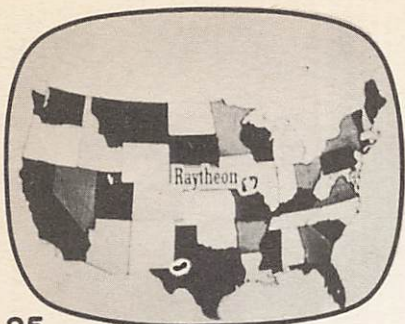
Sync OK heading on the troubleshooting charts. Poor vertical sync is generally caused by improper adjustment of the vertical hold control or a defect in the vertical oscillator, sync amplifier or sync clipper circuits. In receivers where an agc or a noise-gate control is incorporated, these adjustments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

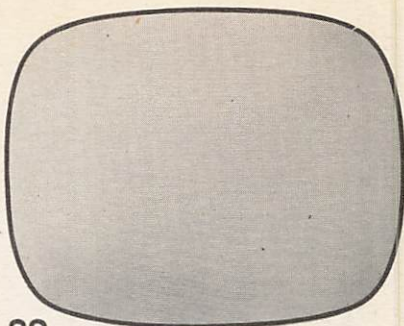
Nos. 19, 20. *Poor Horizontal Sync* is a condition which may be caused by the misadjustment of the horizontal oscillator controls. For correction, check the following headings in the troubleshooting chart for the receiver on which the condition exists: *No Hor. or Vert. Sync. - Pix Signal OK* or *No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

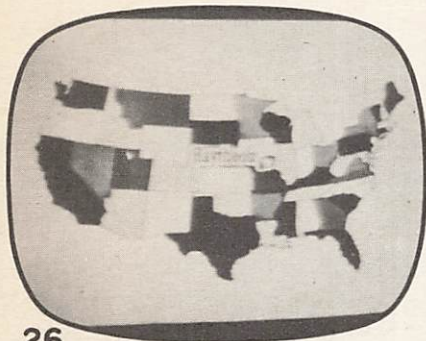
No. 22. *Horizontal Displacement* is an unstable horizontal hold condition. Very similar conditions hold true for patterns No. 19 and 20. Always check the adjustment of the horizontal oscillator controls. Also make certain that the noise gate and agc controls (when used) are correctly adjusted. For correction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



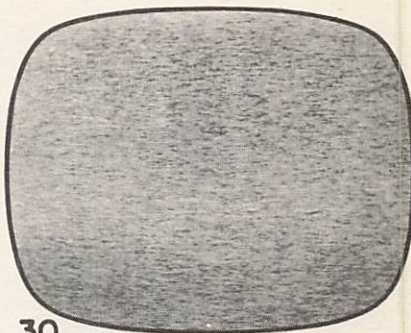
25



29



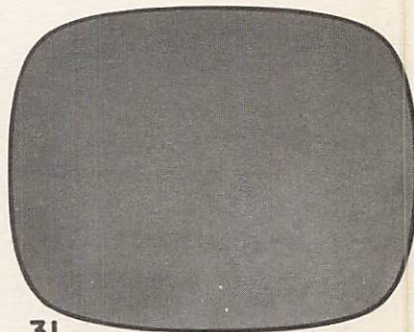
26



30



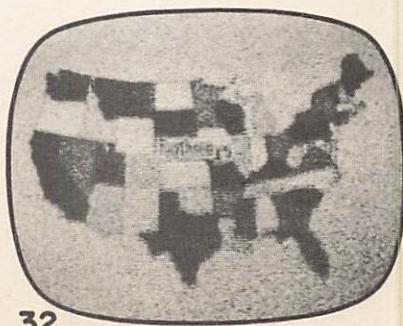
27



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.

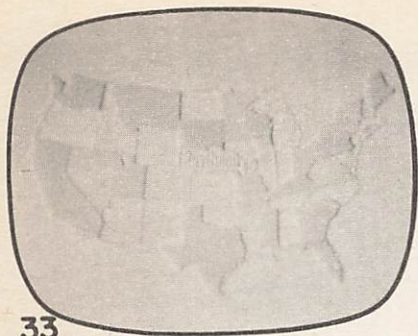
No. 24. *Insufficient Horizontal and Vertical Size* is sometimes caused by an incorrect horizontal drive control, horizontal size (width) control, horizontal linearity, vertical size (height) control, and vertical linearity control adjustments. Another source of such trouble may be the boosted B+ filter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

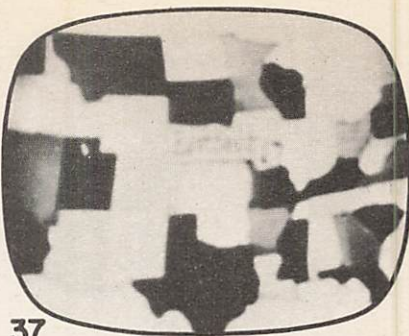
No. 26. See No. 15.

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*.

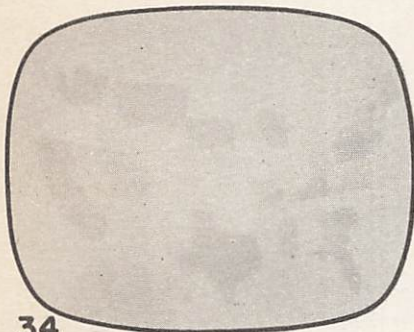
No. 29. When the picture tube is lit (raster is present) but *No Picture* can be seen, loss of video reaching the picture tube is indicated. This condition may be caused by a defect in the r-f, i-f, or video amplifiers. As a fast method to help localize the defective stage causing the trouble, observe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



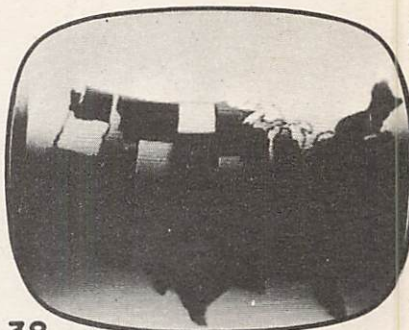
33



37

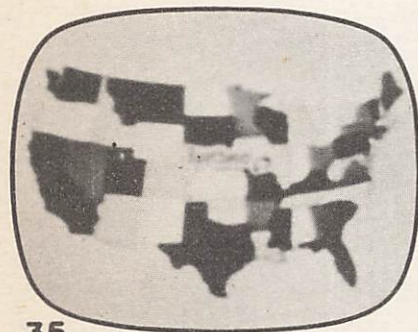


34

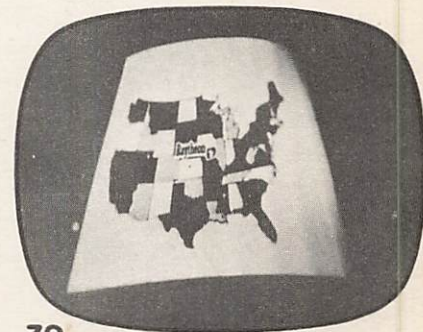


38

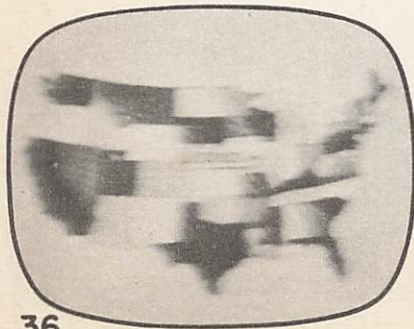
MAY MOVE UP OR DOWN



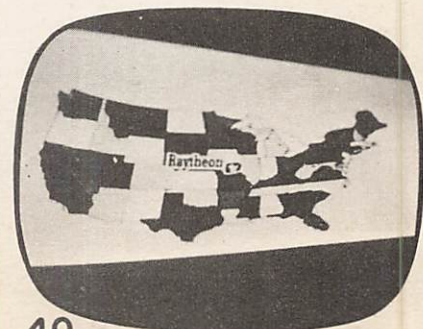
35



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.

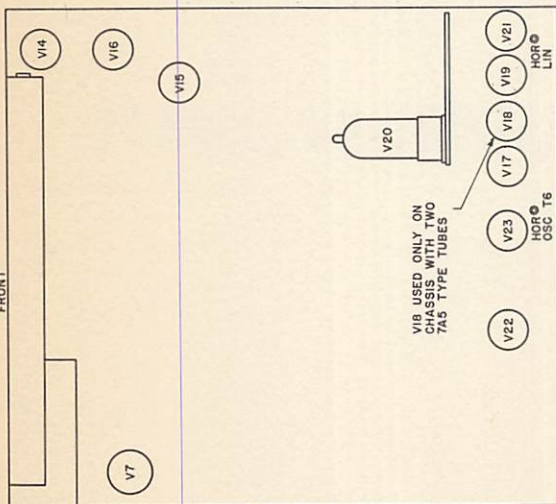
Intermittent Raster - Sound OK is usually caused by intermittently defective components and tubes in the high-voltage or horizontal oscillator circuit.

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 8*C* 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.

TROUBLESHOOTING CHARTS

FRONT



TOP VIEW

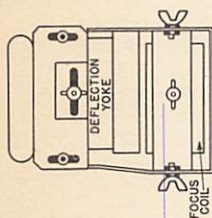
TUBE LIST

Symbol	Type	Circuit Function
V1	6J5	RF Amp.
V2	6J5	Osc.
V3	6J6	Mix.
V4	6AG5	Sound IF
V5	6AV6	Sound IF
V6	6X4	Rect. & B+.
V7	6Y6	Disc. 1st Audio & AGC Delay
V8	6Y6G	Audio Out.
V9	6AG5	1st Pic. IF Amp.
V10	6AG5	2nd Pic. IF Amp.
V11	6AG5	3rd Pic. IF Amp.
V12	6AC7	4th Pic. IF Amp.
V13	10BP4	Vid. Amp.
V14	6SN7GT	Picture CRT
V15	6SN7GT	Sync. Sep. & Amp.
V16	6SN7GT	Sync. Clipper & AGC Amp.
V17	6SN7GT	Linearity & Horiz. Osc. & Out.
V18	6SN7GT	Hor. Osc. & Hor. Drive
V19	7A5 or 6X4	Hor. Out.
V20	6BD6	Rect.
V21	159GT/8016	Rect.
V22	6W4GT	Regen. Damp.
V23	6W4GT	LV Rect.

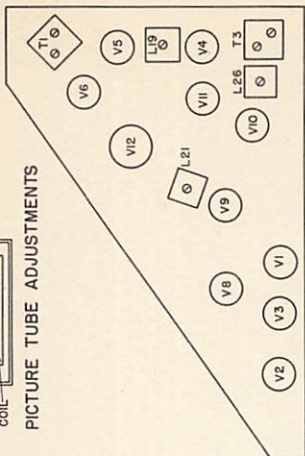
KEY VOLTAGES

B ₊ , plate of damper, V21	pin 5	185 to 205vdc
Boosted B ₊ , cath. of damper, V21	pin 3	275 to 325vdc
Plate of Vert. Osc., V16	pin 2	-30 to -55vdc
Plate of Vert. Out., V16	pin 5	160 to 195vdc
Plate of Hor. Osc., V17	pin 2	-120 to -135vdc
Grid of Hor. Out., V19	pin 5	-120 to -135vdc

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



PICTURE TUBE ADJUSTMENTS



TOP VIEW - R-F CHASSIS

FUSE (4 AMP.)

VERT. CENT. O

HOR. CENT. O

HOR. FREQ. O

HOR. DRIVE O

HOR. LIN. O

REAR CONTROLS

BRIGHTNESS

HEIGHT

FOCUS

VERT. HOLD

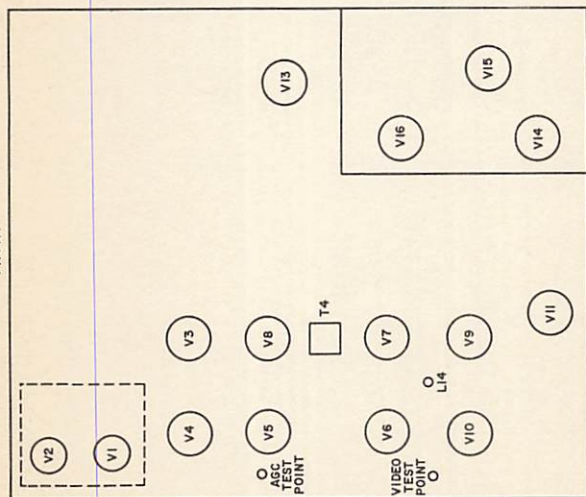
VERT. LIN.

CONTRAST

OFF-ON VOLUME

FRONT CONTROLS

FRONT



TOP VIEW

TUBE LIST

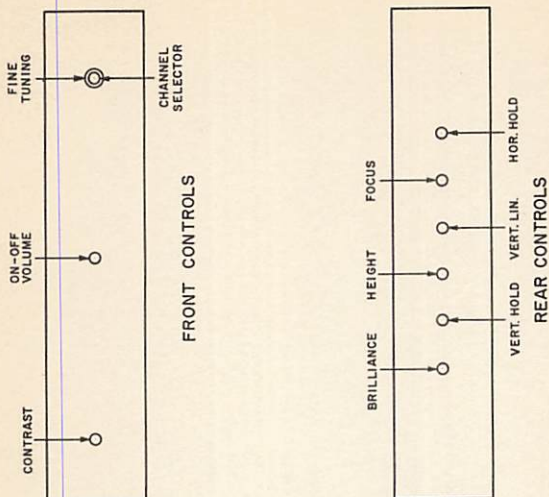
Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	616	Osc. & Mix.
V3	6AU6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	3rd IF Amp.
V6	6AU6	Video Amp.
V7	6X4	Rectifier
V8	6BD6	Radio Det. & 1st Audio
V9	6AQ5	Audio Out.
V10	6AU6	Syn. Limiter
V11	6SN7GT	Vert. Osc. & Out.
V12	12X4	12X4 or Picture Tube
V13	5Y4G	Low-Volt. Rect.
V14	6SN7GT	Hor. Phase Det.
V15	6BD6GT	Hor. Osc. & Out.
V16	1B3GT	High-Volt. Rect.

KEY VOLTAGES

B₊ HV Fuse holder 375vdc
 Plate of Vert. Osc., V11 pin 2 47vdc
 Plate of Vert. Out., V11 pin 5 310vdc
 Plate of Hor. Osc., V14 pin 5 -18vdc
 Grid of Hor. Out., V15 pin 5 -57vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V13	WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4	WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4
NO RASTER - SOUND OK (31) Brightness con. Ion trap HV trans. Hor. yoke CRT connections V12, V14, V15, V16	NO RASTER - SOUND OK (31) Brightness con. Ion trap HV trans. Hor. yoke CRT connections V12, V14, V15, V16	NO RASTER - SOUND OK (31) Brightness con. Ion trap HV trans. Hor. yoke CRT connections V12, V14, V15, V16
WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60)	WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60)	WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60)
POOR HOR. LIN. V14, V15	POOR HOR. LIN. V14, V15	POOR HOR. LIN. V14, V15
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V1, V2, V3, V4, V5, V6 Check 100 μ f cap. connected to pin 6 of V11 Check 1000 μ f cap. connected to pin 1 of V11	POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V1, V2, V3, V4, V5, V6 Check 100 μ f cap. connected to pin 6 of V11 Check 1000 μ f cap. connected to pin 1 of V11	POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V1, V2, V3, V4, V5, V6 Check 100 μ f cap. connected to pin 6 of V11 Check 1000 μ f cap. connected to pin 1 of V11
PIX JITTER SIDEWAYS Hor. Hold con. V14, V15 Check 100 μ f cap. connected to pin 4 of V14 Check 10 μ f cap. connected to pin 1 of V14	PIX JITTER SIDEWAYS Hor. Hold con. V14, V15 Check 100 μ f cap. connected to pin 4 of V14 Check 10 μ f cap. connected to pin 1 of V14	PIX JITTER SIDEWAYS Hor. Hold con. V14, V15 Check 100 μ f cap. connected to pin 4 of V14 Check 10 μ f cap. connected to pin 1 of V14
SMEARED PIX (36) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	SMEARED PIX (36) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	SMEARED PIX (36) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment
POOR PIX DETAIL (35) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner line tuning Contrast con. V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils IF and RF alignment
SOUND BARS IN PIX (4A, 4E) Tuner line tuning Contrast con. V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner line tuning Contrast con. V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner line tuning Contrast con. V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) IF and RF alignment
SNOW IN PIX (32) V1, V2, V3, V4, V5 Antenna and transmission line	SNOW IN PIX (32) V1, V2, V3, V4, V5 Antenna and transmission line	SNOW IN PIX (32) V1, V2, V3, V4, V5 Antenna and transmission line
AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6
ENGRAVED EFFECT IN PIX (33) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils Check Vid. Det. crystal X1 (IN60)	ENGRAVED EFFECT IN PIX (33) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils Check Vid. Det. crystal X1 (IN60)	ENGRAVED EFFECT IN PIX (33) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. and Amp. peaking coils Check Vid. Det. crystal X1 (IN60)
VERT. BARS (21) V1, V2, V3, V4, V5 Det. yoke ringing	VERT. BARS (21) V1, V2, V3, V4, V5 Det. yoke ringing	VERT. BARS (21) V1, V2, V3, V4, V5 Det. yoke ringing
PIX BENDING (22) Hor. Hold con. Check Vid. Det. crystal X1 (IN60) V14, V15 Check 0.02 μ f cap. connected to pin 6 of V14	PIX BENDING (22) Hor. Hold con. Check Vid. Det. crystal X1 (IN60) V14, V15 Check 0.02 μ f cap. connected to pin 6 of V14	PIX BENDING (22) Hor. Hold con. Check Vid. Det. crystal X1 (IN60) V14, V15 Check 0.02 μ f cap. connected to pin 6 of V14
WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning Contrast con. V1, V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) RF and IF alignment	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning Contrast con. V1, V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) RF and IF alignment	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning Contrast con. V1, V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) RF and IF alignment
INTERMITTENT RASTER - SOUND OK Brightness con.	INTERMITTENT RASTER - SOUND OK Brightness con.	INTERMITTENT RASTER - SOUND OK Brightness con.
INSUFFICIENT BRIGHTNESS Ion trap Brightness con. V12, V13, V14, V15, V16 Check 15K Res. connected to pin 4 of V15 Low line voltage	INSUFFICIENT BRIGHTNESS Ion trap Brightness con. V12, V13, V14, V15, V16 Check 15K Res. connected to pin 4 of V15 Low line voltage	INSUFFICIENT BRIGHTNESS Ion trap Brightness con. V12, V13, V14, V15, V16 Check 15K Res. connected to pin 4 of V15 Low line voltage
EXCESSIVE RASTER (PIX SIZE) (9, 10) V12, V15, V16	EXCESSIVE RASTER (PIX SIZE) (9, 10) V12, V15, V16	EXCESSIVE RASTER (PIX SIZE) (9, 10) V12, V15, V16
RASTER BLOOMING (37) V12, V13, V14, V15, V16 Check 50K Res. connected to HV BPP Res. Check HV Filter cap.	RASTER BLOOMING (37) V12, V13, V14, V15, V16 Check 50K Res. connected to HV BPP Res. Check HV Filter cap.	RASTER BLOOMING (37) V12, V13, V14, V15, V16 Check 50K Res. connected to HV BPP Res. Check HV Filter cap.
INSUFFICIENT RASTER WIDTH (23) V13, V14, V15 Check 3K Res. connected to HV BPP Res. Check 15K Res. connected to pin 4 of V15 H.O.T. Low line voltage	INSUFFICIENT RASTER WIDTH (23) V13, V14, V15 Check 3K Res. connected to HV BPP Res. Check 15K Res. connected to pin 4 of V15 H.O.T. Low line voltage	INSUFFICIENT RASTER WIDTH (23) V13, V14, V15 Check 3K Res. connected to HV BPP Res. Check 15K Res. connected to pin 4 of V15 H.O.T. Low line voltage
NO SOUND - PIX OK (8B) Tuner line tuning V7, V8, V9 Contrast con. Speakers (open voice coil or defective connection) Sound and Vid. IF alignment L-14 Det. alignment T-4	NO SOUND - PIX OK (8B) Tuner line tuning V7, V8, V9 Contrast con. Speakers (open voice coil or defective connection) Sound and Vid. IF alignment L-14 Det. alignment T-4	NO SOUND - PIX OK (8B) Tuner line tuning V7, V8, V9 Contrast con. Speakers (open voice coil or defective connection) Sound and Vid. IF alignment L-14 Det. alignment T-4
AUDIO HUM IN SOUND (8E) V7, V8, V9	AUDIO HUM IN SOUND (8E) V7, V8, V9	AUDIO HUM IN SOUND (8E) V7, V8, V9
DISTORTED SOUND (8D) Tuner line tuning V2, V6, V7, V8, V9 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4	DISTORTED SOUND (8D) Tuner line tuning V2, V6, V7, V8, V9 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4	DISTORTED SOUND (8D) Tuner line tuning V2, V6, V7, V8, V9 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4
NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold con. V14, V15 Check 6000 μ f cap. connected to pin 4 of V15 Check 470 μ f cap. connected to pin 5 of V15	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold con. V14, V15 Check 6000 μ f cap. connected to pin 4 of V15 Check 470 μ f cap. connected to pin 5 of V15	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold con. V14, V15 Check 6000 μ f cap. connected to pin 4 of V15 Check 470 μ f cap. connected to pin 5 of V15
NO HOR. OR VERT. SYNC. - PIX SIGNAL OK Check Vid. Det. crystal X1 (IN60) V5, V10	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK Check Vid. Det. crystal X1 (IN60) V5, V10	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK Check Vid. Det. crystal X1 (IN60) V5, V10
NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Contrast con. Vert. Hold con. Vert. Int. Network V10, V11	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Contrast con. Vert. Hold con. Vert. Int. Network V10, V11	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Contrast con. Vert. Hold con. Vert. Int. Network V10, V11
NO VERT. BUZZ IN SOUND Contrast con. V2, V6, V7, V8 Check Vid. Det. crystal X1 (IN60) Sound IF and Det. alignment L-14, T-4	NO VERT. BUZZ IN SOUND Contrast con. V2, V6, V7, V8 Check Vid. Det. crystal X1 (IN60) Sound IF and Det. alignment L-14, T-4	NO VERT. BUZZ IN SOUND Contrast con. V2, V6, V7, V8 Check Vid. Det. crystal X1 (IN60) Sound IF and Det. alignment L-14, T-4
INTERMITTENT SOUND - PIX OK V7, V8, V9 Poor connections in sound system	INTERMITTENT SOUND - PIX OK V7, V8, V9 Poor connections in sound system	INTERMITTENT SOUND - PIX OK V7, V8, V9 Poor connections in sound system
NO VERT. DEFL. (14) V11 Check 0.1 μ f cap. connected to pin 4 of V11 Vert. Det. yoke V.O.I.	NO VERT. DEFL. (14) V11 Check 0.1 μ f cap. connected to pin 4 of V11 Vert. Det. yoke V.O.I.	NO VERT. DEFL. (14) V11 Check 0.1 μ f cap. connected to pin 4 of V11 Vert. Det. yoke V.O.I.
INSUFFICIENT RASTER HEIGHT (15) Vert. Height and Lin. con. Check 0.03 μ f cap. connected to pin 5 of V11 Check 0.05 μ f cap. connected through 8.2K Res. to pin 2 of V11 Low line voltage V.O.I.	INSUFFICIENT RASTER HEIGHT (15) Vert. Height and Lin. con. Check 0.03 μ f cap. connected to pin 5 of V11 Check 0.05 μ f cap. connected through 8.2K Res. to pin 2 of V11 Low line voltage V.O.I.	INSUFFICIENT RASTER HEIGHT (15) Vert. Height and Lin. con. Check 0.03 μ f cap. connected to pin 5 of V11 Check 0.05 μ f cap. connected through 8.2K Res. to pin 2 of V11 Low line voltage V.O.I.
WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4	WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4	WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast con. V2, V3, V4, V5, V6 Check Vid. Det. crystal X1 (IN60) Sound and Vid. IF alignment L-14 Det. alignment T-4

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6NC3	RF Amp.
V2	6J6	Mixer & Osc.
V3	6CB6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	Yld. Amp.
V6	6X4	Rect. Driver
V7	6Y3	1st AF Amp. & Det.
V8	6AS5	AF Out.
V9	6X6GT	Vert. Out.
V10	6AU6	Sync. Limiter
V11A	1/2 6SN7GT	Sync. Clipper
V11B	1/2 6SN7GT	Vert. Osc.
V12	{ 12LP4A 16DP4A }	Pix Tube
V13	16HP4A	Low Voltage Rect.
V14	504G	Hor. Osc. & Phase
V15	6SN7GT	Hor. Out.
V16	6W4GT	Regenerative Damp.
V17	1B3GT	HV Rect.

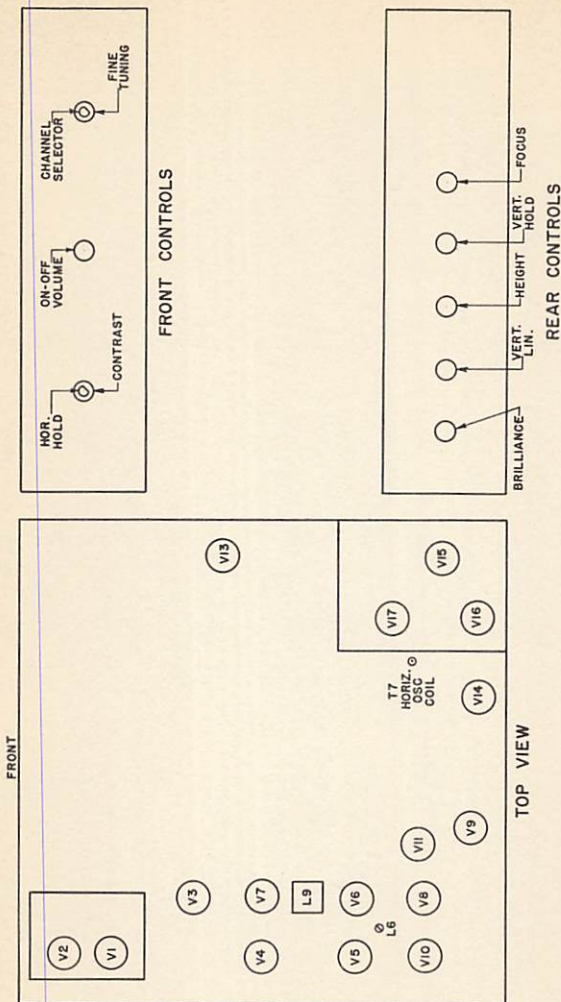
KEY VOLTAGES

B+, plate of damper, V16 pin 5 320vdc
 Boosted B+, cath. of damper, V16 pin 3 440vdc
 Plate of Hor. Osc., V14 pin 5 400vdc
 Plate of Vert. Osc., V9 pin 3 400vdc
 Plate of Hor. Osc., V14 pin 3 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. For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.



TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, 6CB6, 6BK3	RF Amp. Intermediate Osc. 1st IF Amp.
V2	6CB6	2nd IF Amp.
V3	6AU6	Vid. Amp.
V4	6AU6	Rat. Det. Driver
V5	6T8	1st AF Amp. and Tuner Det.
V6	6AS5	AF Osc.
V7	6K6GT	Vid. Out.
V8	6AU6	Sync. Limiter
V9	1/2 6SN7GT	Sync. Clipper
V10	1/2 6SN7GT	Vert. Osc.
V11	6X4	Rectifier Tube
V12	5U4G	L.V. Rect.
V13	6SN7GT	Hor. Osc. and Phase Det.
V14	6BQ6GT	Hor. Out.
V15	6W4GT	Damper
V16	1B3GT	H. V. Rect.

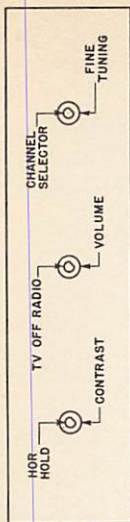
KEY VOLTAGES

B₁, plate of damper, V15 pin 5 320vdc
 Boosted B₂, 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 197vdc
 Grid of Hor. Out., V15 pin 5 -1.4vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

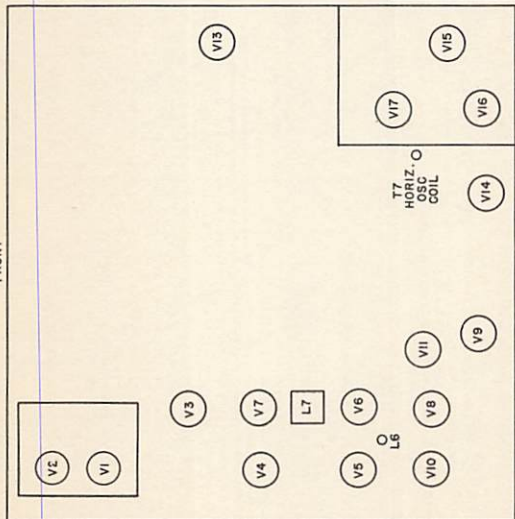
For horizontal oscillator adjustment, see HOR. OSC. ADJ.-1. (In this case, the horizontal lock control is known as Hor. Osc. Coil Adj.)
 For tuner oscillator adjustment, see TUNER OSC. ADJ.-2.

FRONT

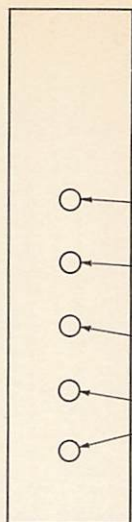


FRONT CONTROLS

TOP VIEW



REAR CONTROLS



NO RASTER - NO SOUND (31) Power input circuit 13 Check B - Filter network caps.	NO RASTER - SOUND OK (31) Brightness control HV Fuse (1.5 Amps) HV Trans., Hor. yoke, CRT connections	WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control Check Vid. Det. crystal X1 (IN60)	POOR HOR. LIN. Hor. Drive control Check 0.05 mf cap. connected to pin 3 of V16	POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V9, V11 Check 0.03 mf cap. connected to pin 3 of V9 Check 0.05 mf cap. connected to pin 5 of V9	PIX JITTER SIDEWAYS V14, V15 Check 0.02 mf cap. connected to pin 3 of V14 Check 0.05 mf cap. connected to pin 2 of V14	PIX JITTER UP AND DOWN (16, 17) V9, V11 Check 0.05 mf cap. connected to pin 5 of V9	SMEARED PIX (36) Tuner fine tuning V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus control V1, V2, V3, V4, V12 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) IF and RF alignment	SNOW IN PIX (32) V1, V2, V3, V4 Check Vid. Det. crystal X1 (IN60) Antenna and transmission line	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5 Tuner fine tuning ENGRAVED EFFECT IN PIX (33) V1, V2, V3, V4, V5 Check Vid. Det. and Amp. peaking coils Check Vid. Det. crystal X1 (IN60)	VERT. BARS (21) V1, V2, V3, V4, V5 Defl. yoke ringing	PIX BENDING (22) Hor. Hold control V14, V15 Check 0.05 mf cap. connected to pin 2 of V14	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast control V1, V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) RF and IF alignment	INTERMITTENT RASTER - SOUND OK Brightness control V12, V14, V15, V16, V17 HV trans.	INSUFFICIENT BRIGHTNESS Brightness and Hor. Drive controls V12, V13, V15, V17 Check 2-47000 res. connected to pin 4 of V15 Low line voltage	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Vert. Height controls V15, V17	NO RASTER - NO SOUND (31) Power input circuit 13 Check B - Filter network caps.	NO RASTER - SOUND OK (31) Brightness control HV Fuse (1.5 Amps) HV Trans., Hor. yoke, CRT connections	WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast control Check Vid. Det. crystal X1 (IN60)	POOR HOR. LIN. Hor. Drive control Check 0.05 mf cap. connected to pin 3 of V16	POOR VERT. LIN. (11, 12) Vert. Lin. and Height controls V9, V11 Check 0.03 mf cap. connected to pin 3 of V9 Check 0.05 mf cap. connected to pin 5 of V9	PIX JITTER SIDEWAYS V14, V15 Check 0.02 mf cap. connected to pin 3 of V14 Check 0.05 mf cap. connected to pin 2 of V14	PIX JITTER UP AND DOWN (16, 17) V9, V11 Check 0.05 mf cap. connected to pin 5 of V9	SMEARED PIX (36) Tuner fine tuning V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus control V1, V2, V3, V4, V12 Check Vid. Det. crystal X1 (IN60) Check Vid. Det. and Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) V12, V13, V15, V17 Check 2-880K res. in series with sec. anode lead	INSUFFICIENT RASTER WIDTH (23) V13, V15, V16 Drive control Check 470 mmf cap. connected to Hor. Low line voltage	INSUFFICIENT RASTER HEIGHT (15) V9, V11, V13 Check 0.05 mf cap. connected to pin 4 of V9 Check 0.03 mf cap. connected to pin 3 of V9 Low line voltage	NO VERT. DEFL. (14) V9, V11 Check 0.05 mf cap. connected to pin 4 of V9 Vert. Defl. yoke Vert. Out. Trans.	NO HOR. SYNC. - HOR. SYNC. OK (16, 17) V9, V11 Check 1000 mmf cap. connected to pin 4 of V11	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V13, V15 Check 0.05 mf cap. connected to pin 1 of V10	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold control V14, V15 Check 220 mmf cap. connected to pin 4 of V14	AUDIO HUM IN SOUND (9E) V6, V7, V8	DISTORTED SOUND (8D) Tuner fine tuning V1, V2, V3, V4, V5 Check Vid. Det. crystal X1 (IN60) Contrast control Sound and Vid. IF alignment L6 Det. alignment L7	NO SOUND - PIX OK (8B) Tuner fine tuning V6, V7, V8 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L6 Det. alignment L7	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V6, V7, V8 Check Vid. Det. crystal X1 (IN60) Volume control Sound and Vid. IF alignment L6 Det. alignment L7	NOISY SOUND - PIX OK V6, V7, V8 Check sound system for loose connections Volume control Speaker Sound IF and Det. alignment L6, L7	SYNC BUZZ IN SOUND (8E) V5, V6, V7 Contrast control Check Vid. Det. crystal X1 (IN60) Sound IF and Det. alignment L6, L7	INTERMITTENT SOUND - PIX OK V6, V7, V8 Poor connections in sound system
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TUBE LIST

Symbol	Type	Circuit Function
V1	6BQ7	RF Amp.
V2	6J6	Mix. & Osc.
V3	6BA6	1st IF Amp.
V4	6BD6	2nd IF Amp.
V5	6CB6	3rd IF Amp.
V6	6CB6	4th IF Amp.
V7	6AU6	4.5 MC Amp.
V8	6AU6	Ratio Det. Driver
V9	6AL5	Ratio Det.
V10	6AV6	1st AF Amp.
V11	6X6GT	Asst. Osc.
V12	6AU6 or 6AG5	AGC Amp.
V13	6AH6	Vid. Amp.
V14	6AV6	2nd AF Amp.
V15	6AU6 or 6AG5	Phase Inverter
V16	21FP4A	Sync. Limiter
V17	504G	Picture Tube
V18	6SN7GT	Low-Volt. Rect.
V19	6SN7GT	Sync. Clipper
V20	6X6GT	1/2 Vert. Gen. & Out.
V21	6AL5	Phase Det.
V22	6SN7GT	Hor. Gen.
V23	6BQ6GT	Hor. Out.
V24	6W4GT	Hor. Damp.
1B5		HV Rect.

KEY VOLTAGES

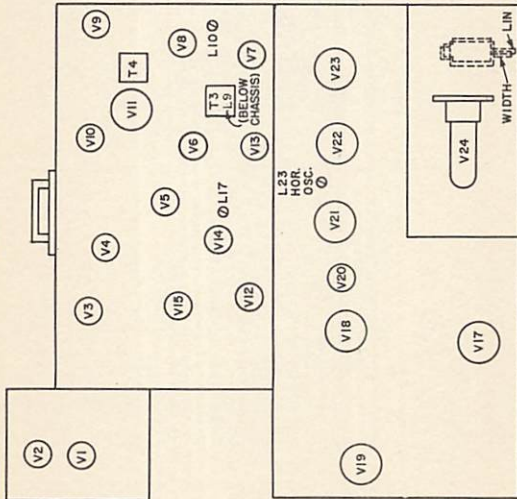
B+, plate of damper, V23 pin 5	300vdc
Boosted B+, cath. of damper, V23 pin 3	510vdc
Plate of Vert. Osc., V19 pin 5	100vdc
Plate of Vert. Osc., V19 pin 3	210vdc
Plates of Hor. Osc., V21 pin 2	310vdc
pin 5	174vdc
Grid of Hor. Out., V22 pin 5	-32vdc

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

ADJUSTMENTS

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

FRONT



TOP VIEW

FRONT CONTROLS

FINE TUNING

NO RASTER - NO SOUND (11)

Power input circuit
Phono-TV-Switch
V17

NO RASTER - SOUND OK (31)

Brightness con.
Ion trap
V12, V20, V21, V22, V23, V24, V16

WEAK PIX - SOUND AND RASTER OK (34)

Contrast con.
V12, V3, V4, V5, V6, V13
X1 (IN660 crystal Vid. Det.) Part of T-3

POOR HOR. LIN.

Hor. Drive con.
V21, V22, V23
Check 0.1 μ f cap. connected to
Hor. Lin. coil
H.O.T.

POOR VERT. LIN. (11, 12)

Vert. Lin. and Height con.
V18, V19
Check 0.035 μ f cap. connected to
Vert. Lin. coil
Check 0.0027 μ f cap. connected to pin 4 of V18

PIX JITTER SIDEWAYS

Hor. Hold and Osc. con. (L-23)
V20, V21
Noise inverter con.
Check 0.047 μ f cap. connected to pin 1 of V21

PIX JITTER UP & DOWN (16, 17)

Vert. Hold con.
Noise inverter con.
V.O.T.

SMEARED PIX (36)

Contrast con.
V13, V12
X1 (IN660 crystal Vid. Det.) Part of T-3
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
V.O.T.

POOR PIX DETAIL (35)

Tuner line tuning
Focus con.
V2, V13, V12, V16
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)

Tuner line tuning
V1, V2, V3, V4, V5, V6
Check L-17 for proper alignment
IF and RF alignment

SNOW IN PIX (32)

V1, V3, V4, V5, V6, V12
Antenna and transmission line
V2, V4, V5, V6, V13

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

V1, V2, V13, V12
X1 (IN660 crystal Vid. Det.) Part of T-5
Check Vid. Amp. and Det. peaking coils

ENGRAVED EFFECT IN PIX (33)

Contrast con.
V1, V2, V13, V12
X1 (IN660 crystal Vid. Det.) Part of T-5
Check Vid. Amp. and Det. peaking coils

VERT. BARS (21)

Hor. Drive con.
V21, V22, V23
Check 0.0027 μ f cap. connected to terminals 5 and 4 of yoke
Defl. yoke ring

PIX BENDING (22)

Hor. Hold and Osc. con. (L-23)
V20, V21
Check 0.047 and 0.0036 μ f caps. connected to pin 1 of V21

WEAK OR NO PIX - SOUND WEAK -

RASTER OK (32C, 34C)
Tuner line tuning
V12
X1 (IN660 crystal Vid. Det.) Part of T-3
IF and RF alignment

INTERMITTENT RASTER - SOUND OK

Brightness con.
V20, V21, V22, V23, V24, V16
HV trans.

INSUFFICIENT BRIGHTNESS

Ion trap
Hor. Drive con.
Brightness con.
V21, V22, V24, V16, V17
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)

Height con.
Hor. Drive and Width con.
V22, V24

RASTER BLOOMING (37)

V22, V24, V16, V17
Hor. Drive con.
Check two 680K Ω Res. in series with second anode lead
Check HV Filter cap.

INSUFFICIENT RASTER WIDTH (23)

Hor. Drive con.
Width con.
V21, V22, V23, V17
Check 0.0027 μ f cap. connected to pin 5 of V21
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)

Height and Vert. Lin. con.
V18, V19
Check 0.0027 μ f cap. connected to pin 4 of V18
Check 0.001 μ f cap. connected through 0.0027 μ f cap. to pin 4 of V18
Low line voltage

NO VERT. SYNC. - PIX SIGNAL OK

V12, V14, V15, V18
Vert. Int.
Check two 0.047 μ f caps. connected to pin 5 of V18

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

V12, V14, V15
Noise inverter con.
NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold and Osc. con. (L-23)
Noise inverter con.
V18, V20, V21, V12
Check 390 μ f cap. connected between pins 2 and 3 of V21
Check 330K Ω Res. connected to pin 5 of V21

AUDIO HUM IN SOUND (8E)

V8, V9, V10, V11
Tuner line tuning
V9, V10, V11, V12
Vol. con.
Sound and Vid. IF alignment L-9, L-10
Det. alignment T-4

NO SOUND - PIX OK (8B)

Tuner line tuning
V7, V8, V9, V10, V11
Vol. con.
Speaker (open voice coil or defective)
Sound and Vid. IF alignment L-9, L-10
Det. alignment T-4

WEAK SOUND - PIX OK (8C)

Tuner line tuning
V7, V8, V9, V10, V11, V12, V3
Vol. con.
Check 0.0027 μ f cap. connected to pin 5 of V21
X1 (IN660 crystal Vid. Det.) Part of T-3
Sound and Vid. IF alignment L-9, L-10
Det. alignment T-4

NOISY SOUND - PIX OK

V7, V8, V9, V10, V11
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment L-9, L-10, T-4

SYNC. BUZZ IN SOUND

Tuner line tuning
V2, V12, V8, V9
Check Vid. Det. crystal IN660 (Part of T-3)
Sound IF and Det. alignment L-9, L-10, T-4

INTERMITTENT SOUND - PIX OK

V7, V8, V9, V10, V11
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6, or 6AG5	RF Amp.
V2	6BC5	Mix. & Osc.
V3	6CB6	1st IF Amp.
V4	6CB6	2nd IF Amp.
V5	6CB6	3rd IF Amp.
V6	6AH6 or 6AC7	Vid. Amp.
V7	6AU6	Ratio Det., Driver
V8	6AL5	Rectifier
V9	6V6 or 6W6GT	Audio Out.
V10	6AU6 or 6AG5	Sync. Limiter
V11A	6SN7GT	Sync. Clipper
V11B	6SN7GT	Vert. Gen.
V12	6BL7GT or 6W6GT	Vert. Out.
V13	6AU6 or 6AG5	AGC Amp.
V14	504G	Picture Tube
V15	504G	Low-Volt. Rect.
V16	6AL5	Phase Det.
V17	6SN7GT	Hor. Gen.
V18	6W6GT	Hor. Out.
V19	6W6GT	Hor. Driver
V20	18AGT	High-Volt. Rect.
V21	6AU6	4.5 MC Amp.
V22	6AU6	1st Audio Amp.

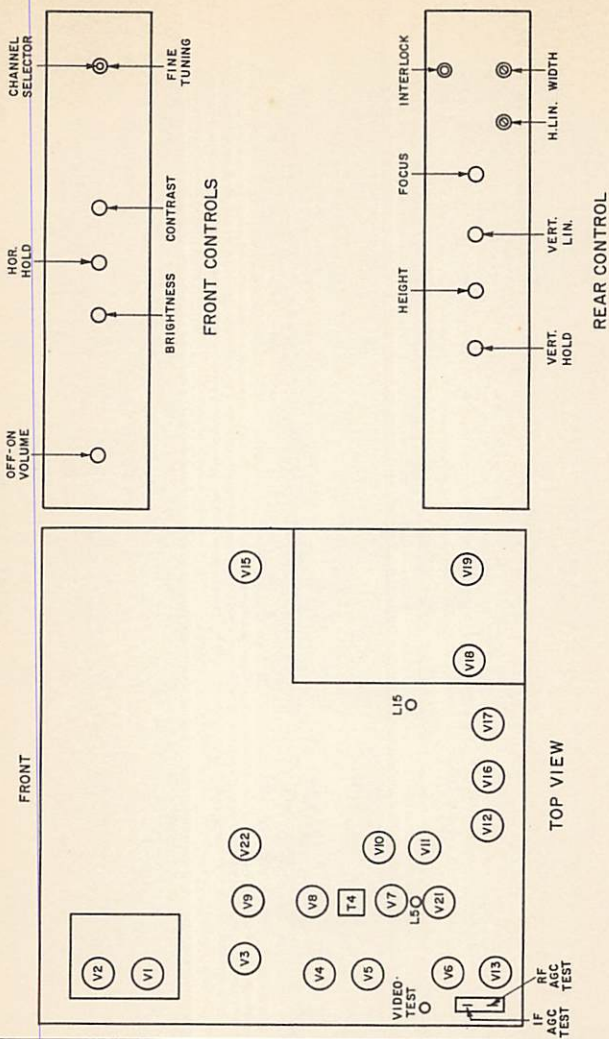
KEY VOLTAGES

B ₁ plate of damper, V19 pin 5	250vdc
Base of V1, V2, V3, V4, V5	0vdc
Plate of Vert. Osc., V11 pin 3	100vdc
Plate of Vert. Out., V12 pin 3	280vdc
Plates of Hor. Osc., V17 pin 2	140vdc
pin 5	280vdc
Grid of Hor. Out., V18 pin 5	-15vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31)
Tuner input circuit
V15

NO RASTER - SOUND OK (31)
Brightness con.
V13, V16, V17, V18, V19, V20
V14
Trap
HV trans. Hor. yoke CRT
connections

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast con.
V2, V3, V4, V5, V6, V13
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Check Vid. Det. crystal XI

POOR HOR. LIN.
Hor. Lin. and Drive con.
V17, V18, V19
Check 0.05 μ f cap. connected to
Hor. Lin. coil

POOR VERT. LIN. (11, 12)
Vert. Lin. and Height con.
V11, V12
Check 0.0027, 0.001 and 0.033 μ f
caps. connected between pin 4
of V11 and pin 4 of V12

PIX JITTER SIDEWAYS
Hor. Hold and Osc. con. (L-15)
Contrast con.
V16, V17, V18
Check 330K Res. and 0.004 μ f
cap. connected to pin 7 of V16

PIX JITTER UP & DOWN (16, 17)
V11, V12
Vert. Hold con.
Vert. out trans.

SMOARED PIX (36)
Tuner fine tuning
Contrast con.
V2, V3, V4, V5, V6, V13
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Check Vid. Det. and Amp. peaking
coils

IF and RF alignment
POOR PIX DETAIL (35)
Tuner fine tuning
Focus con.
V3, V4, V5, V6, V14
Check Vid. Det. and Amp. peaking
coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
V3, V4, V5, V6
Check alignment of L-9
IF and RF alignment

SNOW IN PIX (23)
V1, V3, V4, V5, V13
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Antenna and transmission line

AC IN PIX (DARK HOR. BAR) (38)
V1, V2, V3, V4, V5, V6, V13

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
V2, V3, V4, V5, V6, V13
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Check Vid. Det. and Amp. peaking
coil

VERT. BARS (21)
Hor. Drive con.
V17, V18, V19
Check 39 μ f cap. connected
between terminals 1 and 2
of yoke
Defl. yoke ringing

PIX BENDING (22)
Hor. Hold and Osc. con. (L-15)
Contrast con.
V13, V14, V15
Check 0.008 and 0.05 μ f caps.
connected to pin 4 of V17

**WEAK OR NO PIX - SOUND WEAK -
FASTER OK (32C, 34C)**
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V13
Check Vid. Det. crystal XI
(1N60 Part of T-3)
RF and IF alignment

**INTERMITTENT RASTER - SOUND OK
(13, 14, 15, 16, 17, 18, 19, 20)**
V13, V14, V16, V17, V18, V19, V20
Brightness con.
HV trans.

INSUFFICIENT BRIGHTNESS
Hor. Drive
V17, V18, V20, V13, V14, V15
Hor. Drive and Brightness con.
Low line voltage

**EXCESSIVE RASTER (PIX SIZE)
(4, 10)**
Height and Width con.
Hor. Drive con.
V18, V20

RASTER BLOOMING (37)
Hor. Drive con.
V15, V14, V18, V19, V20
Check HV Filter cap.
Check 680K Res. connected to
HV Filter cap.

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Width con.
V17, V18, V19, V20, V15
Check 470 and 390 μ f caps.
connected to pin 2 of V17
H. O. T.
Low line voltage

INSUFFICIENT RASTER HEIGHT (15)
Height and Vert. Lin. con.
V11, V12, V15
Check 0.0027, 0.001 and 0.033 μ f
caps. connected between pin 4
of V11 and 4 of V12
V. O. T.
Low line voltage

NO VERT. DEF. (14)
V11, V12
Check 0.047 μ f cap. connected
to pin 5 of V12
Yoke
Vert. Defl. yoke
V. O. T.

**NO VERT. SYNC. - HOR. SYNC. OK
(16, 17)**
V11, V12
Vert. Int.
Vert. Hold con.
Check 0.047 μ f cap. connected
to pin 5 of V12

**NO HOR. OR VERT. SYNC. -
PIX SIGNAL OK**
V10, V11, V13, V16

NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Hold and Osc. con. (L-15)
V13, V16, V17
Check 330 μ f cap. connected
to pin 1 of V17

AUDIO HUM IN SOUND (8E)
V21, V17, V8, V9, V22

DISORTED SOUND (8D)

Tuner fine tuning
V2, V7, V8, V9, V21, V22
Check Vid. Det. alignment L-5
Det. alignment T-4

NO SOUND - PIX OK (8B)
Tuner fine tuning
V7, V8, V9, V21, V22
Vol. con.
Speaker (open voice coil or
closed circuit connection)
Sound and Vid. IF alignment L-5
Det. alignment T-4

WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V7, V8, V9, V21, V22, V13
Vol. con.
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Sound and Vid. IF alignment L-5
Det. alignment T-4

NOISY SOUND - PIX OK
Vol. con.
V7, V8, V9, V21, V22
Check sound system for loose
connections
Speaker
Sound IF and Det. alignment L-5, T-4

SYNC. BUZZ IN SOUND
Tuner fine tuning
V7, V8, V9, V21, V22
Check Vid. Det. crystal XI
(1N60 Part of T-3)
Sound IF and Det. alignment L-5, T-4

INTERMITTENT SOUND - PIX OK
Vol. con.
V7, V8, V9, V21, V22
Check connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	12AT7	Converter-Osc.
V3	6AU6	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	4th IF Amp.
V6	6AL5	Video Det. & AGC Rect.
V7	12AU7	1st & 2nd Vid. Amp.
V8	12SN7	Vert. Multivibrator
V9	6AV6	Audio IF Amp.
V10	6AV6	Audio AF Amp.
V11	6AU6	Ratio Det., AGC & Audio Amp.
V12	878	Audio Amp.
V13	25L6	DC Restorer & Sync.
V14	12SN7	Clipper, Sync. & Hor. AFC
V15	12SN7	Hor. Out.
V16	183CT/8016	HV Rect.
V17	25W4	Hor. Damper
V18	FARNSWORTH 125	Picture Tube

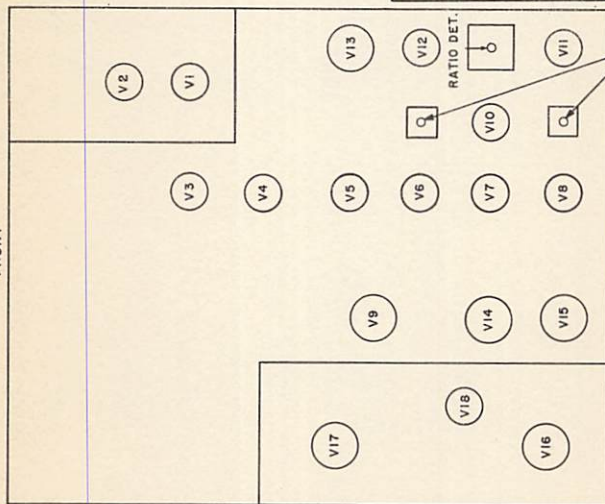
KEY VOLTAGES

B₊ plate of damper, V16 pin 5 350vdc
 Plate of V18, V18 pin 5 350vdc
 Plate of Vert. Out., V9 pin 2 350vdc
 Plates of Hor. Osc., V15 pin 2 197vdc
 pin 5 212vdc
 Grid of Hor. Out., V16 pin 5 -45vdc
 (All voltages are measured with a VTVM between the tube pins and B-.)

ADJUSTMENTS

A number of tube filaments are connected in series. The connections are indicated on this page will show these connections.

FRONT



TOP VIEW

SOUND I-F

TUNING

ON-OFF

VOLUME

VERTICAL

HOLD

PICTURE

BRILLIANCE

(CHASSIS MAY BE VERTICALLY MOUNTED)

PICTURE

FOCUS

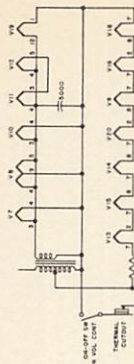
HORIZ.

HOLD

PICTURE

CONTRAST

FRONT CONTROLS



FILAMENT WIRING

WIDTH

RATIO DET.

HORIZ.

CENT.

HORIZ.

DRIVE

HORIZ.

FREQ.

CUTOUT

THERMAL

CONTROL

HORIZ.

VERT.

LIN.

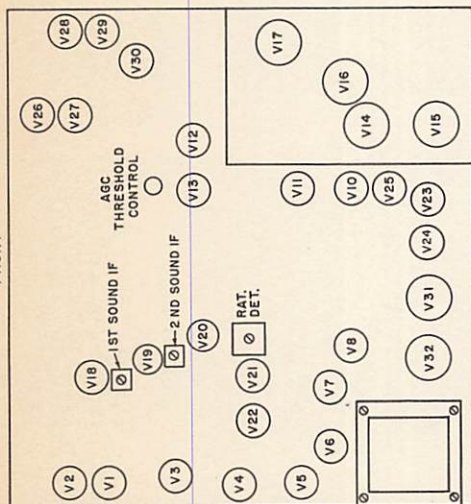
VERT.

SIZE

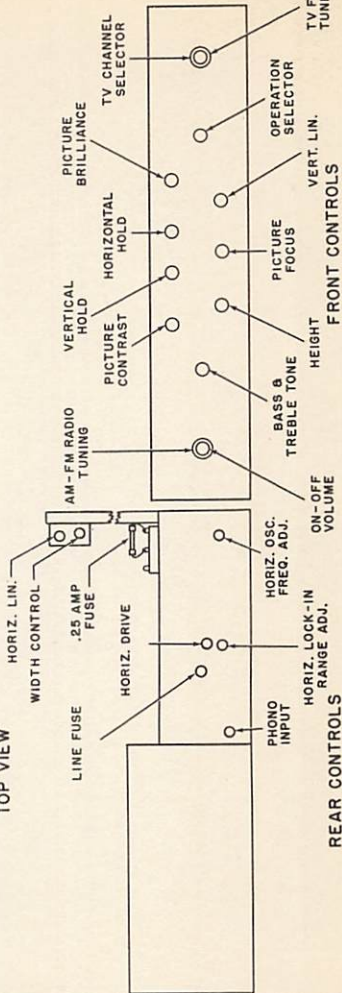
REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit Check Thermal Cutout Check all tubes of series filament string NO RASTER - SOUND OK (31) Brightens con. Ion trap V2, V15, V16, V17, V18, V19 HV trans. Hor. yoke CRT connections Check 0.1 μf cap. connected through a peaking coil to pin 6 of V8 WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast con. V2, V3, V4, V5, V6, V7, V8 V15, V18 Hor. Drive con. POOR HOR. LNK. Check 0.1 μf cap. connected to terminal 8 of H. O. T. POOR VERT. LNK. (11, 12) Vert. Lnk. and Size con. V9 Check 100 μf cap. connected to pin 3 of V9 Check 0.03 μf cap. connected to pin 1 of V9 V.O.T. PIX JITTER SIDEWAYS Hor. Hold con. V14, V15 V16, V17 - Osc. trans. Check 0.003 μf cap. connected to pin 1 of V15 PIX JITTER UP & DOWN (16, 17) Contrast and Vert. Hold con. V5, V14, V20 SMEARED PIX (36) Tuner fine tuning V2, V3, V4, V5, V6, V7, V8 Contrast con. Check 0.003 μf cap. connected to pin 7 of V8 Check Vid. Det. and Amp. Peaking coils IF and RF alignment Tuner fine tuning Focus con. V3, V4, V5, V6, V13 Check Vid. Det. and Amp. Peaking coils Check HV filter cap.	SOUND BARS IN PIX (44, 4E) Tuner fine tuning V1, V2, V3, V4, V5, V6 Check alignment of 1st sound IF transformer IF and RF alignment SNOW IN PIX (32) V1, V2, V3, V4, V5, V6 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3, V4, V5, V6, V7, V8 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V2, V3, V4, V5, V6, V7, V8, V19 Check Vid. Det. and Amp. Peaking coils VERT. BARS (21) Hor. Drive con. V15, V17 Check 47 μf cap. connected inside of yoke Defl. yoke ringing PIX BURNING (23) V15, V16 Hor. Drive con. WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V3, V4, V5, V6, V7 RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightens con. V15, V16, V17, V18, V19 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightens and Hor. Drive con. V16, V17, V18, V19 Check B1 voltage, if low test all selenium rectifiers EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Vert. Size con. V15, V17 RASTER BLOOMING (37) Hor. Drive con. V16, V17, V18, V19 Check B1 voltage, if low test all selenium rectifiers	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V1, V2, V3, V4, V5, V6 Check B1 voltage, if low test all selenium rectifiers Check 600 and 1200 μf caps. connected to horizontal oscillator trans. Low line voltage INSUFFICIENT RASTER HEIGHT (15) Vert. Size and Lnk. con. V9 Check 1000 μf cap. connected to pin 4 of V12 Check 0.03 μf cap. connected to pin 1 of V12 Low line voltage NO VERT. DEFL. (14) V9 Check 4.7 Meg Ω Res. and Vert. Size pin connected to pin 1 of V12 V.O.T. V.O.T. yoke NO VERT. SYNC. - HOR. SYNC. OK (14, 17) Vert. Hold con. V9, V14 V.O.T. network NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V14, V20 Check 600 μf cap. connected to pins 2 and 4 of V14 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold con. V15, V16 Check 47 μf cap. connected to pin 4 of V15 Check 0.002 μf cap. connected to pin 1 of V15 AUDIO HUM IN SOUND (8E) V10, V11, V12, V13 DISTORTED SOUND (8D) Tuner fine tuning V2, V10, V11, V12, V13 Check 0.02 and 0.003 μf caps. connected to pin 9 of V12 Sound and Vid. IF alignment Det. alignment	NO SOUND - PIX OK (8B) Tuner fine tuning Voi. con. V10, V11, V12, V13 Speaker (open voice coil or def active connection) Sound and Vid. IF alignment Det. alignment WEAK SOUND - PIX OK (8C) Tuner fine tuning Voi. con. V2, V10, V11, V12, V13 Sound and Vid. IF alignment Det. alignment NOISY SOUND - PIX OK Voi. con. V10, V11, V12, V13 Check sound system for loose connections Speaker Sound IF and Det. alignment SYNC. BUZZ IN SOUND Tuner fine tuning V2, V10, V11, V12, V13 Sound IF and Det. alignment INTERMITTENT SOUND - PIX OK V10, V11, V12, V13 Poor connections in sound system
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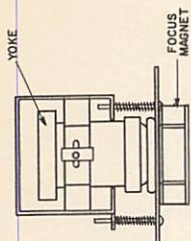
FRONT



TOP VIEW



PICTURE TUBE ADJUSTMENTS



TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	6J6	Converter Osc.
V3	6AG5	1st Picture IF Amp.
V4	6AG5	2nd Picture IF Amp.
V5	6AG5	3rd Picture IF Amp.
V6	6AG5	4th Picture IF Amp.
V7	6BA6	1st Sound IF Amp.
V8	6BA6	2nd Sound IF Amp.
V9	6AU6	Sound Driver
V10	6AL5	Ratio Det.
V11	6AL5	Picture Det. & Sync. Clipper
V12	6SN7	1st. Amp. & AGC Rect.
V13	6SN7	2nd. Amp. & Clipper
V14	6SN7	Vert. Osc. & AGC Amp.
V15	6SK5	Vert. Amp.
V16	6SN7	Hor. Osc. & Hor. AFC
V17	6SN7	Hor. Amp.
V18	6BA6	Hor. Driver
V19	6BA6	Hor. Driver
V20	1B6GT/8015	HV Rect.
V21	6AV6	1st Audio Amp. & Bias Clamp
V22	6AV6	Phase Inverter & Gas Gate
V23	6AV6	2nd Audio Amp. & Full-Wave Rect.
V24	6AG5	Full-Wave Rect.
V25	5Y3GT	Full-Wave Rect.
V26	6AG5	FM RF Amp.
V27	12AT7	FM Converter-Osc.
V28	6BA6	AM RF Amp.
V29	6BE6	AM Conv.-Osc.
V30	6SF7	AM IF Amp. Det. & AVC

AM-FM CHASSIS

KEY VOLTAGES

B+, plate of damper, V16 pin 5	400vdc
Boosted B+, cath. of damper V16	560vdc
Plate of Vert. Osc., V12 pin 3	560vdc
Plate of Vert. Out., V13 pin 3	100vdc
Plates of Hor. Control & Osc. Tubes	25vdc
-V14 pin 2	120vdc
Grid of Hor. Out., V15 pin 5	-145vdc

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

REAR CONTROLS

FRONT CONTROLS

TV FINE TUNING

NO RASTER - NO SOUND (31) Power input circuit Check correct position of the Line Fuse (5 Amps) V31, V32	NO RASTER IN PIX (4A, 4E) Tuner line tuning Check alignment of 4.5-mc trap V2, V3, V4, V5, V6 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V9, V15, V16, V17, V31, V32 Check IF filter cap. Check IF filter res. connected to HV filter cap.	NO SOUND - PIX OK (8B) Tuner line tuning V18, V19, V20, V21, V22, V23, V24, V25 Speaker connections Sound IF alignment Det. alignment
NO RASTER - SOUND OK (31) Brightness con. Ion trap (1/4 Amps) V9, V14, V15, V16, V17 HV trans. Hor. yoke CRT connections	SNOW IN PIX V2, V3, V4, V5, V6, V7, V10, V12 AGC Threshold con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V15, V16, V31, V32 0.002 μ f caps. Check 100 μ f cap. connected to terminal "D" of the Hor. Osc. trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner line tuning V2, V18, V19, V20, V21, V22, V23, V24, V25 Sound IF alignment Det. alignment
WEAK PIX - SOUND AND RASTER OK (34) AGC Threshold and Contrast con. V2, V3, V4, V5, V6, V7, V8, V10, V12	ENGRAVED EFFECT IN PIX (33) Tuner line tuning AGC Threshold and Contrast con. V15, V16, V31, V32 0.047 μ f caps. V12, V13, V31, V32 Check Vid. Det. and Amp. Peaking coils	INSUFFICIENT RASTER HEIGHT (15) V12, V13, V31, V32 V12, V13, V31, V32 connected to terminal "D" of the Hor. Osc. trans. Low line voltage	NOISY SOUND - PIX OK V18, V19, V20, V21, V22, V23, V24, V25 Check Sound System for loose connections Speaker Sound IF and Det. alignment
POOR HOR. LIN. Hor. Drive and Lin. con. Check 0.03 and 0.05 μ f caps. connected to the Hor. Lin. coil	VERT. BARS (21) Hor. Drive and Lin. con. V15, V16 Check 56 μ f cap. connected inside of yoke Defl. yoke ringing	NO VERT. DEFL. (14) V12, V13 Check 0.1 μ f cap. connected to pin 5 of V13 Vert. Drive V.O.T. and Vert. Osc. trans.	INTERMITTENT SOUND - PIX OK V18, V19, V20, V21, V22, V23, V24, V25 poor connections in sound system
POOR VERT. LIN. (11, 12) V12, V13 Check 0.1 and 0.047 μ f caps. connected to the Vert. Osc. trans. pin 3 of V13	PIX BENDING (22) AGC Threshold and Contrast con. Hor. Hold, Freq., Waveform and Locking Range con. V14, V15	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) AGC Threshold and Vert. Hold con. Vert. Int. network Locking Range con. Check 0.003 μ f cap. connected to Vert. Osc. trans.	
PIX JITTER SIDEWAYS Hor. Hold, Freq., Waveform and Locking Range con. V14, V15 Check 3000 μ f cap. connected to pin 1 of V14 Check 0.02 μ f cap. connected to pin 3 of V14	WEAK OR NO PIX - SOUND WEAK Tuner line tuning V15, V16, V31, V32 AGC Threshold con. RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC Threshold con. V10, V11, V12	
PIX JITTER UP & DOWN (16, 17) AGC Threshold and Contrast con. V10, V12, V13	INTERMITTENT RASTER - SOUND OK V15, V16, V31, V32 HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Freq., Waveform and Locking Range con. V12, V14, V15 Check 180 μ f cap. connected to pin 4 of V18	
SMOARED PIX (36) Tuner line tuning Contrast and AGC Threshold con. V2, V3, V4, V5, V6, V7, V8, V10, V12 Waveform and Amp. Peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V9, V15, V16, V17, V31, V32 Check 0.1 μ f cap. connected to pin 11 of V9 (CRT) Low line voltage	AUDIO HUM IN SOUND (8E) V18, V19, V20, V21, V22, V23, V24, V25	
POOR PIX DETAIL (38) Tuner line tuning Focus con. V15, V16, V31, V32 AGC Threshold con. IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Antenna and Height con. V15, V16, V17 Check 0.05 μ f and 10K Ω Res. connected to pin 8 of V15	DEFORMED SOUND (8D) V18, V19, V20, V21, V22, V23, V24, V25 Tuner line tuning Treble and Base con. Det. alignment	

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5	RF Amp.
V2	610	Converter-Osc.
V3	6AG5	1st Picture IF Amp.
V4	6AG5	2nd Picture IF Amp.
V5	6AG5	3rd Picture IF Amp.
V6	6AG5	4th Picture IF Amp.
V7	6BA6	Sound IF Amp.
V8	6AU6	Sound Limiter
V9	6AL5	Sound Processor
V10	6AL5	Picture Det. & Sync. Clipper
V11	12AU7	Vid. Amp.
V12	6SN7	Sync. Amp. & AGC Rect.
V13	6SN7	Sync. Amp. & Clipper
V14	6SN7	Vert. Osc. & AGC Amp.
V15	6SN7	Vert. Amp.
V16	6SN7	Hor. Osc. & Hor. AFC
V17	6BG6G	Hor. Amp.
V18	6W4GT	Hor. Damp.
V19	1B5GT/8016	HV Rect.
V20	6X4	Hi Audio Amp. & Bias Clamp
V21	6AV6	Power Amp. (Push-pull)
V22	6K6	Power Amp. (Push-pull)
V23	6K6	Full Wave Rect.
V24	5U4G	Full Wave Rect.

KEY VOLTAGES

B+, pin 8 of deflection yoke plug 215vdc
 Boosted B+, cath. of damper, V24 pin 3 480vdc
 Plate of Vert. Osc., V19 pin 2 50vdc
 Plate of Vert. Osc., V20 pins 3 and 4 255vdc
 Plate of AFC and Hor. Osc. Tubes, V21 pin 3 29vdc*
 Grid of Hor. Out., V22 pin 5 145vdc
 -145vdc

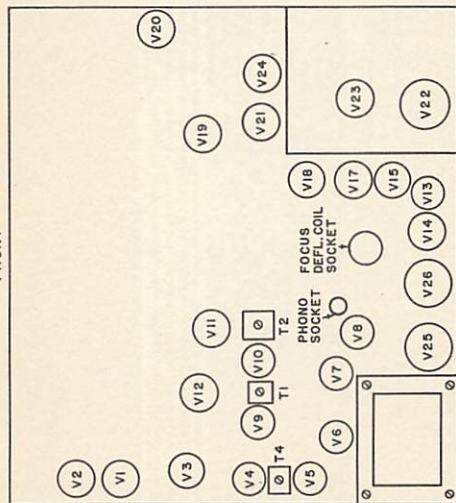
*Voltage is a function of Hor. Hold control setting.

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

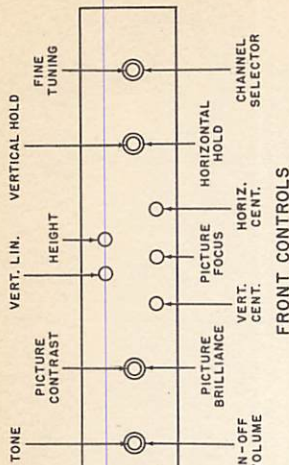
ADJUSTMENTS

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

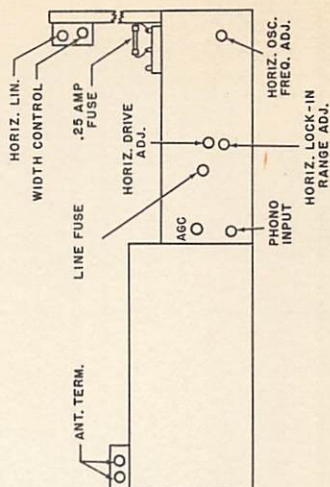
FRONT



TOP VIEW



FRONT CONTROLS



REAR CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V101	6CB6	RF Amp.
V102	6CB6	Mix.
V103	6AG5	1st IF Amp.
V104	6AG5	2nd IF Amp.
V105	6AG5	3rd IF Amp.
V106	6AL5	Vid. Det. & Sync. Leveler
V107	6AH6	Vid. Amp.
V108	6AU6	Sound Rep. Amp.
V109	6AV6	Sound Rep. Amp.
V110	6AV6	1st Audio Amp. & Bias Clamp.
V111	6K6	Audio Out.
V112	12AU7	Pre-Sync. S. Sep. AGC Rect.
V113	12AU7	AGC Amp. & Sync. Amp.
V114	6SN7	Sync. Clipper & Vert. MV
V115	6SN7	Sync. Clipper & Out.
V116	6AL5	AFC Det.
V117	6AU6	Rectance Tube
V118	6SN7	Hor. Osc. & Disch. Tube
V119	6BG6	Hor. Out.
V120	1B3/6016	HV Rect.
V121	6X4	Rectifier
V122	5046	Picture Tube
V123	150	

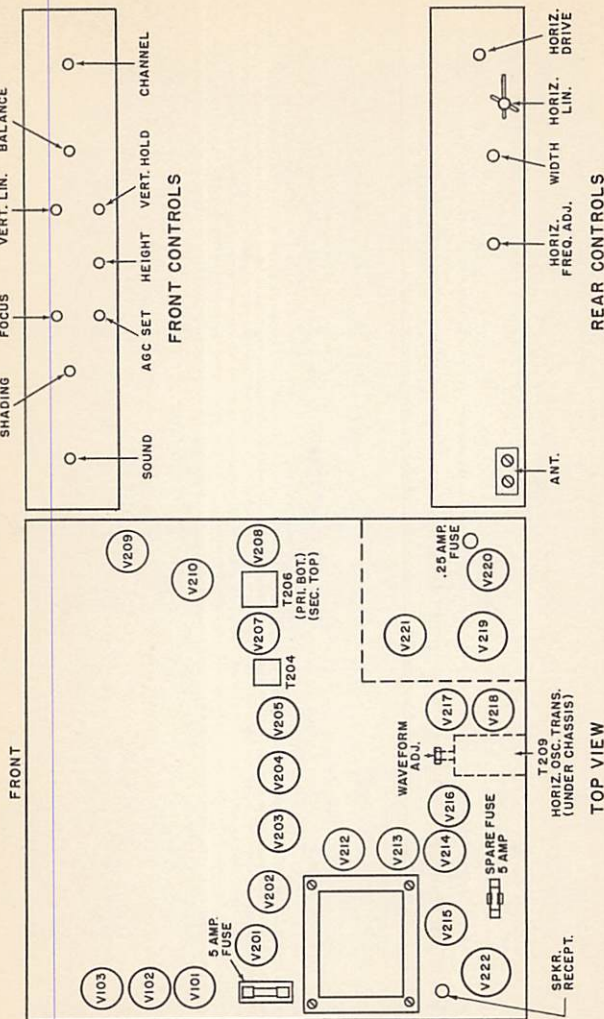
KEY VOLTAGES

B+, plate of damper, V220 pin 5	285vdc
Boosted B+, cath. of damper, V220	
Plate of Vert. Osc., V214 pin 5	350vdc
Grid of Hor. Osc., V218 pin 2	200 to 220vdc
Grid of Hor. Out., V219 pin 5	-70 to -125vdc

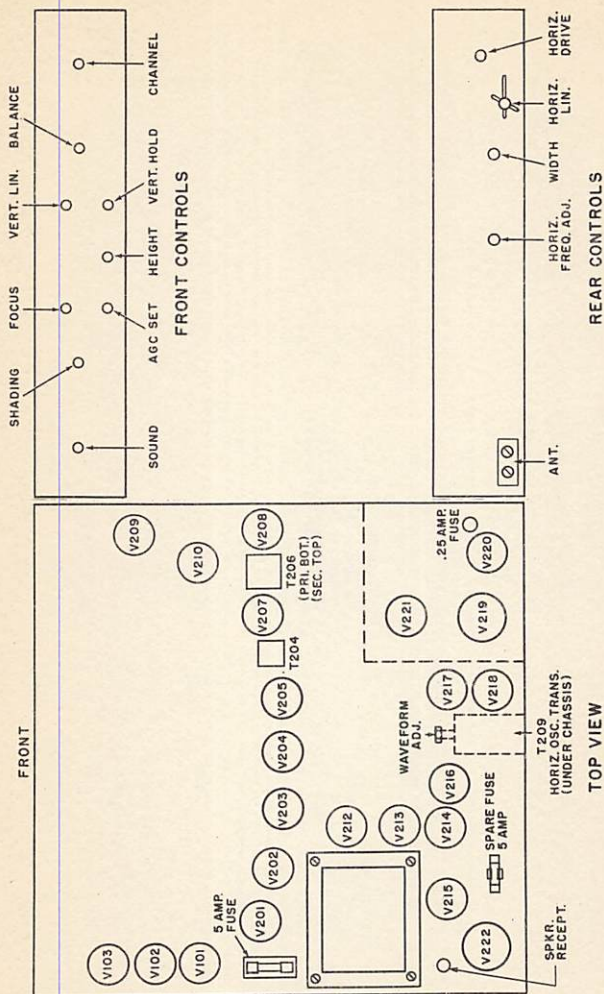
(All voltages are measured with a VTVM between the tube pins and chassis.)

ADJUSTMENTS

For horizontal oscillator adjustment, see HOR. OSC. ADJ. -3. (In this case the receiver does not use a separate Hor. Osc. adjustment.)
For tuner oscillator adjustment, see TUNER OSC. ADJ. -5.



NO RASTER - NO SOUND (31) Power input circuit Check AC-Line fuse (5 Amps) V222 NO RASTER - SOUND OK (31) Shading con. Ion trap V211, V216, V217, V218, V219, V220, V221 HV trans. Hor. yoke CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning AGC Set con. V201, V202, V203, V204, V205 POOR HOR. LIN. Hor. Lin. and Drive con. V219, V220 Check two 0.02 μf caps. connected to Hor. Lin. coil POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V214, V215 Check 80 μf cap. connected to pin 8 of V215 Check 0.1 μf cap. connected to pin 1 of V215 V.O.T. PIX JITTER SIDEWAYS Hor. Freq. and waveform adj. V216, V217, V218, V219 Check 0.01 μf cap. connected to pin 1 of V216 Check 0.047 μf cap. connected through a 470KΩ Res. to pin 1 of V215 PIX JITTER UP & DOWN (16, 17) V212, V214, V215 Check 0.0047 μf cap. connected to pin 5 of V215 SMEARED PIX (86) Tuner fine tuning AGC Set con. V102, V103, V201, V202, V203, V204, V205, V212 Check Vid. Det. and Amp. Peaking coils IF and RF alignment POOR PIX DETAIL (85) Tuner fine tuning Focus con. V201, V202, V203, V204, V205 Check Vid. Det. and Amp. Peaking coils IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V201, V202, V203 Check alignment of T-204 IF and RF alignment SNOW IN PIX V101, V102, V103, V201, V202, V203, V205, V212 AGC Set con. Antenna and transmission line AC IN PIX (DARK HOR. BAR) (8) V101, V102, V103, V201, V203, V204, V205, V212 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning AGC Set con. V102, V103, V201, V202, V203, V204, V205, V212 Check Vid. Det. and Amp. Peaking coils VERT. BARS (21) Hor. Drive con. V218, V219, V220 Check 56 and 270 μf caps. connected to yoke Ddl. yoke rapping PIX BENDING (22) AGC Set con. V216, V217, V218, V219 Check 0.01 μf cap. connected to pin 4 of V216 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning AGC Set con. V101, V102, V103, V201, V202, V203, V204, V212 Check Vid. Det. and Amp. Peaking coils RF and IF alignment INTERMITTENT RASTER - SOUND OK V211, V216, V217, V218, V219 HV trans. INSUFFICIENT BRIGHTNESS Ion trap V211, V216, V219, V220, V221, V222 Low line voltage	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V218, V219, V220 Check two 18KΩ Res. and 0.047 μf cap. connected to pin 4 of V219 RASTER BLOOMING (37) Hor. Drive con. V211, V216, V219, V220, V221, V222 Check HV Filter cap. INSUFFICIENT RASTER WIDTH (23) V218, V219, V220, V222 Check 0.001 μf and 680 μf caps. connected to pin 5 of V218 Low line voltage INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V214, V215, V222 Check 0.0047 and 0.1 μf caps. connected to pin 5 of V215 Low line voltage NO VERT. DEFL. (14) V214, V215 Check 0.0047 and 0.1 μf cap. connected to pin 5 of V215 Check 0.033 μf cap. connected to pin 5 of V214 Check 0.0047 and 0.1 μf caps. connected to pin 5 of V215 V.O.T. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) AGC Set con. V214, V215 Check 0.0047 μf cap. connected to pin 5 of V215 Check 0.0022 μf cap. connected to pin 3 of V215 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC Set con. V204, V212, V213, V214 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Freq. and Waveform adj. V216, V217, V218, V219 Check 0.0047 μf cap. connected to pin 1 of V218 AUDIO HUM IN SOUND (8E) V207, V208, V209, V210	DISTORTED SOUND (8D) Tuner fine tuning V102, V103, V207, V208, V209, V210 Check 0.01 μf cap. connected to pin 5 of V207 Sound IF and Det. alignment T-204, T-206 NO SOUND - PIX OK (8B) Tuner fine tuning V207, V208, V209, V210 Vol. con. Speaker (open voice coil or shorted voice coil action) Sound and Vid. IF alignment T-204 Det. alignment T-206 WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V103 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206 NOISY SOUND - PIX OK Vol. con. V207, V208, V209, V210 Check sound system for loose connections Speaker Sound IF and Det. alignment T-204, T-206 SYNC. BUZZ IN SOUND Tuner fine tuning AGC Set con. V207, V208, V209, V210 Sound IF and Det. alignment T-204, T-206 INTERMITTENT SOUND - PIX OK Vol. con. V207, V208, V209, V210 Poor connections in sound system
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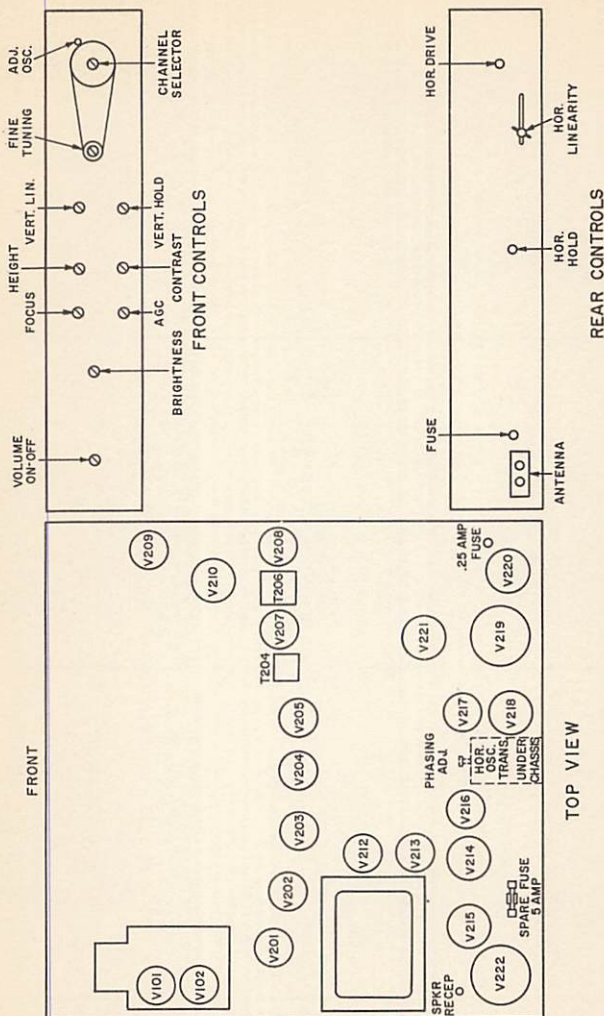
TUBE LIST

Symbol	Type	Circuit Function
V101	6CB6	RF Amp.
V102	6CB6	Mix.
V103	6AB4	1st Vid. IF
V201	6AG5	2nd Vid. IF
V202	6AG5	3rd Vid. IF
V203	6AL5	Vid. Det. & Sync. Leveler
V204	6AL5	Vid. Amp.
V205	6AH6	Sound IF
V206	6AU6	1st AF Amp. & AGC Bias Cl.
V207	6AV6	Audio Out.
V208	6E5GT	Pre-Sync. Sup. & AGC Det.
V209	12AU7	AGC Det. & Sync. Amp.
V210	12AU7	AGC Det. & Sync. Amp.
V211	6SN7GT	Sync. Clipper & Vert. MV
V212	6E5GT	Vert. MV & Out.
V213	6AL5	AFC Det.
V214	6AU6	Resonance Tube
V215	6SN7GT	Hor. Sync. Osc. & Hor. Discharge
V216	6E5GT	Hor. Out.
V217	6W4GT	Damper
V218	1B3GT/8018	RV Rect.
V219	6X4	Picture Tube
V220	6X4	Picture Tube
V221	6X4	Picture Tube

NO RASTER - NO SOUND (31) Power input circuit Check 5 Amp. Fuse in AC input circuit V222	NO RASTER - SOUND OK (31) Shading con. V205, V211, V216, V217, V218, V219, V220, V221 on trap HV Trans. Hor. yoke CRT connections	SNOW IN PIX V101, V102, V103 V201, V202, V203, V204 AGC Set con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and width con. V218, V219, V220, V221 Check 0.01 μ cap. connected to connected to pin 5 of V218 H. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V202, V203, V204 V102, V203 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206
NO RASTER - SOUND AND RASTER OK (34) Tuner fine tuning AGC Set con.	WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning AGC Set con.	AC IN PIX (DARK HOR. BAR) (38) V101, V102, V103 V201, V202, V203, V204, V205, V212 Tuner fine tuning AGC Set con.	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V214, V215, V222 Check 0.1 μ cap. connected to pin 5 of V215 Check 0.035 μ cap. connected through pin 5 of V215 Check 0.035 μ cap. connected to pin 5 of V214 Low line voltage	NOISY SOUND - PIX OK Sound con. V207, V208, V209, V210 Check Sound System for loose connections Speaker Sound IF and Det. alignment Tuner fine tuning AGC Set con.
POOR HOR. LIN. Hor. Lin. and Drive con. V218, V219, V220, V221 Check 80 μ cap. connected to pin 8 of V215 Check 0.1 μ cap. connected to pin 5 of V215 V. O. T.	POOR HOR. LIN. Hor. Lin. and Drive con. V218, V219, V220, V221 Check 80 μ cap. connected to pin 8 of V215 Check 0.1 μ cap. connected to pin 5 of V215 V. O. T.	PIX BENDING (22) Hor. Freq. and Phasing adj. V216, V217, V219, V219 Check 0.01 μ cap. connected to pin 4 of V215 Check 55 and 270 μ cap. connected to yoke terminals Defl. yoke ringing	NO VERT. DEF. (14) V214, V215 Check 0.035 μ cap. connected to pin 5 of V215 Check 0.035 μ cap. connected through a 15K Ω Res. to pin 5 of V214 Vert. Defl. yoke V. O. T.	INTERMITTENT SOUND - PIX OK V207, V208, V209, V210 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Freq. and Phasing con. V216, V217, V218 Check 0.047 μ cap. connected to pin 8 of V216 Check 0.047 μ cap. connected through a 470K Ω Res. to pin 1 of V216	PIX JITTER SIDEWAYS Hor. Freq. and Phasing con. V216, V217, V218 Check 0.047 μ cap. connected to pin 8 of V216 Check 0.047 μ cap. connected through a 470K Ω Res. to pin 1 of V216	WEAK OR NO PIX - SOUND WEAK RASTER OK (32C, 34C) Tuner fine tuning AGC Set con. V102, V202, V203, V204, V205 RF and IF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. V214, V215 Vert. Int. Network Check 0.003 μ cap. connected to pin 5 of V215 Check 0.0022 μ cap. connected to pin 3 of V215	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V202, V203, V204 V102, V203 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206
SMOKEH PIP (39) Tuner fine tuning AGC Set con. V102, V202 Check Vid. Det. & Amp. Peaking Coils IF and RF alignment	SMOKEH PIP (39) Tuner fine tuning AGC Set con. V102, V202 Check Vid. Det. & Amp. Peaking Coils IF and RF alignment	INTERMITTENT RASTER - SOUND OK V211, V216, V217, V218, V219, V220, V221 HV Trans.	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC Set con. V207, V208, V209, V210 V211, V216, V217, V218, V219 AGC Set con.	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V202, V203, V204 V102, V203 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206
POOR PIX DETAIL (35) Tuner fine tuning Focus adj. V205, V206, V209, V210 Check Vid. Det. & Amp. Peaking Coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus adj. V205, V206, V209, V210 Check Vid. Det. & Amp. Peaking Coils IF and RF alignment	INSUFFICIENT BRIGHTNESS on trap Hor. Drive con. V211, V219, V220, V221, V222 Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Freq. and Phasing adj. V216, V217, V219, V219 Check 0.0047 μ cap. connected to pin 1 of V218	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V202, V203, V204 V102, V203 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206
SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Sound and Vid. IF alignment of T-204 V102, V202, V203 IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Sound and Vid. IF alignment of T-204 V102, V202, V203 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, width and height con. V211, V219, V220, V221, V222 Check two 18K Ω Res. and 0.047 μ cap. connected to pin 4 of V219	NO SOUND - PIX OK (8B) Tuner fine tuning V207, V208, V209, V210 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-204 Det. alignment T-206	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V202, V203, V204 V102, V203 V207, V208, V209, V210 Sound and Vid. IF alignment T-204 Det. alignment T-206

TUBE LIST

Symbol	Type	Circuit Function
V101	6AK5	RF Amp.
V102	6BD6 or 6BM7	Alternate tuner
V201	6CH6	Carrier Osc.
V202	6AG5	1st IF Amp.
V203	6CB6	2nd IF Amp.
CR201	1N34	Vid. Det.
V205	6AH6	Vid. Amp.
V206	6AL5	Sync. Amp.
V208	6AL5	Ratio Det. (Sound)
V209	6AV6	1st Audio Amp. Bias Clamp
V210	6K5	Audio Out. Amp.
V212	12AT7	Pre-Sync. Sep., Sync. Leveller & AGC Rect.
V204	6CB6	Sync. Amp.
V213	12AU7	AGC Amp. & Sync. Amp.
V214	6SN7	Sync. Clipper & Vert. MV
V215	6K5	Vert. MV & Vert. Out.
V216	6AL5	AFC Det.
V217	6AU6	Reaction Tube
V218	6BD6	Hor. Osc.
V219	6BQ6	Hor. Out.
V221	13B/8016	HV Rect.
V220	6W-AGT	Hor. Damp.
V222	5U4G	Full Wave Rect.



- NO RASTER - NO SOUND (31)
Power input circuit
Fuses (5 Amps.)
V22
- NO RASTER - SOUND OK (31)
HV Fuses (.25 Amps.)
V216, V217, V218, V219, V220, V221
V211, V213
Brightness con.
HV trans. Hor. yoke CRT
connections
- WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
V102, V201, V202, V203, V205, V213
Contrast con.
CR-201 Vid. Det. (1N34 crystal)
AGC Set con.
- POOR HOR. LIN.
Hor. Lin. and Drive con.
V218, V219, V220
Check 0, 022 if caps. connected
to Hor. Lin. coil
- POOR VERT. LIN. (11, 12)
Vert. Lin. and Height con.
V214, V215
- PIX JITTER SIDEWAYS
Hor. Phasing con.
Hor. Osc. Freq. adj.
V216, V217, V218
- PIX JITTER UP & DOWN (16, 17)
V214, V215, V213, V212
AGC Set con.
Vert. Hold con.
- SNEARED PIX (36)
Tuner fine tuning
V205, V213
AGC Set con.
Contrast con.
CR-201 Vid. Det. (1N34 crystal)
IF and RF alignment
- POOR PIX DETAIL (35)
Tuner fine tuning
V205, V213, V211
AGC Set con.
CR-201 Vid. Det. (1N34 crystal)
IF and RF alignment
- NO SOUND - PIX OK (37)
Hor. Drive con.
V219, V221, V211
- INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and Width con.
V218, V219, V220, V211
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)
Height con.
V214, V215, V211
Low line voltage
- NO VERT. DEF. (14)
V214, V215
Vert. Defl. yoke
V.O.T.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
V213, V214, V215
Vert. Hold con.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V204, V212, V213, V214
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
Hor. Phasing con.
Hor. Osc. Freq. adj.
V216, V217, V218, V219
- AUDIO HUM IN SOUND (8E)
V207, V208, V209, V210
- DISTORTED SOUND (8D)
Tuner fine tuning
V205, V213, V206, V209, V210, V205
Contrast con.
Sound and Vid. IF alignment T-204
Det. alignment T-206
- NO SOUND - PIX OK (8B)
Tuner fine tuning
V207, V208, V209, V210
Voi. con.
- Speaker (open voice coil or defective
connections)
Sound and Vid. IF alignment T-204
Det. alignment T-206
- WEAK SOUND - PIX OK (8C)
Tuner fine tuning
V219, V221, V222, V213
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive and Width con.
Height con.
V219, V221
- NOISY SOUND - PIX OK
T-207, V208, V209, V210
Voi. con.
Check for loose connections in sound
system
Speaker
Sound IF and Det. alignment T-204 and
T-206
- SYNC BUZZ IN SOUND
Tuner fine tuning
Contrast con.
V207, V208
AGC Set con.
Sound IF and Det. alignment
T-204 and T-206
- INTERMITTENT SOUND - PIX OK
V207, V208, V209, V210
Voi. con.
Poor connections in sound system

NO RASTER - NO SOUND (31) Power input circuit V901, V602	POOR PIX DETAIL (35) Tuner fine tuning AGC Set con. CR-201 Vid. Det. (IN64 crystal) V205, V206 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Hor. Drive con. Shading con. V602, V601, V504, V505 Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK (13, 20) V404, V501, V502 Hor. Hold and Phasing con. Hor. Osc. Freq. adj. Noise switch should be in "ON" Check 0.001 μ F cap. connected to pin 7 of V507
NO RASTER - SOUND OK (31) Check HV Fuse (1/4 Amp.) Shading con. Ion trap	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V201, V202, V203, V204, V205, V206 Check 0.001 μ F cap. connected to pin 4 of V503 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Height con. Hor. Drive and Width con. Check 10K Ω Res. and 0.047 μ F cap. connected to pin 4 of V503	NO SOUND - PIX OK (8B) Tuner fine tuning V205, V301, V302, V303, V304 Vol. con. (open voice coil or defective connection) Sound and Vid. IF alignment L-211 Det. alignment T-202
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V102, V201, V202, V203, V204, V205, V206, V303, V401 Contrast con. AGC Set con. CR-201 Vid. Det. (IN64 crystal)	SNOW IN PIX (32) V101, V201, V202, V203, V204, V401 AGC Set con. Antenna and transmission line AC IN PIX (DARK HOR. BAR) (98) V101, V102, V202, V203, V204, V205, V206, V401	RASTER BLOOMING (37) Hor. Drive con. V504, V505 Check 330K Ω Res. connected to HV Filter cap. Check HV Filter cap.	NO SOUND - PIX OK (8C) Tuner fine tuning V102, V301, V302, V303, V304 Vol. con. AGC Set con. Sound and Vid. IF alignment L-211 Det. alignment T-202
POOR VERT. LIN. (11, 12) V906, V507 Check 0.1 and 0.033 μ F connected to pins 1 and 5 of V506	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V401, V205, V206 AGC Set con. CR-201 Vid. Det. (IN64 crystal) Check Vid. Det. and Amp. peaking coils Hor. Drive con. V502, V503, V504 Check 56 μ F cap. connected to terminal 1 of yoke Defl. yoke wiring	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V502, V503, V601, V602 Check 0.001 μ F and 820 μ F caps. connected to pins 1 and 5 of V506 Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V102, V301, V302, V303, V304 Vol. con. AGC Set con. Sound and Vid. IF alignment L-211 Det. alignment T-202
PIX JITTER SIDEWAYS Hor. Hold and Phasing con. Hor. Osc., Freq. adj. V301, V302, V502, V401 Check 100 μ F caps. connected to terminal "E" of Hor. Osc. trans.	VERT. BARS (21) Hor. Drive con. V502, V503, V504 Check 56 μ F cap. connected to terminal 1 of yoke Defl. yoke wiring	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V506, V507, V601, V602 Check 0.1 and 0.033 μ F caps. connected to pins 1 and 5 of V506 Low line voltage	NOISY SOUND - PIX OK V301, V302, V303, V304 Vol. con. Check for loose connections in sound system Speaker and system
PIX JITTER UP & DOWN (16, 17) V906, V507 Noise switch should be in "ON" position for max. noise immunity	WEAK OR NO PIX - SOUND WEAK - RASTER OK (33C, 34C) Tuner fine tuning V101, V102 V201, V202, V203, V204, V205 CR-201 Vid. Det. (IN64 crystal) Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO VERT. DEFL. (14) V506, V507 Check 0.022 μ F cap. connected to pin 3 of V507 Check 0.1 and 0.033 μ F caps. connected to pins 1 and 5 of V506 V.O.T.	NOISY SOUND - PIX OK (8C) Tuner fine tuning V102, V301, V302, V303, V304 Vol. con. AGC Set con. Sound and Vid. IF alignment L-211 Det. alignment T-202
SMOARED PIX (36) Tuner fine tuning V101, V102 AGC Set con. CR-201 Vid. Det. (IN64 crystal) V205, V206 Check Vid. Det. and Amp. peaking coils IF and RF alignment	WEAK OR NO PIX - SOUND WEAK - RASTER OK (33C, 34C) Tuner fine tuning V101, V102 V201, V202, V203, V204, V205 CR-201 Vid. Det. (IN64 crystal) Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO VERT. SYNC - HOR. SYNC. OK (16, 17) V506, V507, V404 Vert. Hold con. Vert. Int. Check 0.001 μ F cap. connected to pin 6 of V506 Check 0.0022 μ F cap. connected to pin 3 of V507	NOISY SOUND - PIX OK (8C) Tuner fine tuning V102, V301, V302, V303, V304 Vol. con. AGC Set con. Sound and Vid. IF alignment L-211 Det. alignment T-202
	INTERMITTENT RASTER - SOUND OK V404, V302, V503, V504, V505 Check 0.001 μ F cap. connected to pin 4 of V503 HV Trans.	NO HOR. OR VERT. SYNC. V401, V403, V404 PIX SIGNAL OK AGC Set Noise switch should be in "ON" position for max. noise immunity	INTERMITTENT SOUND - PIX OK V205, V301, V302, V303, V304 Vol. con. Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5 or 6CB6	RF Amp.
V2	6J5 or 6BC5	RF Converter
V3	6J5 or 6BC5	1st IF Amp.
V4	6AU6	2nd IF Amp.
V5	6AU6	3rd IF Amp.
V6	1/2 6AL5	Vid. Det.
V7A	1/2 6AL5	AGC Diode
V7B	1/2 6AL5	1st AF Amp.
V8	1/2 12BH7	2nd Vid. Amp.
V9	6AU6	3rd IF Amp.
V10	6AL5	1st Det. Driver
V11	6AL5	1st Det.
V12	6V6	AF Det.
V13	16RP4	AF Amp.
V14	1/2 12BH7	DC Rest. & Sync.
V15	1/2 12BH7	Sync. Amp. & Phase Splitter
V16	1/2 12BH7	Vert. Sweep Osc.
V17	1/2 12BH7	Vert. Sweep Osc.
V18	6X4	Hor. Phase Det.
V19	6X4	Hor. Sweep Osc.
V20	6X4	Hor. Rect.
V21	6X4	Hor. Damp.
V22	6X4	Power Supply Rect.
V23	6X4	AF Amp.

KEY VOLTAGES

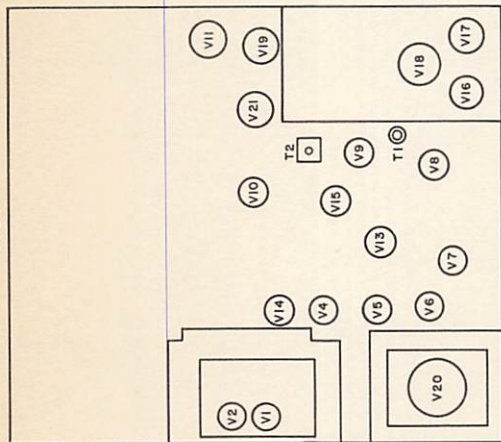
B ₁ plate of damper, V19 pin 5	275vdc
B ₂ cath. of damper, V19 pin 3	450vdc
Plate of Vert. Osc., V14 pin 6	95vdc
Plate of Vert. Osc., V14 pin 2	400vdc
Plate of Hor. Osc., V16 pin 1	150vdc
Grid of Hor. Osc., V16 pin 6	100vdc
Grid of Hor. Osc., V17 pin 5	-0.2vdc

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

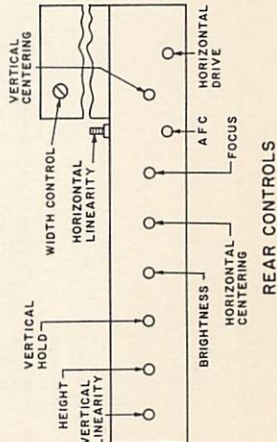
ADJUSTMENTS

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

FRONT



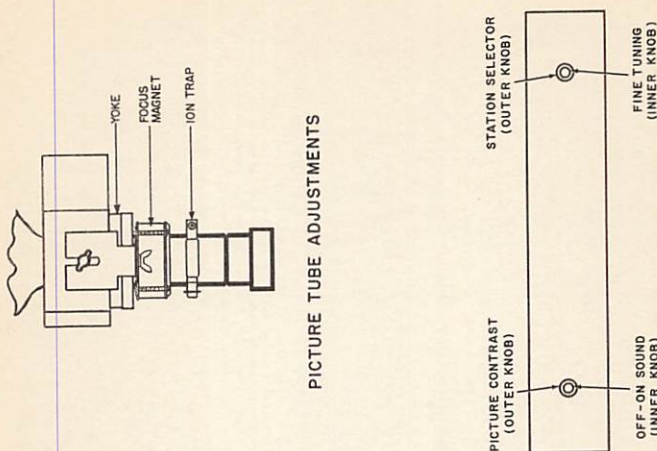
TOP VIEW



REAR CONTROLS

FRONT CONTROLS

PICTURE TUBE ADJUSTMENTS



- NO RASTER - NO SOUND (31)**
Tuner input circuit
V20
Check B. Filter caps.
- NO RASTER - SOUND OK (31)**
Brightness control
V1, V2, V3, V11, V18, V19, V12
Ion trans., Hor. yoke, CRT connections
Focus coil ckt open
- WEAK PIX - SOUND AND RASTER OK (34)**
Contrast control
V2, V4, V5, V6, V7, V8, V12
- POOR HOR. LIN.**
Hor. Lin. and Drive controls
V14, V15, V16, V17
Check 0.05 and 0.1 mf caps. connected to Hor. Lin. coil
Hor. Out. Trans.
- POOR VERT. LIN. (1, 12)**
Vert. Lin. and Height controls
V14
Check 0.02 and 0.05 mf caps. connected to red lead of Vert. Osc. Trans.
- PIX JITTER SIDEWAYS**
Contrast control
V15, V16, V17
Check 0.005 mf cap. connected to pins 5 and 7 of V15
Check 2-0, 0.005 mf caps. connected in series with 0.005 mf cap. to pins 5 and 7 of V15
- PIX JITTER UP AND DOWN (16, 17)**
V14
Vert. Hold control
Check 470 mf cap. connected to green or yellow lead of Vert. Osc. Trans.
- SMEARED PIX (36)**
Tuner fine tuning
V1, V2, V3, V11, V18, V19, V12
Check 0.05 mf cap. connected to pin 1 of V3
Check Vert. Det. and Amp. peaking coils IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
V8, V20
Check Vert. Amp. peaking coils IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
V2, V4, V5, V6, V9
Check T1 for alignment
IF and RF alignment
- SNOW IN PIX (32)**
V1, V2, V4, V5
Antenna and transmission line
- AC IN PIX (DARK BAR, BAR) (38)**
V1, V2, V4, V5, V6, V7, V8
Tuner fine tuning
Contrast control
V7, V8, V20
Peaking coils
- VERT. BARS (21)**
Hor. Drive control
V16, V17, V19
Check 47 mf cap. connected to terminals 1 and 7 of defl. yoke
Hor. Out. Trans.
Defl. yoke ranging
- PIX BENDING (22)**
Automatic Freq. control
V15, V16, V17
Check 0.005 and 0.1 mf caps. connected to pin 2 of V10
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (35C, 34C)**
Tuner fine tuning
V1, V2, V4, V5, V6, V7, V8
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V12, V15, V16, V17, V19
Brightness control
RV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
V16, V17, V18, V20
Hor. Drive control
Brightness control
Check 4.7k Ω res. connected to pin 4 of V17
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Height and Width control
V17, V14, V16
Hor. Drive
- RASTER BLOOMING (37)**
Ion trap
V17, V18
Check 1 meg Ω res. connected in series with second anode lead
- INSUFFICIENT RASTER WIDTH (23)**
Height and Width control
V16, V17, V20
Check 270 and 390 mf cap. connected to pin 6 of V16
Hor. Drive control
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Height and Vert. Lin. controls
V14, V17, V20
Check 0.05 and 0.05 mf caps. connected to red lead of Vert. Osc. Trans.
Vert. Out. Trans.
Low line voltage
- 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 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 mf cap. connected to pins 1 and 7 of V16
- AUDIO HUM IN SOUND (8E)**
V9, V10, V11, V21
- DISTORTED SOUND (8D)**
Tuner fine tuning
V9, V10, V11, V21
Check 0.05 mf cap. connected to pin 5 of V11
Sound and Vid. IF alignment T1
Det. alignment T2
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V9, V10, V11, V21
Check 0.05 mf cap. connected to pins 1 and 7 of V16
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T1
Det. alignment T2
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V2, V9, V10, V11, V21
Volume control
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment T1 and T2
- NOISY SOUND - PIX OK**
V2, V9, V10, V11, V21
Volume control
Check for loose connections in sound system
Speaker
- SYNC. BUZZ IN SOUND (8E)**
Contrast control
V8, V9, V10, V11
Sound IF and Det. alignment T1 and T2
- INTERMITTENT SOUND - PIX OK**
V9, V10, V11, V21
Volume control
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6BC5	RF Amp.
V2	6J6	Osc. - Mix.
V3	6CB6	1st Vid. IF Amp.
V4	6CB6	2nd Vid. IF Amp.
V5	6AL5	Vid. Det.
V6	6AL5	Vid. Amp.
V7	12BH7	Rad. Det. Driver
V8	6AU6	Rad. Det. Driver
V9	6AL5	Rad. Det.
V10	6X07	Audio Amp.
V11	6V6GT	Audio Out.
V12	12BH7	Sync. Amp. - Phase Inverter
V13	12BH7	Vert. Osc.
V14	12BH7	Vert. Osc. - Vert. Out.
V15	6AL5	Hor. Phase Det.
V16	12BH7	Hor. Osc.
V17	6X07	Hor. Osc.
V18	6X07	RV Rect.
V19	6X07	RV Rect.
V20	50AGT	Rect.
V21	17HF4	Picture Tube

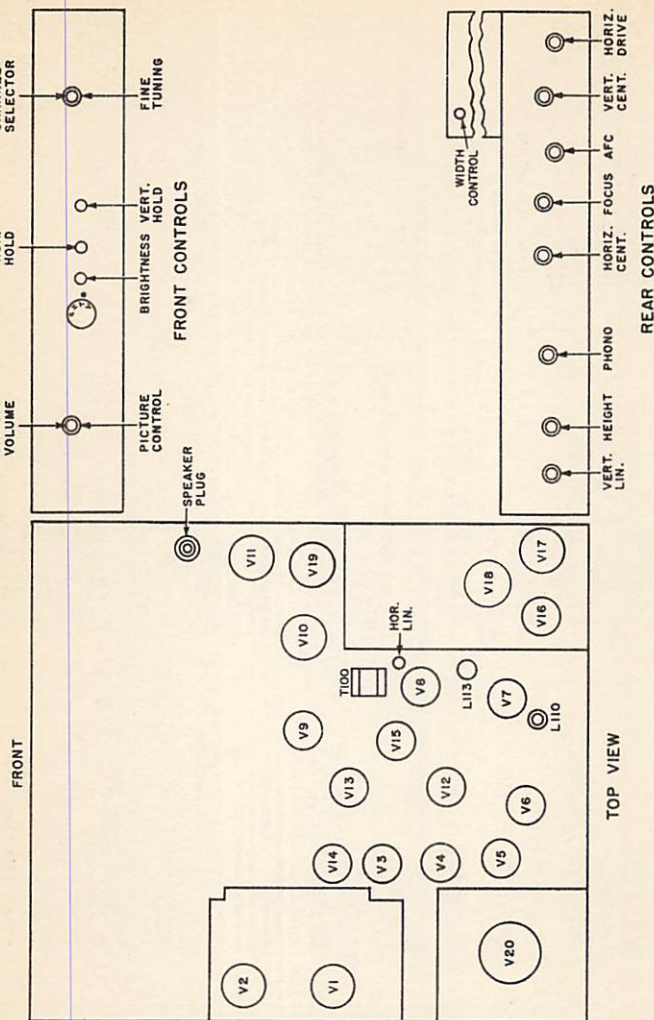
KEY VOLTAGES

B+, plate of damper, V19 pin 5 320Vdc
 Boosted B+, cath. of damper, V19 pin 3 525Vdc
 Plate of Vert. Osc., V14 pin 6 200Vdc
 Plate of Vert. Out., V14 pin 1 410Vdc
 Plates of Hor. Osc., V16 pin 1 200Vdc
 Grid of Hor. Out., V17 pin 5 120Vdc
 -1Vdc

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

ADJUSTMENTS

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



- NO RASTER - NO SOUND (31)**
Power input circuit
V20
Photo-TV Switch
- NO RASTER - SOUND OK (31)**
Ion trap
Brightness con.
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V3, V3, V4, V5, V6, V7
Contrast con.
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V16, V17, V19
Check 0.05 and 0.1 μ f caps. connected to Hor. Lin. con.
H.O.T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Height con.
V14
Check 0.035 and 0.05 μ f caps. connected to red lead of Vert.
Osc. trans.
Check 100 μ f Elec. cap. connected to pin 8 of V14
- PIX JITTER SIDWAYS**
Hor. Hold con.
Automatic Freq. con.
V15, V16, V17
Check 0.005 μ f cap. and 2K Ω Res. connected to pins 5 and 7 of V15
- PIX JITTER UP & DOWN (16, 17)**
Vert. Hold con.
V12, V14
Contrast con.
- SMOORED PIX (36)**
Ion trap
Contrast con.
Tuner fine tuning
V6, V7
V3, V4, V5
Check Det. and Amp. Peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
Ion trap
Check Vid. Det. and Amp. Peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V4, V5, V6, V7
Contrast con.
Check alignment of L-110
IF and RF alignment
- SNOW IN PIX (32)**
V1, V3, V4, V5
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V1, V2, V3, V4, V5, V6, V7
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V6, V7
V2, V3, V4, V5
Check Vid. Det. and Amp. Peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V16, V17, V19
Check 56 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIX BENDING (22)**
V15, V16, V17
Hor. Hold con.
Automatic Freq. con.
Contrast con.
Check 0.05 and 0.005 μ f caps. connected to pin 2 of V15
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V12, V13, V14, V5, V6, V7
Contrast con.
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Ion trap
Brightness con.
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V16, V17, V19, V20, V21
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Width con.
Height con.
V17, V18
- RASTER BLOOMING (37)**
V15, V17, V18, V21
Check HV Filter cap.
Check 1 Meg Ω Res. connected to HV Filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width con.
V16, V17, V20
Check 270 μ f cap. connected to pin 5 of V16
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Height and Vert. Lin. con.
V14, V20 0.035 and 0.05 μ f caps. connected to red lead of Vert.
Osc. trans.
V.O.T.
Low line voltage
- NO VERT. DEFL. (14)**
V14
Check 0.035 and 0.05 μ f caps. connected to red lead of Vert. Osc. trans.
Vert. Defl. yoke
V.O.T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
V15, V14
Hor. Hold con.
V12, V13
Check 4700 μ f cap. connected to yellow lead of Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V7, V12, V13, V15
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold con.
Automatic Freq. con.
V12, V15, V16, V17
Check 390 μ f cap. connected to pins 1 and 5 of V16
- AUDIO HUM IN SOUND (8F)**
V8, V9, V10, V11
- DISTORTED SOUND (8D)**
Ion trap
V8, V9, V10, V11, V2
Contrast con.
Check 0.05 μ f cap. connected to pin 5 of V11
Sound and Vid. IF alignment L-113
Det. alignment T-100
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V8, V9, V10, V11
Voi. con.
Speaker (open voice coil or defective speaker)
Sound and Vid. IF alignment L-113
Det. alignment T-100
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V8, V9, V10, V11
Voi. and Contrast con.
Sound and Vid. IF alignment L-113
Det. alignment T-100
- NOISY SOUND - PIX OK**
V8, V9, V10, V11
Voi. con.
Check sound system for loose connections
Speaker
Sound IF and Det. alignment L-113, T-100
- SYNC. BUZZ IN SOUND**
Tuner fine tuning
V8, V9, V10, V11
Contrast con.
Sound IF and Det. alignment L-113, T-100
- INTERMITTENT SOUND - PIX OK**
V8, V9, V10, V11
Poor connections in sound system

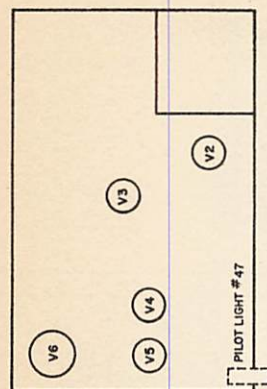
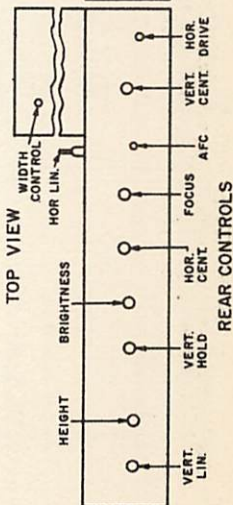
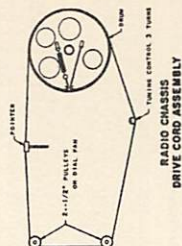
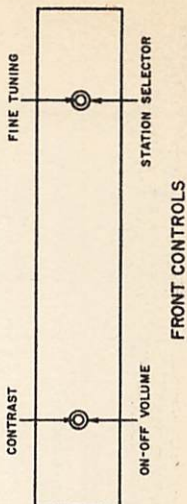
TUBE LIST

Symbol	Type	Circuit Function
V1	6AG5, 615 or 6BC5	RF Amp.
V2	6X4 or 6X5	Rectifier
V3	6BC5	RF Converter
V4	6AL5	1st IF Amp.
V5	6AL5	2nd IF Amp.
V6	6AL5	1st AF Amp.
V7	6AL5	2nd AF Amp.
V8	6AL5	1st Vd. Amp.
V9	6AL5	2nd Vd. Amp.
V10	6AL5	3rd Vd. Amp.
V11	6X4	Radio Det. Audio
V12	6X4	Audio Out.
V13	12BH7	Picture Tube
V14	12BH7	Picture Tube
V15	12BH7	Picture Tube
V16	12BH7	Picture Tube
V17	12BH7	Picture Tube
V18	12BH7	Picture Tube
V19	12BH7	Picture Tube
V20	12BH7	Picture Tube
V21	12BH7	Picture Tube
V22	12BH7	Picture Tube
V23	12BH7	Picture Tube
V24	12BH7	Picture Tube
V25	12BH7	Picture Tube
V26	12BH7	Picture Tube
V27	12BH7	Picture Tube
V28	12BH7	Picture Tube
V29	12BH7	Picture Tube
V30	12BH7	Picture Tube
V31	12BH7	Picture Tube
V32	12BH7	Picture Tube
V33	12BH7	Picture Tube
V34	12BH7	Picture Tube
V35	12BH7	Picture Tube
V36	12BH7	Picture Tube
V37	12BH7	Picture Tube
V38	12BH7	Picture Tube
V39	12BH7	Picture Tube
V40	12BH7	Picture Tube
V41	12BH7	Picture Tube
V42	12BH7	Picture Tube
V43	12BH7	Picture Tube
V44	12BH7	Picture Tube
V45	12BH7	Picture Tube
V46	12BH7	Picture Tube
V47	12BH7	Picture Tube
V48	12BH7	Picture Tube
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V61	12BH7	Picture Tube
V62	12BH7	Picture Tube
V63	12BH7	Picture Tube
V64	12BH7	Picture Tube
V65	12BH7	Picture Tube
V66	12BH7	Picture Tube
V67	12BH7	Picture Tube
V68	12BH7	Picture Tube
V69	12BH7	Picture Tube
V70	12BH7	Picture Tube
V71	12BH7	Picture Tube
V72	12BH7	Picture Tube
V73	12BH7	Picture Tube
V74	12BH7	Picture Tube
V75	12BH7	Picture Tube
V76	12BH7	Picture Tube
V77	12BH7	Picture Tube
V78	12BH7	Picture Tube
V79	12BH7	Picture Tube
V80	12BH7	Picture Tube
V81	12BH7	Picture Tube
V82	12BH7	Picture Tube
V83	12BH7	Picture Tube
V84	12BH7	Picture Tube
V85	12BH7	Picture Tube
V86	12BH7	Picture Tube
V87	12BH7	Picture Tube
V88	12BH7	Picture Tube
V89	12BH7	Picture Tube
V90	12BH7	Picture Tube
V91	12BH7	Picture Tube
V92	12BH7	Picture Tube
V93	12BH7	Picture Tube
V94	12BH7	Picture Tube
V95	12BH7	Picture Tube
V96	12BH7	Picture Tube
V97	12BH7	Picture Tube
V98	12BH7	Picture Tube
V99	12BH7	Picture Tube
V100	12BH7	Picture Tube

KEY VOLTAGES
B₁ plate of damper, V19 pin 5 310vdc
B₂ plate of damper, V19 pin 3 325vdc
Plate of Verr. Osc., V14 pin 6 325vdc
Plate of Verr. Osc., V14 pin 1 325vdc
Plate of Hor. Osc., V18 pin 1 325vdc
Plate of Hor. Osc., V18 pin 6 325vdc
Grid of Hor. Osc., V17 pin 5 110vdc
Grid of Hor. Osc., V17 pin 6 110vdc
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

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

TOP VIEW
(RADIO CHASSIS)TOP VIEW
(REAR CONTROLS)

FRONT CONTROLS

NO RASTER - NO SOUND (11)
Power input circuit
V20

NO RASTER - SOUND OK (31)
Brightnes control
Ion trap
V12, V15, V16, V17, V18, V19
HV trans. Hor. yoke CRT
connections

WEAK PIX - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast con.
V2, V4, V5, V6, V7, V8, V9

POOR HOR. LIN.
Hor. Drive con.
V17, V19
Check 0.05 and 0.1 μ f caps.
connected to Hor. Lin. coll
H. O. T.

POOR VERT. LIN. (11, 12)
Vert. Lin. and Height con.
V14
Check two 0.05 μ f caps.
connected to red lead of
Vert. osc. trans.
Check 0.05 μ f caps.
connected to pin 3 of V14
V. O. T.

PIX JITTER SIDEWAYS
V15, V16, V17
Check 0.05 μ f cap. connected
to pin 5 of V15 and two 0.05 μ f
caps. connected to this cap.

PIX JITTER UP & DOWN (16, 17)
Contrast con. Hold con.
V7, V8, V13, V14

SMOARED PIX (36)
Tuner fine tuning
Contrast con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp.
peaking coils
IF and RF alignment

POOR PIX DETAIL (35)
Tuner fine tuning
Focus con.
V4, V5, V6, V7, V8
Check Vid. Det. and Amp.
peaking coils
IF and RF alignment

SOUND BARS IN PIX (4A, 4E)
Tuner fine tuning
V1, V2, V4, V5, V6
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, V4, V5, V6, V7, V8

ENGRAVED EFFECT IN PIX (33)
Tuner fine tuning
Contrast con.
V2, V4, V5, V6, V7, V8, V12
Check Vid. Det. and Amp.
peaking coils

VERT. BARS (21)
Hor. Drive con.
V17, V19
Check 47 μ f cap. connected
to red lead of Vert. osc. trans.
Defl. yoke ringing

PIX BENDING (22)
Contrast and AFC con.
V13, V15, V16, V17
Check 0.05 μ f caps.
connected to pin 2 of V18
V. O. T.

WEAK OR NO PIX - SOUND WEAK -
RASTER OK (32C, 34C)
Tuner fine tuning
V1, V2, V3, V4, V5, V6, V7, V8
RF and IF alignment

INTERMITTENT RASTER - SOUND OK
V13, V14
Check 390 μ f cap. connected
between pins 1 and 7 of V16
HV trans.

INSUFFICIENT BRIGHTNESS
Ion trap
Antenna and Hor. Drive con.
V8, V12, V17, V18, V19, V20
Low line voltage

EXCESSIVE RASTER (PIX SIZE) (9, 10)
Hor. Drive, Width and Height con.
V12, V17, V18

RASTER BLOOMING (37)
Hor. Drive con.
V12, V17, V18, V19, V20
Check HV Filter cap.

INSUFFICIENT RASTER WIDTH (23)
Width and Hor. Drive con.
V17, V19, V20
Check 270 and 390 μ f caps.
connected to pin 6 of V16
Check 0.05 μ f caps. connected
to pin 4 of V17
Check two 4.7K Ω Res. connected
to pin 2 of yoke plug
Low line voltage
H. O. T.

INSUFFICIENT RASTER HEIGHT (15)
Height and Vert. Lin. con.
V14, V20
Check 0.001 and two 0.05 μ f caps.
connected to red lead of Vert. Osc.
trans.
V. O. T.

NO VERT. DEFL. (14)
Low line voltage
Check 0.001 and two 0.05 μ f caps.
connected to red lead of Vert. Osc.
trans.
Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.

NO VERT. SYNC. - HOR. SYNC. OK (16, 17)
Vert. Hold con.
Vert. Int. network
V13, V14
Check 4700 μ f cap. connected to
yellow lead of Vert. Osc. trans.

NO HOR. OR VERT. SYNC. - PIX SIGNAL OK
V13
NO HOR. SYNC. - VERT. SYNC. OK (19, 20)
V15, V16
Check 390 μ f cap. connected
between pins 1 and 7 of V16
V9, V10, V11

AUDIO HUM IN SOUND (8E)
V9, V10, V11, V21
Tuner fine tuning
Contrast con.

DISTORTED SOUND (8D)
Tuner fine tuning
V2, V9, V10, V11, V21
Check 0.05 μ f cap. connected to
pin 5 of V11
Sound and Vid. IF alignment T-1
Det. alignment T-2

NO SOUND - PIX OK (8B)
Tuner fine tuning
V9, V10, V11, V21
Speaker (open voice coil or defective
speaker)
Sound and Vid. IF alignment T-1
Det. alignment T-2

WEAK SOUND - PIX OK (8C)
Tuner fine tuning

V2, V9, V10, V11, V21
Sound and Vid. IF alignment T-1
Det. alignment T-2

NOISY SOUND - PIX OK
V9, V10, V11, V21
Check sound system for loose
connections
Speaker

Sound IF and Det. alignment T-1 and T-2
SYNC. BUZZ IN SOUND
Tuner fine tuning
Contrast con.
V2, V9, V10
Sound IF and Det. alignment T-1 and T-2
INTERMITTENT SOUND - PIX OK
V9, V10, V11, V21
Poor connections in sound system

TUBE LIST

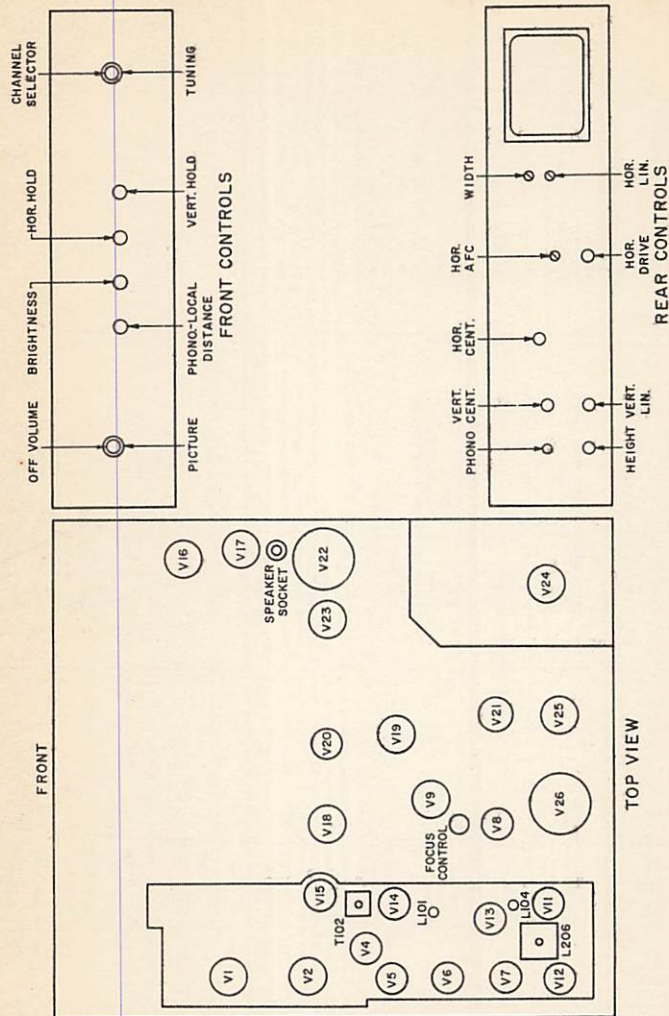
Symbol	Type	Circuit Function
V1	6BC7 or 6BZ7	RF Amp.
V2	6J5	Mix.-Osc.
V4	6AU6	1st Vid.-IF Amp.
V5	6AU6	2nd Vid.-IF Amp.
V6	6AU6	3rd Vid.-IF Amp.
V7	6CB6	4th Vid.-IF Amp.
V8	6AU6	Keyed AGC
V9	12BZ7	Sync. Sep.
V10	21FP4A	Picture Tube
V11	6AC5	2nd Vid. Amp.
V12	6AU6	4.5-sec. Amp.
V13	6AU6	4.5-sec. Amp.
V14	6AU6	Rad. Det. Driver
V15	6AL5	Rad. Det.
V16	6AV6	Audio Amp.
V17	6Y8	Audio Out.
V18	12BH7	Sync. Separator & Vert. Osc.
V19	12A4	Vert. Out.
V20	6AL5	Hor. Phase Det.
V21	12BH7	Hor. Osc.
V22	6CB6	Hor. Out.
V23	6X4	Rect.
V24	193	HW Rect.
V25	5Y3	Rect.
V26	504	Rect.

KEY VOLTAGES

B₁—plate of damper, V23 pin 3 340vdc
 B₂—plate of damper, V23 pin 5 500vdc
 B₃—cath. of damper, V23 pin 1 70vdc
 Plate of Vert. Osc., V18 pin 9 340vdc
 Plates of Hor. Osc., V21 pin 1 110vdc
 V22 pin 6 200vdc
 Grid of Hor. Out., V22 pin 5 -40vdc
 (All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

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



NO PASTER - NO SOUND (31) Power input circuit V2, V25	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Check alignment of L-204 V1, V2, V4, V5, V6, V7 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V22, V23, V25, V28 Check 270 μ f and 0.005 μ f caps. H. O. T. Connected to pin 1 of V21 Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V13, V14, V15, V16, V17 Speaker (check for loose or defective connection) Sound and Vid. IF alignment L-101 Det. alignment T-102
NO RASTER - SOUND OK (31) Brightness con. V10, V21, V22, V23, V24 Ion trap HV trans. Hor. yoke CRT connections	SNOW IN PIX (32) V1, V2, V4, V5, V6, V7, V8 Check Vid. Det. crystal M1 (IN60) Part of L-206 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Vert. Size and Lin. con. Check 0.005 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V13, V14, V15, V16, V17 Vol. con. Check Vid. Det. crystal M1 (IN60) Part of L-206 Sound and Vid. IF alignment L-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V2, V4, V5, V6, V7, V8, V11, V12 Check Vid. Det. crystal M1 (IN60) Part of L-206	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V4, V5, V6, V7, V8, V11, V12	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V8, V9 Check 0.005 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans.	MOIST SOUND - PIX OK V13, V14, V15, V16, V17 Check sound system for loose connections Speaker Sound IF and Det. alignment L-101, T-102
POOR VERT. LIN. (11, 12) Vert. Lin. and Size con. V13, V19 005 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 1 of V19 V. O. T.	VERT. BARS (21) V22, V23 Check cap. connected to yoke terminals Defl. yoke ringing	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V8, V9 Check 0.01 μ f cap. connected to pins 1 and 6 of V9 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and AFC con. V8, V18, V20, V21 Check 470 μ f cap. connected to pin 2 of V21	SYNC. BUZZ IN SOUND Tuner fine tuning V8, V13, V14, V15 Check Vid. Det. crystal M1 (IN60) Part of L-206 Sound IF and Det. alignment L-101, T-102
PIX JITTER SIDWAYS Hor. Hold and AFC con. V18, V20, V21, V22 Check 0.005 μ f cap. and 33K Res. connected to pins 5 and 7 of V20	PIX BENDING (22) Hor. Hold and AFC con. Check 0.003 and 0.05 μ f caps. connected to pin 7 of V21	AUDIO HUM IN SOUND (8E) V13, V14, V15, V16, V17	INTERMITTENT SOUND - PIX OK V13, V14, V15, V16, V17 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Vert. Hold and Contrast con. V8, V9, V16, V19	WEAK OR NO PIX - SOUND WEAK - RASTER OK (22C, 34C) Tuner fine tuning V1, V2, V4, V5, V6, V7, V8 RF and IF alignment	DISORTED SOUND (8D) Tuner fine tuning V13, V14, V15, V16, V17 Check 0.02 μ f cap. connected to pin 5 of V17 Check Vid. Det. crystal M1 (IN60) Part of L-206 Sound and Vid. IF alignment L-101 Det. alignment T-102	
SMEARED PIX (26) Tuner fine tuning Contrast con. V1, V2, V4, V5, V6, V7, V8, V11, V12 Check Vid. Det. crystal M1 (IN60) Part of L-206 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V10, V21, V22, V23, V24, V25 Low line voltage	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Vert. Size con. V22, V23, V24	
POOR PIX DETAIL (35) Tuner fine tuning V13, V14, V15, V16, V17 Check Vid. Det. and Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V10, V22, V23, V24, V25, V26 Check HV filter cap.		

TUBE LIST

Symbol	Type	Circuit Function
V101	6J5	RF Amp.
V102	6AK5	RF Mix.
V103	6J5	RF Osc.
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AG5	3rd Vid. IF Amp.
V4	6AL5	Vid. Det. & Sync. Limiter
V5	12AU7	1st & 2nd Vid. Amp.
V6	10BP4	Picture Tube
V7	6X4	1st Sound IF Amp.
V8	6AU6	2nd Sound IF Amp.
V9	6T8	Sound Det. & 1st Audio Amp.
V10	6V8GT	Audio Out.
V11	6SN7GT	Sync. Amp. & Sep.
V12	6SN7GT	Vert. Osc. & Out.
V13	6SN7GT	Hor. Osc. & Sync. Guide
V14	6BD6	Hor. Out.
V15	5V4G	Damper
V16	1B3GT	High-Volt. Rect.
V17	5Y3GT	Low-Volt. Rect.
V18	5Y3GT	Low-Volt. Rect.

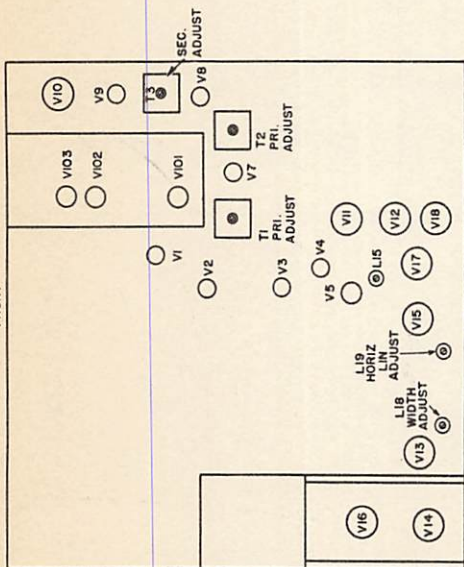
KEY VOLTAGES

B+, plate of damper, V15 pins 4 and 6 270vdc
 Boosted B+, cath. of damper, V15 pin 8 350vdc
 Plate of Vert. Osc., V12 pin 5 18vdc
 Plate of Vert. Osc., V12 pin 2 220vdc
 Plates of Hor. Osc., V13 pin 2 27vdc
 Grid of Hor. Osc., V13 pin 5 47vdc
 Grid of Hor. Out., V14 pin 5 -50vdc
 (All voltages are measured with a VTVM between the tube pins and chassis.)

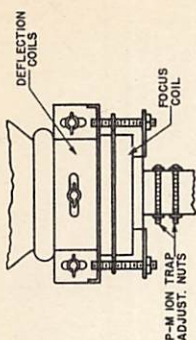
ADJUSTMENTS

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

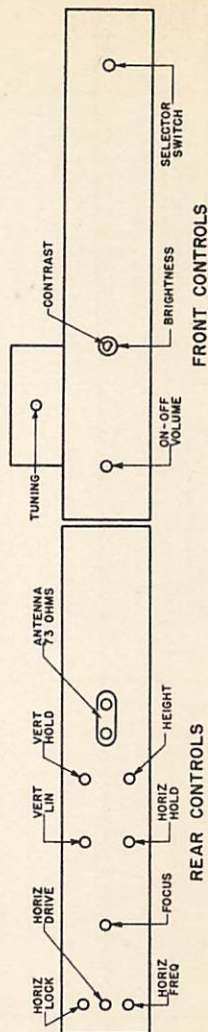
FRONT



TOP VIEW



PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS

REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V17, V18	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Contrast con. Check alignment of L-15 V102, V103 V1, V2, V3 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Det. drive and width con. V14, V15, V17, V18 Check 300 and 2200 μ f cap. connected to Hor. Osc. trans. H. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V102, V103 Sound and Vid. IF alignment T-1, T-2 Det. alignment T-3
NO RASTER - SOUND OK (31) Brightness con. Ion trap HV Fuse P-1 (200 ma) V6, V13, V14, V15, V16 V6 trans. Hor. yoke CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast con. V101, V102, V103 V1, V2, V3, V4, V5	SNOW IN PIX (33) V101, V102, V103 V1, V2, V3, V4 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V101, V102, V103 V1, V2, V3, V4, V5 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast con. V102, V103 V1, V2, V3, V4, V5 Check Vid. Det. and Amp. peaking coils to Hor. Lin. coil	INSUFFICIENT RASTER HEIGHT (15) V12, V17, V18 Check 0.25 μ f cap. connected to V12, V17, V18 Check 0.1 μ f cap. connected to red lead of Vert. Osc. trans. Low line voltage V. O. T. NO VERT. DEF. (14) V12 Check 0.1 and 0.25 μ f caps. connected to red lead of Vert. Osc. trans. Def. yoke V. O. T. and Vert. Osc. trans. NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V4, V11	NOISY SOUND - PIX OK Vol. con. V7, V8, V9, V10, V11 Check sound system for loose connections Speaker Sound IF and Det. alignment T-1, T-2 T-3 INTERMITTENT SOUND - PIX OK V7, V8, V9, V10, V11 Poor connections in sound system
POOR VERT. LIN. (11, 12) Hor. Drive and Lin. con. V14, V15 Check 0.04 and 0.1 μ f caps. connected to Hor. Lin. coil	VERT. BARS (21) Hor. Drive con. V14, V15 Check 30 μ f cap. connected to yoke Def. yoke ringing PIX BENDING (22) Hor. Hold, Freq. and Lock-Range con. V4, V11, V13, V14 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast con. V101, V102, V103 RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) V13, V14 Hor. Hold, Hor. Freq. and Lock-Range con. Check 200 μ f cap. connected to pin 4 of V13 AUDIO HUM IN SOUND (8E) V7, V8, V9, V10 DISTORTED SOUND (8D) Tuner fine tuning V102, V103 V7, V8, V9, V10, V11 Check 0.01 μ f cap. connected to pin 9 of V9 Sound and Vid. IF alignment T-1, T-2 Det. alignment T-3 NO SOUND - PIX OK (8B) Ion trap Tuner fine tuning Vol. con. V7, V8, V9, V10, V11 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-1, T-2 Det. alignment T-3	
PIX JITTER SIDEWAYS V13, V14 Check 0.002 μ f cap. connected to pin 1 of V13 Check 0.02 and 0.25 μ f caps. connected to pin 3 of V13	PIX JITTER UP & DOWN (16, 17) Vert. Hold and Contrast con. V4, V11, V12 SMEARED PIX (30) Tuner fine tuning Contrast con. V102, V103 V1, V2, V3, V4, V5 Check Vid. Det. and Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V14, V15, V16 RASTER BLOOMING (37) Hor. Drive con. V6, V14, V15, V16, V17, V18 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap.	

TUBE LIST

Symbol	Type	Circuit Function
V101	616	RF Amp.
V102	6AB5	IF Amp.
V103	6AB4	VHF Osc.
V200	6AU6	1st Vid. IF Amp.
V201	6AU6	2nd Vid. IF Amp.
V202	6AG5	3rd Vid. IF Amp.
V203	6AG5	4th Vid. IF Amp.
V204	6AL5	Defl. Beam Defl. & Sync. Take-off
V205	6AC7	Vid. Amp.
V206	12LP4	Picture Tube
V207	12CP4	1st Sound IF Amp.
V208	6AU6	2nd Sound IF Amp.
V209	6AL5	Sound Defl. Beam Defl. & Sync. Take-off
V210	6S17	1st Sound Amp.
V211	6V9GT/G	2nd Sound Amp.
V212A	6SN7GT	Hor. Saw Gen.
V212B	6S17	Sync. Clipper
V213	6S17	Sync. Discriminator
V214	6S17	Sync. Buffer
V215	6S17	Vert. Buffer
V216A	6S17	Vert. Saw Gen.
V217	6S17	Vert. Defl. Amp.
V218	504G	Low-Volt. Rect.
V219	504G	High-Volt. Rect.
V220	6BD6	Hor. Defl. Amp.
V221	6BD6-G	Hor. Defl. Amp.
V222	1B9-A/7	8016
V223	5V4G	Hor. Damp.
V224	6AL5	Time Delay Relay

KEY VOLTAGES

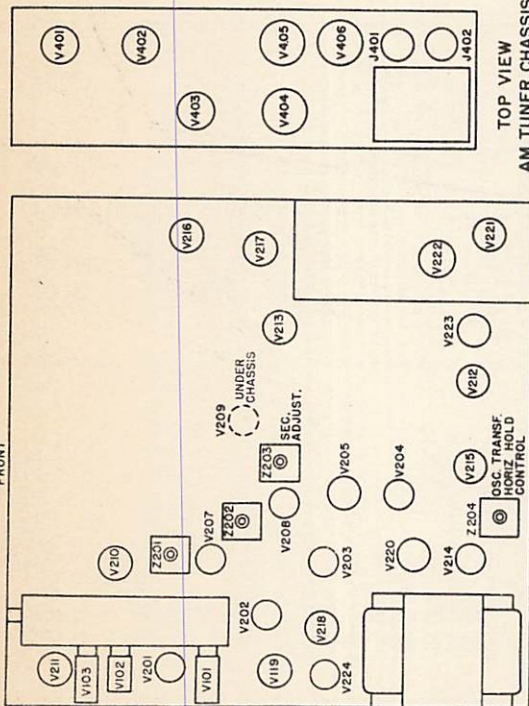
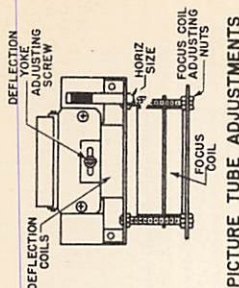
B+, plate of damper, V223 pins 4 and 6 385vdc
 Boosted B+, cath. of damper, V223 pin 8 475vdc
 Plate of Vert. Osc., V216 pin 2 200vdc
 Plate of Hor. Osc., V216 pins 2 and 5 225vdc
 Plate of Reactance Tube, V220 pin 3 280vdc
 Grid of Hor. Out., V221 pin 5 -0.3vdc

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

ADJUSTMENTS

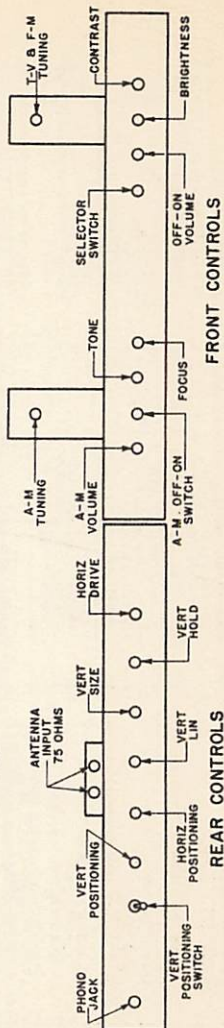
For horizontal oscillator adjustment, see HOR. OSC. ADJ. -3.

FRONT

TOP VIEW
AM TUNER CHASSIS

PICTURE TUBE ADJUSTMENTS

TOP VIEW



FRONT CONTROLS

REAR CONTROLS

WEAK SOUND - PIX OK (8C)
Tunar fine tuning
Vol. con.
V201, V203, V209, V200, V209, V210, V211
Check V209, V200, V209, V210
V201, V203, V209, V200, V209, V210, V211
Det. alignment Z-201, Z-202
Det. alignment Z-203

NOISY SOUND - PIX OK
Vol. con.
V201, V203, V209, V210, V211
Check connections
Speaker
Sound If and Det. alignment Z-201, Z-202,
Z-203

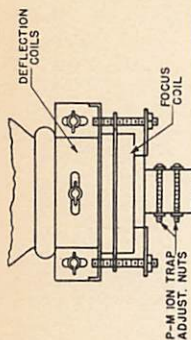
INTERFERENT SOUND - PIX OK
Vol. con.
V201, V203, V209, V210, V211
Poor connections in sound system

INSUFFICIENT RASTER WIDTH (23)
Hor. Drive and size con.
V212, V218, V219, V231, V223
Check 0.001" pt cap. connected to pin 5
of V212 22KΩ Res. and 0.05 μf cap.
connected to pin 8 of V231
Low line voltage
H. O. T.

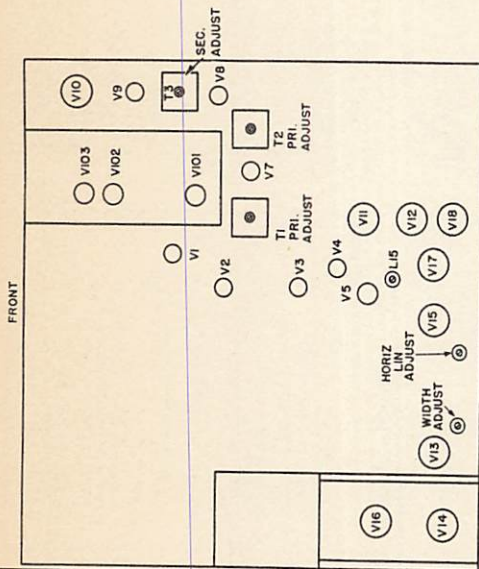
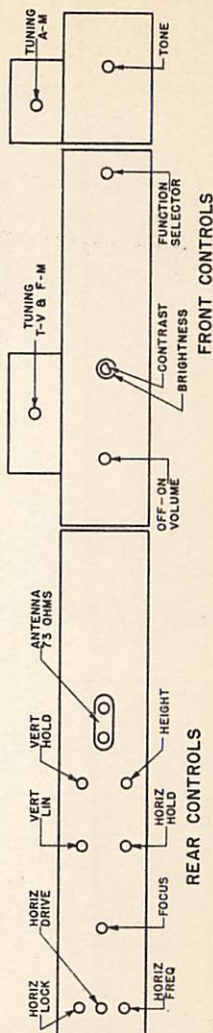
INSUFFICIENT RASTER HEIGHT (15)
Vert. Osc. and size con.
V212, V218, V219
Check two 0.1 μf caps. connected to
black lead of Vert. Osc. trans.
V. O. T.
Low line voltage
H. O. T. DEF. (14)

FOUND BARS IN P1X (4A, 4E)
 1. Check alignment of antenna
 2. Check alignment of 4.5-mc trap
 3. Check alignment of pin 8 of V205
 V101, V102, V103, V200, V201, V202, V203,
 V204, V205
 IF and RF alignment
 SNOW IN P1X (32)
 V101, V102, V103, V200, V201, V202, V203,
 V204
 Antenna and transmission line
 AC IN P1X (DARK HOR. BAR) (58)
 V101, V102, V103
 V200, V201, V202, V203, V204, V205
 ENGRAVED EFFECT IN P1X (33)

NO RASTER - NO SOUND (31)
Power input circuit
resistor (M201)
V218, V219, V224
Check Delay Relay
NO RASTER - SOUND OK (31)
Brightlines on
screen
Check HV Fuse F-202 (0.25 Amps.)
V206, V215, V220, V221, V222, V223
V206, V215, V220, V221, V222, V223
HV trans. Hbr. yoke CRT connections
HWK RASTER - SOUND AND RASTER OK (34)
Tuner fine tuning
Contrast
V206, V201, V202, V203, V204, V205



PICTURE TUBE ADJUSTMENTS

TOP VIEW
AM TUNER CHASSIS

TUBE LIST

Symbol	Type	Circuit Function
V101	6J6	RF Amp.
V102	6AK5	RF Mix.
V103	6J6 or 6AR4	RF Osc. IF Amp.
V1	6AG5	2nd Vfd. IF Amp.
V2	6AG5	3rd Vfd. IF Amp.
V3	6AL5	Vid. Det. & Sync. Limiter
V4	12AU7	1st & 2nd Vfd. Amp.
V5	6BD6	Picture Tube
V6	6AU6	2nd Sound IF Amp.
V7	6BT8	Sound Det. & 1st Audio Amp.
V8	6V6GT	Audio Out.
V9	6SN7GT	Sync. Amp. & Sep.
V10	6SN7GT	Vert. Osc. & Out.
V11	6SN7GT	Hor. Osc. & Sync. Guide
V12	6BD6	Hor. Out.
V13	6BD6	Damper
V14	5V4G	High-Volt. Rect.
V15	1B3GT	Low-Volt. Rect.
V16	5Y3GT	Low-Volt. Rect.
V17	6BD6	RF Amp.
V18	6BD6	RF Amp.
V19	6BD6	RF Amp.
V20	6BD6	RF Amp.
V21	6BD6	RF Amp.
V22	6BD6	RF Amp.
V23	6BD6	RF Amp.
V24	6BD6	RF Amp.
V25	6BD6	RF Amp.
V26	6BD6	RF Amp.
V27	6BD6	RF Amp.
V28	6BD6	RF Amp.
V29	6BD6	RF Amp.
V30	6BD6	RF Amp.
V31	6BD6	RF Amp.
V32	6BD6	RF Amp.
V33	6BD6	RF Amp.
V34	6BD6	RF Amp.
V35	6BD6	RF Amp.
V36	6BD6	RF Amp.
V37	6BD6	RF Amp.
V38	6BD6	RF Amp.
V39	6BD6	RF Amp.
V40	6BD6	RF Amp.
V41	6BD6	RF Amp.
V42	6BD6	RF Amp.
V43	6BD6	RF Amp.
V44	6BD6	RF Amp.
V45	6BD6	RF Amp.
V46	6BD6	RF Amp.
V47	6BD6	RF Amp.
V48	6BD6	RF Amp.
V49	6BD6	RF Amp.
V50	6BD6	RF Amp.
V51	6BD6	RF Amp.
V52	6BD6	RF Amp.
V53	6BD6	RF Amp.
V54	6BD6	RF Amp.
V55	6BD6	RF Amp.
V56	6BD6	RF Amp.
V57	6BD6	RF Amp.
V58	6BD6	RF Amp.
V59	6BD6	RF Amp.
V60	6BD6	RF Amp.
V61	6BD6	RF Amp.
V62	6BD6	RF Amp.
V63	6BD6	RF Amp.
V64	6BD6	RF Amp.
V65	6BD6	RF Amp.
V66	6BD6	RF Amp.
V67	6BD6	RF Amp.
V68	6BD6	RF Amp.
V69	6BD6	RF Amp.
V70	6BD6	RF Amp.
V71	6BD6	RF Amp.
V72	6BD6	RF Amp.
V73	6BD6	RF Amp.
V74	6BD6	RF Amp.
V75	6BD6	RF Amp.
V76	6BD6	RF Amp.
V77	6BD6	RF Amp.
V78	6BD6	RF Amp.
V79	6BD6	RF Amp.
V80	6BD6	RF Amp.
V81	6BD6	RF Amp.
V82	6BD6	RF Amp.
V83	6BD6	RF Amp.
V84	6BD6	RF Amp.
V85	6BD6	RF Amp.
V86	6BD6	RF Amp.
V87	6BD6	RF Amp.
V88	6BD6	RF Amp.
V89	6BD6	RF Amp.
V90	6BD6	RF Amp.
V91	6BD6	RF Amp.
V92	6BD6	RF Amp.
V93	6BD6	RF Amp.
V94	6BD6	RF Amp.
V95	6BD6	RF Amp.
V96	6BD6	RF Amp.
V97	6BD6	RF Amp.
V98	6BD6	RF Amp.
V99	6BD6	RF Amp.
V100	6BD6	RF Amp.

KEY VOLTAGES

B+	Plates of damper, V15 pins 4 and 6	270vdc
Boosted B+	Plate of V15 pin 8	380vdc
Plate of Vert. Osc., V12 pin 5		18vdc
Plate of Vert. Osc., V12 pin 2		215vdc
Plates of AFC and Hor. Osc., V13 pin 2		17vdc
Grid of Hor. Out., V14 pin 5		55vdc
		-80vdc

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

ADJUSTMENTS

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

- NO RASTER - NO SOUND (31)**
Power input circuit
Check Function Switch
- NO RASTER - SOUND OK (31)**
Brightness con.
RV Fuse F-1 (0.2 Amps.)
V6, V13, V14, V15, V16
HV trans. Hor. yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast con.
V102, V103, V2, V3, V4, V5
- POOR HOR. LIN.**
Hor. Lin. and Drive con.
V12, V13, V14, V15, V16
Check 0.04 and 0.1 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
V12, V13, V14, V15, V16
Check 0.1 and 0.25 μ f caps. connected to Vert. Osc. trans.
Check 100 μ f Elec. cap. connected to pin 3 of V12
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Lock con.
V11, V13
Check 120 μ f cap. connected to pin 6 of V13
Check 0.0022 μ f cap. connected to pin 1 of V13
- PIX JITTER UP & DOWN (16, 17)**
Contrast and Vert. Hold con.
V4, V11, V12
- SMEARED PIX (36)**
Tuner fine tuning
Contrast con.
V103, V105, V1, V2, V3, V4, V5
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V1, V2, V3, V4
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Power input circuit
Check alignment of 4.5-mc trap
connected to pin 6 of V3
V102, V103, V1, V2, V3, V4
IF and RF alignment
- SNOW IN PIX (32)**
V101, V102, V103, V1, V2, V3, V4
Antenna and transmission line
V101, V102, V103
V1, V2, V3, V4, V5
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast con.
V102, V103, V1, V2, V3, V4, V5, V6
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V14, V15
Check 50 μ f cap. connected to yoke terminals
Defl. yoke ringing
- PIX BENDING (22)**
V13, V14
Hor. Hold, Freq. and Lock con.
Check 0.02 and 0.25 μ f caps. connected to pin 3 of V13
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast con.
V101, V102, V103, V1, V2
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V6, V13, V14, V15, V16
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Brightness and Hor. Drive con.
V6, V14, V15, V16, V17, V18
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive, Width and Height con.
V14, V16
- RASTER BLOOMING (37)**
Hor. Drive con.
V6, V14, V15, V16, V17, V18
Check HV Filter cap.
Check 1 Meg Ω Res. connected to HV Filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Width con.
V14, V15, V16, V17, V18
Check 390 and 2200 μ f caps. connected to Hor. Drive con.
Check 750 Res. and 0.05 μ f cap. connected to pin 8 of V14
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (16)**
Height and Vert. Lin. con.
V12, V17, V18
Check 0.1 and 0.25 μ f caps. connected to Vert. Osc. trans.
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V13
Check 0.1 and 0.25 μ f caps. connected to Vert. Osc. trans.
Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Lin. network
V11, V12
Check 0.003 μ f cap. connected to pin 4 of V12
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V4, V11
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Defl. yoke, Freq. and Lock con.
V11, V13
Check 200 μ f cap. connected to pin 1 of V13
- AUDIO HUM IN SOUND (8E)**
V7, V8, V9, V10
- DISTORTED SOUND (8D)**
Tuner fine tuning
V102, V103, V7, V8, V9, V10
Sound and Vid. IF alignment T-1, T-2
Det. alignment T-3
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V7, V8, V9, V10
Speaker (open voice coil or defective connections)
Sound and Vid. IF alignment T-1, T-2
Det. alignment T-3
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V7, V8, V9, V10
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-1, T-2, T-3
- NOISY SOUND - PIX OK**
V7, V8, V9, V10
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T-1, T-2, T-3
- INTERMITTENT SOUND - PIX OK**
V7, V8, V9, V10
Poor connections in sound system

TUBE LIST

Symbol Type Circuit Function

V101	616	RF Amp.
V102	6AK5	Mixer
V103	6J8	VHF Osc.
V201	6AG5	1st Vid. IF
V202	6AG5	2nd Vid. IF
V203	6AL5	3rd Vid. IF
V204	6AL5	4th Vid. IF
V205	6AL5	DC Restorer & Sync. Take-off
V206	6AC7	Vid. Amp.
V207	12J4	Picture Tube
V208	12LP4	Picture Tube
V209	12KP4	Picture Tube
V210	6AL5	FM Sound Limiter
V211	6AL5	FM Sound Del.
V212	6817	1st Sound Amp.
V213	6V6GT/G	2nd Sound Amp.
V214	6SN7GT	Sync. Clipper
V215	6SN7GT	Sync. Gen.
V216	6AL5	Sync. Discriminator
V217	6SN7GT	Vert. Buffer
V218	6SN7GT	Vert. Saw Gen.
V219	6V6GT	Vert. 1st Amp.
V220	6V6GT	Low-Volt. Rect.
V221	6AC7	Reactance Tube (Hor. Sync.)
V222	6BD6-G	Hor. Defl. Amp.
V223	1B3-GT/8016	High-Volt. Rect.
V224	6V6GT	Hor. Defl. Amp.
V225	6AL7GT	Tuning Indicator

KEY VOLTAGES

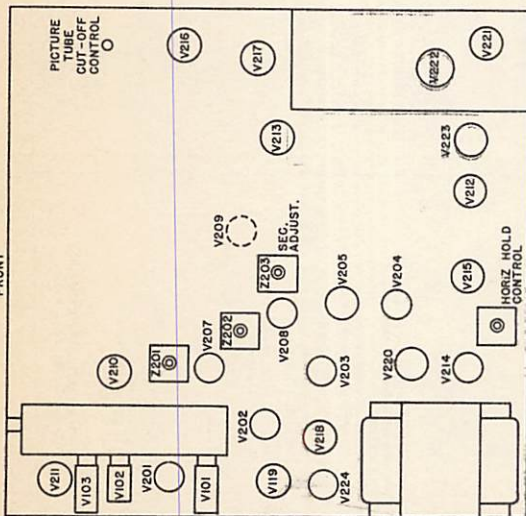
B+, plate of damper, V223 pins 4 and 5 410vdc
 Boosted B+, cath. of damper, V223 pin 8 490vdc
 Plate of Vert. Osc., V216 pin 2 200vdc
 Plate of Vert. Out., V216 pins 2 and 5 350vdc
 Plate of Hor. Osc., V221 pin 8 240vdc
 Grid of Hor. Out., V221 pin 5 -25vdc

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

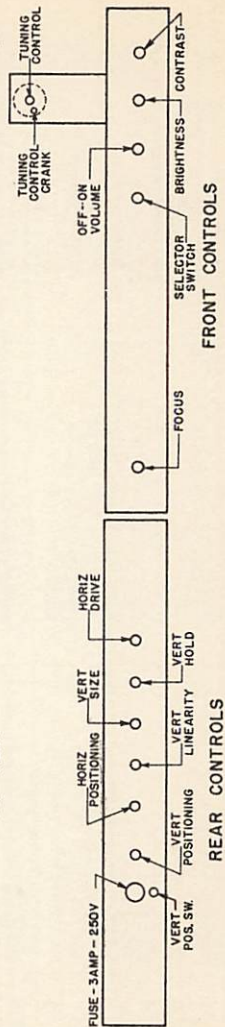
ADJUSTMENTS

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

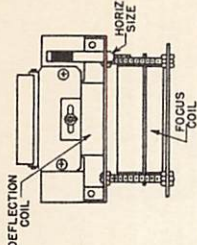
FRONT



TOP VIEW



PICTURE TUBE ADJUSTMENTS

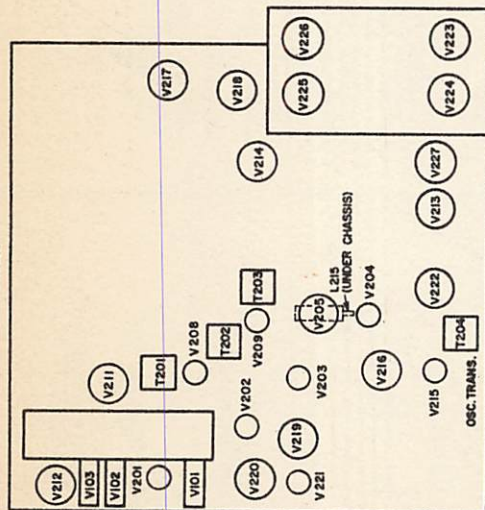


FRONT CONTROLS

REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit AC line Fuse F-207 (3 Amps) V211, V219	SOUND BARS IN PIX (4A, 4E) Tuner line tuning V101, V102, V103 V201, V202, V203 Check alignment of 4.5-mc trap connected to pin 8 of V205 (Z210) IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V101, V102, V103 V201, V202, V203 Check HV Filter cap. Check 220K Res. connected to HV Filter cap.	AUDIO HUM IN SOUND (8E) V207, V208, V209, V210, V211
NO RASTER - SOUND OK (31) Brightness con. V212, V215, V220, V221, V222, V223 Ion trap CRT	SNOW IN PIX (32) V101, V102, V103 V201, V202, V203 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Size con. V212, V218, V219, V221, V223 Check 0.001 μ f cap. connected to pin 5 of V212 Check 680 μ f cap. connected to Hor. Drive con. H.O.T.	NO SOUND - PIX OK (8B) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast con. V201, V202, V203, V204, V205	AC IN PIX (DARK HOR. BAR) (36) V101, V102, V103 V201, V202, V203, V204, V205	NO SOUND - PIX OK (8C) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	WEAK SOUND - PIX OK (8C) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
POOR HOR. LIN. V212, V221, V223 Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil H.O.T.	ENGRAVED EFFECT IN PIX (33) Tuner line tuning V101, V102, V201, V202, V203, V204 CRT Check Vid. Det. and Amp. Peaking coils	NO SOUND - PIX OK (8D) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8E) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
POOR VERT. LIN. (11, 12) V216, V217 Check two 0.1 μ f caps. connected to black lead of V.O.T.	VERT. BARS (21) Hor. Drive con. V221, V223 Defl. yoke ringing	NO SOUND - PIX OK (8F) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8G) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
PIX JITTER SIDEWAYS Hor. Hold and Phasing con. V212, V214, V215, V221 Check 0.001 μ f cap. connected to V.O.T.	PIX BENDING (22) Hor. Hold and Phasing con. V212, V214, V215, V220, V221	NO SOUND - PIX OK (8H) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8I) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
PIX JITTER UP & DOWN (16, 17) V204, V216, V217	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning Contrast con. V101, V102, V103, V201 RF and IF alignment	NO SOUND - PIX OK (8J) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8K) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
SMEARED PIX (39) Tuner line tuning Contrast con. V201, V202, V203, V204, V205	INTERMITTENT RASTER - SOUND OK Brightness con. V212, V215, V221, V222, V223 CRT	NO SOUND - PIX OK (8L) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8M) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
POOR PIX DETAIL (35) Tuner line tuning V201, V202, V203 Check Vid. Det. and Amp. Peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V212, V216, V219, V221, V223 Low line voltage	NO SOUND - PIX OK (8N) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8O) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211
	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Size and Vert. Size con. V221, V222	NO SOUND - PIX OK (8P) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211	NO SOUND - PIX OK (8Q) Tuner line tuning V101, V102, V103 V201, V202, V203, V209, V210, V211

FRONT



TUBE LIST

Symbol	Type	Circuit Function
V101	6X6	RF Amp.
V102	6AK5	Mix.
V103	6AB4	VHF Osc.
V200	6AU6	1st Vid. IF Amp.
V201	6AU6	2nd Vid. IF Amp.
V202	6AG5	3rd Vid. IF Amp.
V203	6AG5	4th Vid. IF Amp.
V204	6AL5	Vid. Det.
V204A		DC-Restorer & Sync. Take-off
V204B		Vid. Amp.
V205	6AC7	Picture Tube
V206	6AU6	1st Sound IF Amp.
V208	6AU6	2nd Sound IF Amp.
V210	6AL5	Sound Det.
V211	6S7	1st Sound Audio Amp.
V212	6V6GT	Sound Power Amp.
V213	6X4	Sync. Clipper
V213A	6SN7GT	Sync. Separator
V213B		Sync. Clipper
V214	6S7	Sync. Discriminator
V215	6AL5	Reactance Tube (Hor. Sync.)
V216	6AC7	Vert. Buffer
V217	6SN7GT	Vert. Saw Gen.
V217A		Vert. Post-Def. Amp.
V217B		Vert. Post-Def. Rect.
V218	6SN7GT	Low-Volt. Rect.
V219	5U4G	Low-Volt. Rect.
V220	5U4G	Low-Volt. Rect.
V221	6AL5	Time Delay Relay Rect.
V222	6X4	Hor. Osc.
V223	6K0GT	Hor. Defl. Amp.
V224	6BG6	Hor. Post-Def. Amp.
V225	1B5GT	High-Volt. Rect.
V226	1B5GT	High-Volt. Rect.
V227	5V4G	Hor. Damper

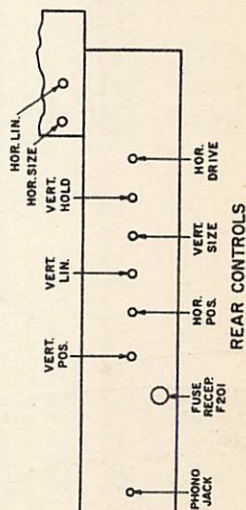
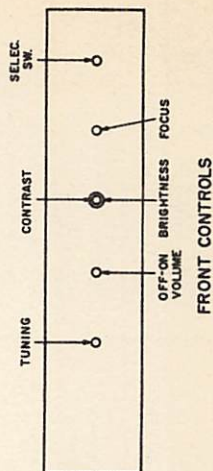
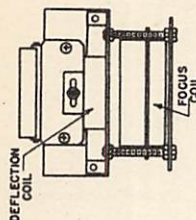
KEY VOLTAGES

B+, plates of damper, V227 pins 4 and 5 300vdc
 Boosted B+, cath. of damper, V227 pins 3 and 8 450vdc
 Plate of Vert. Osc., V217 pin 2 240vdc
 Plate of Vert. Out., V218 pins 2 and 5 320vdc
 Plate of Hor. Osc., V222 pin 3 240vdc
 Plate of Hor. Reactance Tube, V216 275vdc
 Grids of Hor. Out., V223, V224, pin 5 -20vdc
 (All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

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

PICTURE TUBE ADJUSTMENTS



REAR CONTROLS

TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V101	6X6	RF Amp.
V102	6X5	RF Mix.
V103	6AR5 or 6AB4	RF Osc.
V1	6AG5	1st Vid. IF Amp.
V2	6AG5	2nd Vid. IF Amp.
V3	6AG5	3rd Vid. IF Amp.
V4	6AR5	1st Aud. & Sync. Limiter
V5	12AU7	1st & 2nd Vid. Amp.
V6	10B4	Picture Tube
V7	6AU6	1st Sound IF Amp.
V8	6AU6	2nd Sound IF Amp.
V9	6AR5	Sound Det. & 1st Audio Amp.
V10	6AR5	Audio Out.
V11	6SN7GT	Sync. Sep.
V12	6SN7GT	Vert. Osc. & Sync. Guide
V13	6SN7GT	Hor. Osc.
V14	6BD6	Hor. Out.
V15	5Y4G	Damper
V16	6X4	High-Volt. Rect.
V17	5Y3GT	Low-Volt. Rect.
V18	5Y3GT	Low-Volt. Rect.
V19	6BE6	Conv.
V20	6BE6	Det. AVC IF Amp.
V21	6BE6	Det. AVC IF Amp.

KEY VOLTAGES

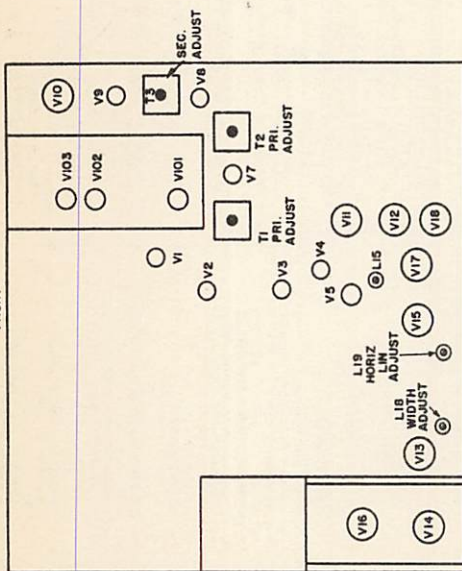
B+, plate of damper, V15 pins 4 and 6 270vdc
 Boosted B+, cath. of damper, V15 pin 8 380vdc
 Plate of Vert. Osc., V12 pin 5 18vdc
 Plate of Vert. Out., V12 pin 2 215vdc
 Plate of AFC and Hor. Osc., V13 pin 2 215vdc
 Grid of Hor. Out., V14 pin 5 -30vdc

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

ADJUSTMENTS

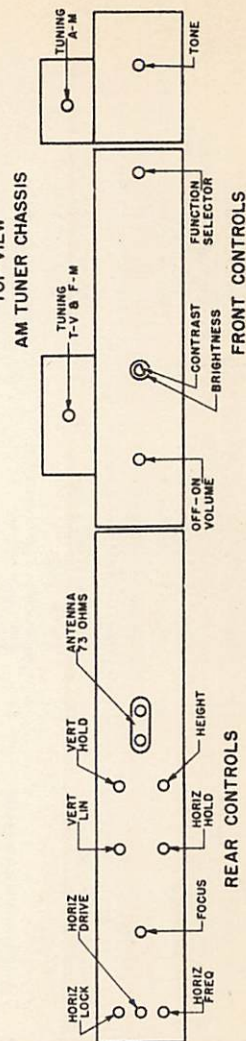
For horizontal oscillator adjustment, see HOR. OSC. ADJ. -2.

FRONT



TOP VIEW

AM TUNER CHASSIS



REAR CONTROLS

FRONT CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6AU6	1st Vid. IF Amp.
V2	6AU6	2nd Vid. IF Amp.
V3	6AG5	3rd Vid. IF Amp.
V4	6AG5	4th Vid. IF Amp.
V5	6AL5	Vid. Det., -Sync. Limiter
V6	12AU7	1st & 2nd Vid. Amp.
V7	10BP4	Picture Tube
V8	6AU6	1st Sound IF Amp.
V9	6AU6	2nd Sound IF Amp.
V10	6X8	Sound Det., 1st Audio Amp.
V11	6V6GT	Audio Out.
V12	6SN7GT	Sync. Amp. & Sep.
V13	6SN7GT	Vert. Osc. - Vert. Out.
V14	6SN7GT	Hor. Osc. - AFC
V15	6X4	Rect. Out.
V16	5Y4G	Diode
V17	1B5GT	HV Rect.
V18	5Y3GT	Rect.
V19	5Y3GT	Rect.
V101	6J6	RF Amp.
V102	6AK5	Mix.
V103	6AR4	Osc.

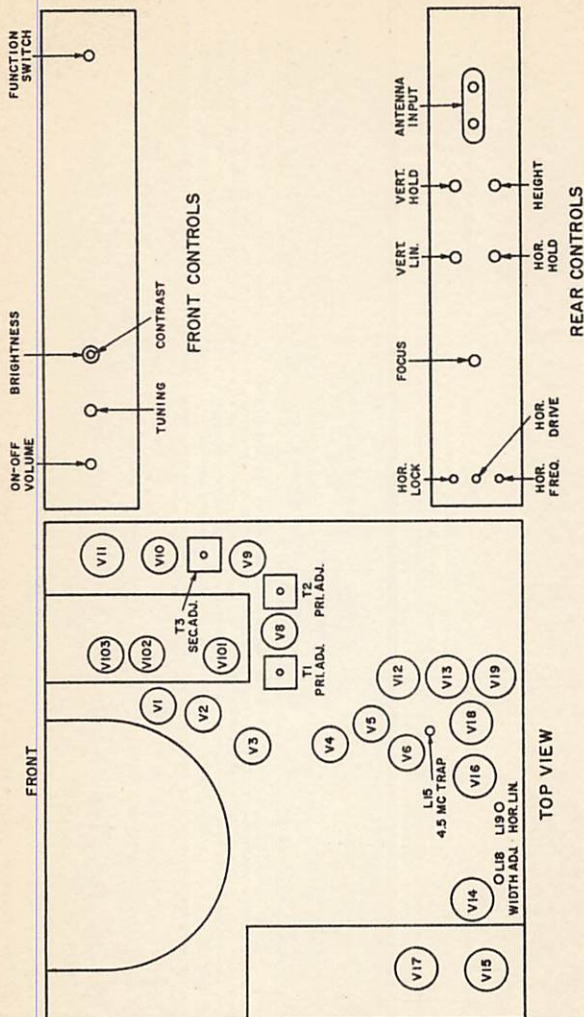
KEY VOLTAGES

B₁, plate of damper, V16 pins 4 and 6 270vdc
 B₂, cath. of damper, V16 pins 2 and 8 350vdc
 Plate of Vert. Osc., V13 pin 5 18vdc
 Plate of Vert. Out., V13 pin 2 220vdc
 Plates of Hor. Osc. and AFC, V14 pins 2 and 3 27vdc
 Grid of Hor. Osc., V15 pin 5 47vdc
 Grid of Hor. Osc., V15 pin 5 -50vdc

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

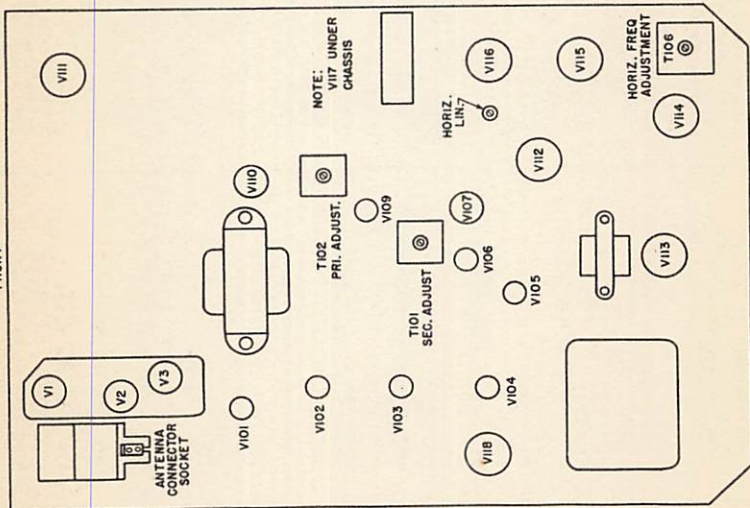
ADJUSTMENTS

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



- NO RASTER - NO SOUND (31)**
Power input circuit
V18, V19
- NO RASTER - SOUND OK (31)**
Brightness con.
HV Fuse F-1 (200 ma)
Ion trap
V7, V14, V15, V16, V17
V18, V19, V20, V21
V22, V23, V24, V25
V26, V27, V28, V29, V30, V31
V32, V33, V34, V35, V36
V37, V38, V39, V40, V41
V42, V43, V44, V45, V46
V47, V48, V49, V50, V51
V52, V53, V54, V55, V56
V57, V58, V59, V60, V61
V62, V63, V64, V65, V66
V67, V68, V69, V70, V71
V72, V73, V74, V75, V76
V77, V78, V79, V80, V81
V82, V83, V84, V85, V86
V87, V88, V89, V90, V91
V92, V93, V94, V95, V96
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V102, V103, V104, V105
V106, V107, V108, V109
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V2098, V2099, V2100, V2101
V2102, V2103, V2104, V2105
V2106, V2107, V2108, V2109
V2110, V2111, V2112, V2113
V2114, V2115, V2116, V2117
V2118, V2119, V2120, V2121
V2122, V2123, V2124, V2125
V2126, V2127, V2128, V2129
V2130, V2131, V2132, V2133
V2134, V2135, V2136, V2137
V2138, V2139, V2140, V2141
V2142, V2143, V2144, V214

FRONT



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V1	6AB4	RF Amp.
V2	6AK5	VHF Osc.
V3	6AU6	1st IF Amp.
V101	6AU6	2nd IF Amp.
V102	6AU6	3rd IF Amp.
V103	6AU6	4th IF Amp.
V104	6AU6	2nd Det. & AGC Delay
V105	6AL5	Video Amp.
V106	6X4	DC Restorer, 1st Sync. Sep. & AGC Amp.
V107	12AU6	DC Restorer, 1st Sync. Sep. & AGC Amp.
V108	12LP4 or 12TP4	Picture Tube
V109	6X4	Picture Tube
V110	6V6GT	Sound Detector & 1st Audio Amp.
V111	6V6GT	Audio Out.
V112	6SL7GT	Sync. Clipper & Sync. Out.
V113	6SN7GT	Vert. Osc.
V114	6SN7GT	AFC & Hor. Osc.
V115	6X4	Rectifier
V116	6X4	Rectifier
V117	1B3GT	HV Rect.
V118	5U4G	LV Rect.

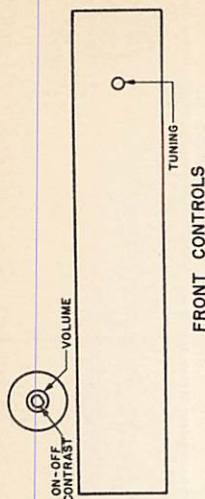
KEY VOLTAGES

B₊ plate of damper, V116 pin 5 380vdc
 Boosted B₊ cath. of damper, V116 pin 3 480vdc
 Plate of Vert. Osc., V113 pin 2 100vdc
 Plate of Vert. Osc., V113 pin 5 270vdc
 Plates of Hor. Osc. and AFC tube, V112 250vdc
 pin 1 250vdc
 pin 5 155vdc
 Grid of Hor. Output, V115 pin 5 -15vdc

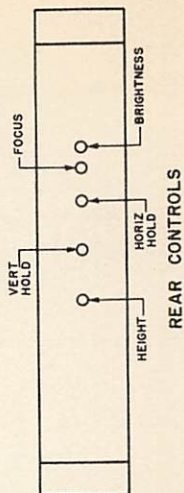
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

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



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V118	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V2, V3 V101, V102, V103, V104, V107 Check alignment of T-101 IF and RF alignment	RASTER BLOOMING (37) H.V. Filter cap. V108, V115, V116, V117, V118 Check HV Filter cap. Check 220K Ω Res. connected to HV Filter cap.	DISTORTED SOUND (8D) Tuner fine tuning V2, V3 V109, V110, V111 Check 0.02 μ f cap. connected to pin 5 of V111 Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) V107, V108, V114, V115, V116, V117 Ion trap Check HV Fuse, F-101 (0.25 Amp.) HV trans. Hor. yoke CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast con. V101, V102, V103, V104, V105, V106, V107	SNOW IN PIX (33) V1, V2 V101, V102, V103, V104, V105, V107 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3 V101, V102, V103, V104, V105, V106, V107	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V115, V116, V118 Check 390 and 2000 μ f caps. connected to Hor. Osc. trans. H.O.T. trans. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V109, V110, V111 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 0.05 and 0.02 μ f caps. connected to Hor. Lin. con. POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V113 Check 100 μ f cap. connected to pin 6 of V113 Check two 0.1 μ f caps. connected to lead of Vert. Osc. trans.	VERT. BARS (21) Hor. Drive con. V115, V116 Check 55 μ f cap. connected to yoke terminals Def. yoke ringing	NO VERT. DEF. (14) V113 Check two 0.1 μ f caps. connected to the red lead of the Vert. Osc. trans. Def. yoke V.O.T. and Vert. Osc. trans.	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V109, V110, V111 Sound and Vid. IF alignment T-101 Det. alignment T-102
PIX JITTER SIDEWAYS Hor. Hold con. Hor. Freq., Waveform and Lock Adj. V113, V114 Check 20 μ f cap. connected to pin 6 of V113 Check 0.0022 μ f cap. connected to pin 4 of V114	PIX BENDING (22) Contrast and Hor. Hold con. Hor. Freq. Waveform and Lock adj. V107, V112, V114, V115 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast con. V1, V2, V3 V101, V102, V103, V104, V105, V106, V107 RF and IF alignment	NO HOR. OR VERT. SYNC. NO HOR. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. Vert. Int. Network V112, V113 Check 0.0047 μ f cap. connected to pin 1 of V113 NO HOR. OR VERT. SYNC.	NOISY SOUND - PIX OK V109, V110, V111 Check sound system for loose connections Speaker Check sound system for loose connections Tuner fine tuning Contrast con. V1, V2, V3 V109, V110 Sound IF and Det. alignment T-101, T-102
PIX JITTER UP & DOWN (16, 17) Hor. Hold and R.T. Hold con. V107, V112, V113	INTERMITTENT RASTER - SOUND OK Brightness con. V114, V115, V116, V117 HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold con. Hor. Freq. Waveform and Lock adj. V107, V114 Check 200 μ f cap. connected to pin 1 of V114	SYNC. BUZZ IN SOUND Tuner fine tuning Contrast con. V1, V2, V3 V109, V110 Sound IF and Det. alignment T-101, T-102
SMOARED PIX (36) Tuner fine tuning Contrast con. V101, V102, V103, V104, V105, V106, V107 Check Vid. Det. and Amp. Peaking coils Check 0.05 μ f cap. connected to T-101 IF and RF alignment	INSUFFICIENT BRIGHTNESS Hor. Drive and Brightness con. V108, V115, V116, V117, V118 Low line voltage	INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system	
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V107 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V115, V116	AUDIO HUM IN SOUND (8E) V109, V110, V111	

TUBE LIST

Symbol	Type	Circuit Function
V1	6AB4	RF Amp.
V2	6AK5	Mix.
V3	6AB4	VHF Osc.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6AG5	4th IF Amp.
V105	6AL5	2nd Det. & AGC Delay
V106	6AG5	Vid. IF Amp.
V107	12AU7	DC Restorer, 1st Sync Sep.
V108	16AP4	AGC Amp. & Video Amp.
V109	6AU6	Sound Det. Driver
V110	6T8	Sound Det. & 1st Audio Amp.
V111	6V6GT	Audio Out.
V112	6SL7GT	Sync. Clipping & Sync. Out.
V113	6X4	Rect. & Video Amp.
V114	6SN7GT	AFC & Hor. Osc.
V115	6BC6G	Hor. Out.
V116	6N4GT	Hor. Damp.
V117	1X2	HW Rect.
V118	504G	LV Rect.
V119	504G	LV Rect.
V120	6X4	Rect. & Video Amp.
V121	6AU6	AGC Amp.

KEY VOLTAGES

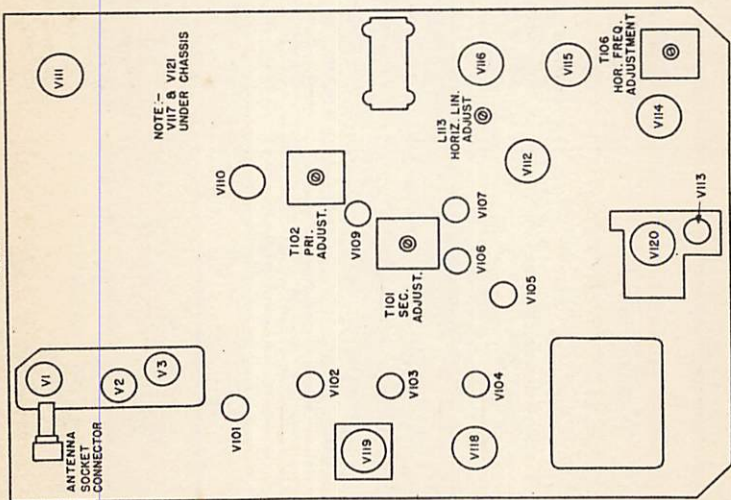
B+, plate of damper, V116 pin 5 350vdc
 Boosted B+, cath. of damper, V116 pin 2 450vdc
 Plate of Vert. Osc., V113 pin 5 220vdc
 Plate of Vert. Out., V120 pins 3 and 4 250vdc
 Plate of Hor. Osc. and AFC, V114 pin 5 250vdc
 Grid of Hor. Out., V115 pin 5 -15vdc

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

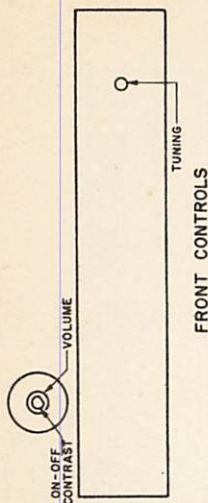
ADJUSTMENTS

For horizontal oscillator adjustment, see Hor. Osc. Adj. -2.

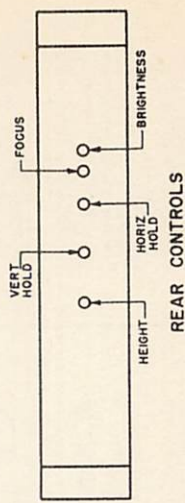
FRONT



TOP VIEW



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V118, V119	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Check alignment of T-101 V2, V3, V101, V102, V103, V104 IF and RF alignment SNOW IN PIX (32) V1, V2, V3 V101, V102, V103, V104, V105, V121 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3 V101, V102, V103, V104, V105, V106, V107, V121	RASTER BLOOMING (37) Tuner fine tuning V108, V115, V117, V118, V119 Check HV Filter cap. Check 220K Res. connected to HV Filter cap. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V115, V116, V118, V119 Check 390 and 1800 μ f caps. connected to terminal 6 of Hor. Osc. trans. Check 5.6K Res. connected to pin 6 of V115 Low line voltage H. O. T.	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111 Vol. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102 WEAK SOUND - PIX OK (8C) Tuner fine tuning V109, V110, V111 Vol. and AGC con. V3, V109, V110, V111, V121 Sound and Vid. IF alignment T-101 Det. alignment T-102 NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102 SYNC BUZZ IN SOUND Tuner fine tuning Contrast, AGC con. V106, V109, V110, V121 Sound IF and Det. alignment T-101, T-102 INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system
NO RASTER - NO SOUND (31) Power input circuit V118, V119	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Check alignment of T-101 V2, V3, V101, V102, V103, V104 IF and RF alignment SNOW IN PIX (32) V1, V2, V3 V101, V102, V103, V104, V105, V121 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3 V101, V102, V103, V104, V105, V106, V107, V121	RASTER BLOOMING (37) Tuner fine tuning V108, V115, V117, V118, V119 Check HV Filter cap. Check 220K Res. connected to HV Filter cap. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V115, V116, V118, V119 Check 390 and 1800 μ f caps. connected to terminal 6 of Hor. Osc. trans. Check 5.6K Res. connected to pin 6 of V115 Low line voltage H. O. T.	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111 Vol. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102 WEAK SOUND - PIX OK (8C) Tuner fine tuning V109, V110, V111 Vol. and AGC con. V3, V109, V110, V111, V121 Sound and Vid. IF alignment T-101 Det. alignment T-102 NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102 SYNC BUZZ IN SOUND Tuner fine tuning Contrast, AGC con. V106, V109, V110, V121 Sound IF and Det. alignment T-101, T-102 INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system
NO RASTER - NO SOUND (31) Power input circuit V118, V119	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Check alignment of T-101 V2, V3, V101, V102, V103, V104 IF and RF alignment SNOW IN PIX (32) V1, V2, V3 V101, V102, V103, V104, V105, V121 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3 V101, V102, V103, V104, V105, V106, V107, V121	RASTER BLOOMING (37) Tuner fine tuning V108, V115, V117, V118, V119 Check HV Filter cap. Check 220K Res. connected to HV Filter cap. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V115, V116, V118, V119 Check 390 and 1800 μ f caps. connected to terminal 6 of Hor. Osc. trans. Check 5.6K Res. connected to pin 6 of V115 Low line voltage H. O. T.	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111 Vol. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102 WEAK SOUND - PIX OK (8C) Tuner fine tuning V109, V110, V111 Vol. and AGC con. V3, V109, V110, V111, V121 Sound and Vid. IF alignment T-101 Det. alignment T-102 NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102 SYNC BUZZ IN SOUND Tuner fine tuning Contrast, AGC con. V106, V109, V110, V121 Sound IF and Det. alignment T-101, T-102 INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V1	6AB4	RF Amp.
V2	6CB6	Mix.
V3	6AB4	VHF Osc.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6AG5	4th IF Amp.
V105	6AL5	2nd Det. - AGC Delay
V106	6AU6	Vid. Amp.
V107	6AV6	Picture - AGC Amp.
V108	12X4A	Picture Tube
V109	6AU6	Sound Det. - AF Amp.
V110	6T8	Sound Det. - AF Amp.
V111	6V6GT	AF Out.
V112	6SL7GT	Sync. Clipper - Sync. Out.
V113	6BD6	Rect. - AF - AF Osc.
V114	6BN7GT	AF - AF Osc.
V115	6BQ7GT	Hor. Out.
V116	6W4GT	Hor. Damper
V117	1B3GT	HV Rect.
V118	5D4GT	LV Rect.
V119	6X6GT	Vid. Amp.

KEY VOLTAGES

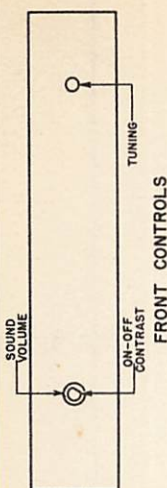
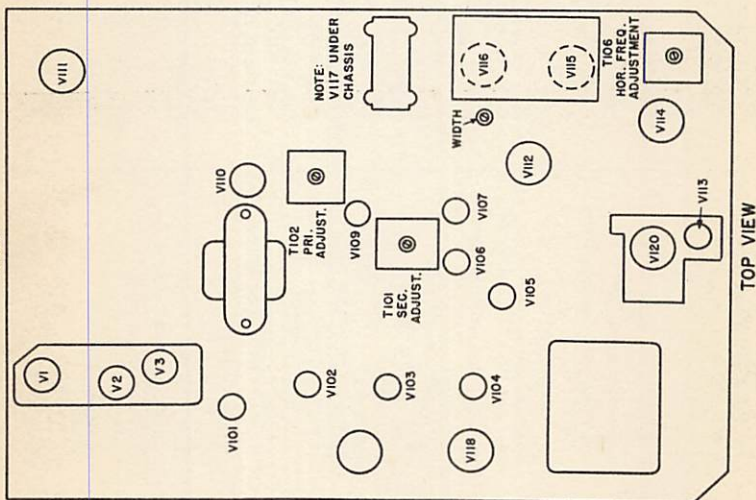
B+, plate of damper, V116 pin 5 400Vdc
 Boosted B+, cath. of damper, V116 pin 3 550Vdc
 Plate of Vert. Osc., V113 pin 5 100Vdc
 Plates of Hor. Osc. and AFC V114 pin 2 150Vdc
 pin 5 150Vdc

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

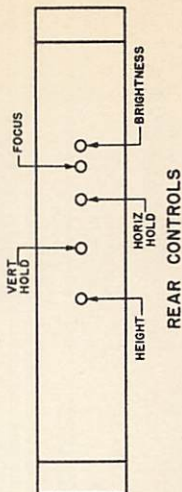
ADJUSTMENTS

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

FRONT



FRONT CONTROLS



REAR CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V118	SOUND BARS IN PIX (4A, 4E) Hor. Drive con. Check alignment of T-101 V1, V2, V3 V101, V102, V103, V104 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V1, V2, V3 Check 220K resistor connected to HV Filter cap.	DISTORTED SOUNDING (8D) Tuner fine tuning V2, V3 V109, V110, V111 Check 0.02 μ f cap. connected to Sound and Vid. IF alignment T-101 Det. alignment T-102
NO FASTER - SOUND OK (31) HV Pulse F-101 (0.25 Amps) Ion Trap V108, V114, V115, V117 HV Trans. Hor. yoke CRT connections	SNOW IN PIX (33) V1, V2, V3 V101, V102, V103, V104, V105, V107 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V1, V2, V3 Check 330 μ 2000 μ f caps. connected to terminal 6 of H. O. T. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V101, V102, V103, V104, V105, V106, V107	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V3 V101, V102, V103, V104, V105, V106, V107	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V113, V118, V119 Check 0.1 and 0.05 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V3 V109, V110, V111 Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive con. V115, V116 Check 0.1 μ f cap. connected to pin 3 of V116 H. O. T.	ENGRAVED EFFECT IN PIX (35) Tuner fine tuning Contrast and AGC con. V2, V3 V101, V102, V103, V104, V105, V106, V107, V108 Check Vid. Det. and Amp. peaking coils	NO VERT. DEFL. (14) V113, V119 Check 0.1 and 0.05 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans.	NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V113, V119 Check 0.1 and 0.05 μ f cap. connected to red lead of Vert. Osc. trans. V. O. T.	VERT. BARS (21) Hor. Drive con. V115, V116 Check 0.1 μ f cap. connected to yoke terminal Defl. yoke ringing	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. Vert. Lin. network V112, V119 Check 0.0047 μ cap. connected to pin 1 of V113	SYNC. BUZZ IN SOUND Contrast con. AGC con. V2, V3, V107, V109, V110 Sound IF and Det. alignment T-101, T-102
PIX JITTER SIDWAYS Hor. Hold, Freq., Waveform and Lock con. Check 120 μ cap. connected to pin 6 of V113 Check 0.0022 μ cap. connected to pin 4 of V114	PIX BENDING (22) Hor. Hold, Freq., Waveform and Lock con. AGC con. V107, V114, V115	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC con. V105, V107, V112	INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Vert. Hold con. Contrast and AGC con. V107, V112, V113, V119	WEAK OR NO PIX - SOUND WEAK - FASTER OK (32C, 34C) Tuner fine tuning Contrast and AGC con. V1, V2, V3 V101, V102, V103, V104, V105, V106, V107 Check Vid. Det. and Amp. peaking coils RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Freq., Waveform and Lock con. V114, V115 Check 200 μ cap. connected to pin 1 of V114	
SMEARED PIX (36) Tuner fine tuning Contrast and AGC con. V2, V3 V101, V102, V103, V104, V105, V106, V107	INTERMITTENT RASTER - SOUND OK Brightness con. V108, V114, V115, V116, V117 HV trans.	AUDIO HUM IN SOUND (8E) V109, V110, V111	
POOR PIX DETAIL (35) Focus fine tuning V101, V102, V103, V104 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V108, V115, V116, V117, V118 Low line voltage		
	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V115, V117		

NO RASTER - NO SOUND (31) Power input circuit V1, V2, V3, V101, V102, V103, V104, V105, V121	WEAK SOUND - PIX OK (8C) Tuner fine tuning V1, V2, V3, V109, V110, V111 Sound and Vid. IF alignment T-101 Det. alignment T-102	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V115, V116, V118, V119 Check 820 and 1300 μ f caps connected to terminal 6 of Hor. Osc. trans. Check 0.02 μ f cap and 0.05 μ f cap connected to pin 6 of V115 Low line voltage H.O.T.	WEAK SOUND - PIX OK V109, V110, V111 Check sound system for loose connections Sound IF and Det. alignment T-101, T-102
NO RASTER - SOUND OK (31) Brightlines con. HF fuse F-101 (0.25 Amps) on trap V1, V2, V3, V101, V102, V103, V104, V105, V106, V107, V121	NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Sound IF and Det. alignment T-101, T-102	INSUFFICIENT RASTER HEIGHT (15) Hor. Drive and Width con. V115, V118, V119, V120 Check 0.05 and 0.1 μ f cap. connected to red lead of Vert. Osc. trans. V.O.T. Low line voltage NO VERT. SYNC. - DEF. (14) V113, V120 Check 0.05 and 0.1 μ f cap. connected to red lead of Vert. Osc. trans. V.O.T. and Vert. Osc. trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hmt. Network V113, V115, V116, V117 Check 0.0047 μ f cap. connected to pin 6 of V120	SYNC. BUZZ IN SOUND AGC and Contrast con. V105, V106, V109, V110, V121 Sound IF and Det. alignment T-101, T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning AGC and Contrast con. V101, V102, V103, V104, V105, V106, V107, V121	POOR HOR. LIN. Hor. Lin. and Drive con. V115, V116 Check 0.05 and 0.1 μ f caps. connected to Hor. Lin. coil H.O.T.	POOR VERT. LIN. (11, 12) V113, V120 Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 8 of V120	INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold, Freq. and Lock con. V112, V114 Check 180 μ f cap. connected to pin 6 of V112 Check 0.0025 μ f cap. connected to pin 4 of V114	POOR VERT. LIN. (11, 12) V113, V120 Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 8 of V120	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning AGC and Contrast con. V1, V2, V3, V101, V102, V103, V104 RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightlines con. V106, V114, V115, V116, V117 HV trans.	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V121 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Freq. and Lock con. V112, V114 Check 200 μ f cap. connected to pin 1 of V114
PIX JITTER UP & DOWN (18, 17) Contrast, Vert. Hold and AGC con. V112, V113, V121	POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V105, V106 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Brightlines and Hor. Drive con. V108, V115, V116, V117, V118, V119 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Check 0.02 μ f cap. connected to pin 6 of V115 V108, V115, V117	AUDIO HUM IN SOUND (8E) V108, V110, V111 DISTORTED SOUND (8D) Tuner fine tuning V109, V110, V110, V111 Check 0.02 μ f cap. connected to pin 5 of V111 AGC and Contrast con. Sound and Vid. IF alignment T-101 Det. alignment T-102
SHARED PIX (36) Contrast and AGC con. V101, V102, V103, V104, V105, V106, V107 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V105, V106 Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V109, V110, V111 Speaker (open voice coil or defective connection) Sound and Det. alignment T-101 Det. alignment T-102	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V109, V110, V111 Speaker (open voice coil or defective connection) Sound and Det. alignment T-101 Det. alignment T-102
SOUND BASES IN PIX (4A, 4E) Check alignment of T-101 V2, V3, V101, V102, V103, V104 IF and RF alignment	SOUND BASES IN PIX (4A, 4E) Check alignment of T-101 V2, V3, V101, V102, V103, V104 IF and RF alignment		

FRONT

TUBE LIST

Symbol	Type	Circuit Function
V1	6AB4	RF Amp.
V2	6CD6	Mix.
V3	6AB4	VHF Osc.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6AU6	4th IF Amp.
V105	6AU6	2nd Det. & AGC Delay
V106	6AC5	Vid. Amp.
V107	12AU7	DC Restorer, 1st Sync. Sep. & AGC Amp.
V108	12LP4A or 12TP4A	Picture Tube
V109	6X4	Sound Det. & 1st Audio Amp.
V110	6V6GT	Audio Out.
V111	6SL7GT	Sync. Clipper & Sync. Out.
V112	6SN7GT	Vert. Osc.
V113	6SN7GT	AFC Error. Osc.
V114	6CA6	Hor. Osc.
V115	6W6GT	Hor. Damp.
V116	1B3GT	HV Rect.
V117	5U4G	LV Rect.

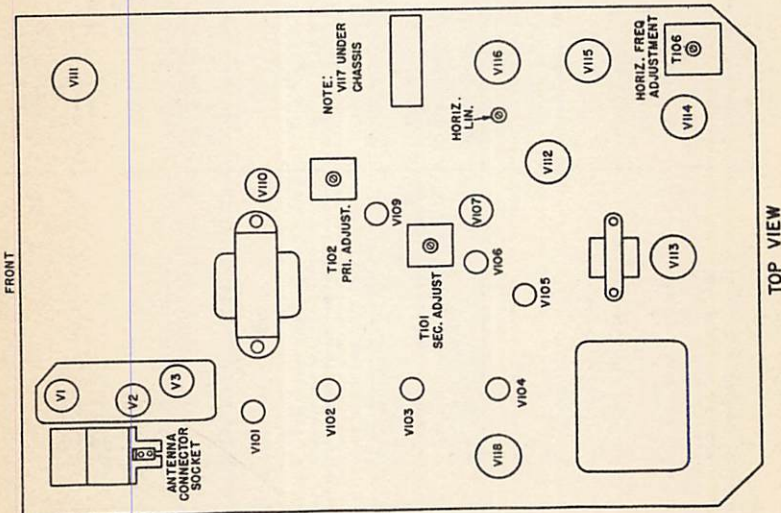
KEY VOLTAGES

B+, plate of damper, V116 pin 5	350Vdc
Boosted B+, cath. of damper, V116 pin 3	480Vdc
Plate of Vert. Osc., V113 pin 2	270Vdc
Plate of Hor. Osc. & AFC, V114 pin 2	250Vdc
Grid of Hor. Out., V115 pin 5	-15Vdc

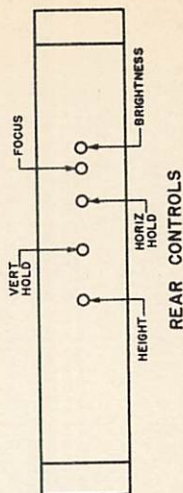
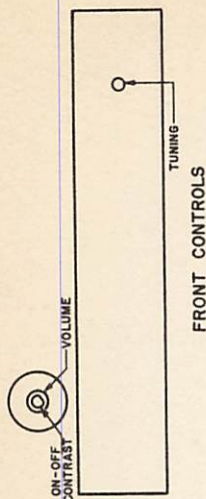
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

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



TOP VIEW



NO RASTER - NO SOUND (31) Power input circuit V118	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. V115, V117	DISTORTED SOUND (8D) Tuner fine tuning V109, V110, V111, V2 Contrast con. Check 0.02 μ f cap. connected to pin 5 of V109 Sound and Vid. IF alignment T-101 Det. alignment T-102	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111 Volume con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) Contrast con. Check alignment of T-101 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive and Width con. V114, V115, V117, V108 Check HV Filter cap. Check 220K Res. connected to HV Filter cap.	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V109, V110, V111, V112 Contrast con. Sound and Vid. IF alignment T-101 Det. alignment T-102
SNOW IN PIX (32) Contrast con. Antenna and transmission line	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105, V106 ENGRAVED EFFECT IN PIX (33)	NO VERT. SYNC. - HOR. SYNC. OK (15, 17) V12, V113 Vert. Hold con. Check 0.0047 μ f cap. connected to pin 1 of V113	NO VERT. SYNC. - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 0.05 and 0.02 μ f caps. connected to Hor. Lin. coil H.O.T.	VERT. BARS (21) Hor. Drive con. V114, V115, V116 Check 55 μ f cap. connected to Defl. yoke terminals Defl. yoke ranging	NO VERT. SYNC. - VERT. SYNC. OK Hor. Hold and Lock con. (15, 20) Bright. con. V114, V115 Check 200 μ f cap. connected to pin 1 of V114	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN. (11, 12) V115, V116 and Height con. V113 Check 0.1 μ f cap. connected to red lead of V109 trans. Check 100 μ f Elec. cap. connected to pin 6 of V114 V.O.T.	PK BENDING (22) V107, V114, V115 Contrast con. Hor. Hold and Osc. adj. Check 0.0022 μ f cap. connected to pin 4 of V114 Check 120 μ f cap. connected to pin 6 of V112	NO HOR. SYNC. - VERT. SYNC. OK Hor. Hold and Lock con. (15, 20) Bright. con. V114, V115 Check 200 μ f cap. connected to pin 1 of V114	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
PK JITTER SIDEWAYS Hor. Hold and Lock con. V109, V114 Check 0.0022 μ f cap. connected to pin 4 of V114 Check 120 μ f cap. connected to pin 6 of V112	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V104, V105, V106 Contrast con. RF and IF alignment V114, V115, V116, V117 Bright. con. HV trans.	NO HOR. SYNC. - VERT. SYNC. OK Hor. Hold and Lock con. (15, 20) Bright. con. V114, V115 Check 200 μ f cap. connected to pin 1 of V114	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. UP & DOWN (15, 17) V107, V113 Vert. Hold con. Contrast con.	INTERMITTENT RASTER - SOUND OK V114, V115, V116, V117 Bright. con. HV trans.	NO HOR. SYNC. - VERT. SYNC. OK Hor. Hold and Lock con. (15, 20) Bright. con. V114, V115 Check 200 μ f cap. connected to pin 1 of V114	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
SMEARED PIX (30) Tuner fine tuning Contrast con. V105, V106, V107 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Drive con. V114, V115, V117, V118 Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK Hor. Hold and Lock con. (15, 20) Bright. con. V114, V115 Check 200 μ f cap. connected to pin 1 of V114	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V105, V106 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus con. V105, V106 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system	NOISY SOUND - PIX OK V109, V110, V111 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AT7	VHF Osc. & Mix.
V101	6X4	Rectifier
V102	6A05	2nd IF Amp.
V103	6A05	3rd IF Amp.
V104	6AG5 cr	4th IF Amp.
V105	6AU6	2nd Det. & AGC Delay
V106	6AL5	Voice Detector
V107	12AU7	DC Resistor, Sync. Take-off & AGC Amp.
V108	12LP4A	Picture Tube
V109	6AU6	Sound Det. Driver
V110	6X4	Sound Det. & 1st Audio Amp.
V111	6BD6	Sound Amp.
V112	6SL7GT	Sync. Clipper & Sync. Out.
V113	6SN7GT	Vert. Osc. & Vert. Amp.
V114	6SN7GT	AFC & Hor. Osc.
V115	6X4	Hor. Det.
V116	6BA6	Hor. Amp.
V117	1B3GT	HV Rect.
V118	5U4G	LV Rect.

KEY VOLTAGES

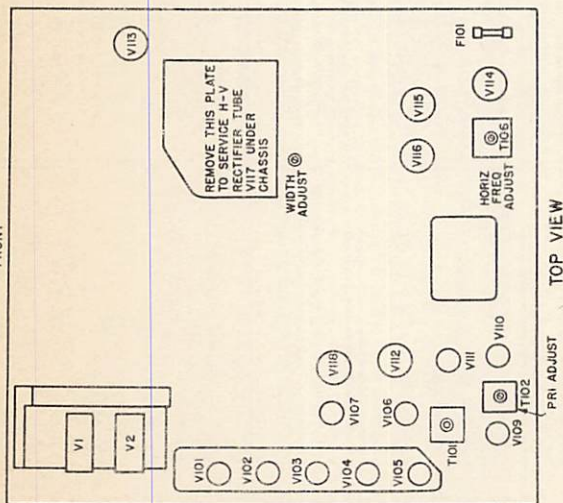
B₊ plate of damper, V118 pin 5
 Boosted B₊ cath. of damper, V116 pin 3 300vdc
 Plate of Vert. Osc., V113 pin 2 125vdc
 Plate of Vert. Osc., V113 pin 5 330vdc
 Plate of Hor. Osc. and AFC, V114 pin 2 230vdc
 Grid of Hor. Out., V115 pin 5 -20vdc

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

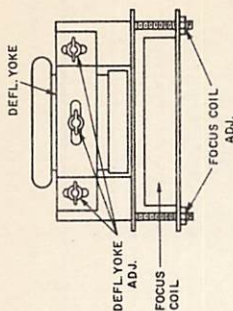
ADJUSTMENTS

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

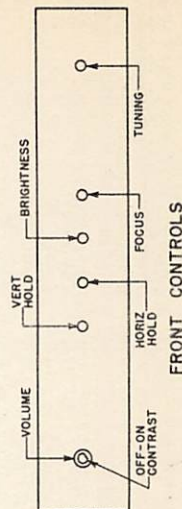
FRONT



TOP VIEW



PICTURE TUBE ADJUSTMENTS



REAR CONTROLS

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V101	6AV6	1st IF Amp. & Mix.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6AG5 or 6BC5	4th IF Amp.
V105	6AX8	2nd Det. & AGC Delay
V106	6AH6	Vid. Conv.
V107	12AU7	DC Restorer, 1st Sync.
V108	16TP4	Clipper & Noise Limiter
V109	6AU6	Picture Tube
V110	6AU6	Sound Det. & Driver
V111	6V6GT	Sound Det. & 1st Audio Amp.
V112	6AU6	AGC Amp.
V113	6SL7GT	Sync. Clipper & Sync. Out.
V114	6C4	Vert. Osc.
V115	6V6GT	Vert. Amp.
V116	6V6GT	AFC & Hor. Osc.
V117	6BD6GT	Hor. Rect.
V118	6BD6GT	Hor. Out.
V119	1B3GT	HV Rect.
V120	6W4GT	Hor. Damp.
V121	504G	LV Rect.
V122	504G	LV Rect.

KEY VOLTAGES

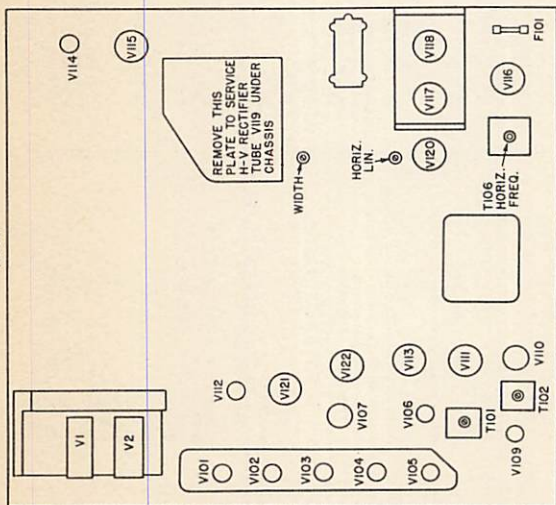
B+, plate of damper, V120 pin 5 350vdc
 Boosted B+, cath. of damper, V120 pin 3 515vdc
 Plate of Vert. Osc., V114 pin 3 350vdc
 Plate of Hor. Osc., V116 pin 3 350vdc
 Plates of Hor. Osc. & AFC, V116 pin 2 270vdc
 Grid of Hor. Osc., V117 & V118 pin 5 140vdc
 Grid of Hor. Out., V117 & V118 pin 5 -19vdc

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

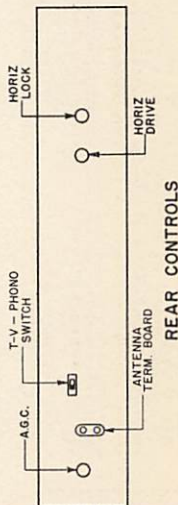
ADJUSTMENTS

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

FRONT



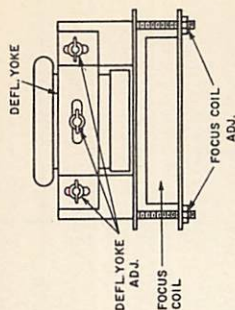
TOP VIEW



REAR CONTROLS

FRONT CONTROLS

PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31) Power input circuit V121, V122 Photo - TV switch	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check V101, V102, V103, V104, V105, V106 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V117, V118, V119, V121, V122 V108 Check HV Filter cap. Check Meggit Res. connected to HV Filter cap.	DISTORTED SOUND (8D) Tuner fine tuning V2, V102, V110, V111, V112 AGC con. Check 0.01 μ f cap. connected to pin 5 of V111 IF alignment T-101 Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) F101 HV Fuse (25 Amps Delay) V116, V117, V118, V119, V120, V108 Ion trap Brightness con. HV trans. Hor. yoke CRT connections	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V112 AGC con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) V116, V117, V118 V121, V122 Check 1000 μ f cap. connected to terminal 6 of Hor. Osc. trans. H. O. T. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V2, V102, V110, V111 AGC con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V2, V101, V102, V103, V104, V105, V106, V107 AGC and Contrast con.	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105 V106, V107	INSUFFICIENT RASTER HEIGHT (15) V114, V115 Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V102, V110, V111, V112 AGC and Vid. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V117, V118, V120 Check 100 μ f Elec. cap. connected to to Hor. Lin. coil H. O. T.	VERT. BARS (21) V116, V117, V118, V120 Check 56 μ f cap. connected to yoke terminals Defl. yoke ringing	NO VERT. DEF. (14) V114, V115 Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans.	NOISY SOUND - PIX OK V109, V110, V111 Vol. con. Check for loose connections in audio system Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN (11, 12) Vert. Lin. and Height con. V114, V115 Check 0.05 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 8 of V. O. T.	PIX BENDING (22) Hor. Hold and Osc. adj. V116, V117, V118, V112 AGC con. Check 0.02 and 0.25 μ f caps. connected to pin 6 of V116	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. Hold con. Vert. Int. Check 0.0047 μ f cap. connected to pin 6 of V114	SYNC. BUZZ IN SOUND Tuner fine tuning V105, V106, V112 Contrast con. AGC con. Sound IF and Det. alignment T-101 and T-102
PIX JITTER SIDEWAYS Hor. Hold and Lock con. Hor. Osc. adj. V117, V118 Check 160 μ f cap. connected to pin 6 of V113 Check 0.0022 μ f cap. connected to pin 4 of V116	WEAK OR NO PIX - SOUND WEAK - RASTER OK Hor. Drive and Lock con. V116, V117, V118, V119, V120 Brightness con. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V117, V118, V119, V121, V122 Low line voltage	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V112, V113, V107 AGC con. NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock con. Hor. Osc. adj. V116, V117, V118 Check 200 μ f cap. connected to pin 1 of V116	INTERMITTENT SOUND - PIX OK V109, V110, V111 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V114, V115	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. Height con. V117, V118, V119	AUDIO HUM IN SOUND (8F) V109, V110, V111	
SMEARED PIX (36) Tuner fine tuning V105, V106, V107, V112 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (85) Tuner fine tuning V106, V107, V112, V108 AGC con. Check Vid. Det. and Amp. peaking coils IF and RF alignment		

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AV7 or 12AV7	VHF Osc. & Mix.
V101	6AU6 or 6AU6	1st IF Amp.
V102	6AU6 or 6AU6	2nd IF Amp.
V103	6AG5 or 6AG5	3rd IF Amp.
V104	6AG5 or 6AG5	4th IF Amp.
V105	6AL5	2nd Det. & AGC Delay
V106	6AH6 or 6AH6	Wid. Amp.
V107	6SN7GT	DC Restorer, 1st Sync.
V108	17DP4	Clipper & Noise Limiter
V109	6AL5	2nd Det. & AGC Delay
V110	6AL5	Sound Det. Driver
V111	6V8GT	Audio Out.
V112	6AG5 or 6AG5	AGC Amp.
V113	6SL7GT	Sync. Clipper & Sync. Out.
V114	6C4	Vert. Osc.
V115	6V8GT	Vert. Amp.
V116	6SN7GT	AFC & Hor. Osc.
V117	6CD6G	Hor. Out.
V118	6V8GT	Hor. Amp.
V119	6V8GT	Hor. Damp.
V120	6V8GT	Hor. Damp.
V121	5U4G	LV Rect.
V122	5U4G	LV Rect.
V123	6AV6	Audio Amp.

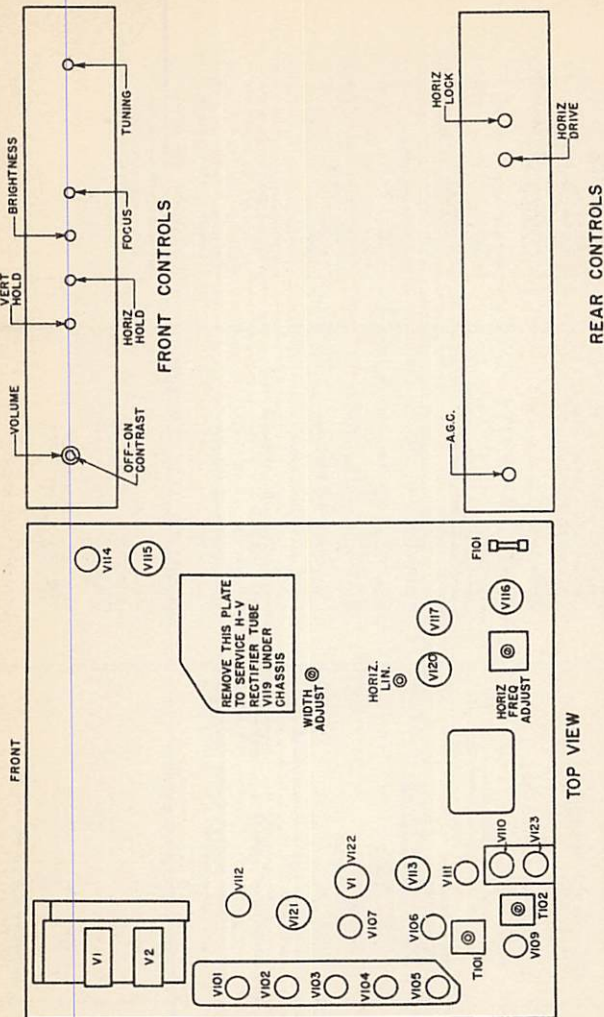
KEY VOLTAGES

B+, Plate of damper, V120 pin 5 350vdc
 Boosted B+, Cath. of damper, V120 pin 3 540vdc
 Plate of Vert. Osc., V114 pin 5 160vdc
 Plate of Vert. Out., V115 pin 3 300vdc
 Plates of Hor. Osc., V116 pin 2 150vdc
 pin 5 210vdc
 Grid of Hor. Out., V117 -24vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V121, V122 Phono-TV Switch	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check alignment of T-101 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V116, V117, V119, V108 Check HV Filter cap. Check 1 Meg 11 res. connected to HV Filter cap.	DISTORTED SOUND (8D) Tuner fine tuning V2, V109, V110, V111, V123, V112 AGC con. Check 0.1 μ f cap. connected to pin 5 of V109 Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) F-101 HV Fuse (25 Amps.) Ion trap V116, V117, V119, V120, V108 Brightness con.	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V112 AGC con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V116, V117, V121, V122 Check 820 and 1300 μ f cap. Check 100 μ f terminal 6 of Hor. Osc. trans. H.O.T. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V109, V110, V111, V123 Voi. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) AGC and Contrast con. Tuner fine tuning V2, V101, V102, V103, V104, V105, V106, V107 V107, V112	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V105, V106, V107, V112 Check Vid. Det. and Amp. peaking coils V105, V107	INSUFFICIENT RASTER HEIGHT (15) Tuner fine tuning V114, V115 Check 0.1 and 0.05 μ f caps. connected to red lead of Vert. Osc. trans. V.O.T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V109, V110, V111, V123 AGC and Voi. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V117, V116, V120 Check 0.1 and 0.05 μ f caps. connected to Hor. Lin. con. H.O.T.	VERT. BARS (21) Hor. Drive and Lin. con. Check 56 μ f cap. connected to yoke terminals Defl. yoke ringing PIX BENDING (22) Hor. Hold and Osc. adj. AGC con. V116, V117, V112	NO VERT. DEF. (14) Check 0.1 and 0.05 μ f caps. connected to red lead of Vert. Osc. trans. V.O.T. and Vert. Osc. trans.	NOISY SOUND - PIX OK V109, V110, V111, V123 Voi. con. Check for loose connections in speaker system Speaker Sound IF and Det. alignment T-101 and T-102
PIX JITTER SIDEWAYS Hor. Hold and Lock con. Hor. Osc. adj. V116, V117 Check 0.0022 μ f cap. connected to pin 3 of V116	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V104, V105, V106, V112 Contrast and AGC con. RF and IF alignment	NO HOR. SYNC. - HOR. SYNC. OK (16, 17) V112, V113, V114, V115 Vert. Hold and AGC con. V.O.T. and Vert. Osc. trans. Check 0.0047 μ f cap. connected to pin 6 of V114	SYNC. BUZZ IN SOUND Tuner fine tuning V105, V106, V107, V112 Contrast con. AGC con. Sound IF and Det. alignment T-101 and T-102
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V114, V115	INTERMITTENT RASTER - SOUND OK V116, V117, V119, V120, V107 Brightness con. HV trans.	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V113, V116, V117, V112 AGC con.	INTERMITTENT SOUND - PIX OK V103, V110, V111, V123 Poor connections in sound system
SMOARED PIX (36) Tuner fine tuning V105, V106, V107, V112 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V116, V117, V119, V121, V122, V107 Low line voltage	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock con. Hor. Osc. adj. V113, V116, V117, V112 Check 200 μ f cap. connected to pin 1 of V116	
POOR PIX DETAIL (35) Tuner fine tuning V105, V106, V107, V112 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. Height con. V117, V119	AUDIO HUM IN SOUND (8E) V109, V110, V111, V123	

NO RASTER - NO SOUND (31) Power input circuit V121, V122	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V117, V118, V120, V121, V122 Contrast and AGC con. V1, V2, V101, V102, V103, V104 IF and RF alignment Check 22K Ω Res. and 0.05 μ f caps. connected through 100K Ω Res. to pins 4 of V117 and V118 Low line voltage H. O. T.	WEAK SOUND - PIX OK (8C) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104 IF and RF alignment Det. alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) Brightness con. HV Fuse F-101 (.25 Amps. Relay Type) V1, V2, V101, V102, V103, V104 HV trans. Hor. yoke CRT connections	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V105, V112 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105, V106, V107, V112	NO SOUND - PIX OK (8B) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104 IF and RF alignment Check 1 Meg Ω Res. connected to HV Filter cap.	NOISY SOUND - PIX OK Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V101, V102, V103, V104, V105, V106, V107, V112	ENGRAVED EFFECT IN PIX (33) Contrast and AGC con. V2, V101, V102, V103, V104, V105, V106, V107, V108, V112 Check Vid. Det. and Amp. peaking coils V. O. T.	NO SOUND - PIX OK (8B) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104 IF and RF alignment Check 1 Meg Ω Res. connected to HV Filter cap.	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR HOR. LIN. Hor. Lin. and Drive con. V117, V118, V120 Check 0.1 and 0.15 μ f caps. connected to red lead of Vert. Osc. trans. H. O. T.	VERT. BARS (21) Hor. Drive con. V117, V118, V120 Check 56 μ f cap. connected to yoke terminals Defl. yoke ringing PIX BENDING (23) Hor. Hold, Freq. and Lock con. V116, V117, V118 Check 0.02 and 0.25 μ f caps. connected to pin 6 of V116 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104, V105, V106 IF and RF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. int. network Check 0.0047 μ f cap. connected to pin 6 of V114 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V113 NO HOR. SYNC. - VERT. SYNC. OK (15, 20) Hor. Hold, Freq. and Lock con. V113, V116 Check 100 μ f cap. connected to pin 1 of V113	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V114, V115 Check 0.1 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 8 of V115 V. O. T.	PIX JITTER SIDWAYS Hor. Hold, Freq. and Lock con. V113, V114 Check 180 μ f cap. connected to pin 6 of V113 PIX JITTER UP & DOWN (16, 17) V107, V112, V113, V114 Check 0.0022 μ f cap. connected to pin 4 of V114	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. int. network Check 0.0047 μ f cap. connected to pin 6 of V114 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V113 NO HOR. SYNC. - VERT. SYNC. OK (15, 20) Hor. Hold, Freq. and Lock con. V113, V116 Check 100 μ f cap. connected to pin 1 of V113	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
PIX JITTER UP & DOWN (16, 17) V107, V112, V113, V114 Check 0.0022 μ f cap. connected to pin 4 of V114	SMOARED PIX (36) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104, V105, V106, V107, V112 Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. int. network Check 0.0047 μ f cap. connected to pin 6 of V114 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V113 NO HOR. SYNC. - VERT. SYNC. OK (15, 20) Hor. Hold, Freq. and Lock con. V113, V116 Check 100 μ f cap. connected to pin 1 of V113	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V112 Check 1 Meg Ω Res. connected to IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (6, 10) Hor. Drive, Width and Height con. V117, V118, V119, V120 RASTER BLOOMING (37) Hor. Drive con. V108, V117, V118, V119, V120, V121, V122 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap.	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. int. network Check 0.0047 μ f cap. connected to pin 6 of V114 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V113 NO HOR. SYNC. - VERT. SYNC. OK (15, 20) Hor. Hold, Freq. and Lock con. V113, V116 Check 100 μ f cap. connected to pin 1 of V113	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V112 Check 1 Meg Ω Res. connected to IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (6, 10) Hor. Drive, Width and Height con. V117, V118, V119, V120 RASTER BLOOMING (37) Hor. Drive con. V108, V117, V118, V119, V120, V121, V122 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap.	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. int. network Check 0.0047 μ f cap. connected to pin 6 of V114 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V107, V112, V113 NO HOR. SYNC. - VERT. SYNC. OK (15, 20) Hor. Hold, Freq. and Lock con. V113, V116 Check 100 μ f cap. connected to pin 1 of V113	WEAK SOUND - PIX OK (8C) Vol. con. V109, V110, V111 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102

NO RASTER - NO SOUND (31) Power input circuit V121, V122 Photo-TV switch	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105 V106, V107	NO VERT. DEFL. (14) V114, V115 Vert. Defl. yoke V.O. T.	SYNC BUZZ IN SOUND Tuner line tuning V105, V106, V112 Contrast and AGC con. Sound IF and Det. alignment T101, T102 INTERMITTENT SOUND - PIX OK V108, V109, V110, V111 Poor connections in sound system
NO RASTER - SOUND OK (31) F-101 HV Fuse (.25 Amps) V116, V117, V119, V120, V108 Ion trap HV trans. Hor. yoke CRT connections	ENGRAVED EFFECT IN PIX (33) Tuner line tuning AGC and Contrast con. V105, V106, V107, V112 VERT. BARS (21) Hor. Drive V116, V117, V120 Defl. yoke raling	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V113, V114, V115 Vert. Hold con. Vert. Mt.	
WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning V2, V101, V102, V103, V104, V105, V106, V107, V112 AGC and Contrast con.	PIX BENDING (22) Hor. Hold and Osc. adj. AGC con. V116, V117, V112	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V112, V113, V107 AGC con.	
POOR HOR. LIN. Hor. Drive and Lin. con. V117, V120, V116	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning V1, V2, V101, V102, V103, V104, V105, V106 Contrast and AGC con. RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock con. Hor. Osc. adj. V116, V117, V118	
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V114, V115	INTERMITTENT RASTER - SOUND OK V116, V117, V118, V119, V120 Brightness con. HV trans.	AUDIO HUM IN SOUND (8E) V108, V109, V110, V111	
PIX JITTER SIDEWAYS Hor. Hold and Lock con. V115, V117	INSUFFICIENT RASTER - SOUND OK V116, V117, V118, V119, V120 Brightness con. HV trans.	DISTORTED SOUND (8D) Tuner line tuning V108, V109, V110, V111, V112 AGC con. Sound and Vid. IF alignment T101 Det. alignment T102	
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V114, V115	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V117, V119, V121, V122 Low line voltage	NO SOUND - PIX OK (8B) Tuner line tuning V108, V109, V110, V111 Vol. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T101 Det. alignment T102	
SMEARED PIX (36) Tuner line tuning Contrast and AGC con. V105, V106, V107, V112 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. Height con. V117, V119	WEAK SOUND - PIX OK (8C) Tuner line tuning V108, V109, V110, V111, V112 AGC and Vol. con. Sound and Vid. IF alignment T101 Det. alignment T102	
POOR PIX DETAIL (35) Tuner line tuning Focus con. V106, V107, V112, V108 AGC con. IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V117, V119 CRT R211	NOISY SOUND - PIX OK V108, V109, V110, V111 Vol. con. Check for loose connections in sound system Speaker Sound IF and Det. alignment T101, T102	
SOUND BARS IN PIX (4A, 4E) Tuner line tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check alignment of T-101 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V116, V117, V121, V122 Low line voltage		
SNOW IN PIX (32) Hor. Hold and Lock con. AGC con. Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Height con. V114, V115 Low line voltage		

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TUBE LIST

Symbol	Type	Circuit Function
V1	6CH6 or 12AV7	RF Amp.
V2	6AU6	VHF Osc. & Mix.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6CH6	4th IF Amp.
V105	6CH6	Video & Noise Limiter
V106	6CH6	Vid. Amp.
V107	6AU6	Sound Det. Driver
V108	6AU6	AGC Amp.
V109	6SL7GT	Sync. Clipper & Sync. Out.
V110	6C4	DC Restorer & Sync Take-off
V111	6X4	Low-Volt. Rect.
V112	6966GT	Audio Out.
V113	6AV6	Audio Amp. & AGC Delay
V114	6AL5	Sound Det.
V115	6W4GT	Hor. Dumper
V116	6CD6G	Hor. Output
V117	6SL7GT	Hor. Osc. & AFC
V118	6SL7GT	Vert. Osc. & Vert. Amp.
V120	183GT	High-Volt. Rect.
V121	17BR4	Picture Tube

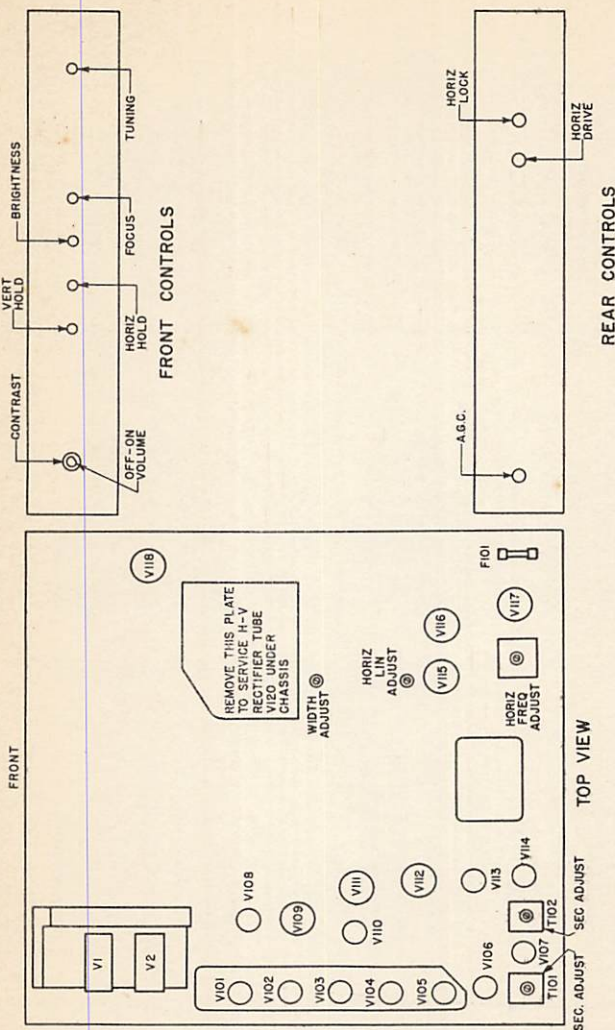
KEY VOLTAGES

B+, plate of damper, V115 pin 5	305vdc
Boosted B+, cath. of damper, V115 pin 3	480vdc
Plate of Vert. Osc., V118 pin 2	160vdc
Plate of Vert. Out., V118 pin 5	320vdc
Plates of Hor. Osc., V117 pin 2	200vdc
Grid of Hor. Out., V116 pin 5	-44vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V111	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V105, V106, V110 AGC con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V116, V117, V111 Check 820 and 1300 μ f cap. connected to terminal 6 of the Hor. Osc. trans. H. O. T. and V. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) F-101 HV Fuse (.25 Amps.) V115, V116, V117, V120, V121 HV trans. Hor. yoke CRT connections	AG IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105, V106, V108, V110 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V105, V106, V108, V110, V121 Check Vid. Det. and Amp. peaking coils	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V111, V118 Check 0.1 and 0.08 μ f cap. connected to red lead of Vert. Osc. trans. Low line voltage	NOISY SOUND - PIX OK V107, V108, V112, V113, V114, V105 Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning V2, V107, V108, V112, V113, V114, V105, V106, V108, V110, V121 AGC and Contrast con.	VERT. BARS (21) Hor. Drive con. V116, V117, V111 Check 55 μ f cap. connected to terminals of yoke Defl. yoke ringing	NO VERT. SYNC. - HOR. SYNC. OK (15, 17) V107, V108, V112, V113, V114, V105 Vert. Hold con. Vert. Int. network Check 0.0047 μ f cap. connected to pin 1 of V118	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
POOR HOR. LIN. (11, 12) Hor. Drive and Lin. con. V115, V116, V117 Check 0.08 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T.	PIX BENDING (22) Hor. Hold and Osc. adj. AGC con. V116, V117, V108, V110	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V105, V106, V109 AGC con.	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
PIX JITTER SIDEWAYS Hor. Hold and Lock con. Hor. Osc. adj. V116, V117 Check 0.0022 μ f caps. connected to pin 4 of V117	WEAK OR NO PIX - SOUND WEAK - RASTER OK (34C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V104, V105, V106, V108 Contrast and AGC con. RF and IF alignment	NO VERT. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock con. V116, V117, V118 Check 150 μ f cap. connected to pin 1 of V117	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V118	INTERMITTENT RASTER - SOUND OK V117, V118, V115, V120 Brightness con. HV trans.	AUDIO HUM IN SOUND (8E) V107, V112, V113, V114	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
SMOARED PIX (36) Tuner fine tuning V2, V107, V108, V112, V113, V114 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ben trap Hor. Drive and Hor. Drive con. V116, V117, V111 Low line voltage	DISTORTED SOUND (8D) Tuner fine tuning V107, V112, V113, V114, V108, V2 AGC con. Check 0.05 μ f cap. connected to pin 5 of V112 Sound and Vid. IF alignment T-101 Det. alignment T-102	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
POOR PIX DETAIL (35) Tuner fine tuning V2, V107, V108, V112, V113, V114 Fus and AGC con. V105, V106, V108, V110, V121 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. V116, V117, V120	NO SOUND - PIX OK (8B) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V108, V112, V113, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
SOUND BARS IN PIX (4A, 4F) Tuner fine tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check alignment of T-101 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V116, V117, V111, V121 Check HV Filter cap. HV Filter cap. HV Filter cap.		

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AV7 or 6AV6	VHF Osc. & Mix.
V101	6AV6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6CB6	4th IF Amp.
V105	6AL5	2nd Det. & Noise Limiter
V106	6AL5	Video Amp.
V107	6AL5	Sync. Separator
V108	6AU6	AGC Amp.
V109	6SL7GT	Sync. Clipper & Sync. Out.
V110	6CA	DC Restorer & Sync. Take-off
V111	5U4G	Low-Vol. Rect.
V112	6W6GT	Audio Out.
V113	6AL5	Sound Def.
V114	6W4GT	Hor. Damper
V115	6CD6G	Hor. Output
V116	6SN7GT	Hor. Osc. & AFC
V117	6SN7GT	Vert. Osc. & Vert. Amp.
V118	6AL5	Rect. & Horiz. Def.
V120	1B3GT	Rect.
V121	20CP4	Picture Tube

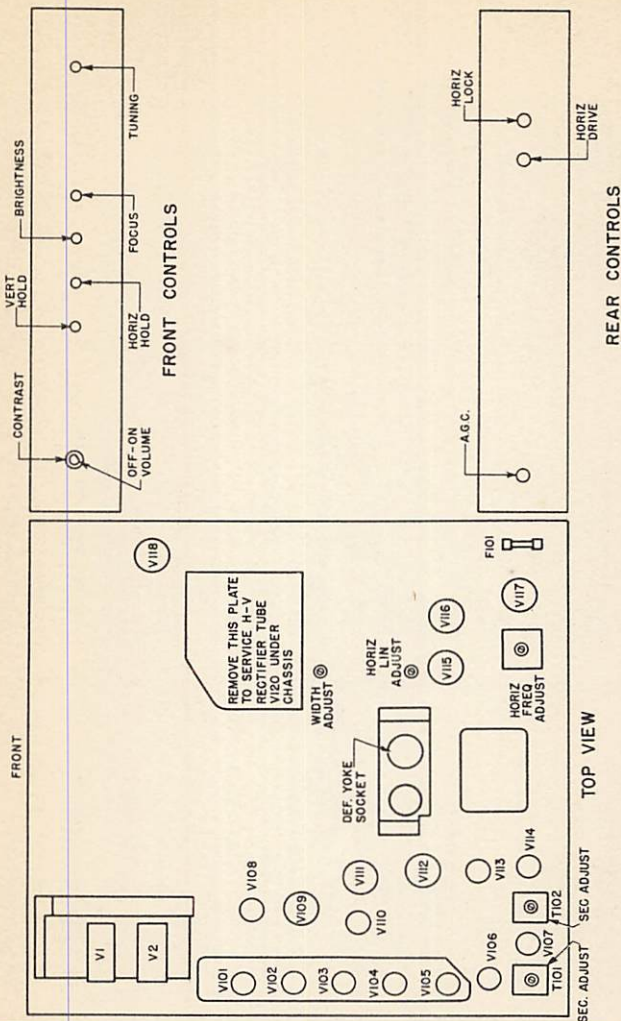
KEY VOLTAGES

B+, plate of damper, V115 pin 5 305vdc
 Boosted B+, cath. of damper, V116 pin 3 480vdc
 Plate of Vert. Osc., V118 pin 2 160vdc
 Plate of Vert. Out., V118 pin 5 320vdc
 Plate of Hor. Osc. and AFC, V117 pin 2 305vdc
 Grid of Hor. Out., V116 pin 5 -44vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V111	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check alignment of T-101 IF and RF alignment	NO SOUND - PIX OK (8B) Tuner fine tuning V107, V112, V113, V114 V105, V106, V107, V114 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) F-101 HV Fuse (25 Amps.) V115, V116, V117, V120, V121 Brightness con. HV trans.	SNOW IN PIX (32) V1, V2, V101, V102, V104, V108 AGC con. Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105, V106, V110	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V112, V113, V114 AGC and Vol. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning AGC and Contrast con. V2, V101, V102, V103, V104, V105, V106, V108, V110	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V101, V102, V103, V104, V105, V106, V108, V110, V121 Check Vid. Det. and Amp. peaking coils	NOISY SOUND - PIX OK Vol. con. Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
POOR HOR. LIN. (11, 12) Hor. Drive and Lin. con. V115, V116 Check 0.1 and 0.15 μ f caps. connected to Hor. Lin. con. H. O. T.	VERT. BARS (21) Hor. Drive con. V15, V16, V117 Check 50 μ f cap. connected to yoke terminals Defl. yoke ringing	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V109, V118 Vert. Hold and AGC con. Vert. Int. network Check 0.0047 μ f cap. connected to pin 1 of V118
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V118 Check 0.1 and 0.08 μ f caps. connected to red lead of Vert. Osc. trans. to pin 6 of V118	PIX BENDING (22) Hor. Hold and Osc. adj. AGC con. V109, V117, V118, V108 Check 0.25 and 0.02 μ f caps. connected to pin 6 of V117	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Osc. adj. Hor. Hold and Lock con. Check 100 μ f cap. connected to pin 1 of V117
PIX JITTER SIDEWAYS Hor. Hold and Lock con. Hor. Osc. adj. V116, V1022 μ f cap. connected to pin 4 of V117	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V104, V105, V106, V108, V110 Contrast and AGC con. RF and IF alignment	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V116	MEASURED PIX (36) Tuner fine tuning Contrast and AGC con. V105, V106, V108, V110 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
POOR PIX DETAIL (35) Tuner fine tuning Focus and AGC con. V105, V106, V110, V121 Check 0.15 μ f cap. connected to Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V116, V117, V120, V121, V110, V111 Low line voltage	NOISY SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V112, V113, V114 AGC and Vol. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. Height con. V116, V120	

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AT7 or 6AU6	VHF Osc. & Mix.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6CB6	4th IF Amp.
V105	6AL5	2nd Det. & Noise Limiter
V106	6CB6	Vid. Amp.
V107	6AU6	Sound Det. Driver
V108	6CB6	IF Amp. & Sync. Clipper
V109	6SL7GT	Sync. Clipper & Sync. Take-off
V110	6C4	DC Restorer & Sync. Take-off
V111	504G	Low-Volt. Rect.
V112	6W6GT	Audio Out.
V113	6AV6	Audio Amp. & AGC Delay
V114	6AV6	Audio Amp.
V115	6W6GT	Hor. Damp.
V116	6CD6G	Hor. Out.
V117	6SN7GT	Hor. Osc. & AFC
V118	6SL7GT	Vert. Osc. & Vert. Amp.
V120	1B3GT	High-Volt. Rect.
V121	6X4	Rectifier Tube
V201	6BD6	AM Det. & AVC
V202	6BA6	AM IF Amp.
V203	6AV6	AM Det. & AVC

KEY VOLTAGES

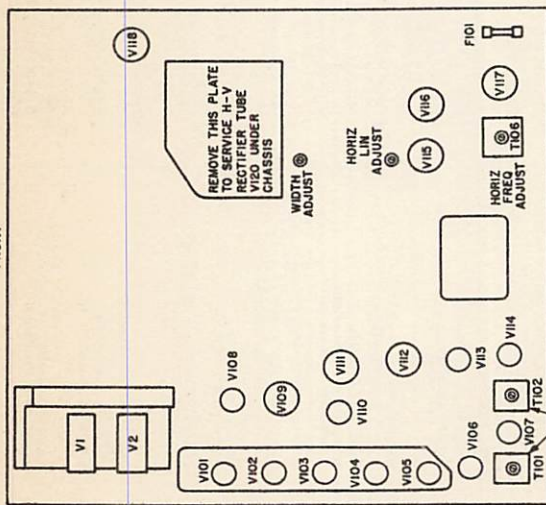
B₁ Plate of damper, V115 pin 5 305vdc
 Boosted B₁ Cath. of damper, V115 pin 3 480vdc
 Plate of Vert. Osc., V118 pin 2 160vdc
 Plate of Vert. Out., V118 pin 5 320vdc
 Plates of Hor. Osc. and AFC, V117 pin 2 305vdc
 Plate of Hor. Out., V116 pin 5 244vdc
 Grid of Hor. Out., V116 pin 5 -144vdc

ADJUSTMENTS

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

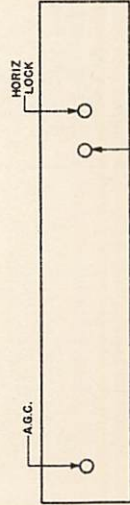
For horizontal oscillator adjustment, see HOR. OSC. ADJ. -2.

FRONT

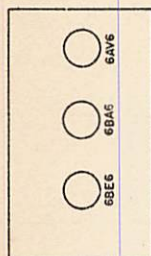
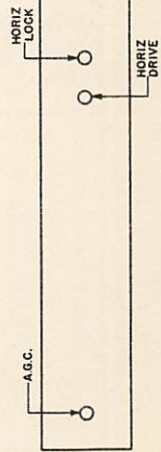


TOP VIEW

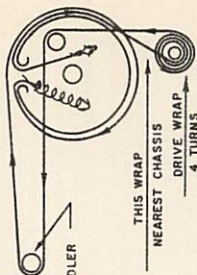
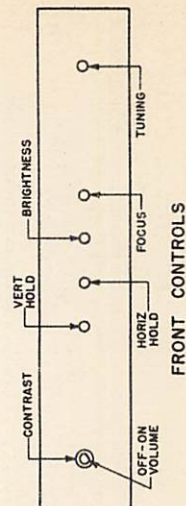
SEC. ADJUST SEC. ADJUST



REAR CONTROLS

AM CHASSIS
TOP VIEW

PLACEMENT OF DIAL DRIVE - CORD GANG IN CLOSED POSITION

DRIVE CORD ASSEMBLY
AM TUNER

FRONT CONTROLS

FRONT

TUBE LIST

Symbol	Type	Circuit Function
V1	6C96	RF Amp.
V2	12AT7 or 12AV7	VHF Osc. & Mix.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6C96	2nd Det. & Noise Limiter
V105	6AU6	Vid. Amp.
V106	6AU6	Sound Det. Driver
V107	6AU6	AGC Amp.
V108	6SL7GT	Sync. Clipper & Sync. Out.
V109	6SL7GT	DC Restorer & Sync Take-off
V110	6C96	1st Video Amp.
V111	6C96	2nd Video Amp.
V112	6C96	Audio Amp. & AGC Delay
V113	6AU6	Sound Det.
V114	6AL5	Sound Det.
V115	6W4GT	Hor. Damp.
V116	6CD6G	Hor. Out.
V117	6C96	Hor. Osc. & AVC
V118	6SL7GT	Vert. Osc. & Vert. Amp.
V119	6SL7GT	High-Volt Rect.
V120	20CP4	Picture Tube
V121	8BE6	AM Conv.
V301	6BE6	FM RF Amp.
V302	8BA6	1st FM IF Amp.
V303	8BA6	2nd FM IF Amp.
V304	8BA6	FM 2nd IF Amp.
V305	12AT7	FM RF Osc. & Mix.
V306	6T8	FM Ratio Det., AM Diode Det., & AM AVC
V401	6SO7GT	Phase Inverter
V402	6X4GT	Rect. Amp.
V403	6V6GT	Audio Amp.
V404	5Y3GT	Rect.

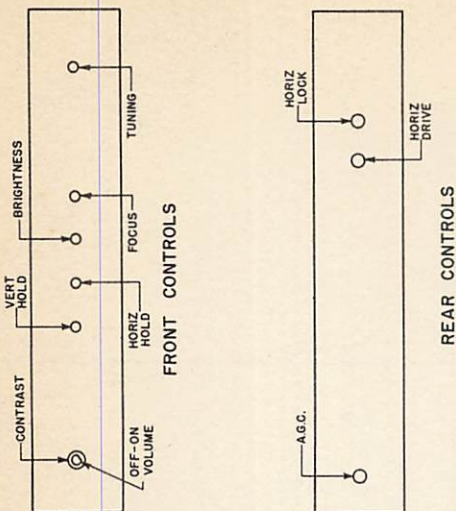
KEY VOLTAGES

B+	plate of damper, V115	pin 5	305vdc
Boosted B+	cath. of damper, V115	pin 3	485vdc
Screen Grid	V115	pin 2	305vdc
Plate of Vert. Out.	V118	pin 5	320vdc
Plates of Hor. Osc.	V117	pin 2	305vdc
Grid of Hor. Out.	V116	pin 5	230vdc
			-44vdc

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

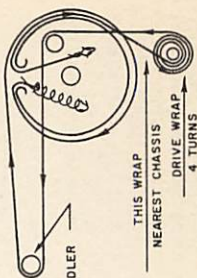
ADJUSTMENTS

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



REAR CONTROLS

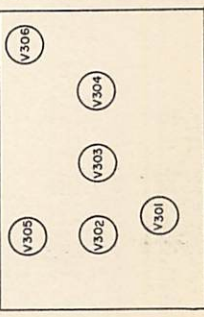
PLACEMENT OF DIAL DRIVE CORD GANG IN CLOSED POSITION



DRIVE CORD ASSEMBLY
FM-AM TUNER

TOP VIEW

SEC. ADJUST



AM-FM CHASSIS
TOP VIEW

PA CHASSIS
TOP VIEW

NO RASTER - NO SOUND (31) Power input circuit V111	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V101, V102, V103, V104, V105, V106 Contrast and AGC con. Check alignment of T-101 IF and RF alignment	NO SOUND - PIX OK (8B) Tuner fine tuning V107, V113, V114, V401, V402, V403, V404 Voi. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - SOUND OK (31) V115, V116, V117, V120, V121 Ion trap Brightness con.	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V105 AGC con. Antenna and transmission line	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V107, V113, V114, V401, V402, V403 AGC and Voi. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning AGC and Contrast con. V2, V101, V102, V103, V104, V105, V106, V110	AC IN PIX (DARK HOR. BAR) (38) V1, V2, V101, V102, V103, V104, V105, V106, V110	NOISY SOUND - PIX OK V107, V113, V114, V401, V402, V403 Voi. con. Check for loose connections on Audio Amp. Chassis and sound system of tv chassis Speaker Sound IF and Det. alignment T-101, T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 0.1 and 0.15 μ F caps. connected to Hor. Lin. coil	ENGRAVED EFFECT IN PIX (33) V115, V116 AGC and Contrast con. Check V106, V108, V110 Check Vid. Det. and Amp. peaking coils	SYNC BUZZ IN SOUND V105, V106, V107, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN. (11, 12) V118 Vert. Lin. and Height con. Check 0.1 and 0.08 μ F caps. connected to red lead of Vert. Osc. trans. V.O.T.	VERT. BARS (21) V115, V116, V117 Hor. Drive and Lin. con. Check 56 μ F cap. connected to terminals of yoke Deli. yoke ringing PIX BENDING (22) Hor. Hold and Osc. adj. AGC con. V109, V117, V116, V108	INTERMITTENT SOUND - PIX OK V107, V113, V114, V401, V402, V403, V404 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Hor. Hold and AGC con. V116 Check 0.0022 μ F cap. connected to pin 4 of V117	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V104, V105, V106, V108, V110 Contrast and AGC con. IF and RF alignment	
SMEARED PIX (36) Tuner fine tuning Contrast and AGC con. V105, V106, V108, V110 Check for loose connections on Amp. peaking coils IF and RF alignment	INTERMITTENT RASTER - SOUND OK V115, V116, V117, V120, V121 Brightness con. HV trans.	
POOR PIX DETAIL (35) Tuner fine tuning Foci and AGC con. V105, V106, V108, V110 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Drive con. V115, V117, V120, V121, V110, V111 Low line voltage	AUDIO HUM IN SOUND (8E) V107, V113, V114, V401, V402, V403
	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive and Width con. Height con. V116, V120	DISTORTED SOUND (8D) Tuner fine tuning V2, V107, V113, V114, V401, V402, V403 AGC con. Sound and Vid. IF alignment T-101 Det. alignment T-102
		NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V108, V109, V110 AGC con.
		NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Lock con. Hor. Osc. adj. V116, V117, V108 Check 160 μ F cap. connected to pin 1 of V117
		NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V109, V118 Vert. Hold and AGC con. Vert. Int. network Check 100 μ F cap. connected to pin 1 of V118
		NO VERT. DEF. (14) V118 Check 0.1 and 0.08 μ F caps. connected to red lead of Vert. Osc. trans. V.O.T. and Vert. Osc. trans.
		INSUFFICIENT RASTER HEIGHT (15) V118, V111 Check 0.1 and 0.08 μ F caps. connected to red lead of Vert. Osc. trans. V.O.T. Low line voltage
		INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V116, V117, V120 Check 1300 μ F caps. connected to terminal 6 of Hor. Osc. trans. H.O.T. Low line voltage
		RASTER BLOOMING (37) Hor. Drive con. V116, V117, V120, V121 Check HV Filter cap. Speaker (loose connection) to HV Filter cap.

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AT7 or 12AV7	VHF Osc. & Mix.
V101	6AU6	1st IF Amp.
V102	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6CB6	4th IF Amp.
V105	6AL5	2nd Det. & Noise Limiter
V106	6CB6	Vid. Amp.
V107	6AH6	Vid. Amp.
V108	6AU6	AGC Amp.
V109	6SL7GT	Sync. Clipper & Sync. Out.
V110	6C4	DC Restorer & Sync. Take-off
V111	504G	LV Rect.
V112	6W6GT	Audio Out.
V113	6AL5	Sound Rep. & AGC Delay
V114	6AL5	Sound Det.
V115	6W4GT	Hor. Damper
V116	6CD6G	Hor. Out.
V117	6SN7GT	AFC & Hor. Osc.
V118	6SL7GT	Vert. Osc. & Vert. Amp.
V119	6X4	HT Rect.
V121	17HP4A	Picture Tube
V121	21FP4A	Picture Tube

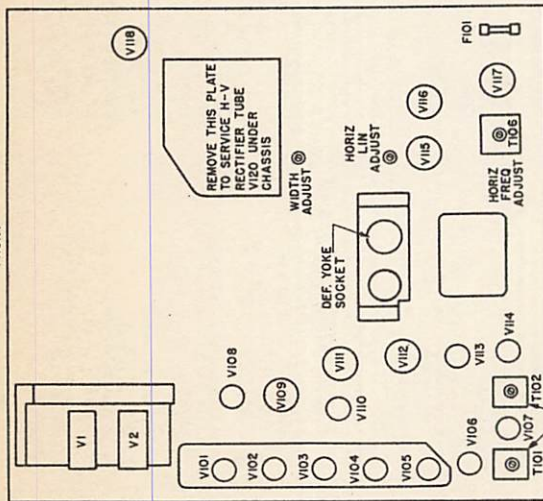
KEY VOLTAGES

B+, plate of damper, V115 pin 5 285vdc
 B+, cath. of damper, V115 pin 3 150vdc
 B+, plate of damper, V115 pin 2 150vdc
 plate of Vert. Osc., V118 pin 5 300vdc
 plates of Hor. Osc. and AFC, V117 pin 2 300vdc
 pin 5 200vdc
 Grid of Hor. Out., V116 pin 5 -4vdc
 (All voltages are measured with a VTVM connected between the tube pins and chassis.)

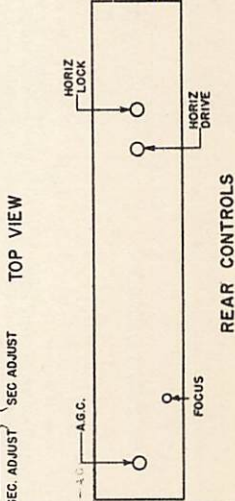
ADJUSTMENTS

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

FRONT

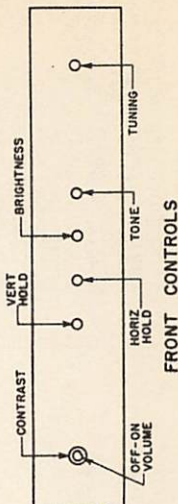


TOP VIEW

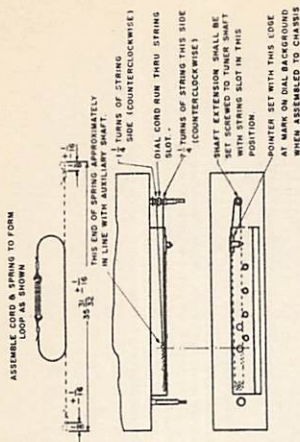


REAR CONTROLS

FRONT CONTROLS



DRIVE CORD ASSEMBLY



NO RASTER - NO SOUND (31) Power input circuit V111	POOR PIX DETAIL (35) Focus and AGC con. V106, V108, V110, V121 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Raster height and width con. V116, V120	DISTORTED SOUND (8D) Speaker (open voice coil or defective) V107, V112, V113, V114 AGC con. Contrast con. Sound and Vid. IF alignment T-101 Det. alignment T-102
NO RASTER - NO SOUND (31) Power input circuit V111	NO RASTER - SOUND OK (31) F-101 HV Fuse (2.5 Amps.) V115, V116, V117, V120, V121 Ion trap Brightness con. HV trans. Hor. yoke CRT connections	RASTER BLOOMING (37) Ion trap V111, V116, V117, V120, V121 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap.	NO SOUND - PIX OK (8B) Tuner line tuning V107, V112, V113, V114 Vol. con. Speaker (open voice coil or defective) Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning AGC and Contrast con. V106, V108, V110	SNOW IN PIX (32) V1, V2, V101, V102, V103, V104, V108 AGC con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V116, V117, V121 Check 820 and 1300 μ f caps. connected to terminal 6 of Hor. Osc. trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner line tuning V107, V112, V113, V114 AGC and Vol. con. Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 1 and 0.15 μ f caps. connected to Hor. Lin. coil H.O.T.	ENGRAVED EFFECT IN PIX (33) Tuner line tuning AGC and Contrast con. V105, V106, V108, V110, V121 Check Vid. Det. and Amp. peaking coils	NO VERT. DEF. (14) Hor. Drive and Width con. Check 0.1 and 0.08 μ f caps. connected to red lead of Vert. Osc. trans. Vert. Defl. yoke V.O.T. and Vert. Osc. trans.	NOISY SOUND - PIX OK V107, V112, V113, V114 Vol. con. Check for loose connections in sound system Speaker Sound IF and Det. alignment T-101, T-102
PIX JITTER SIDEWAYS Hor. Hold and Lock con. V116, V117 Check 180 μ f cap. connected to pin 6 of V117	PIX BENDING (32) Hor. Hold and Osc. ad. AGC con. V108, V109, V116, V117 Check 0.25 and 0.02 μ f caps. connected to pin 6 of V117	NO VERT. SYNC. - HOR. SYNC. OK (18, 17) V109, V118 Vert. Hold and AGC con. Vert. Int. network Check 0.0047 μ f cap. connected to pin 1 of V118	SYNC. BUZZ IN SOUND Tuner line tuning V105, V106, V107, V114 Contrast and AGC con. Sound IF and Det. alignment T-101, T-102
PIX JITTER UP & DOWN (16, 17) Vert. Hold and AGC con. V118	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning V1, V2, V102, V103, V104, V105, V106, V108, V110 Contrast and Lock con. RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V109, V109, V110 AGC con.	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
SMOARED PIX (36) Tuner line tuning Contrast and AGC con. V105, V106, V108, V110 Check 180 μ f cap. connected to pin 4 of V117	INTERMITTENT RASTER - SOUND OK V115, V116, V117, V120, V121 Brightness con. HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Drive and Lock con. Hor. Osc. ad. V116, V117, V108 Check 160 μ f cap. connected to pin 1 of V117	
	INSUFFICIENT BRIGHTNESS Brightness and Hor. Drive con. V116, V117, V120, V121, V110, V111 Low line voltage	AUDIO HUM IN SOUND (8E) V107, V112, V113, V114	

TUBE LIST

Symbol	Type	Circuit Function
V1	6BC5	RF Amp.
V2	6J5	VHF Osc. & Mix.
V101	6CB6	1st IF Amp.
V102	6CB6	2nd IF Amp.
V103	6CB6	3rd IF Amp.
V104	6C3	1st Audio Amp.
V105	12BH7	Vert. Osc. & Out.
V106	6AL5	Ratio Det. (Sound)
V107	6AU6	Sound Det. Driver
V108	6AH6	Vid. Amp.
V109	6AN8	Sync. & Horiz. Def.
V110	6AL5	Hor. AFC Driver & Sync. Out.
V111	6W6GT	Audio Out.
V112	6AX4	Hor. Damper
V113	6SN7GT	Hor. Osc.
V114	12X6GT	Hor. Out.
V115	12X6GT	RV Rect.
V116	17BP4 or 21MP4	Picture Tube
V116	21FP4A	Picture Tube

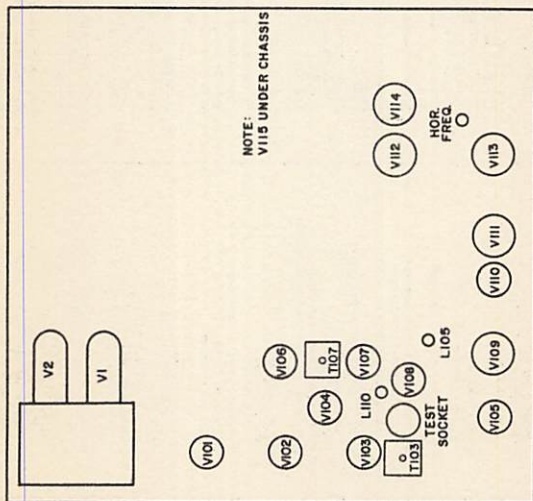
KEY VOLTAGES

B+, plate of damper, V112 pin 5 260vdc
 Boosted B+, cath. of damper, V112 pin 3 400vdc
 B-1, cath. of V105 450vdc
 Plate of Vert. Out., V105 pin 6 450vdc
 Plates of Hor. Osc., V113 pin 2 112vdc
 Grid of Hor. Osc., V113 pin 5 200vdc
 Grid of Hor. Out., V114 pin 5 -26.5vdc
 (All voltages are measured with a VTVM connected between tube pins and chassis.)

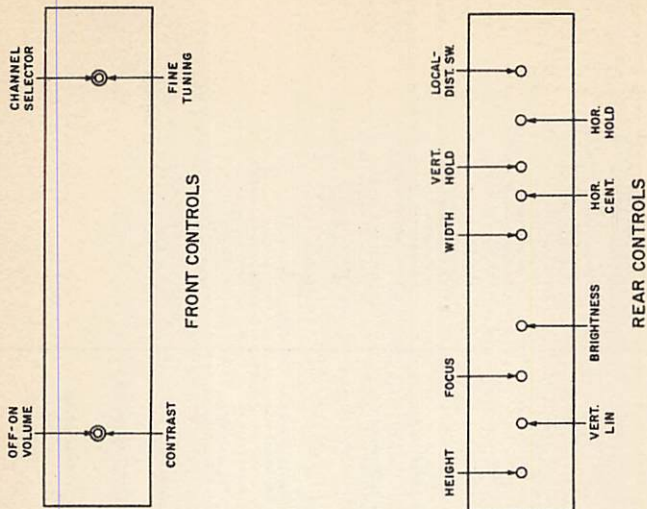
ADJUSTMENTS

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

FRONT



TOP VIEW



NO SOUND - NO SOUND (31) Power input circuit Check output of Selenium Rectifier NO RASTER - SOUND OK (31) V104, V106, V107, V111 V110, V112, V114, V115, V116 Ion trap Brightness con. HV trans. Hor. yoke CRT connections	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V101, V102, V103, V108 CR-101 Vid. Det. (IN60 or IN64 crystal) Contrast and AGC con. Check alignment of L-105 IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Check raster height con. V114, V115 RASTER BLOOMING (37) V114, V115, V116 INSUFFICIENT RASTER WIDTH (23) V113, V114 Check 560 and 5000 μ f caps. connected to pin 2 of V113 H. O. T. Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning V104, V106, V107, V111 Voc con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment L-110 Det. alignment T-107
POOR HOR. LIN. V112, V113, V114 Check 0.1 μ f cap. connected to Hor. Det. con. H. O. T.	SNOW IN PIX (32) V1, V2, V101, V102, V103 CR-101 Vid. Det. (IN60 or IN64 crystal) Part of T-103 AGC con. Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) V105 Check 0.047 μ f cap. connected to pin 1 of V105 Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning V2, V104, V106, V107, V111 AGC and Vol. con. Check alignment L-110 Det. alignment T-107
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V105 Check 0.047 μ f cap. connected to V105 Vert. Lin. con.	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning V108 and Contrast con. H. O. T. CR-101 Vid. Det. (IN60 or IN64 crystal) Part of T-103 Check Vid. Det. and Amp. peaking coils	NO VERT. DEF. (14) V105 Check 0.047 μ f cap. connected to pin 1 of V105 Vert. Def. yoke V. O. T. and Vert. Osc. trans.	NOISY SOUND - PIX OK V104, V106, V107, V111 Voc con. Check for loose connections in sound system Speaker Sound IF and Det. alignment L-110, T-107
PIX JITTER SIDEWAYS Hor. Hold and Stabilizer con. V104, V105, V113 Check 0.1 μ f cap. connected to connected to pin 5 and 7 of V110	VERT. BARS (21) V113, V114, V112 Check 47 μ f cap. connected between terminals 3 and 7 of yoke Def. yoke ringing PIX BENDING (22) Hor. Hold and Stabilizing con. V110, V113 Check 0.003 and 0.01 μ f cap. connected to pin 4 of V113	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V109 Vert. Hold and AGC con. Vert. Int. network NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V109 AGC con.	SYNC. BUZZ IN SOUND Tuner fine tuning V105, V107, V108 CR-101 Vid. Det. (IN60 or IN64 crystal) Contrast and AGC con. Sound IF and Det. alignment L-110, T-107
PIX JITTER UP & DOWN (16, 17) V105 Hor. Hold and AGC con.	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning V1, V2, V101, V102, V103, V108 CR-101 Vid. Det. (IN60 or IN64 crystal) Part of T-103 AGC con. Contrast and AGC con. RF and IF alignment	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and stabilizing con. V110, V113, V114 Check 390 μ f cap. connected to pin 5 of V113	INTERMITTENT SOUND - PIX OK V104, V106, V107, V111 Poor connections in sound system
SMEARED PIX (36) Tuner fine tuning V105, V107, V108 CR-101 Vid. Det. (IN60 or IN64 crystal) Part of T-103 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INTERMITTENT RASTER - SOUND OK (V110, V112, V113, V114, V115, V116 HV trans. Brightnes con. Ion trap Brightness con. V110, V112, V114, V116 Low line voltage	AUDIO HUM IN SOUND (8E) V104, V106, V107, V111 DISTORTED SOUND (8D) Tuner fine tuning V2, V104, V106, V107, V111 AGC con. Sound and Vid. IF alignment Det. alignment T-107	INTERMITTENT SOUND - PIX OK V104, V106, V107, V111 Poor connections in sound system
POOR PIX DETAIL (35) Tuner fine tuning V108 Focus and AGC con. CR-101 Vid. Det. (IN60 or IN64 crystal) Part of T-103 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness con. V110, V112, V114, V116 Low line voltage		

TUBE LIST

Symbol	Type	Circuit Function
V1	6CB6	RF Amp.
V2	12AT7	12.5T or VHF Osc. & Mix.
V3	6AU6	1st IF Amp.
V101	6AU6	2nd IF Amp.
V103	6AU6	3rd IF Amp.
V104	6CG6	2nd Det. & Noise Limiter
V105	6CG6	2nd Det. & Noise Limiter
V106	6AU6	Vid. Amp.
V107	6AU6	Sound Det. Driver
V108	6AU6	AGC Amp.
V109	6CG6	AGC Amp. & Sync. Out.
V110	6CG6	AGC Restorer & Sync. Take-off
V111	5U4G	LV Rect.
V112	5W6GT	Audio Out.
V113	6AV6	& AGC Delay
V114	6AV6	Audio Amp.
V115	6AV6	Audio Amp.
V116	5W6GT	R/R Damper
V117	5D5CB	RF Osc.
V118	5D5CB	AF & Hor. Osc.
V119	5BN7GT	AF & Hor. Osc.
V120	5BL7GT	AF & Hor. Osc. & Vert. Amp.
V121	5YF	RF Rect.
V122	21F24A	Picture Tube

NO RASTER - NO SOUND (31) Tuner input circuit V11	NO RASTER - SOUND OK (31) No brightness con. V115, V116, V117, V120, V121 RV Tune F-101 (0.25 Amps.) HV Trans. Hor. yoke CRT connections	SNOW IN PIX (23) V1, V2, V101, V102, V103, V104, V105, V108 Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V1, V2, V101, V102, V103, V104, V105, V108 Check 820 and 1200 μ f caps. connected to terminal 6 of Hor. Osc. trans. H. O. T. Low line voltage	NO SOUND - PIX OK (8B) Tuner line tuning V1, V2, V101, V102, V103, V104, V105, V108 V2, V107, V112, V113, V114 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102
WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast and AGC con. V101, V102, V103, V104, V105, V108	WEAK PIX - SOUND AND RASTER OK (34) Tuner line tuning Contrast and AGC con. V101, V102, V103, V104, V105, V108	AC IN PIX (DARK HOR. BAR) (8B) V1, V2, V101, V102, V103, V104, V105, V106, V108, V110	INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V111, V118 Check 0.08 and 0.1 μ f caps. connected to red lead of Vert. trans. V. O. T. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner line tuning Contrast and AGC con. V2, V107, V112, V113, V114 Sound and Vid. IF alignment T-101 Det. alignment T-102
POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 0.08 and 0.15 μ f caps. connected to Hor. Lin. coil	POOR HOR. LIN. Hor. Drive and Lin. con. V115, V116 Check 0.08 and 0.15 μ f caps. connected to Hor. Lin. coil	ENGRAVED EFFECT IN PIX (33) Tuner line tuning Contrast and AGC con. V101, V102, V103, V104, V105, V106, V109, V121 Check Vid. Det. and Amp. peaking coils	NO VERT. DEFL. (14) V118 Check 0.08 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans.	NOISY SOUND - PIX OK Vol. con. V107, V112, V113, V114 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102
POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V118 Check 0.08 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 6 of V118	POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V118 Check 0.08 and 0.1 μ f caps. connected to red lead of Vert. Osc. trans. Check 100 μ f Elec. cap. connected to pin 6 of V118	VERT. BARS (21) Hor. Drive con. V115, V116 Check 58 μ f cap. connected to yoke terminals Dht. yoke ringing	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V109, V118 Vert. Int. network Check 0.0047 μ f cap. connected to pin 1 of V118	SYNC. BUZZ IN SOUND Tuner line tuning Contrast and AGC con. V2, V107, V108, V114 Sound IF and Det. alignment T-101, T-102
PIX JITTER SIDEWAYS V109, V117 Check 180 μ f cap. connected to pin 6 of V109 Check 0.0022 μ f cap. connected to pin 4 of V117	PIX JITTER SIDEWAYS V109, V117 Check 180 μ f cap. connected to pin 6 of V109 Check 0.0022 μ f cap. connected to pin 4 of V117	WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning Contrast and AGC con. V109, V117, V120, V121 V105, V106, V108 RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC con. V109, V110, V112	INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
PIX JITTER UP & DOWN (16, 17) Contrast, Vert. Hold and AGC con. V108, V109, V118	PIX JITTER UP & DOWN (16, 17) Contrast, Vert. Hold and AGC con. V108, V109, V118	INTERMITTENT RASTER - SOUND OK Brightness con. V115, V116, V117, V120, V121 HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Freq. and Lock con. V109, V117 Check 160 μ f cap. connected to pin 1 of V117	
SMFARED PIX (36) Tuner line tuning Contrast and AGC con. V2, V101, V102, V103, V104, V105, V106, V108	SMFARED PIX (36) Tuner line tuning Contrast and AGC con. V2, V101, V102, V103, V104, V105, V106, V108	INSUFFICIENT BRIGHTNESS Ion Trap Hor. Drive and Brightness con. V111, V115, V116, V120, V121 Low line voltage	AUDIO HUM IN SOUND (8E) V107, V112, V113, V114	
POOR PIX DETAIL (35) Tuner line tuning V101, V102, V103, V104 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner line tuning V101, V102, V103, V104 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V115, V120	DISTORTED SOUND (8D) Tuner line tuning Contrast con. V2, V107, V112, V113, V114 Check 0.0015 μ f cap. connected to pin 4 of V113 Sound and Vid. IF alignment T-101 Det. alignment T-102	
SOUND BARS IN PIX (4A, 4E) Tuner line tuning Check alignment of T-101 V2, V101, V102, V103, V104 IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner line tuning Check alignment of T-101 V2, V101, V102, V103, V104 IF and RF alignment	RASTER BLOOMING (7) Hor. Drive con. V111, V115, V116, V120, V121 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap.		

NO RASTER - NO SOUND (31) Power input circuit V111 NO RASTER - SOUND OK (31) HV Power F-101 (25 Amp.) Brightness con. Ion trap V115, V116, V117, V120, V121 HV trans. Hor. yoke CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V2, V101, V102, V103, V104, V105, V106, V108 POOR HOR. LIN. Hor. Lin. and Drive con. V1, V2 Check 0.1 and 0.15 μF caps. connected to Hor. Lin. coil H. O. T. POOR VERT. LIN. (11, 12) Hor. Hold, Freq. and Lock con. V108, V109, V116, V117 Check 100 μF Elec. cap. connected to pin 6 of V118 Check 0.1 and 0.08 μF cap. connected to red lead of V118 trans. V. O. T. PIX JITTER SIDEWAYS Hor. Hold, Freq. and Lock con. V108, V109, V116, V117 Check 130 μF cap. connected to pin 6 of V109 Check 0.0022 μF cap. connected to pin 4 of V117 PIX JITTER UP & DOWN (15, 17) Vert. Hold, Contrast and AGC con. V108, V109, V118 MEASURED PIX (36) Tuner fine tuning Contrast and AGC con. V101, V102, V103, V104, V105, V106, V108 Check Vid. Det. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning Focus con. V101, V102, V103, V104, V108 Check Vid. Det. and Amp. peaking coils IF and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner fine tuning Contrast and AGC con. V2, V101, V102, V103, V104 Check alignment of T-101 IF and RF alignment SNOW IN PIX (32) V1, V2 V101, V102, V103, V104, V105, V108 Antenna and transmission line AC IN PIX (DARK HOR. BAR) (36) V1, V2 V101, V102, V103, V104, V105, V106, V108 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast and AGC con. V2, V101, V102, V103, V104, V105, V106, V108 Check Vid. Det. and Amp. peaking coils VERT. BARS (21) Hor. Drive and Lin. con. V115, V116 Check 56 μF cap. connected to yoke terminals Defl. yoke ringing PIX BENDING (22) Hor. Hold, Freq. and Lock con. V108, V109, V116, V117 Check 0.23 and 0.02 μF caps. connected to pin 6 of V117 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast and AGC con. V1, V2, V101, V102, V103, V104, V105, V106 RF and IF alignment INTERMITTENT RASTER - SOUND OK Check V101, V102, V103, V104, V105, V106, V108, V109, V110, V111, V112, V113, V114, V115, V116, V117, V120, V121 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Contrast and Hor. Drive con. V111, V115, V116, V120, V121 Low line voltage	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Width and Height con. V115, V116, V120 RASTER BLOOMING (37) Hor. Drive con. V111, V115, V116, V120, V121 Check HV Filter cap. Check 1 Meg Ω Res. connected to HV Filter cap. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Width con. V111, V115, V116 Check 560 and 1300 μF cap. connected to terminal 6 of Hor. Osc. trans. H. O. T. Low line voltage INSUFFICIENT RASTER HEIGHT (15) Height and Vert. Lin. con. V111, V118 Check 0.1 and 0.08 μF caps. connected to red lead of Vert. Osc. trans. V. O. T. Low line voltage NO VERT. DEFL. (14) V118 Check 0.1 and 0.08 μF caps. connected to red lead of Vert. Osc. trans. Defl. yoke V. O. T. and Vert. Osc. trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. V109, V118 Check 0.0047 μF cap. connected to pin 1 of V118 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK AGC con. V108, V109, V110 NO HOR. SYNC. - VERT. HOLD OK (19, 20) Hor. Hold, Freq. and Lock con. V109, V117 Check 150 μF cap. connected to pin 4 of V117	AUDIO HUM IN SOUND (8E) V107, V112, V113, V114 DISTORTED SOUND (8D) Tuner fine tuning Contrast and AGC con. V2, V107, V112, V113, V114 Sound and Vid. IF alignment T-101 Det. alignment T-102 NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V107, V108, V112, V113, V114 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment T-101 Det. alignment T-102 WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. and Contrast con. V107, V108, V112, V113, V114 Sound and Vid. IF alignment T-101 Det. alignment T-102 NOISY SOUND - PIX OK Vol. con. V107, V112, V113, V114 Check sound system for loose connections Speaker Sound IF and Det. alignment T-101, T-102 SYNC. BUZZ IN SOUND Tuner fine tuning Contrast and AGC con. V105, V106, V107, V108, V114 Sound IF and Det. alignment T-101, T-102 INTERMITTENT SOUND - PIX OK V107, V112, V113, V114 Poor connections in sound system
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TUBE LIST

Symbol	Type	Circuit Function
V101	6X6	RF Amp.
V102	6X5	Mixer
V201	6AG5	1st Vid. IF Amp.
V202	6AG5	2nd Vid. IF Amp.
V203	6AG5	3rd Vid. IF Amp.
V204	6AL5	Vid. Det. - DC Restorer
V205	6AC7	Vid. Amp.
V206	12J54 or 12J54A	Picture Tube
V207	6AU6	1st Sound IF Amp.
V208	6AU6	2nd Sound IF Amp.
V209	6AL5	Sound Det.
V210	6X7	Sound Amp.
V211	6X7	Sound Amp.
V212	6SN7-GT	Sync. Clipper - Hor. Saw. Gen.
V213	6SN7-GT	Sync. Clipper - Hor. Saw. Gen.
V214	6AL5	Sync. Discriminator
V215	6K6GT	Hor. Osc.
V216	6SN7GT	Vert. Buffer - Vert. Saw. Gen.
V217	6SN7GT	Vert. Buffer - Vert. Saw. Gen.
V218	504G	Rect.
V219	504G	Rect.
V220	6AC7	Rectance Tube
V221	6DG6G	Hor. Defl. Amp.
V222	1B3	RV Rect.
V223	5Y4G	Hor. Damp.

RADIO CHASSIS

V401	6BA6	AM-RF Amp.
V402	6BE6	AM-Converter
V403	6BA6	AM-IF Amp.
V404	6SQ7GT	AS-Def., AVC
V405	6X4	Audio Out.
V406	5Y3GT	Rect.

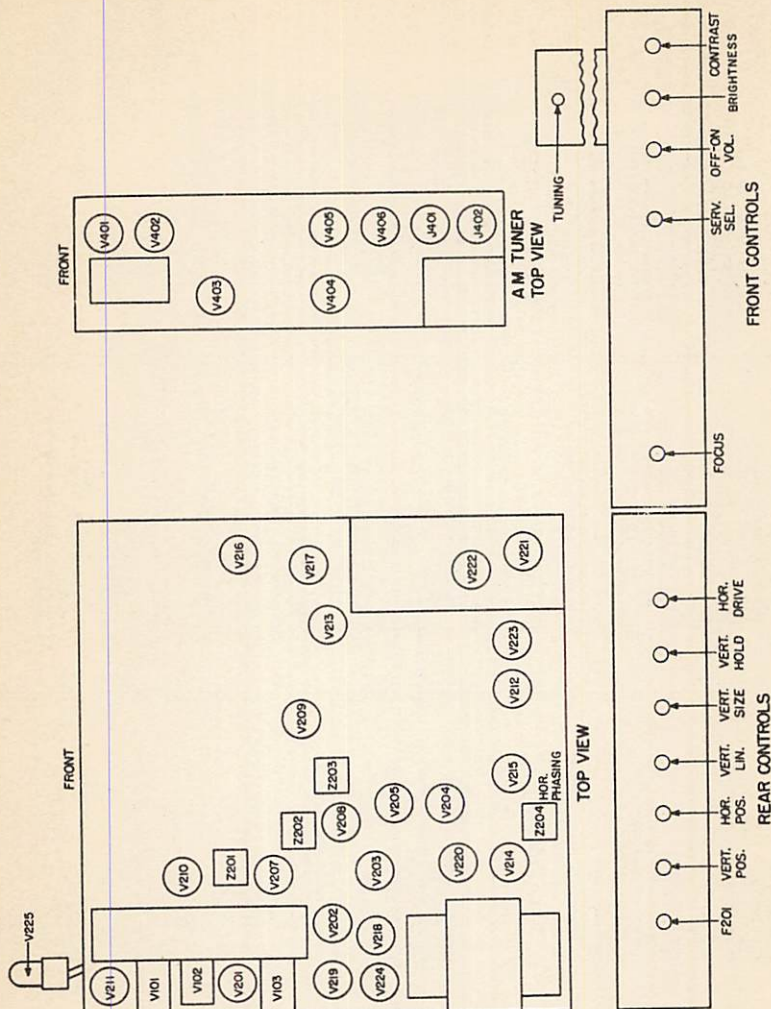
KEY VOLTAGES

B+	plate of damper, V223 pins 4 and 6	350vdc
Boosted B+	cath. of damper, V223 pin 8	450vdc
Plate of Vert. Osc.	V216 pin 5	250vdc
Grid of Hor. Osc.	V215 pins 2 and 5	325vdc
Plate of Hor. Osc.	V215 pin 3	220vdc
Plate of Rectance tube	V220 pin 8	240vdc
Grid of Hor. Out.	V221 pin 5	-25vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V210, V219, V224 Check AC line fuse F-201 (4.0 Amps.)	SNOW IN PIX (32) V101, V102, V103, V201, V202, V203, V204 Antenna and transmission line	INSUFFICIENT RASTER HEIGHT (15) Vert. Size and Lin. con. V216, V217, V218, V219 Check two 0.1 μ f caps. connected to black lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans. Low line voltage	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V102, V103 V201, V207, V208, V209, V210, V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
NO RASTER - SOUND OK (31) Brightness con. Ion trap Z204, V219, V221, V222, V223 HV Trans. Hor. yoke CRT connections WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast con. V201, V202, V203, V204, V205, V206	ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast con. V102, V103, V201, V202, V203, V204, V205, V206 Check Vid. Det. and Amp. peaking coils VERT. BARS (21) Hor. Drive con. V221, V222 Det. yoke ringing PIX BENDING (22) Hor. Hold and Phasing con. V214, V215, V220, V221 WEAK OR NO PIX - SOUND - RASTER OK (32C, 34C) Tuner fine tuning Contrast con. V101, V102, V103, V201 RF and IF alignment BRIGHTNESS con. V206, V212, V215, V221, V222, V223, V224 HV trans.	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. Vert. Int. network V216, V217 Check 0.01 μ f cap. connected to pin 1 of V216 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V204, V213 Check 0.01 μ f cap. connected to pin 7 of V204 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Phasing V213, V214, V215, V220 Check 0.005 μ f cap. connected to pin 5 of V215 AUDIO HUM IN SOUND (8F) V207, V208, V209, V210, V211 DISTORTED SOUND (8D) Tuner fine tuning V102, V103, V201, V207, V208, V209, V210, V211 Check 0.05 μ f cap. connected to pin 5 of V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NOISY SOUND - PIX OK Vol. con. V207, V208, V209, V210, V211 Check sound system for loose connections Speaker Sound IF and Det. alignment Z-201, Z-202, Z-203 INTERMITTENT SOUND - PIX OK V207, V208, V209, V210, V211 Poor connections in sound system
PIX JITTER SIDEWAYS Hor. Hold and Phasing con. V214, V215, V220 Check 47 μ f cap. connected to pin 8 of V213 PIX JITTER UP & DOWN (16, 17) Contrast and Vert. Hold con. V204, V213, V216 SMEARED PIX (30) Tuner fine tuning Contrast con. V102, V103 V201, V202, V203, V204, V205, V206 C. C. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Tuner fine tuning V101, V102, V103, V201, V202, V203, V221, V222 RASTER BLOOMING (37) Hor. Drive con. V216, V217, V221, V222 Check HV Filter cap. HV Filter cap. INSUFFICIENT RASTER WIDTH (23) Tuner fine tuning V216, V217, V221, V222 Check 27K and 22K Res. and 0.05 μ f cap. connected to pin 8 of V221 Check 0.001 μ f cap. connected to pin 5 of V212 Low line voltage H. O. T.	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. Vert. Int. network V216, V217 Check 0.01 μ f cap. connected to pin 1 of V216 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V204, V213 Check 0.01 μ f cap. connected to pin 7 of V204 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Phasing V213, V214, V215, V220 Check 0.005 μ f cap. connected to pin 5 of V215 AUDIO HUM IN SOUND (8F) V207, V208, V209, V210, V211 DISTORTED SOUND (8D) Tuner fine tuning V102, V103, V201, V207, V208, V209, V210, V211 Check 0.05 μ f cap. connected to pin 5 of V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V102, V103 V201, V207, V208, V209, V210, V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
POOR HOR. LIN. Hor. Lin. and Hor. Drive con. V221, V223 Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil H. O. T. POOR VERT. LIN. (11, 12) Vert. Lin. and Size con. V216, V217 Check two 0.1 μ f caps. connected to Vert. Osc. trans. Check 25 μ f cap. connected to pins 3 and 6 of V217 PIX JITTER SIDEWAYS Hor. Hold and Phasing con. V214, V215, V220 Check 47 μ f cap. connected to pin 8 of V213 PIX JITTER UP & DOWN (16, 17) Contrast and Vert. Hold con. V204, V213, V216 SMEARED PIX (30) Tuner fine tuning Contrast con. V102, V103 V201, V202, V203, V204, V205, V206 C. C. and Amp. peaking coils IF and RF alignment	POOR PIX DETAIL (35) Tuner fine tuning V201, V202, V203, V204 Check Vid. Det. and Amp. peaking coils IF and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V103, V201, V202, V203 Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO VERT. SYNC. - HOR. SYNC. OK (16, 17) Vert. Hold con. Vert. Int. network V216, V217 Check 0.01 μ f cap. connected to pin 1 of V216 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V204, V213 Check 0.01 μ f cap. connected to pin 7 of V204 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Phasing V213, V214, V215, V220 Check 0.005 μ f cap. connected to pin 5 of V215 AUDIO HUM IN SOUND (8F) V207, V208, V209, V210, V211 DISTORTED SOUND (8D) Tuner fine tuning V102, V103, V201, V207, V208, V209, V210, V211 Check 0.05 μ f cap. connected to pin 5 of V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V102, V103 V201, V207, V208, V209, V210, V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203

TUBE LIST

Symbol	Type	Circuit Function
V101	6E6	RF Amp.
V102	6AR5	W.F. Osc.
V103	6AG5	1st Vid. IF
V202	6AG5	2nd Vid. IF
V203	6AG5	3rd Vid. IF
V204A	6AL5	Vid. Det.
V204B		DC Rectifier & Sync.
V205	6AC7	Vid. Amp.
V206	12JF4	Picture Tube
V207	6AU6	1st Sound IF
V208	6AU6	FM Sound Limiter
V209	6AL5	1st Sound IF
V210	6AG5	1st Sound Amp.
V211	6V6GT/G	Sound Power Amp.
V212A	6SN7GT	Sync. Clipper
V212B		Hor. Saw Gen.
V213	6BT6	Sync. Clipper
V214	6X4	Sync. Discriminator
V215	6X4GT/G	Hor. Osc.
V216A	6SN7GT	Vert. Buffer
V216B		Vert. Saw Gen.
V217	6SN7GT	Vert. Defl. Amp.
V218	504G	Low-Volt. Rect.
V219	6X4	Low-Volt. Rect.
V220	6V6GT	Rect. & Hor. Drive
V221	6BQ6G	Rect. & Hor. Drive
V222	1B5GT/8018	High-Volt. Rect.
V223	5Y4G	Hor. Damping
V224	6AL5	Time Delay Relay Tube

RADIO CHASSIS

V401	6BA6	AM-RF Amp.
V402	6BE6	AM-Converter.
V403	6BA6	AM-IF Amp.
V404	6SQ7GT	AM-Det., AVC
V405	6V6GT	Audio Out.
V406	5Y3GT	Rect.

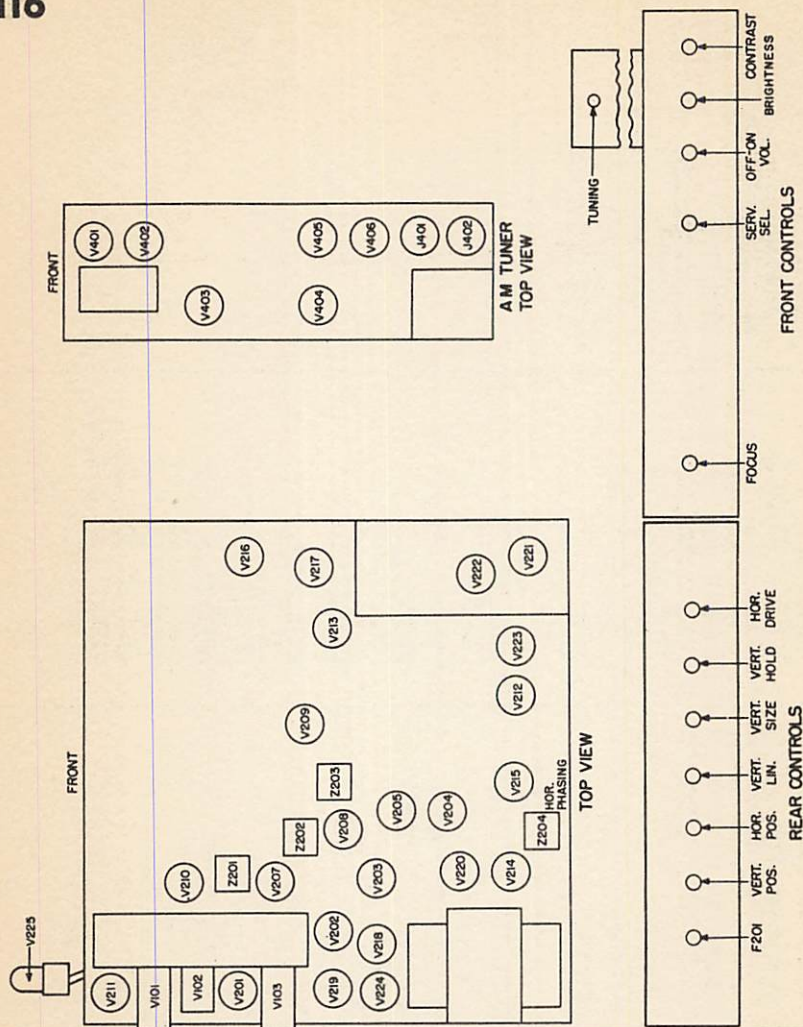
KEY VOLTAGES

B+, plates of damper, V223 pins 4 and 6 350vdc
 B-1, cathode of V223 pin 3 125vdc
 Plate of Vert. Osc., V217 pin 2 125vdc
 Plates of Vert. Osc., V217 pins 2 and 5 238vdc
 Plate of Hor. Osc., V215 pin 3 200vdc
 Plate of Rectance Tube, V220 pin 8 235vdc
 Grid of Hor. Out., V231 pin 5 -25vdc

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

ADJUSTMENTS

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



FRONT CONTROLS

ADJUSTMENTS

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

NO RASTER - NO SOUND (31) Power input circuit V20	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V103 V201, V202, V203, V204 Check alignment of 4.5-mc trap connected to pin 8 of V205 IF and RF alignment	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Size con. V216, V219, V221, V223, V226, V227 Check 0.01 μ f cap. connected to pin 5 of V212 Check 2200 μ f cap. connected to Hor. Drive con. Det. alignment Z-203	WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. con. V102, V103, V201, V207, V208, V209, V210, V211 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
NO RASTER - SOUND OK (31) Brightness con. V212, V214, V215, V220, V221, V222, V223 Ion trap HV Fuse F-302 (0.25 Amp.) HV trans. Hor. yoke CRT connections HV trans. Hor. yoke CRT connections	SNOW IN PIX (32) V101, V102, V103 V201, V202, V203 Contrast con. Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V101, V102, V103 V201, V202, V203, V204, V205	NOISY SOUND - PIX OK Vpl. con. V207, V208, V209, V210, V211 Check 2200 μ f cap. connected to loose connections Speaker Sound IF and Det. alignment Z-201, Z-202, Z-203	INTERMITTENT SOUND - PIX OK V207, V208, V209, V210, V211 poor connections in sound system
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast con. V201, V202, V203, V204, V205	POOR HOR. LIN. Hor. Drive and Lin. con. Check 0.03 and 0.05 μ f caps. connected to Hor. Lin. coil POOR VERT. LIN. (11, 12) Vert. Lin. and Size con. V216, V217, 0.1 μ f caps. connected to Contrast con. Check 25 μ f Elec. cap. connected to pins 3 and 6 of V217 V.O.T.	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
PIX JITTER SIDEWAYS Hor. Hold and Phasing V214, V215, V220 Check 0.01 μ f cap. connected to pins 1 and 5 of V214 Check 47 μ f cap. connected to pin 8 of V215	PIX BENDING (22) Hor. Hold, Drive and Phasing con. V212, V214, V215, V220, V221 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner fine tuning Contrast con. V101, V102, V103, V201 RF and IF alignment	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
PIX JITTER UP & DOWN (16, 17) Contrast and Vert. Hold con. V215, V216, V217	INTERMITTENT RASTER - SOUND OK Brightness con. V209, V212, V215, V216, V220, V221, V222, V223 HV trans.	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
SMEARED PIX (36) Tuner fine tuning Focus con. V102, V103 V201, V202, V203, V204, V205 Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V206, V218, V219, V220, V221, V222, V223, V226, V227 Low line voltage	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V201, V202, V203, V204, V205 Check Vid. Det. and Amp. peaking coils IF and RF alignment	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Size and Vert. Size con. V205, V221, V222	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
POOR PIX DETAIL (35) Tuner fine tuning Focus con. V201, V202, V203, V204, V205 Check Vid. Det. and Amp. peaking coils IF and RF alignment	RASTER BLOOMING (37) V206, V216, V219, V220, V221, V222, V223, V226, V227 Check HV Filter cap. Check 220K Ω Res. connected to HV Filter cap.	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203	NO SOUND - PIX OK (8B) Tuner fine tuning Vol. con. V207, V208, V209, V210, V211 Speaker (check for defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203

TUBE LIST

Symbol	Type	Circuit Function
V101	G16	R/F Amp.
V102	GAK5	Mix.
V103	G16	VHF Osc.
V201	GAK5	VHF Mixer
V202	GAK5	3rd VLF IF
V203	GAK5	3rd VLF IF
V204	GAK5	Vid. Dec. & AGC Diode
V205	GAK5	Vid. Dec. & AGC Diode
V206A	12AU7	Znd Vid. Amp.
V206B	12AU7	Znd Vid. Amp.
V207	G9X7	Dc Restorer
V208	G9X7	Picture Tube
V209	15AP4	Automatic Gain Cont.
V210	6AT5	Sound Indicator
V211	6AL7	2nd Sound IF & Limiter
V212	6AL7	Tuning Indicator
V213	6AL7	1st Sound Amp.
V214	6G7/G	2nd Sound Amp.
V215	6AL5	Sync. Discriminator
V216	6AL5	Sync. Discriminator
V217	6G7/G	Video Buffer
V218	68N7	Vert. Defl. Gen.
V219	68N7	Vert. Defl. Amp.
V220	68N7	Low-Volt. Rect.
V221	31AG5	Reaction Tube
V222	31AG5	Reaction Tube
V223	6AC7	Reaction Tube

FLYBACK POWER SUPPLY CHASSIS

V401A	12AU7	Hor. Saw. Maker
V401B		Relay Cont.
V402	6BG6G	Hor. Sweep Amp.
V403	1B3GT/8016	High-Volt. Rect.
V404	1B3GT/8016	High-Volt. Rect.
V405	5V4G	Damper
V406	6X4	Negative-Volt. Rect.
V407	6X4	Negative-Volt. Rect.

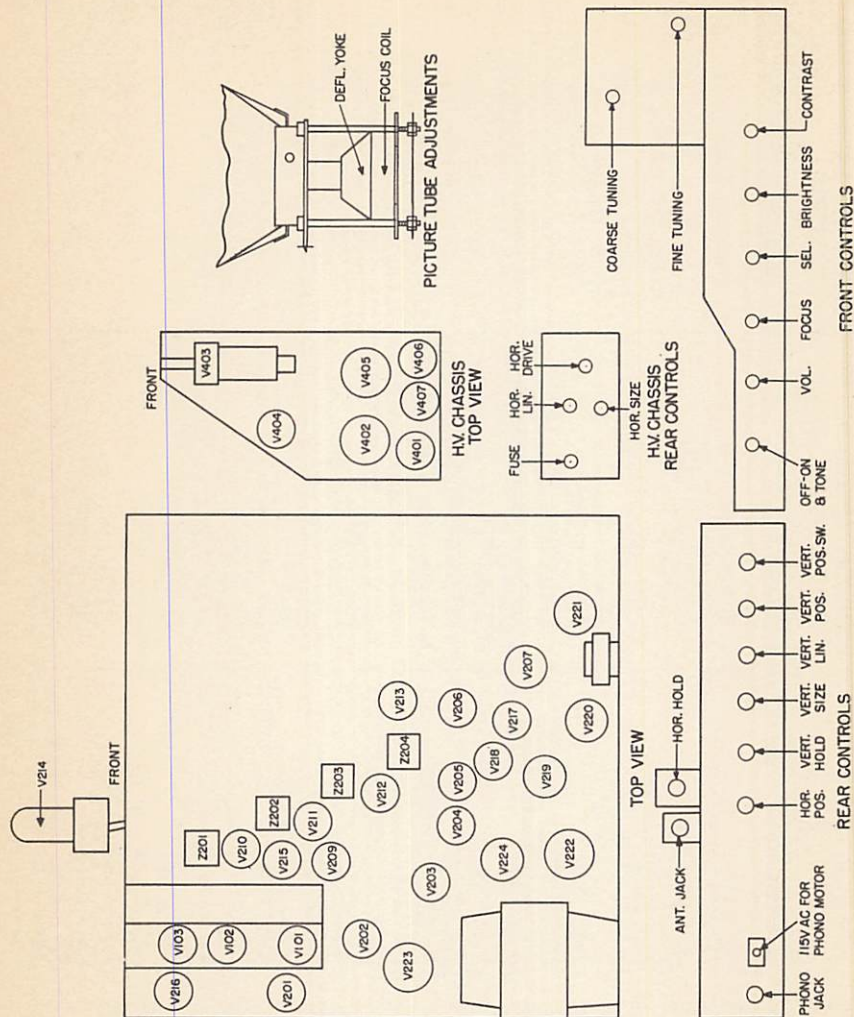
KEY VOLTAGES

B. plates of damper, V405 pins 4 and 6	300rdc
Booster B3, cath. of damper, V405 pin 8	470rdc
Plate of Vert. Osc., V220 pin 2	130rdc
Plates of Vert. Osc., V221 pin 2 and 5	335rdc
Plates of Vert. Osc., V219 pin 3	220rdc
Plate of Reactance Tube, V224 pin 8	235rdc
Grid of Hor. Osc., V402 pin 5	110rdc

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

ADJUSTMENTS

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



TUBE LIST

Symbol	Type	Circuit Function
V101	6J6	RF Amp.
V102	6AK5	Mixer
V103	6AR5	VHF Osc.
V104	6AV6	1st V.F. IF Amp.
V203	6AG5	2nd V.F. IF Amp.
V204	6AG5	3rd V.F. IF Amp.
V205	6AL5	Vid. Det. - AGC
V206	6BA6	1st Vid. Amp.
V207	12AU7	2nd Vid. Amp. - DC Restorer
V208	6AV6	3rd Vid. IF Amp.
V209	6AU6	1st Sound IF Amp.
V210	6AU6	2nd Sound IF Amp.
V211	6AU6	3rd Sound IF Amp.
V212	6AL5	Sound Discriminator
V213	6AL5	Tuning Indicator
V214	6AL7	1st AF Amp.
V215	6AL7	2nd AF Amp.
V216	6V6GT	Sound Out.
V217	6AG5	Sync. Clipper
V218	6AL5	Sync. Discriminator
V219	6K6GT	Hor. Osc.
V220	6SS7GT	Vert. Buffer - Vert. Saw. Gen.
V221	6K6GT	Rect. - Ddl. Amp.
V222	5U4G	Rect.
V223	5U4G	Rectance Tube
V224	6AC7	Rect.
V225	6AU6	Sync. Amp.
V226	6AL5	Sync. & AGC Rect.

HV CHASSIS

V401	12AU7	Hor. Saw. Maker - Relay Cont
V402	6BG6G	Hor. Sweep Amp.
V403	1B5GT	HV Rect.
V404	6X4	Rect.
V405	5V4G	Damper
V406	6X4	Rect.
V407	6X4	Rect.

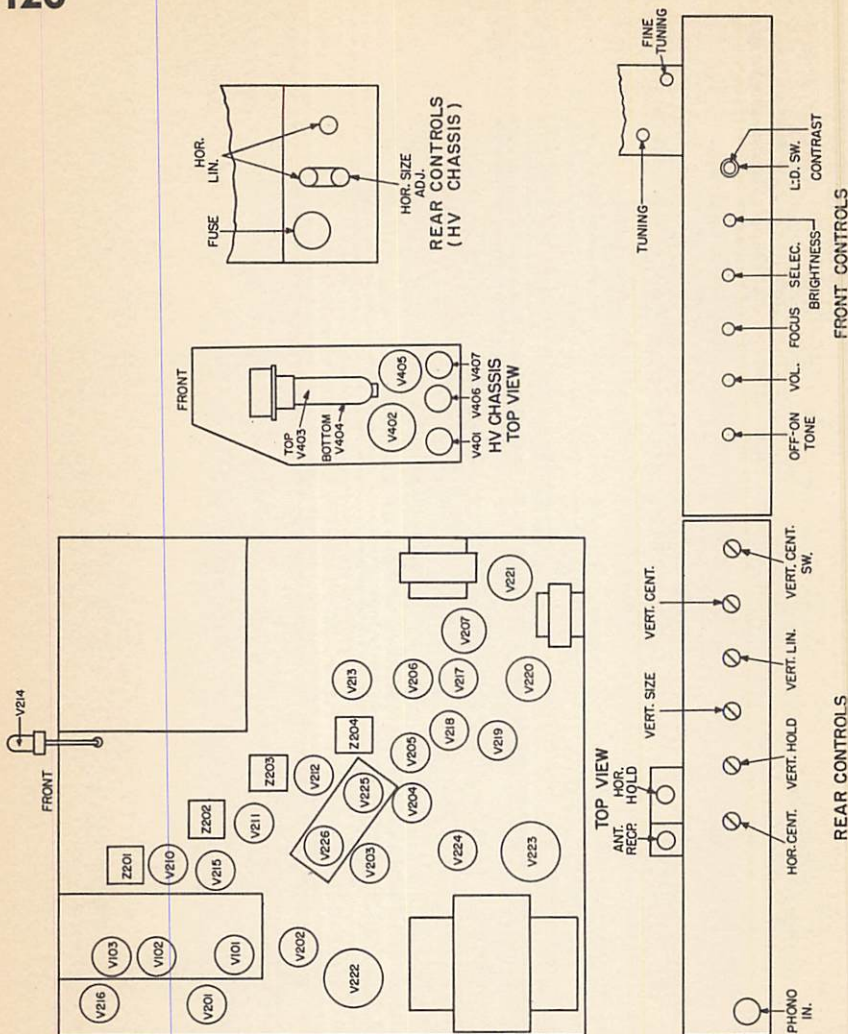
KEY VOLTAGES

B+	plate of damper, V405 pins 4 and 6	390Vdc
Boosted B+	cath. of damper, V405 pin 8	478Vdc
Plate of Vert. Osc.	V220 pin 2	130Vdc
Grid of Hor. Osc.	V219 pin 3 and 5	185Vdc
Plate of Hor. Res. Tube	V224 pin 8	185Vdc
Grid of Hor. Osc.	V402 pin 5	158Vdc

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

ADJUSTMENTS

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



NO RASTER - NO SOUND (31) Power input circuit V222, V223 Check all chassis interconnecting cables NO RASTER - SOUND OK (31) Brightness con. CRT Ion trap HV Fuse F-401 (6 Amp.) F-402 (0.25 Amp.) IF and RF alignment V210, V224, V403, V404, V405, V406, V407 NO RASTER - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V201, V202, V203, V205, V206, V207 POOR HOR. LIN. Hor. Lin. and Drive con. V402, V405 Check 0.035 μf cap. connected to Hor. Lin. coil Check 0.05 μf cap. connected to pin 8 of V405 H. O. T. POOR VERT. LIN. (11, 12) V220, V221 Check two 0.1 μf cap. connected to black lead of Vert. Osc. trans. Check 25 μf Elec. cap. connected to pins 3 and 6 of V221 V. O. T. PIX JITTER SIDWAYS Hor. Hold and Phasing con. V218, V219, V224 Check 0.01 μf cap. connected across pins 2 and 7 of V218 PIX JITTER UP & DOWN (16, 17) Contrast, Vert. Hold and AGC con. V217, V220, V221, V226 MEASURED PIX (36) Tuner fine tuning Contrast and AGC con. V201, V202, V203, V204, V205, V206, V207, V226 Check 0.02 μf Det. and Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus con. V201, V202, V203, V204, V226 Check Vid. Det. and Amp. peaking coils IF and RF alignment	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V103, V201, V202, V203 Check alignment of 4.5-mc trap connected to pin 5 of V205 IF and RF alignment SNOW IN PIX (32) V101, V102, V103 V201, V202, V203, V204, V223 Antenna and transmission line AG IN PIX (BARK HOR. BAR) (38) V101, V102, V103, V201, V202, V203, V204, V205, V206, V207 ENGRAVED EFFECT IN PIX (33) Tuner fine tuning Contrast and AGC con. V102, V103 VERT. BARS (21) Hor. Drive con. V402, V405 Defl. yoke ringing PIX BENDING (23) Hor. Hold, Phasing, AGC and Hor. Drive con. V216, V219, V224, V402 WEAK OR NO PIX - SOUND WEAK - RASTER OK (34C) Tuner fine tuning V101, V102, V103, V201, V226 Contrast and AGC con. RF and IF alignment INTERMITTENT RASTER - SOUND OK Brightness con. V219, V224, V401, V402, V403, V404, V405, V406, V407 CRT HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V401, V402, V403, V404, V405, V406, V407 Low line voltage EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Size and Vert. Size con. V402, V403, V404, V405	RASTER BLOOMING (37) Hor. Drive con. V401, V402, V403, V404, V405, V406, V407 Check 2 Meg Ω Res. connected to plate cap. of V403 CRT Check all HV Filter caps. INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Size con. Check position of Hor. Size Switch V401, V402, V405, V406, V407 Check 12KΩ Res. and 0.05 μf cap. connected to pin 6 of V402 through a 47KΩ Res. Check 0.01 and 0.002 μf caps. connected to pin 1 of V401 Low line voltage H. O. T. INSUFFICIENT RASTER HEIGHT (15) V220, V221, V222, V223 Check two 0.1 μf caps. connected to black lead of Vert. Osc. trans. V. O. T. Low line voltage NO VERT. DEFL. (14) V220, V221 Check two 0.1 μf caps. connected to black lead of Vert. Osc. trans. V. O. T. and Vert. Osc. trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V217, V220, V221, V225 Check 0.02 μf cap. connected to pin 1 of V220 NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V217, V225, V226 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Phasing V216, V219, V224 Check 0.005 μf cap. connected to pin 5 of V219 AUDIO HUM IN SOUND (8E) V210, V211, V212, V213, V215, V216	DEFORMED SOUND (8D) Tuner fine tuning V210, V211, V212, V213, V214, V215, V216 Check 0.05 μf cap. connected to pin 5 of V216 Sound and Vid. IF alignment Z-201, Z-202, Z-203 Det. alignment Z-204 NO SOUND - PIX OK (8B) Tuner fine tuning V210, V211, V212, V213, V215, V216 Vol. con. Speaker (open voice coil or defective connection) Sound and Vid. IF alignment Z-201, Z-202, Z-203 Det. alignment Z-204 WEAK SOUND - PIX OK (8C) Tuner fine tuning Vol. and tone con. V102, V103, V210, V211, V212, V213, V215, V216 Sound and Vid. IF alignment Z-201, Z-202, Z-203 Det. alignment Z-204 NOISY SOUND - PIX OK Tuner fine tuning V210, V211, V212, V213, V215, V216 Check sound system for loose connections Speaker Sound IF and Det. alignment Z-201, Z-202, Z-203, Z-204 INTERMITTENT SOUND - PIX OK V210, V211, V212, V213, V215, V216 Poor connections in sound system
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TUBE LIST

Symbol	Type	Circuit Function
V101	6J6	RF Amp.
V102	6AK5	Mix.
V103	6AB4	VHF Osc.
V201	9AG5	1st Vid. IF Amp.
V202	6AG5	2nd Vid. IF Amp.
V203	6AG5	3rd Vid. IF Amp.
V204	6AL5	Vid. Det. - AGC
V205	6BA6	1st Vid. Amp.
V206	12AU6	2nd Vid. Amp. - DC Restorer
V207	6AG7	3rd Vid. Amp.
V208	6AL5	Automatic Gain Con.
V209	6AL5	1st Sound IF Amp.
V210	6AU6	2nd Sound IF Amp.
V211	6AU6	3rd Sound IF Amp.
V212	6AU6	Sound Discriminator
V213	6AL5	Tuning Indicator
V214	6AL7	1st Sound Amp.
V215	6AT7	2nd Sound Amp.
V216	6AL5	Sync. Clipper
V217	6AG5	Sync. Discriminator
V218	6AL5	Hor. Osc.
V219	6K6GT	Hor. Osc.
V220	6AL5	Vert. Buffer - Vert. Saw. Gen.
V221	58N7GT	Vert. Defl. Amp.
V222	6AG7	Rec.
V223	6AG7	Rec.
V224	6AG7	Resistance Tube
V225	6AG7	Sync. Amp.
V226	6AL5	Sync. & AGC Rect.

Symbol	Type	Circuit Function
V701	12AU7	Hor. Saw Maker-Relay Cont
V702	6BG6 G	Hor. Sweep Amp.
V703	1B3 GT	HV Rect.
V704	1B3 GT	HV Rect.
V705	6AS7 G	Damper
V706	5V4G	Damper
V707	6X4	Rect.
V708	6X4	Rect.

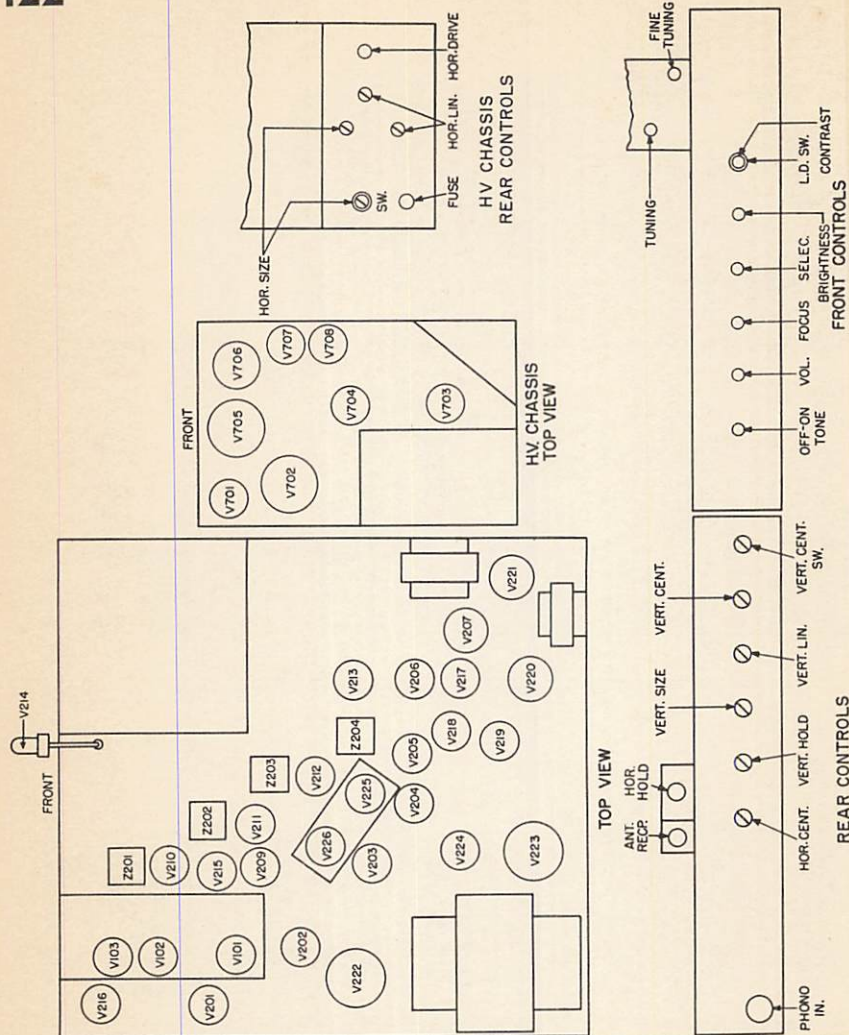
KEY VOLTAGES

B., plates of damper, V706 pins 4 and 6	400vdc
Boosted B., cath. of damper, V706 pin 8	500vdc
Plate of Vert. Osc., V220 pin 2	120vdc
Plates of Vert. Osc., V221 pins 2 and 5	335vdc
Plates of Hor. Osc., V219 pin 3	220vdc
Plate of Reactance Tube, V224 pin 8	225vdc
Grid of Hor. Out., V702 pin 5	-130vdc

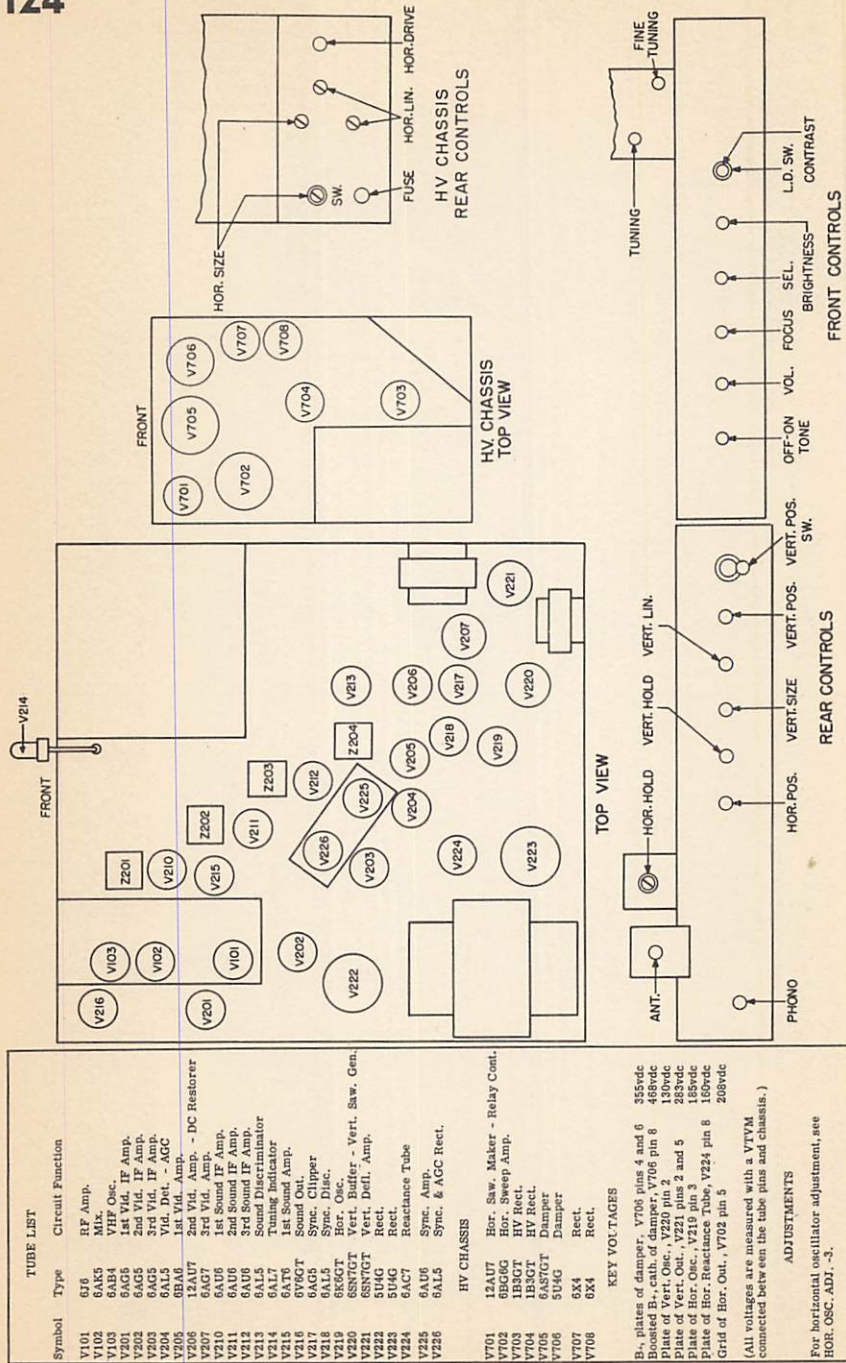
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

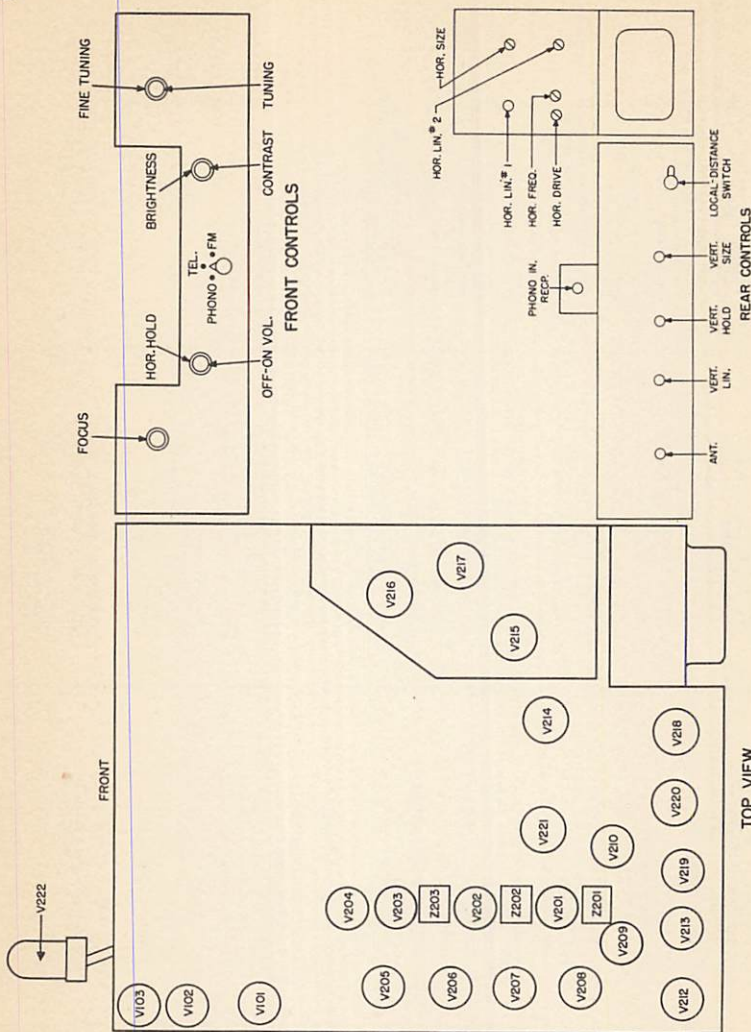
ADJUSTMENTS

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



- NO RASTER - NO SOUND (31)**
Power input circuit
V222, V223
Check chassis connecting cables
- NO RASTER - SOUND OK (31)**
Brightness control
HV Fuse F-701 (4 Amp.)
Ion trap
V219, V220, V201, V202, V204, V205, V206, V207, V208
RF trans. Hor. yoke CRT connections
CRT
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
Contrast and AGC con.
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
- POOR HOR. LIN.**
Hor. Lin. and Peaking con.
V202, V205, V206
Check 0.035 and 0.05 μ f caps. connected to Hor. Lin. coil
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V220, V221
Check two 0.1 μ f caps. connected to V202, V205, V206
Check 25 μ f Elsec. caps. connected to pins 3 and 5 of V221
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Lin. and Size con.
V217, V218, V219, V224
Check 0.01 μ f cap. connected to pins 1 and 5 of V218
Check 47 μ f caps. connected to pins 5 of V217
- PIX JITTER UP & DOWN (16, 17)**
Contrast, Vert. Hold and AGC con.
V217, V220, V221
- SMEARED PIX (36)**
Contrast and AGC con.
V102, V103
V201, V202, V203, V204, V206, V207, V209
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V201, V202, V203, V204, V209
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V102, V103
V201, V202, V203, V204
Check alignment of 4A and 4E trap
V201, V202, V203, V204
IF and RF alignment
- SNOW IN PIX (32)**
V101, V102, V103
V201, V202, V203, V204, V205, V206, V207
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V101, V102, V103
V201, V202, V203, V204, V205, V206, V207, V209
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast and AGC con.
V102, V103, V201, V202, V203, V204, V205, V206, V207
CRT
- VERT. BARS (21)**
Hor. Lin. and Peaking con.
V202, V205, V206
Defl. yoke wiring
- PIX BLENDING (22)**
Hor. Hold, D.C. AGC and Phasing con.
V218, V219, V224, V202
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
Contrast and AGC con.
V101, V102, V103, V201, V202, V209
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
Contrast and AGC con.
V219, V224, V201, V202, V203, V204, V205, V206, V207, V208
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Bright. and Hor. Peaking con.
V101, V203, V204, V205, V206, V207, V208
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (0, 10)**
Hor. Peaking coil
V202, V203, V204, V205, V206
CRT
- RASTER BLOOMING (37)**
Hor. peaking con.
V201, V202, V203, V204, V205, V206, V207, V208
Check 2 Meg. Ω Res. connected to plate cap. of V103
Check all HV Filter caps.
- INSUFFICIENT RASTER WIDTH (23)**
V101, V102, V103
V201, V202, V203, V204, V205, V206, V207, V208
Check 21K Ω , 33K Ω Res. and 0.05 μ f caps. connected to pins 8 of V202
Check 0.01 and 0.001 μ f caps. connected to pin 1 of V201
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
Hor. Lin. and Size con.
V220, V221, V223
Check two 0.1 μ f caps. connected to black lead of Vert. Osc. trans.
V. O. T.
Low line voltage
NO VERT. DEF. L. (14)
V220, V221
Check two 0.1 μ f caps. connected to black lead of Vert. Osc. trans.
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold con.
Vert. Int. network
V201, V202, V203, V204
Check 0.02 μ f cap. connected to pin 1 of V220
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V217, V220
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Phasing con.
Check 0.05 μ f cap. connected to pin 5 of V219
- AUDIO HUM IN SOUND (8E)**
V210, V211, V212, V213, V215, V216
- DISTORTED SOUND (8D)**
Tuner fine tuning
V102, V103, V210, V211, V212, V213, V215, V216
Tuner coils
Check 0.05 μ f cap. connected to pin 5 of V216
Sound and Vid. IF alignment
Z-201, Z-202, Z-203
Det. alignment Z-204
NO SOUND - PIX OK (8B)
Tuner fine tuning
Vol. con.
V210, V211, V212, V213, V215, V216
Speaker (open voice coil or defective)
Sound and Vid. IF alignment Z-201, Z-202, Z-203
Det. alignment Z-204
WEAK SOUND - PIX OK (8C)
Speaker
V210, V211, V212, V213, V215, V216
Speaker
Sound and Vid. IF alignment Z-201, Z-202, Z-203
Det. alignment Z-204
NOISY SOUND - PIX OK
Vol. con.
V210, V211, V212, V213, V215, V216
Check speaker system for loose connections
Speaker
Sound IF and Det. alignment
Z-201, Z-202, Z-203, Z-204
INTERMITTENT SOUND - PIX OK
V210, V211, V212, V213, V215, V216
Poor connections in sound system





TUBE LIST

Symbol	Type	Circuit Function
V101	616	RF Amp.
V102	6A5	MP
V103	6AR5	VHF Osc.
V201	6AU6	1st Sound IF Amp.
V202	6AU6	2nd Sound IF Amp.
V203	6T8	Sound Disc. - 1st Sound Amp.
V204	6AG5	Sound Out.
V205	6AU6	1st Vid. IF Amp.
V206	6AU6	2nd Vid. IF Amp.
V207	6AU6	3rd Vid. IF Amp.
V208	6AU6	4th Vid. IF Amp.
V209	6AL5	Vid. Det.
V210	6AH6	Vid. Amp.
V211	6AR4	Vid. Amp.
V212	6BA6	Narrow Band Sync. Amp.
V213	6AL5	Sync. & AGC Det.
V214	6SN7GT	Hor. AFC - Hor. Saw. Gen.
V215	6BQ6	Hor. Defl. Amp.
V216	6BSGT	HV Amp.
V217	6BD6	Rectifier
V218	6U4G	Damper
V219	6AU6	1st Sync. Clipper
V220	6SN7GT	2nd Sync. Clipper - Vert. Saw. Gen.
V221	6SN7GT	Vert. Defl. Amp.
V222	6AL7GT	Tuning Indicator

KEY VOLTAGES

B+, plate of damper, V217 pin 5 280vdc
 Boosted B+, cath. of damper, V217 pin 3 375vdc
 Plate of Vert. Osc., V220 pin 2 375vdc
 Plates of Vert. Out., V221 pins 2 and 5 230vdc
 Plates of Hor. AFC and Osc., V214 pin 2 70vdc
 Grid of Hor. Out., V215 pin 5 220vdc
 -60vdc

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

ADJUSTMENTS

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

NO RASTER - NO SOUND (31) Power input circuit V116	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V102, V103, V207, V208, V209 Check alignment of 4.5-mc trap connected to pin 1 of V210 IF and RF alignment SNOW IN PIX (32) V101, V102, V103 V205, V206, V207, V208, V213 AGC con. Antenna and transmission line	EXCESSIVE RASTER (PIX SIZE) (9, 10) Hor. Drive, Size and Vert. Size con. V215, V216, V217	AUDIO HUM IN SOUND (8E) V201, V202, V203, V204
NO RASTER - SOUND OK (31) Br/Grhness con. HV Fuse F-202 (0.25 Amp.) Ion trap V214, V215, V216, V217 HV trans. Hor. yoke CRT connections	WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V205, V206, V207, V208, V209, V210	RASTER BLOOMING (37) V215, V216, V217, V218 Hor. Drive con. CRT HV Filter cap. Check 500K Res. connected to HV Filter cap.	DISTORTED SOUND (8D) Tuner fine tuning V201, V202, V203, V204, V205 Check 0.1 μ f cap. connected to V201, V202, V203, V204 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
POOR HOR. LIN. Hor. Lin. #1 and #2 and Hor. Drive con. V215, V217 Check 0.05, 0.15 and 0.25 μ f cap. connected to Hor. Lin. coil H. O. T.	AC IN PIX (DARK HOR. BAR) (38) V101, V102, V103 V205, V206, V207, V208, V209, V210, V213 ENGRAVED EFFECT IN PIX (33) Contrast and AGC con. V102, V103 V205, V206, V207, V208, V209, V210, V213 CRT Check Vid. Det. and Amp. peaking coils VERT. BASIS (21) Hor. Drive con. V215, V217 Det. yoke ringing	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Size con. Check 3.9K Ω and 0.005 μ f cap. connected through a 100K Ω Res. to pin 4 of V215 Check 270 and 1000 μ f cap. connected to horizontal D of Hor. Osc. trans. Low line voltage H. O. T.	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Speaker (open voice coil or defective connection) Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
POOR VERT. LIN. (11, 12) Vert. Lin. and Size con. V220, V221 Check 4.1 μ f cap. connected to pins 3 and 4 of V221 Check 25 μ f Elec. cap. connected to pins 3 and 6 of V221 V. O. T.	PIX BENDING (22) Hor. Hold, Freq. and Osc. adj. V214, V215 Hor. Drive con. Check 0.02 and 0.2 μ f caps. connected to pin 3 of V214	INSUFFICIENT RASTER HEIGHT (15) Vert. Size and Lin. con. V202, V203, V211 Check 0.1 μ f cap. connected to pins 1 and 4 of V220 Check 0.1 μ f cap. connected through a 5.1K Ω Res. to pin 2 of V220 V. O. T. Low line voltage NO RASTER EFFECT. (14) V202, V203 Check 0.1 μ f cap. connected to pins 1 and 4 of V220 a 5.1K Ω Res. to pin 2 of V220 Vert. Defl. yoke V. O. T. and Vert. Osc. trans.	WEAK SOUND - PIX OK (8C) Tuner fine tuning V202, V203 V204, V205 Sound and Vid. IF alignment Z-201, Z-202 Det. alignment Z-203
PIX JITTER SIDEWAYS V214, V215 Check 0.002 μ f cap. connected to pin 1 of V214 Check 180 μ f cap. connected to pin 3 of V220	WEAK OR NO PIX - SOUND WEAK - RASTER OK (33C, 34C) Tuner fine tuning Contrast and AGC con. V101, V102, V103, V205, V206, V213 RF and IF alignment INTERMITTENT RASTER - SOUND OK Contrast and AGC con. V214, V215, V216, V217 HV trans. CRT	NO SOUND - PIX OK (8B) Tuner fine tuning V201, V202, V203, V204 Check sound system for loose connections Speaker Sound IF and Det. alignment Z-201, Z-202, Z-203	NOISY SOUND - PIX OK V201, V202, V203, V204 Check sound system for loose connections Speaker Sound IF and Det. alignment Z-201, Z-202, Z-203
PIX JITTER UP & DOWN (16, 17) Contrast, Vert. Hold and AGC con. V212, V213, V220, V221	SMEARED PIX (86) V205, V206, V207, V208, V209, V210 Check Vid. Det. and Amp. peaking coils IF and RF alignment POOR PIX DETAIL (35) Tuner fine tuning Focus con. V205, V206, V207, V208 Check Vid. Det. and Amp. peaking coils IF and RF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V212, V213, V220 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold, Freq. and Osc. adj. V214, V215 Check 270 μ f cap. connected to pin 4 of V214 Low line voltage	INTERMITTENT SOUND - PIX OK V201, V202, V203, V204 Poor connections in sound system

TUBE LIST

Circuit Function

Symbol	Type	Circuit Function
V101	6J6	RF Amp.
V102	6AR5	Mix.
V103	6AB4	VHF Osc.
V104	6AU6	1st Sound IF
V201	6AL5	2nd Sound IF
V202	6AR5	Sound Discriminator, 1st Amp.
V203	6AR5	2nd Sound Amp.
V204	6A2	1st Vid. IF
V205	6AL6	2nd Vid. IF
V206	6AU6	3rd Vid. IF
V207	6AR5	2nd Vid. IF
V208	6AL5	Vid. Det.
V209	6AL5	DC Restorer
V210	6AL6	Vid. Amp.
V211	19AP4	Picture Tube
V212	6AR5	1st Sound IF
V213	6AL5	Sound Discriminator, 1st Amp.
V214	6AL5	2nd Sound IF
V215	6AR5	Sound Discriminator, 1st Amp.
V216	6AL5	2nd Sound IF
V217	6AR5	Sound Discriminator, 1st Amp.
V218	6AL5	2nd Sound IF
V219	6AL5	Sound Discriminator, 1st Amp.
V220	6AL5	2nd Sound IF
V221	6AR5	Sound Discriminator, 1st Amp.
V222	6AL5	2nd Sound IF
V223	6AL5	Sound Discriminator, 1st Amp.
V224	6AL5	2nd Sound IF
V225	6AL5	Sound Discriminator, 1st Amp.
V226	6AL5	2nd Sound IF
V227	6AL5	Sound Discriminator, 1st Amp.
V228	6AL5	2nd Sound IF
V229	6AL5	Sound Discriminator, 1st Amp.
V230	6AL5	2nd Sound IF
V231	6AL5	Sound Discriminator, 1st Amp.
V232	6AL5	2nd Sound IF
V233	6AL5	Sound Discriminator, 1st Amp.
V234	6AL5	2nd Sound IF
V235	6AL5	Sound Discriminator, 1st Amp.
V236	6AL5	2nd Sound IF
V237	6AL5	Sound Discriminator, 1st Amp.
V238	6AL5	2nd Sound IF
V239	6AL5	Sound Discriminator, 1st Amp.
V240	6AL5	2nd Sound IF

AM TUNER CHASSIS

V401	6BA6	RF Amp.
V402	6AR5	1st Sound IF
V403	6AR5	2nd Sound IF
V404	6AR5	3rd Sound IF
V405	6AR5	4th Sound IF
V406	6AR5	5th Sound IF
V407	6AR5	6th Sound IF
V408	6AR5	7th Sound IF
V409	6AR5	8th Sound IF
V410	6AR5	9th Sound IF
V411	6AR5	10th Sound IF
V412	6AR5	11th Sound IF
V413	6AR5	12th Sound IF
V414	6AR5	13th Sound IF
V415	6AR5	14th Sound IF
V416	6AR5	15th Sound IF
V417	6AR5	16th Sound IF
V418	6AR5	17th Sound IF
V419	6AR5	18th Sound IF
V420	6AR5	19th Sound IF
V421	6AR5	20th Sound IF
V422	6AR5	21st Sound IF
V423	6AR5	22nd Sound IF
V424	6AR5	23rd Sound IF
V425	6AR5	24th Sound IF
V426	6AR5	25th Sound IF
V427	6AR5	26th Sound IF
V428	6AR5	27th Sound IF
V429	6AR5	28th Sound IF
V430	6AR5	29th Sound IF
V431	6AR5	30th Sound IF
V432	6AR5	31st Sound IF
V433	6AR5	32nd Sound IF
V434	6AR5	33rd Sound IF
V435	6AR5	34th Sound IF
V436	6AR5	35th Sound IF
V437	6AR5	36th Sound IF
V438	6AR5	37th Sound IF
V439	6AR5	38th Sound IF
V440	6AR5	39th Sound IF
V441	6AR5	40th Sound IF
V442	6AR5	41st Sound IF
V443	6AR5	42nd Sound IF
V444	6AR5	43rd Sound IF
V445	6AR5	44th Sound IF
V446	6AR5	45th Sound IF
V447	6AR5	46th Sound IF
V448	6AR5	47th Sound IF
V449	6AR5	48th Sound IF
V450	6AR5	49th Sound IF
V451	6AR5	50th Sound IF
V452	6AR5	51st Sound IF
V453	6AR5	52nd Sound IF
V454	6AR5	53rd Sound IF
V455	6AR5	54th Sound IF
V456	6AR5	55th Sound IF
V457	6AR5	56th Sound IF
V458	6AR5	57th Sound IF
V459	6AR5	58th Sound IF
V460	6AR5	59th Sound IF
V461	6AR5	60th Sound IF
V462	6AR5	61st Sound IF
V463	6AR5	62nd Sound IF
V464	6AR5	63rd Sound IF
V465	6AR5	64th Sound IF
V466	6AR5	65th Sound IF
V467	6AR5	66th Sound IF
V468	6AR5	67th Sound IF
V469	6AR5	68th Sound IF
V470	6AR5	69th Sound IF
V471	6AR5	70th Sound IF
V472	6AR5	71st Sound IF
V473	6AR5	72nd Sound IF
V474	6AR5	73rd Sound IF
V475	6AR5	74th Sound IF
V476	6AR5	75th Sound IF
V477	6AR5	76th Sound IF
V478	6AR5	77th Sound IF
V479	6AR5	78th Sound IF
V480	6AR5	79th Sound IF
V481	6AR5	80th Sound IF
V482	6AR5	81st Sound IF
V483	6AR5	82nd Sound IF
V484	6AR5	83rd Sound IF
V485	6AR5	84th Sound IF
V486	6AR5	85th Sound IF
V487	6AR5	86th Sound IF
V488	6AR5	87th Sound IF
V489	6AR5	88th Sound IF
V490	6AR5	89th Sound IF
V491	6AR5	90th Sound IF
V492	6AR5	91st Sound IF
V493	6AR5	92nd Sound IF
V494	6AR5	93rd Sound IF
V495	6AR5	94th Sound IF
V496	6AR5	95th Sound IF
V497	6AR5	96th Sound IF
V498	6AR5	97th Sound IF
V499	6AR5	98th Sound IF
V500	6AR5	99th Sound IF
V501	6AR5	100th Sound IF

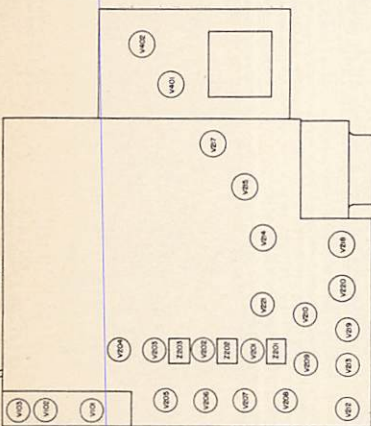
KEY VOLTAGES

B₁ plate of damped V217 pin 5
 B₂ plate of damped V217 pin 5
 B₃ plate of damped V217 pin 3
 B₄ plate of damped V217 pin 5
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 B₉₉ plate of damped V217 pin 5
 B₁₀₀ plate of damped V217 pin 5

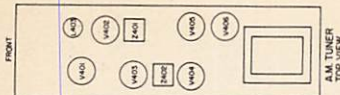
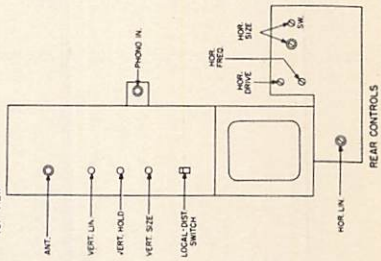
ADJUSTMENTS

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

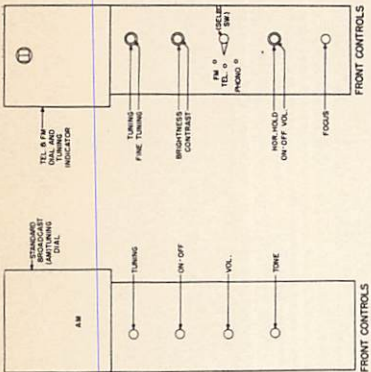
FRONT



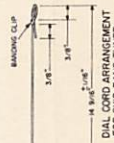
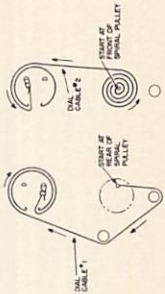
TOP VIEW



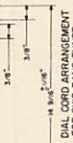
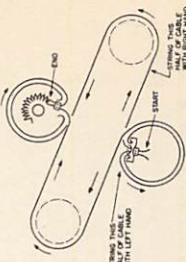
AM TUNER TOP VIEW



FRONT CONTROLS AM TUNER CHASSIS



DRIVE CORD ARRANGEMENT



DIAL ARRANGEMENT FOR SSB BAND TUNER

TUBE LIST

Symbol	Type	Circuit Function
V101	6BC5	RF Amp.
V102	6J6	Mix. & Osc.
V201	6AU6	1st Sound IF
V202	6AU6	2nd Sound IF
V203	6T8	Sound Discriminator, 1st Sound IF
V204	6AQ5	2nd Sound IF & AGC Clamp
V205	6BA6	2nd Sound IF
V206	6AU6	2nd Vid. IF
V207	6BA6	3rd Vid. IF
V208	6BC5	4th Vid. IF
V209A	6AL5	5th Vid. IF
V209B	6AL5	5th Vid. IF
V210	6AH6	DC Deflector
V211	17AP4A	Picture Tube
V212	6BA6	Narrow Band Sync. Amp.
V213	6AL5	Sync. & AGC Det.
V214	6SN7GT	Hor. AFC & Saw. Gen.
V215	6SN7GT	Hor. Defl. Amp.
V216	6N4GT	Damper
V217	5U4G	Low-Volt. Rect.
V218	6AU6	1st Sync. Clipper
V219	6SN7GT	2nd Sync. Clipper
V220A	6SN7GT	Vert. Saw. Gen.
V220B	6SN7GT	Vert. Saw. Gen.
V221	6AL7GT	Tuning Indicator
V222	1X2	High-Volt. Rect.
V223	1X2	High-Volt. Rect.

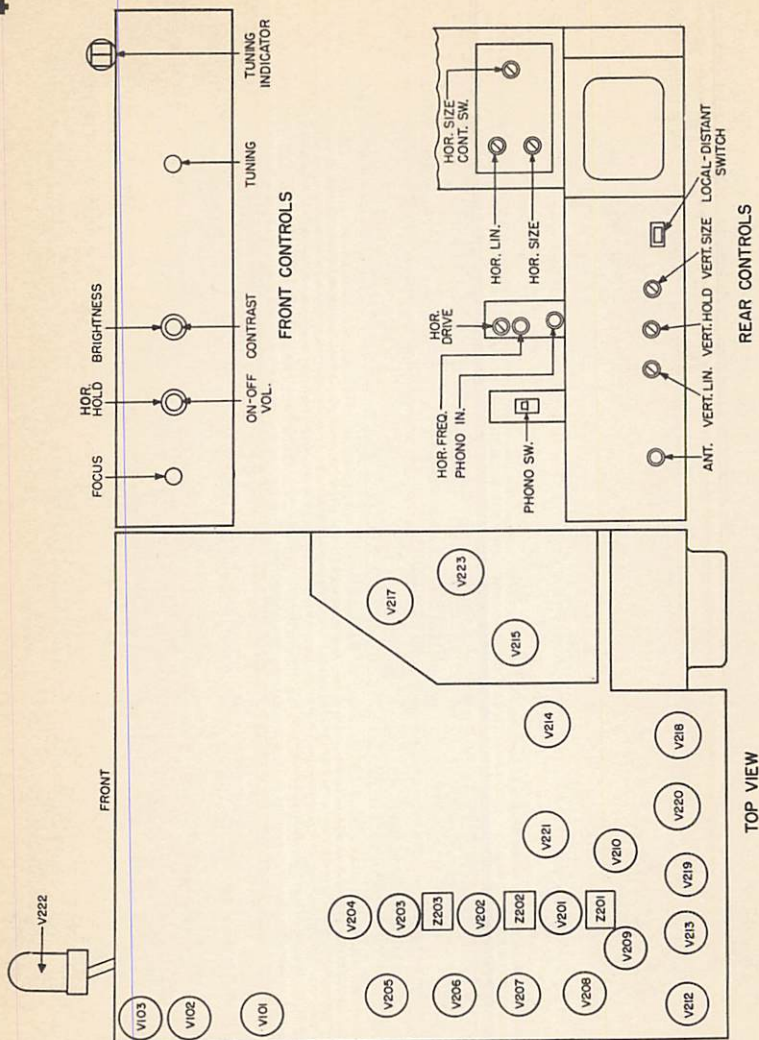
KEY VOLTAGES

B+, cath. of damper, V217 pin 5 310vdc
 Boosted B+, plate of damper, V217 pin 3 495vdc
 Plate of Vert. Osc., V220 pin 5 37vdc
 Plates of Vert. Osc., V221 pins 2 and 5 400vdc
 Plates of Hor. AFC and Saw. Gen., V214 pin 5 110vdc
 Grid of Hor. Defl. Amp., V215 pin 5 250vdc
 Grid of Hor. Defl. Amp., V215 pin 5 -80vdc

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

ADJUSTMENTS

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



- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V209, V210, V211
V209, V210, V211
V209, V210, V211
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V209, V210, V211
AGC con.
Check alignment of 4.5-mc trap
connected to pin 1 of V210
IF and RF alignment
- SNOW IN PIX (32)**
V101, V205, V206, V207, V208
AGC con.
Local Distance Switch
Antenna and Transmission line
- AC IN PIX (DARK HOR, BAR) (38)**
V101, V102, V205, V206, V207, V208
V209, V210
- ENGRAVED EFFECT IN PIX (33)**
V209, V210
AGC and Contrast con.
Local Distance Switch
V102, V103, V205, V206, V207, V208, V209,
V210, V211
*If fine diagonal lines exist on channel 5,
carefully tune L210 until they disappear.
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
Hor. Drive con.
V214, V215, V216
Check 51 μ f cap. connected to terminals
of V214, V215, V216
Defl. yoke ringing
- PIX BENDING (22)**
Check tuning of narrow sync amp. (Z-209)
Hor. Drive and Freq. con.
V209, V210, V211
AGC con.
V209, V214, V215
- WEAK OR NO PIX - SOUND WEAK -**
Tuner fine tuning
V101, V102, V205, V206, V207, V213
Local Distance Switch
AGC con.
RF and IF alignment
- NO RASTER - NO SOUND (31)**
Power input circuit
F-203 (.25 Amps.)
V216
- NO RASTER - SOUND OK (31)**
V214, V215, V217, V209, V211
F-203 (.25 Amps.)
Brightness con.
HV trans. for yoke CRT connections
- WEAK PIX - SOUND AND RASTER OK (34)**
Tuner fine tuning
V205, V206, V207, V208, V209, V210, V213
AGC and Contrast con.
*If fine diagonal lines exist on channel
5, carefully tune L210 until they
disappear.
- POOR HOR. LIN.**
Hor. Drive con.
V214, V215, V216
Check 0.03 and 0.1 μ f caps. connected
to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
V209, V210, V211
AGC and Contrast con.
Check two 0.1 μ f caps. connected to
pin 5 of V220
Check 25 μ f Elec. cap. connected to
pins 3 and 6 of V221
V. O. T.
- PIX JITTER SIDEWAYS**
Hor. Drive and Freq. con.
Hor. Osc. adj. (syncguide)
AGC con.
Check tuning of narrow band sync
amplifier (Z-209)
V212, V214, V215
Check 0.002 μ f cap. connected to
pin 1 of V214
- PIX JITTER UP & DOWN (15, 17)**
Check tuning of narrow sync amp.
(Z-209)
V212, V220, V221, V209
AGC con.
- SMEARED PIX (40)**
Contrast and AGC con.
Local Distance Switch
V209, V210, V213
AGC con.
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V214, V215, V217, V223, V211, V209
HV trans.
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Drive and Brightness con.
V214, V215, V223, V218, V209
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Drive and Size con.
Hor. Size Switch
V215, V223
V215, V223
- RASTER BLOOMING (37)**
Hor. Drive con.
V215, V223, V211, V218
Check 2.2 Meg Ω Res. connected to
HV Filter cap.
Check HV Filter cap.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
Hor. Size Switch
V214, V215, V218
Check 0.01 μ f caps.
connected to terminal 'D' of
Hor. Osc. trans.
Low line voltage
H. O. T.
- INSUFFICIENT RASTER HEIGHT (15)**
V220, V221, V218
Check 0.01 μ f caps. connected to
terminal 'D' of V220
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
Check two 0.1 μ f caps. connected to
pin 5 of V220
V215, V218
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC - HOR. SYNC. OK**
V215, V218
Vert. Hold
Vert. Int.
Check tuning of Z-209 (narrow band
sync. ampl.)
V220, V221
- NO HOR. OR VERT. SYNC. - PIX**
SIGNAL OK
Check tuning of Z-209 (narrow band
sync. ampl.)
V209, V213, V219, V220
AGC con.
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Check tuning of Z-209 (narrow band
sync. amp.)
AGC con.
V220, V214, V215
Hor. Hold and Freq. con.
Check 370 μ f cap. connected to
pin 4 of V214
- AUDIO HUM IN SOUND (8E)**
V201, V202, V203, V204
- DISTORTED SOUND (8D)**
Tuner fine tuning
V102, V201, V202, V203, V204
Check 0.01 μ f cap. connected
to pin 1 of V204
Sound and Vid. IF alignment Z-201, Z-202
Det. alignment Z-203
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V201, V202, V203, V204
Vol. con.
Speaker (open voice coil or defective
speaker)
Sound and Vid. IF alignment Z-201, Z-202
Det. alignment Z-203
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V102, V202, V203, V204, V201
Vol. con.
Local Distance Switch
AGC con.
Sound and Vid. IF alignment
Z-201, Z-202
Det. alignment Z-203
- NOISY SOUND - PIX OK**
V202, V203, V204, V201
Vol. con.
Speaker
Sound IF and Det. alignment Z-201, Z-202,
Z-203
- INTERMITTENT SOUND - PIX OK**
V201, V202, V203, V204
Poor connections in sound system

- NO RASTER - NO SOUND (31)**
Power input circuit
F-301 (5 Amps. Fuse)
V231, V222
- NO RASTER - SOUND OK (31)**
F-302 (1.25 Amps. Fuse)
V231, V222, V227, V228, V229
Ion trap
V231, V231, V231, V231, V231, V231
Brightness con.
HV trans. Hor. yoke CRT connections
WEAK PIX - SOUND AND RASTER OK (34)
V103, V209, V210, V211, V212, V213, V214
Contrast and AGC con.
V107, V227
- POOR HOR. LIN.**
V238, V229, V233
Check 0.03 and 0.1 μ f caps. connected to Hor. Lin. coil
H. O. T.
- POOR VERT. LIN. (11, 12)**
Vert. Lin. and Size con.
V219, V220
Check 0.1 and 0.15 μ f caps. connected to pin 5 of V219
Check 250 μ f Elec. cap. connected to pin 3 of V220
V. O. T.
- PIX HITTER SIDEWAYS**
Hor. Hold and Osc. con.
V244, V225, V226, V227, V217
AGC con.
- PIX JITTER UP & DOWN (16, 17)**
AGC and Vert. Hold con.
V227, V218, V219, V220
- SKEWERED PIX (36)**
Tuner fine tuning
Contrast and AGC con.
V212, V213, V214, V217, V227
V209, V209, V210, V211
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus and AGC con.
V212, V213, V214
V209, V209, V210, V211
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V209, V209, V210, V211, V212
F-301 (5 Amps. Fuse)
Check component of 4.5 sec. trap connected to pin 5 of V213
AGC con.
IF and RF alignment
- SNOW IN PIX (32)**
V209, V209, V210, V211
AGC con.
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (36)**
V103, V210, V209, V209, V210, V211, V212, V214
- ENGRAVED EFFECT IN PIX (33)**
Tuner fine tuning
Contrast and AGC con.
V217, V227, V213, V214
V209, V209, V210, V211
Check Vid. Det. and Amp. peaking coils
- VERT. BARS (21)**
V227, V228, V228, V232
Check 68 μ f cap. connected between terminals 3 and 7 of defl. yoke
Dett. yoke ringing
- PIX BENDING (22)**
AGC and Hor. Osc. con.
V227, V224, V225, V226, V227, V228
Hor. Drive con.
- WEAK OR NO PIX - RASTER WEAK - SOUND OK NO PIX - RASTER OK (33C, 34C)**
Tuner fine tuning
V201, V102, V103, V209, V227
AGC con.
IF and RF alignment
- INTERMITTENT RASTER - SOUND OK**
Brightness con.
V225, V226, V227, V228, V229, V230, V231
V212, V221, V221, V226, V229, V230
Check all tubes on HV power supply chassis
Low line voltage
- INSUFFICIENT BRIGHTNESS**
Ion trap
Hor. Hold and Osc. con.
V221, V221, V221, V226, V229, V230
V231, V215
Check all tubes on HV power supply chassis
Low line voltage
- EXCESSIVE RASTER (PIX SIZE) (9, 10)**
Hor. Peaking and Size con.
V228, V229, V230, V231
- RASTER BLOOMING (37)**
V228, V229, V230, V231, V221, V222, V215
Check all tubes on HV power supply chassis
- INSUFFICIENT RASTER WIDTH (23)**
V228, V229, V230, V231, V215, V215
Check 4.30 μ f and 0.01 μ f caps. connected to pin 2 of V227
H. O. T.
Low line voltage
- INSUFFICIENT RASTER HEIGHT (15)**
Vert. Size con.
V219, V220, V215, V215
Check 0.1 and 0.15 μ f caps. connected to pin 5 of V219
V. O. T.
Low line voltage
- NO VERT. DEFL. (14)**
V219, V220
Check 0.1 and 0.15 μ f caps. connected to pin 5 of V219
Vert. Defl. yoke
V. O. T. and Vert. Osc. trans.
- NO VERT. SYNC. - HOR. SYNC. OK (16, 17)**
Vert. Hold and AGC con.
V214, V220
Vert. Int. network
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V227, V217, V210, V219
AGC con.
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
Hor. Hold and Osc. ad.
V219, V224, V225, V227, V228
Check 0.000 μ f cap. connected to pin 1 of V226
- AUDIO HUM IN SOUND (8F)**
V201, V202, V203, V204, V205, V206, V207
- DISTORTED SOUND (8D)**
Tuner fine tuning
V102, V103, V201, V202, V203, V204, V205, V206, V207
Check 0.000 μ f cap. connected to pin 5 of V207
Tone con.
Sound and Vid. IF alignment Z-201, Z-202, Z-203
Det. alignment Z-204
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V103, V201, V202, V203, V204, V205, V206, V207
Vid. con. (open voice coil or speaker defective connection)
Sound and Vid. IF alignment Z-201, Z-202, Z-203
Det. alignment Z-204
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V103, V201, V202, V203, V204, V205, V206, V207
Tone and Vid. con.
Sound and Vid. IF alignment Z-201, Z-202, Z-203
Det. alignment Z-204
- NOISY SOUND - PIX OK**
V201, V202, V203, V204, V205, V206, V207
Vid. and Tone con.
Check for loose connections in sound system
Speaker
Sound IF and Det. alignment Z-201, Z-202, Z-203, Z-204
- INTERMITTENT SOUND - PIX OK**
V201, V202, V203, V204, V205, V206, V207
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
6J6	RF Amp.	
6AK5	Mix.	
6AL5	VHF Osc.	
6AS4	VHF Osc.	
6AL6	2nd Sound IF	
6AL7	2nd Sound IF	
6BT5	Sound Discriminator, 1st Sound Amp.	
6X3	2nd Sound Amp.	
6AC5	1st Vid. IF	
6AU6	2nd Vid. IF	
6AU8	3rd Vid. IF	
6BC5	Vid. Det.	
6AL5	Vid. Det.	
6X4	DC Restorer	
6AH5	Vid. Amp.	
19AP4	Picture Tube	
17AP4	Picture Tube	
6BA5	Narrow-Band Sync. Amp.	
6AL5	Synch. Det.	
6AL5	Synch. AFC & S. Gen.	
6BG7	Hor. Defl. Amp.	
6V6GT	Damper	
5U4G	Rect.	
5U4G	1st Sync. Clipper	
6AU8	2nd Sync. Clipper	
6SN7GT	Vert. Scan. Gen.	
6X4	V. Sync. Gen.	
6SN7GT	Ph. Sync. Gen.	
6AL7GT	Tuning Indicator	
4V401	High-Volt. Rect.	
1X2	High-Volt. Rect.	

RADIO CHASSIS

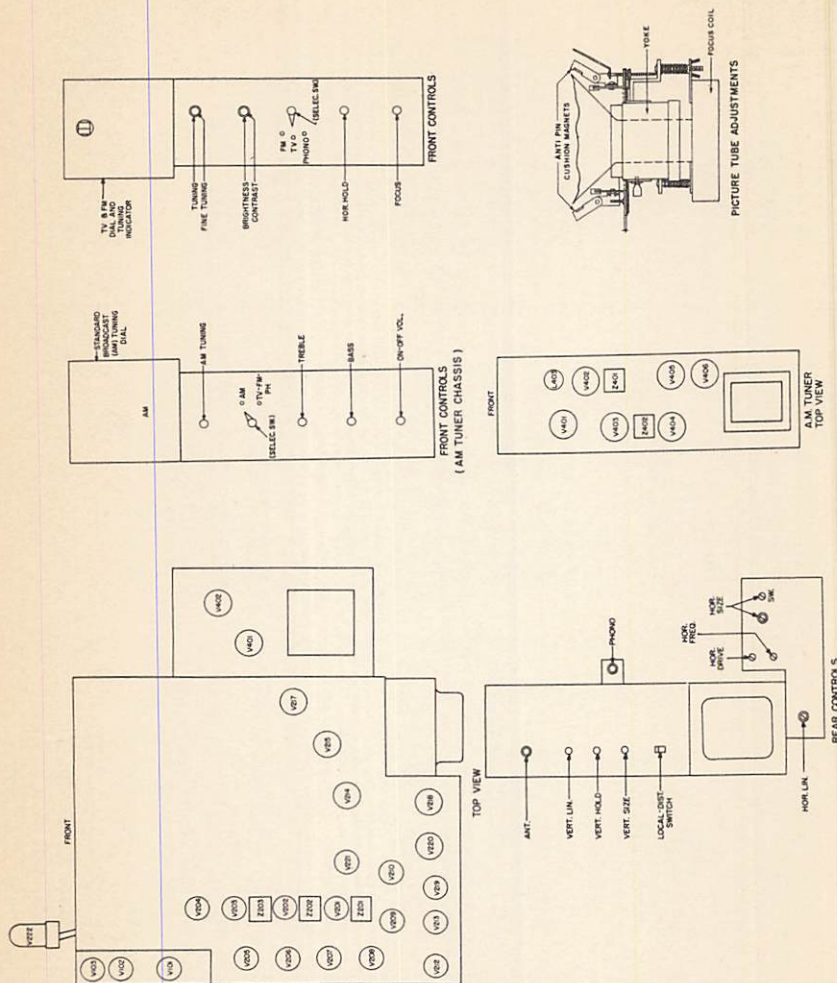
Symbol	Type	Circuit Function
V401	6BA6	RF Amp.
V402	6BE6	Converter
V403	6BA6	IF Amp.
V404	6H6	Detector
V405	6SN7GT	1st & 2nd Audio A
V406	6V6GT	Audio Out.
V407	5V3GT	Rect.

Y VOLTAGES

B+, plate of damper, V217 pin 5	305vdc
Boosted B+, cath. of damper, V217 pin 3	470vdc
Plate of Vert. Osc., V220 pin 5	50vdc
Plates of Vert. Osc., V221 pins 2 and 5	400vdc
Plates of Hor. AFC and Osc., V214 pin 2	140vdc
Grid of Hor. Out., V215 pin 5	255vdc -88vdc

ADJUSTMENTS

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



- NO RASTER - NO SOUND (31)**
Power input circuit
V218
- NO RASTER - SOUND OK (31)**
V218, V206, V207, V208
Check alignment of 4.5-mc trap connected to pin 4 of V210
B+ Fuse P-202 (0.25 Amp.)
Ion trap
- WEAK PIX - SOUND AND RASTER OK (34)**
V211, V214, V215, V217, V401, V402
IF trans. Hor. yoke CRT connections
IF and RF alignment
- WEAK PIX - SOUND AND RASTER OK (34)**
Contrast and AGC con.
Tuner fine tuning
V205, V206, V207, V208, V209, V210
- POOR HOR. LIN.**
Hor. Drive and Size con.
V215, V217, V218
- POOR VERT. LIN. (11, 12)**
V220, V221
Vert. Lin. and Size con.
Check 0.1 μ f cap. connected to pins 1 and 4 of V221
Check 25 μ f Elec. cap. connected to pins 1 and 7 of V221
V.O.T.
- PIX JITTER SIDEWAYS**
Hor. Hold, Freq. and Osc. adj.
V214, V215, V220
Check 100 μ f cap. connected to pin 1 of V214
Check 100 μ f cap. connected to pin 2 of V220
- PIX JITTER UP & DOWN (16, 17)**
Contrast, Vert. Hold and AGC con.
V220, V221
- SMOORED PIX (36)**
Tuner fine tuning
Contrast and AGC con.
V205, V206, V207, V208, V209, V210
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V205, V206, V207, V208
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- SOUND BARS IN PIX (4A, 4E)**
Tuner fine tuning
V102, V103
V205, V206, V207, V208
Check alignment of 4.5-mc trap connected to pin 4 of V210
IF and RF alignment
- SNOW IN PIX (32)**
V101, V102, V103
V205, V206, V207, V208
AGC con.
Antenna and transmission line
- AC IN PIX (DARK HOR. BAR) (38)**
V101, V102, V103
V205, V206, V207, V208, V209, V210
- ENGRAVED EFFECT IN PIX (33)**
Contrast and AGC con.
Tuner fine tuning
V102, V103
V205, V206, V207, V208, V209, V210, V211
Check Vid. Det. and Amp. peaking coils
V.O.T.
- VERT. BARS (21)**
Hor. Drive con.
V215, V217
Check 51 or 58 μ f cap. connected across defl. yoke terminals
Defl. yoke railing
- PIX BENDING (22)**
Hor. Hold, Freq., Osc. adj. and Drive con.
AGC con.
V102, V103, V205, V206, V207, V208, V209, V210, V211
Check 0.02 and 0.2 μ f caps. connected to pin 3 of V214
- WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C)**
Tuner fine tuning
V101, V102, V103, V205, V206
RF and IF alignment
- INTERMITTENT RASTER - SOUND OK**
V102, V103
V205, V206, V207, V208, V209, V210
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- POOR PIX DETAIL (35)**
Tuner fine tuning
Focus con.
V205, V206, V207, V208
Check Vid. Det. and Amp. peaking coils
IF and RF alignment
- RASTER BLOOMING (37)**
Hor. Drive
V211, V215, V217, V218, V401, V402
Check three 470K Ω Res. connected to plate cap. of V402
Check all HV Filter caps.
- INSUFFICIENT RASTER WIDTH (23)**
Hor. Drive and Size con.
V215, V217, V218
Check 25K Ω Res. and 0.05 μ f cap. connected to pin 1 of V218
Check 270 and 1000 μ f caps. connected to terminal "D" of Hor. Osc. trans.
Low line voltage
H.O.T.
- INSUFFICIENT RASTER HEIGHT (15)**
V215, V220, V221
Tuner fine tuning
Check 0.1 μ f cap. connected to pins 1 and 4 of V221
Check 0.1 μ f cap. connected through a 4.7K Ω Res. to pin 5 of V220
V.O.T.
Low line voltage
- NO VERT. DEF. (14)**
V220, V221
Check 0.1 μ f cap. connected to pins 1 and 4 of V221
Check 0.1 μ f cap. connected through a 4.7K Ω Res. to pin 5 of V220
V.O.T. and Vert. Osc. trans.
Vert. Hold con.
Vert. Int. network
V220, V221
Check 0.001 μ f cap. connected to yellow lead of Vert. Osc. trans.
- NO HOR. OR VERT. SYNC. - PIX SIGNAL OK**
V212, V213, V219, V220
- NO HOR. SYNC. - VERT. SYNC. OK (19, 20)**
V212, V213, V219, V220
Check 0.001 μ f cap. connected to yellow lead of Vert. Osc. trans.
V214, V215
Check 220 μ f caps. connected to pins 4 of V214
- AUDIO HUM IN SOUND (8E)**
V201, V202, V203, V405, V406
- DISTORTED SOUND (8D)**
Tuner fine tuning
V102, V103
V201, V202, V203, V405, V406
Check 0.05 μ f cap. connected to pin 5 of V405
Sound and Vid. IF alignment Z-201, Z-202
Det. alignment Z-203
- NO SOUND - PIX OK (8B)**
Tuner fine tuning
V102, V103
V201, V202, V203, V405, V406, V407
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment
Z-201, Z-202
Det. alignment Z-203
- WEAK SOUND - PIX OK (8C)**
Tuner fine tuning
V102, V103, V201, V202, V203, V205, V405, V406
Sound and Vid. IF alignment
Z-201, Z-202
Det. alignment Z-203
- NOISY SOUND - PIX OK**
Vol. con.
V201, V202, V203, V405, V406
Check audio system for loose connections
Speaker
Sound IF and Det. alignment
Z-201, Z-202, Z-203
- INTERMITTENT SOUND - PIX OK**
V201, V202, V203, V405, V406
Poor connections in sound system

TUBE LIST

Symbol	Type	Circuit Function
V101	6T6	RF Amp.
V102	6AK5	Mix.
V103	6AB4	VHF Osc.
V201	6AU6	1st Sound IF
V202	6AU6	2nd Sound IF Limiter
V203	6AL5	Sound Discriminator
V204	6AL7GT	Tuning Indicator
V205A	12AU7	1st Sound Amp.
V205B	6V6GT/G	2nd Sound Amp.
V207	6AU6	3rd Sound Amp.
V208	6AU6	4th Vid. IF
V210	6AU6	3rd Vid. IF
V211	6AU6	4th Vid. IF
V212A	6AL5	Vid. Det.
V212B	6AL5	DC Restorer
V213	6AL5	2nd Vid. Amp.
V214	6A05	2nd Vid. Amp.
V215	21E4A	CHT
V216	6BA5	Narrow-Band Sync. Amp.
V217	6AL5	AGC & Sync. Det.
V218	6AU6	Sync. Clipper
V219	6SN7GT	Vert. Saw. Gen.
V220	6SN7GT	Vert. Sweep Amp.
V221	5U4G	Low-Volt. Rect.
V222	5U4G	Low-Volt. Rect.
V223	6AL5	Sync. Discriminator
V224	6BQ5GT	Hor. Saw. Gen.
V225	6BQ5GT	Hor. Saw. Gen.
V226	6AK5	Hor. Osc.
V227A	6SN7GT	Hor. Saw. Maker
V227B	6BQ5GT	AGC Clamp
V228	6BQ5GT	Hor. Sweep Amp.
V229	6BQ5GT	Hor. Sweep Amp.
V230	1X2	High-Volt. Rect.
V231	1X2	High-Volt. Rect.
V232	6W4GT	Damper
V233	6W4GT	Damper

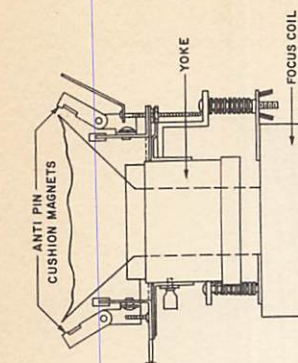
KEY VOLTAGES

B+, plates of dampers, V232 and V233 pins 5
335dc
Boosted B+, cath. of dampers, V232 and V233
pins 3 450dc
Plate of Vert. Osc., V219 pin 5 430dc
Plate of Vert. Osc., V220 pins 2 and 5 225dc
Plate of Hor. Osc., V226 pin 5 225dc
Plate of Reactance Tube, V225 pin 5 280dc
Grids of Hor. Osc., V227 and V228 pins 5
-40dc

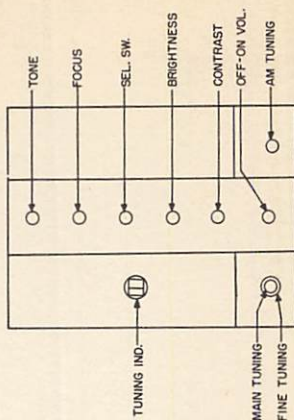
(All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

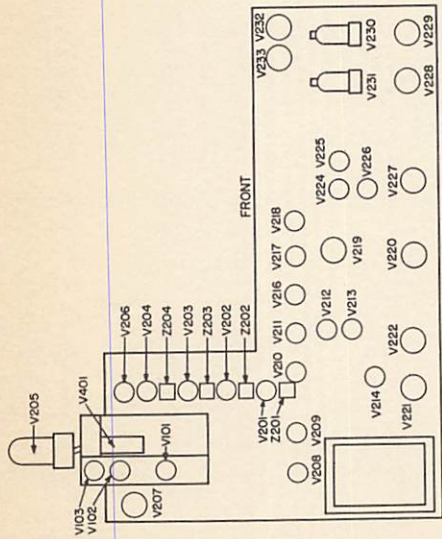
For horizontal oscillator adjustment, see HOR. OSC. ADJ. - 2.



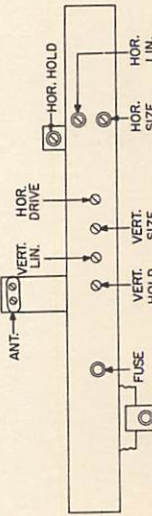
PICTURE TUBE ADJUSTMENTS



FRONT CONTROLS



TOP VIEW



REAR CONTROLS

TUBE LIST

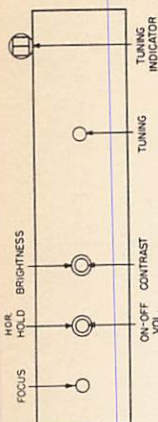
Symbol	Type	Circuit Function
V101	6CB6	RF Amp.
V102	6V6	Mix. - Osc.
V201	6AU6	1st Sound IF Amp.
V202	6AU6	2nd Sound IF Amp.
V203	6T8	Sound Disc.
V204	6AC5	1st Sound Amp. - AGC Clamp
V205	6AC5	Sound Out.
V206	6AU6	2nd Sound IF Amp.
V207	6BA6	2nd Vid. IF Amp.
V208	6BC5	3rd Vid. IF Amp.
V209	6BC5	4th Vid. IF Amp.
V210	6AL5	Vid. Det. - DC Restorer
V211	6AH5	Vid. Amp.
V212	6AV6	Phase Inverter
V213	6AL5	Narrow-Band Sync. Amp.
V214	6SN7GT	Sync. & AGC Det.
V215	6BQ6	Hor. AFC & Saw. Gen.
V216	6X4	Damper
V217	6X4GT	1st Sync. Clipper
V218	6AU6	2nd Sync. Clipper
V219	6SN7GT	2nd Sync. Clipper
V220	6SN7GT	Vert. Saw. Gen.
V221	6SN7GT	Vert. Defl. Gen.
V222	6AL7GT	Tuning Indicator
V223	1X2	HV Rect.

KEY VOLTAGES

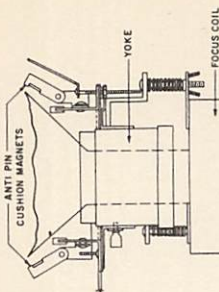
B+, plate of damper, V217 pin 5 310Vdc
 Boosted B+, cath. of damper, V217 pin 3 485Vdc
 Plate of Vert. Osc., V220 pin 5 37Vdc
 Plates of Vert. Out., V221 pins 2 and 5 400Vdc
 Plate of Hor. Osc., V214 pin 2 130Vdc
 Grid of Hor. Out., V215 pin 5 280Vdc
 Grid of Hor. Out., V215 pin 5 -80Vdc
 (All voltages are measured with a VTVM connected between the tube pins and chassis.)

ADJUSTMENTS

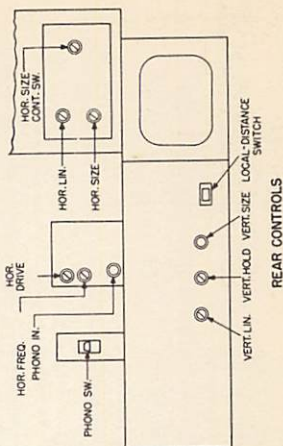
For horizontal oscillator adjustment, see HOR. OSC. ADJ. -2.



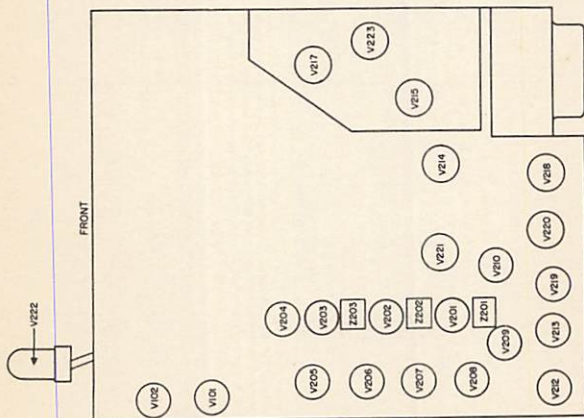
FRONT CONTROLS



PICTURE TUBE ADJUSTMENTS



REAR CONTROLS



TOP VIEW

TUBE LIST

Symbol	Type	Circuit Function
V101	6BK7	RF Amp.
V102	6AR5	Rectifier & Mix.
V201	6CB6	2nd Vid. IF Amp.
V202	6CB8	3rd Vid. IF Amp.
V203	6CB8	4th Vid. IF Amp.
V204	6AL5	Vid. Det. & AGC Rect.
V205	6AG7	Video Amp.
V206	6AR5	Audio Amp.
V207	6AT6	1st Audio Amp.
V208	12AX7	AGC Amp. & AGC Gate
V209	12AX7	Sync. Amp. & 1st Vert.
V210	12AT7	Sync. Clipper
V211	12AT7	2nd Vert. Sync. Clipper
V212	6SN7GT	1st & 2nd Hor. Sync. Clipper
V213	6AU6	Ratio Det.
V214	6AL5	Ratio Det.
V215	6V6GT	2nd Audio Amp.
V216	6V6GT	2nd Sound IF Amp.
V217	6AU6	2nd Sound IF Amp.

SWEEP CHASSIS

Symbol	Type	Circuit Function
V301	6SN7GT	Hor. Osc. & Control
V302	6CD5G	Hor. Sweep Amp.
V303	12X2A	High-Volt. Rect.
V304	12X2A	High-Volt. Rect.
V305	6W4GT	Damper
V306	6BL7GT	Vert. Osc. & Vert. Sweep Amp.
V307	504G	Low-Volt. Rect.
V308	504G	Low-Volt. Rect.

KEY VOLTAGES

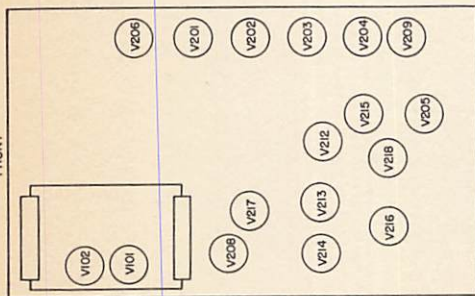
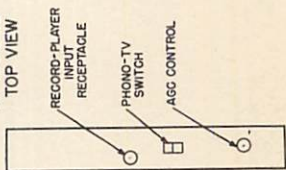
B+, plate of damper, V305 pin 5	300vdc
Boosted B+, cath. of damper, V305 pin 3	500vdc
Plate of Vert. Osc., V306 pin 38 to 180vdc	
Plate of Vert. Sweep Amp., V306 pin 5	310 to 325vdc
Plate of Hor. Osc. & Control, V301 pin 2	260vdc
Grid of Hor. Sweep Amp., V301 pin 2	240 to 450vdc
V302 pin 5	-25vdc

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

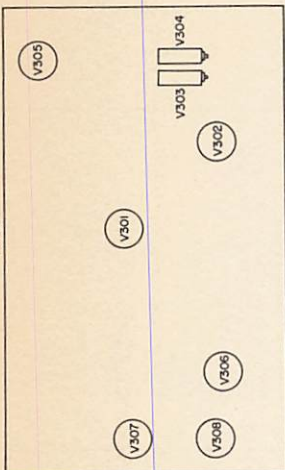
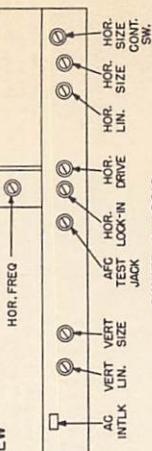
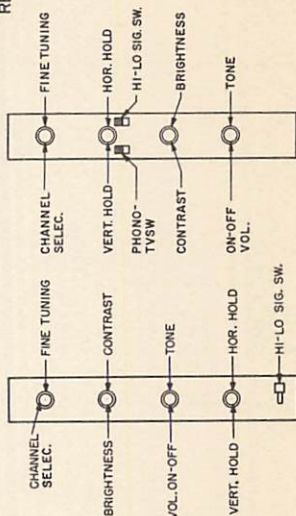
ADJUSTMENTS

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

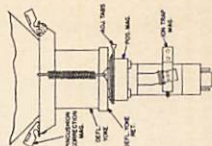
FRONT

RF CHASSIS
TOP VIEWRF CHASSIS
REAR CONTROLS

FRONT

SWEEP CHASSIS
TOP VIEWSWEEP CHASSIS
REAR CONTROLSFRONT CONTROLS
(ALTERNATE)

PICTURE TUBE ADJUSTMENTS



NO RASTER - NO SOUND (31) Power input circuit Check position of TV-Phone Switch V307, V308 NO RASTER - SOUND OK (31) Brightness con. F-301 HV Fuse (.25 Amps.) V301, V302, V303, V304, V305 V306, V307, V308, V309 R318, R319, R320, R321, V530 WEAK PIX - SOUND AND RASTER OK (34) HV trans. Hor. yoke CRT connections Contrast and AGC con. V102, V201, V202, V203, V204, V205, V209 High-Low Switch POOR HOR. LIN. V301, V302, V305 Check 0.05 μf cap. connected to terminal 4 of H.O.T. POOR VERT. LIN. (11, 12) Vert. Lin. and Height con. V306, V309 Check two 0.1 μf caps. connected to pin 5 of V309 through a 4, 7KΩ Res. Check 35 μf Elec. cap. connected to V.O.T. PIX JITTER SIDEWAYS Hor. Hold and Freq. con. High-Low Switch V312, V214, V301, V302 Check connections of P-226 PIX JITTER UP & DOWN (16, 17) V306 (Also remove shield from tube) Hor. Hold and Freq. con. AGC and Vert. Hold con. V209, V212, V213 SNEARED PIX (36) Tuner line tuning High-Low Switch AGC and Contrast con. V201, V202, V203 V204, V205, V209 Check Vid. Det. and Amp. peak ing coils and RF alignment POOR PIX DETAIL (35) Tuner line tuning AGC and Contrast con. V201, V202, V203, V204, V205, V209 Check Vid. Det. and Amp. peak ing coils and RF alignment SOUND BARS IN PIX (4A, 4E) Tuner line tuning V201, V202, V203, V204, V206 Check alignment of 4, 9-mc trap connected to Contrast con. IF and RF alignment SNOW IN PIX (32) V102, V201, V202, V203, V209 High-Low Switch AGC con. Antenna and transmission line AC IN PIX (DARK HOR. BAR) (38) V101, V201, V202, V203, V204, V205, V206 ENGRAVED EFFECT IN PIX (33) Tuner line tuning AGC and Contrast con. V204, V205, V209 Check Vid. Det. and Amp. peak ing coils VERT. BARS (21) V301, V305, V306 Check 82 μf cap. connected between terminals 3 and 7 of defl. yoke Ded. yoke ringing High-Low Switch AGC con. V204, V206, V212, V214, V301 Check 0.05 μf cap. connected to pin 6 of V301 WEAK OR NO PIX - SOUND WEAK - RASTER OK (32C, 34C) Tuner line tuning V101, V102, V201, V202, V203, V206, V209 High-Low Switch AGC con. RF and IF alignment INTERMITTENT RASTER - SOUND OK V301, V302, V303, V304, V305 Brightness con. V530 HV trans. INSUFFICIENT BRIGHTNESS Ion trap Brightness and Hor. Drive con. V302, V303, V304, V307, V308, V309 Low line voltage EXCESSIVE RASTER PIX SIZE (9, 10) Hor. Size and Drive con. Height con. V302, V303, V304 RASTER BLOOMING (37) V302, V303, V304, V309 Hor. Drive con. Check four 470KΩ Res. connected to plate cap. of V304 Check HV Filter caps. INSUFFICIENT RASTER WIDTH (23) Hor. size con. and switch V301, V302, V305 Check 390 and 680 μf caps. connected to terminal "D" of Hor. Osc. coil Low line voltage H.O.T. INSUFFICIENT RASTER HEIGHT (15) Vert. Size con. V306, V309 Check 100, 0.1 μf caps. connected to pin 5 of V309 through a 4, 7KΩ Res. V.O.T. Low line voltage NO VERT. DEFL. (14) V306, V2-302 (1/8 Amp. connected to V.O.T.) Check E-302 (1/8 Amp. connected to V.O.T.) Check two 0.1 μf caps. connected to V309 through a 4, 7KΩ Res. Vert. Defl. yoke V.O.T. and Vert. Osc. trans. NO VERT. SYNC. - HOR. SYNC. OK (16, 17) V306, V212, V213 Vert. Hold con. Vert. Int. network NO HOR. OR VERT. SYNC. - PIX SIGNAL OK High-Low Switch AGC con. V212, V213, V214, V209 NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Freq. con. AGC con. High-Low Switch V212, V214, V301, V302, V209 Check 0.05 μf cap. connected to pin 1 of V301 AUDIO HUM IN SOUND (4E) V215, V216, V217, V218, V208 DISTORTED SOUND (8D) Tuner line tuning V209, V215, V216, V217, V218, V102 AGC con. V306 Sound and Vid. IF alignment L-217 Det. alignment Z-205 NO SOUND - PIX OK (8B) Tuner line tuning V209, V215, V216, V217, V218 Voi. con. Speaker (open voice coil or defective) Sound and Vid. IF alignment L-217 Det. alignment Z-205 WEAK SOUND - PIX OK (8C) Tuner line tuning V209, V215, V216, V217, V218 Voi. and AGC con. Sound and Vid. IF alignment L-217 Det. alignment Z-205 NOISY SOUND - PIX OK V208, V215, V216, V217, V218 Voi. and Tone con. Check sound system for loose connections Speaker Sound IF and Det. alignment L-217, Z-205 SYNC. BUZZ IN SOUND Tuner line tuning High-Low Switch V215, V216, V218, V209 AGC con. Sound IF and Det. alignment INTERMITTENT SOUND - PIX OK V208, V215, V216, V217, V218 Poor connections in sound system	
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TUBE LIST

Symbol	Type	Circuit Function
V101	6X5	RF Osc. & Mix.
V102	6X5	RF Amp.
V201	6CB6	1st Vid. IF
V202	6CB6	2nd Vid. IF
V203	6CB6	3rd Vid. IF
V204	12BY7	Vid. Amp.
V205	6BE6	1st Sync. Clipper
V206	6BE6	2nd Sync. Clipper
V207	6AL5	Hor. Phase Det.
V208	6AU6	Sound IF
V209	6AL5	Ratio Det.
V210	6AT6	1st Audio Amp.
V211	6W6GT	2nd Audio Amp.
V212	6X4	Rect. & B+ Filter
V213	6SN7GT	Hor. Osc.
V214	6BQ6GT	Hor. Defl. Amp.
V215	6W4GT	Hor. Damper
V216	1B3GT	High-Volt. Rect.
V218	6AU6	AGC Amp.
V219	5U4	Power Rect.

KEY VOLTAGES

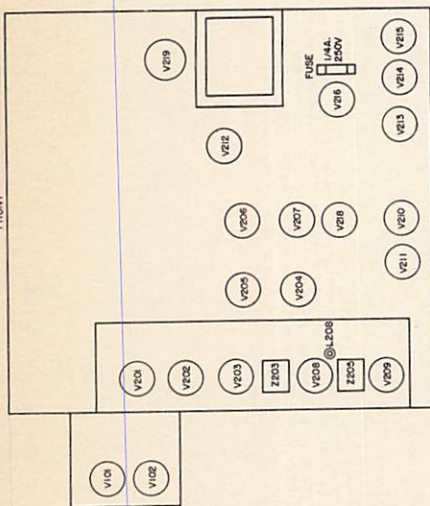
B+, plate of damper, V215 pin 5 270vdc
 Boosted B+, cath. of damper, V215 pin 3 480vdc
 Plate of Vert. Osc., V206 pin 5 420vdc
 Plate of Vert. Defl. Amp., V213 pin 9 420vdc
 Plate of Hor. Osc., V213 pin 2 200vdc
 Grid of Hor. Defl. Amp., V214 pin 5 90vdc
 Grid of Hor. Defl. Amp., V214 pin 5 -17vdc

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

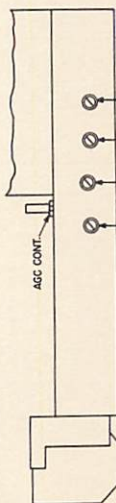
ADJUSTMENTS

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

FRONT



TOP VIEW



REAR CONTROLS

HOR. STAB.
 HOR. DRIVE
 HOR. SIZE
 HOR. LIN.

PICTURE

ON-OFF VOL.

BRIGHTNESS

HOLD

HOLD

HOLD

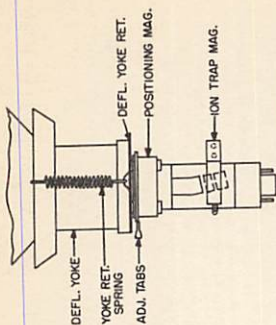
HOLD

HOLD

HOLD

HOLD

HOLD



PICTURE TUBE ADJUSTMENTS

FINE TUNING

STATION SELECTOR

FRONT CONTROLS

NO RASTER - NO SOUND (31) Power input circuit V219	SOUND BARS IN PIX (4A, 4E) Tuner fine tuning V201, V102, V201, V202, V203 Contrast and AGC con. Check 330K Res. connected to pin 7 of V204 IF and RF alignment	RASTER BLOOMING (37) Hor. Drive con. V214, V216, V219, V401 Check 330K Res. connected to HV filter cap. Check HV Filter cap.	NO SOUND - PIX OK (8B) Tuner fine tuning V208, V209, V210, V211 Yol. con. Speaker (open voice coil or defective connections) Sound and Vid. IF alignment Z-208 Det. alignment Z-205
NO RASTER - SOUND OK (31) F-201 HV Fuse (1.25 Amps.) V207, V214, V215, V216 Ion trap V401 Brightness con. HV trans. Hor. yoke CRT connections	SNOW IN PIX (32) V101, V102, V201, V202, V203, V218 AGC con. Antenna and transmission line	INSUFFICIENT RASTER WIDTH (23) Hor. Drive and Size con. V214, V216, V219 Check 330 and 3300 μ f caps. connected between pins 5 of V213 H. O. T.	WEAK SOUND - PIX OK (8C) Tuner fine tuning V208, V209, V210, V211 AGC con. CR-201 Vid. Det. crystal Sound and Vid. IF alignment Z-208 Det. alignment Z-205
WEAK PIX - SOUND AND RASTER OK (34) Tuner fine tuning Contrast and AGC con. V101, V201, V202, V203, V204 CR-201 Vid. Det. crystal	AC IN PIX (DARK HOR. BAR) (38) V101, V102, V201, V202, V203, V204 Tuner fine tuning Contrast and AGC con. V102, V201, V202, V203, V204, V218 CR-201 Vid. Det. crystal Check Vid. Det. and Amp. peaking coils	INSUFFICIENT RASTER HEIGHT (15) Vert. Hold con. V206, V212 Check 0.047 and 0.1 μ f cap. connected to pin 6 of V206 V. O. T. Low line voltage	NOISY SOUND - PIX OK V208, V209, V210, V211 Yol. con. Check sound system for loose connections Speaker Sound IF and Det. alignment L-208 and Z-205
POOR HOR. LIN. Hor. Drive and Lin. con. V213, V214, V215 Check 0.047 μ f cap. connected to pin 6 of V206 H. O. T.	VERT. BARS (21) Hor. Drive con. V213, V214, V215 Check 47 μ f caps. connected to terminals 3 and 7 of the defl. yoke Defl. yoke ringing	NO VERT. DEF. (14) V206, V212 Check 0.047 and 0.1 μ f cap. connected to pin 6 of V206 Vert. Det. yoke V. O. T.	SYNC BUZZ IN SOUND Tuner fine tuning V208, V209 AGC con. Sound IF and Det. alignment L-208 and Z-205
POOR VERT. LIN. (11, 12) Vert. Lin. and Size con. Check 0.047 and 0.1 μ f caps. connected to pin 6 of V206 Check 10 μ f Elec. cap. connected to pin 2 of V212 V. O. T.	PIX BENDING (22) Hor. Hold and Stabilizing V206, V207, V213, V218 Hor. Drive con.	NO HOR. OR VERT. SYNC. - HOR. SYNC. OK (16, 17) Hor. Hold con. V206, V212 V214, V215 Check 0.002 μ f cap. connected to pin 7 of V206	INTERMITTENT SOUND - PIX OK V208, V209, V210, V211 Poor connections in sound system
PIX JITTER SIDEWAYS AGC con. Hor. Hold and Stabilizing con. V207, V213, V218	WEAK OR NO PIX - SOUND WEAK (32C, 4C) Tuner fine tuning V101, V102, V201, V202, V203, V214, V215 AGC con. RF and IF alignment	NO HOR. OR VERT. SYNC. - PIX SIGNAL OK V205, V206, V218 AGC con.	
PIX JITTER UP & DOWN (18, 17) V209, V212 Vert. Hold and AGC con.	INTERMITTENT RASTER - SOUND OK V207, V213, V214, V215, V219 Brightness con. V201 HV trans.	NO HOR. SYNC. - VERT. SYNC. OK (19, 20) Hor. Hold and Stabilizing con. V206, V207, V213 AGC con. Check 330 μ f caps. connected between pins 2 and 4 of V213	
SMOARED PIX (36) Tuner fine tuning V208, V209, V210, V211 V204, V218 CR-201 Vid. Det. crystal Check Vid. Det. and Amp. peaking coils IF and RF alignment	INSUFFICIENT BRIGHTNESS Ion trap Brightness con. V207, V213, V214, V215, V219 Low line voltage	AUDIO HUM IN SOUND (8E) V205, V209, V210, V211	
POOR PIX DETAIL (35) Tuner fine tuning AGC con. V204, V218, V201, V202, V203 Check Vid. Det. and Amp. peaking coils IF and RF alignment	DISORTED SOUND (8D) Tuner fine tuning V101, V206, V209, V210, V211 AGC con. Check 0.02 μ f caps. connected to pin 5 of V211 Sound and Vid. IF alignment L-208 Det. alignment Z-205	DISORTED SOUND (8D) Tuner fine tuning V101, V206, V209, V210, V211 AGC con. Check 0.02 μ f caps. connected to pin 5 of V211 Sound and Vid. IF alignment L-208 Det. alignment Z-205	

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