NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY
EDMONTON ALBERTA

ELECTRONICS DEPARTMENT

CM-107

ADJUSTMENTS

CUSTOMER CONTROLS

On-off, Volume, Contrast, Brightness, Treble, Bass, Vertical and Horizontal Hold controls are typical customer operating controls and are adjusted in the same manner as on black and white receivers. The operation of the Hue and Color Level should be thoroughly demonstrated to the customer, preferably during a color program. If a color program is not being telecast, a display of color bars can be used.

HUE

The Hue control is a color selector control and should be adjusted for correct color reproduction. Facial tones are a guide for proper adjustment. If correct facial tones are obtained, all colors should be true.

COLOR LEVEL

The Color Level Control adjusts the vividness or depth of color. Adjust this control for proper color intensity.

*COLOR OFF SWITCH

On the rear of the Color Level control is a push-On and pull-Off switch to render color. On or Off without disturbing the setting of the Color Level control.

Color "confetti" may appear across the entire picture if a very weak or noisy signal is being received. Placing the Color Off switch in the Off position makes it possible to view the program in black and white.

*PEAK PICTURE

This control is adjusted by the customer to suit a particular program condition. It is part of the Cathode Follower circuit and has a decided effect on the video response. This response can be changed from a slight smear at the extreme counter-clockwise position of the control to a slight overshoot in the maximum clockwise position. The control can be adjusted by the customer for best picture detail under normal signal conditions. As an example, an old movie can be "crispened" or the texture of "snow" in a fringe area can be changed for a more pleasing picture.

AGC

The location of this adjustment is shown in the Chassis Layout Diagrams in this manual for the particular chassis. If it is set too far to the right, picture overload will exist, resulting in a very dark contrasting picture usually accompanied by "picture tearing" or loss of horizontal sync. If the AGC adjustment is set too far to the left, weak or complete loss of video may exist.

To adjust, tune in the strongest TV channel available and slowly turn the AGC adjustment to the right until a point is reached where the picture distorts and buzz is heard in the sound. At this point, the picture becomes dark and pulls horizontally; then turn to the left and set at a point comfortably below the level of buzz, picture distortion, and/or improper sync.

RASTER TILT

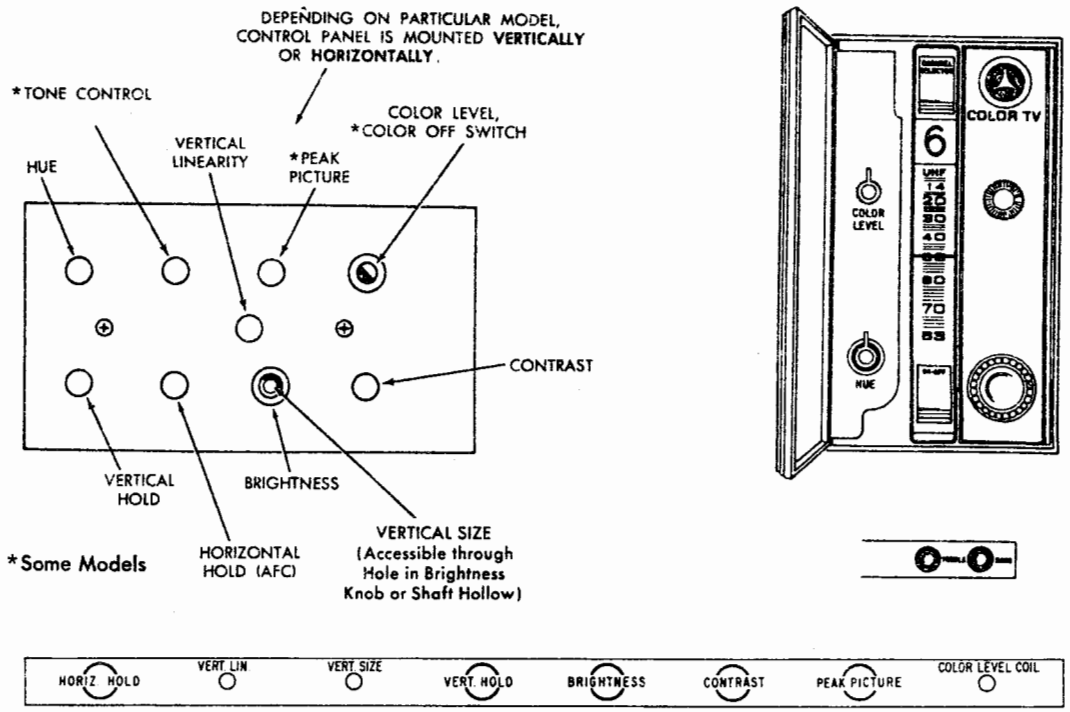
If the horizontal scanning lines are tilted, the deflection yoke must be repositioned. Loosen the yoke retaining hardware, grasp the yoke and adjust for correct position. See Figures 3A and 3B. When positioning the yoke, do not slide it along the neck of the tube or purity will be affected. The horizontal scanning lines should be parallel to the picture tube mask.

*PINCUSHION CORRECTION

(Used on chassis with 90° deflection, rectangular CRT only)

Top and bottom pincushion correction is provided by the 6C4 stage. Correction at the sides is fixed and no adjustment is necessary. Top/bottom pincushion adjustment is provided by T9. To properly adjust, connect a cross-hatch generator to antenna terminals and tune in a cross-hatch pattern on the receiver. Adjust T9 until the top and bottom of the pattern is

***Not used on 24NC31, 24MC32 and 24MC42 Chassis.**



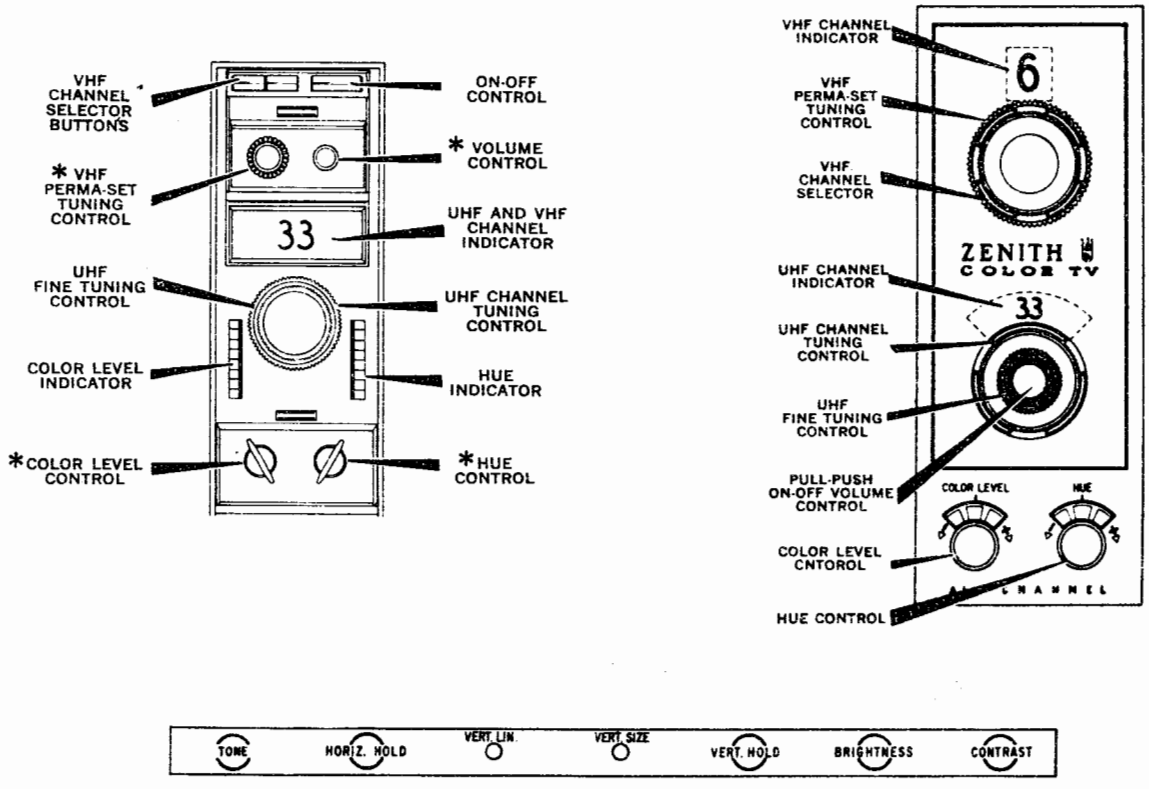


Figure 2—Controls and Adjustments on Front of Cabinet for various Models.

symmetrical (straight) with the picture tube mask. Misadjustment of T9 may cause pin-cushioning, poor linearity, etc.

In monochrome receivers, permanent magnet type pin-cushion correction devices are quite satisfactory since only one beam must be controlled. However, this method would be unsatisfactory for color tubes since the effect on the three beams would be unequal. Thus, dynamic correction is necessary.

Referring to the 25MC36 schematic, a parabolic voltage (unfiltered Boost voltage) is coupled to the junction of C56 and C57; through C56 to transformer T9, and through C57 to the grid of V11. The tube reverses the phase of the parabolic voltage and also applies it to transformer T9.

With no other voltage applied, these "two" parabolic voltages would cancel each other at T9, (plate of V11). However, a 60 cycle sawtooth voltage is also coupled to the grid of V11 to control its gain and thus control the amplitude of the parabolic voltage fed through the tube. The polarity of the sawtooth voltage is such that the gain of the tube is greatest at the start of the vertical sweep and near cut-off at the end of the vertical sweep. Thus, the amplitude of the parabolic voltage coupled through V11 varies from a high amplitude to zero (through one 60 cycle sweep trace). This "varying" parabolic voltage adds to the constant parabolic voltage fed through C56, and causes T9 to "ring" producing the actual necessary voltage at T9 as indicated on the schematic. Maximum correction is provided at the beginning of the vertical sweep, zero correction at the center of the sweep and maximum correction again at the end or bottom of the sweep. Transformer T9 is tuned to 15.75 Kc to provide optimum correction at the top and bottom of the raster.

Pin-cushion correction at the raster sides is provided by coupling a 60 cycle parabolic waveform from the screen grid of the vertical output tube to the screen grid of the horizontal output tube. This causes a gradual increase in raster width (widest in center) in time with the 60 cycle parabolic rate.

PICTURE CENTERING
(25MC36 and 25MC46 Chassis only)

Electrical picture centering is provided by the two controls at the rear of the chassis. The vertical centering control is located on the rear apron of the chassis under the high voltage compartment and the horizontal centering is located in the high voltage compartment near the focus control. See Figure 26. Do not adjust centering to compensate for poor vertical size and/or linearity. If picture centering is required, it should be performed as part of the "Purity Adjustment Procedure" in this manual.

PICTURE CENTERING
(24NC31, 24MC32 and 24MC42 only)

Two picture centering rings are mounted inside the deflection yoke, each ring being controlled by a pair of strings which are joined together to form a loop. The two loops are accessible from the rear of the deflection yoke. The loop at the top side of the yoke is connected to one ring, and the other loop at the lower side of the yoke is connected to the other ring. Both rings have "stops" and therefore, the looped strings cannot be pulled out. Be sure the picture is properly centered *before final* adjustment of dynamic convergence is completed.

Do not adjust the Centering Rings to compensate for poor vertical size and/or linearity.

If picture centering is required, it should be performed as part of the "Purity Adjustment Procedure" in this manual. Dynamic convergence will be affected by the adjustment of the centering rings if **re-centering** is attempted after all other adjustments are completed.

To center the picture, apply pattern to receiver of known centering or reduce line voltage (using variac) until raster sides, top and bottom are just visible. Alternately pull the string on either side of the loop straight back until pattern or raster is centered. When pulling the loops to center the picture, be sure the convergence yoke components are not shifted from their correct position. If variac was used, return line voltage to normal.

After centering is accomplished, re-check for correct positioning of the convergence yoke assembly to be sure the coil sections are properly fastened and the assembly correctly positioned. Otherwise, good convergence may be extremely difficult to achieve or the entire procedure may have to be repeated when the coils are repositioned into place. See Figure 3A.

VERTICAL SIZE and LINEARITY

Location of the Vertical Size and Linearity adjustments are shown in Figures 2A and 2B. These adjustments are also performed or checked during the "Color Purity" adjustment as given in this manual.

Correct vertical size and linearity is achieved when the picture is approximately ½" beyond the top and bottom limits of the mask. If these two controls are **readjusted** after convergence adjustments are made, a *repeat convergence* adjustment *may* be necessary.

WIDTH

(25MC36 and 25MC46 chassis only)

The horizontal sweep section provides ample width, eliminating the necessity of having a width control. However, should a slight increase in width be desired, move the Blue lead (which connects from the horizontal sweep transformer to the terminal strip on top of the chassis next to the high voltage cage) from the blank terminal (to which it is connected) to the terminal connector directly adjacent to it. In this position, a capacitor shunts the horizontal deflection windings, providing an increase in sweep of approximately one-half inch. See Chassis Layout Diagrams.

(24MC32, 24MC42 and 24NC31 chassis only)

On these chassis, the width capacitor is located within the deflection yoke. See schematic.

AFC (HORIZ. HOLD)

The automatic frequency control adjustment is the front panel operating control marked Horiz. Hold. The control is equipped with stops that limit knob rotation to approximately 270 degrees. To adjust the AFC, remove the knob and turn the shaft to a position where it is virtually impossible to lose horizontal synchronization when switching from channel to channel. In this position, replace the knob with its pointer centered between the stops.

BUZZ

The Buzz adjustment is set for minimum buzz in the sound channel. With the receiver properly tuned to a TV station, adjust for minimum buzz. This setting will be near mid-range. See Chassis Layout Diagrams for location.

FOCUS

The Focus adjustment is a potentiometer located in the output bleeder circuit of the Focus Rectifier stage. It is physically located at the rear of the high voltage cage. When adjusting for proper focus, Brightness and Contrast controls should be set at approximately viewing level.

BRIGHTNESS RANGE

The Brightness Range control is located on the rear apron of the chassis. To adjust, set the channel selector for a station signal and set Brightness and Contrast controls to maximum. Adjust the Brightness Range control *just below* the point at which the raster tends to "bloom." Raster lines should be distinct.

COLOR KILLER

The Color Killer Adjustment is a potentiometer located on the rear chassis apron. Adjustment may be required if difficulty is encountered in receiving a weak color signal or if the color channel "opens" on black and white signals.

1. Check or set Color Killer control fully counter-clockwise.
2. Tune in color station signal. If color signal does not tune in, adjust Color Killer control clockwise until color just appears on screen and is normal. Set Channel Selector to a black-and-white program and check for freedom from colored noise. If colored noise appears on black and white programs, adjust Color Killer control slightly counter-clockwise until colored noise is removed. Re-check for normal color reception.

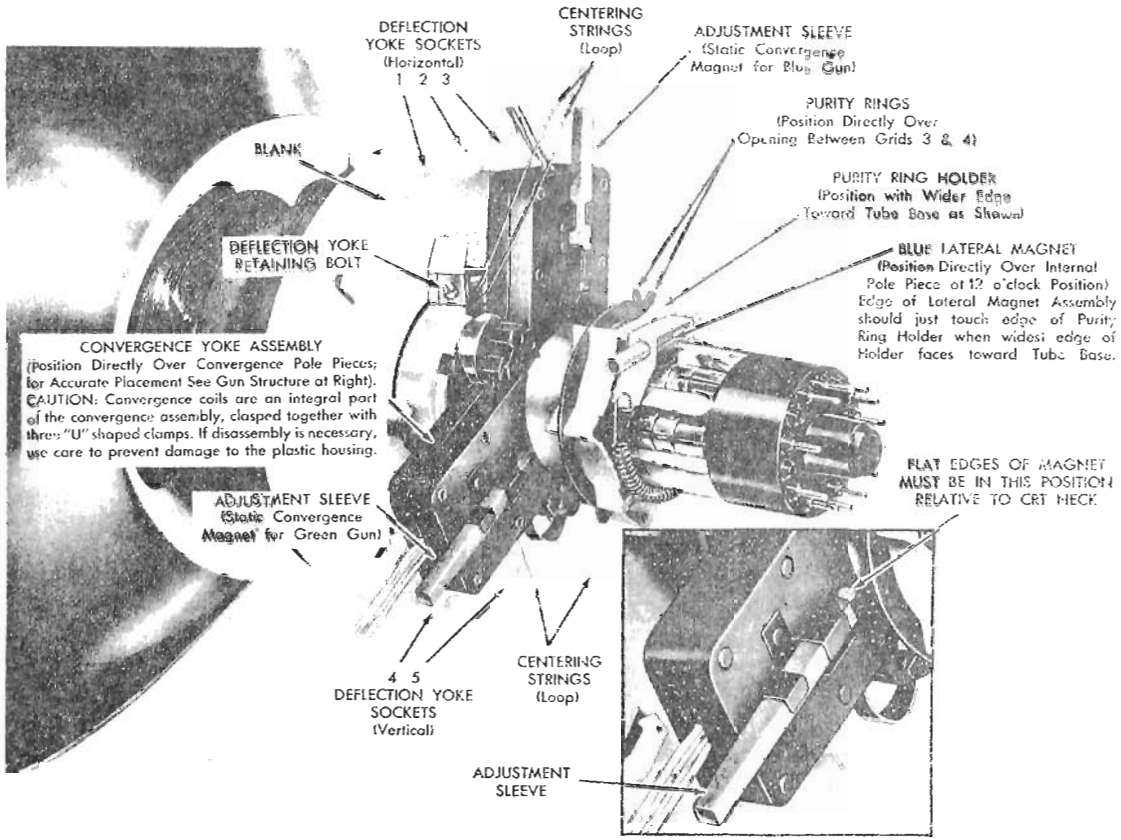
The Color Killer control is properly set when color programs are reproduced in color and black-and-white programs are free from colored noise.

The Color Killer circuit on the 24NC31, 24MC32 and 24MC42 chassis is different than the circuit used on other Zenith Color chassis.

Referring to the schematic of the 24MC32, a negative voltage of approximately 50 volts is coupled from the grid of V18C, Horizontal Discharge tube, to the grid of the 2nd Color Amplifier, V11, through the 330K ohm resistor and Color Level control. This voltage maintains the 2nd Color Amplifier cut-off except during color reception.

During Color reception, ACC voltage is developed and applied to the grid of the 1st Color Amplifier. This small negative grid voltage is sufficient to cause the screen voltage to increase considerably. This increase is reflected through the 150K ohm resistor and Color Killer Adjust control to the grid of the 2nd Color Amplifier. This voltage overcomes the cut-off bias applied to V11 and allows it to conduct. The diode in this circuit prevents the 2nd Color Amplifier grid from going positive by conducting when its anode becomes positive with respect to ground.

The Color Killer Adjust control is part of a voltage divider circuit which sets the point at



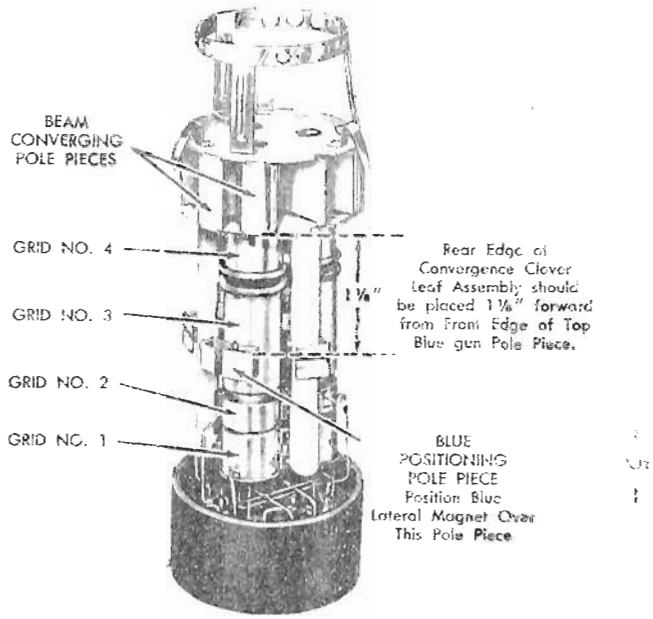
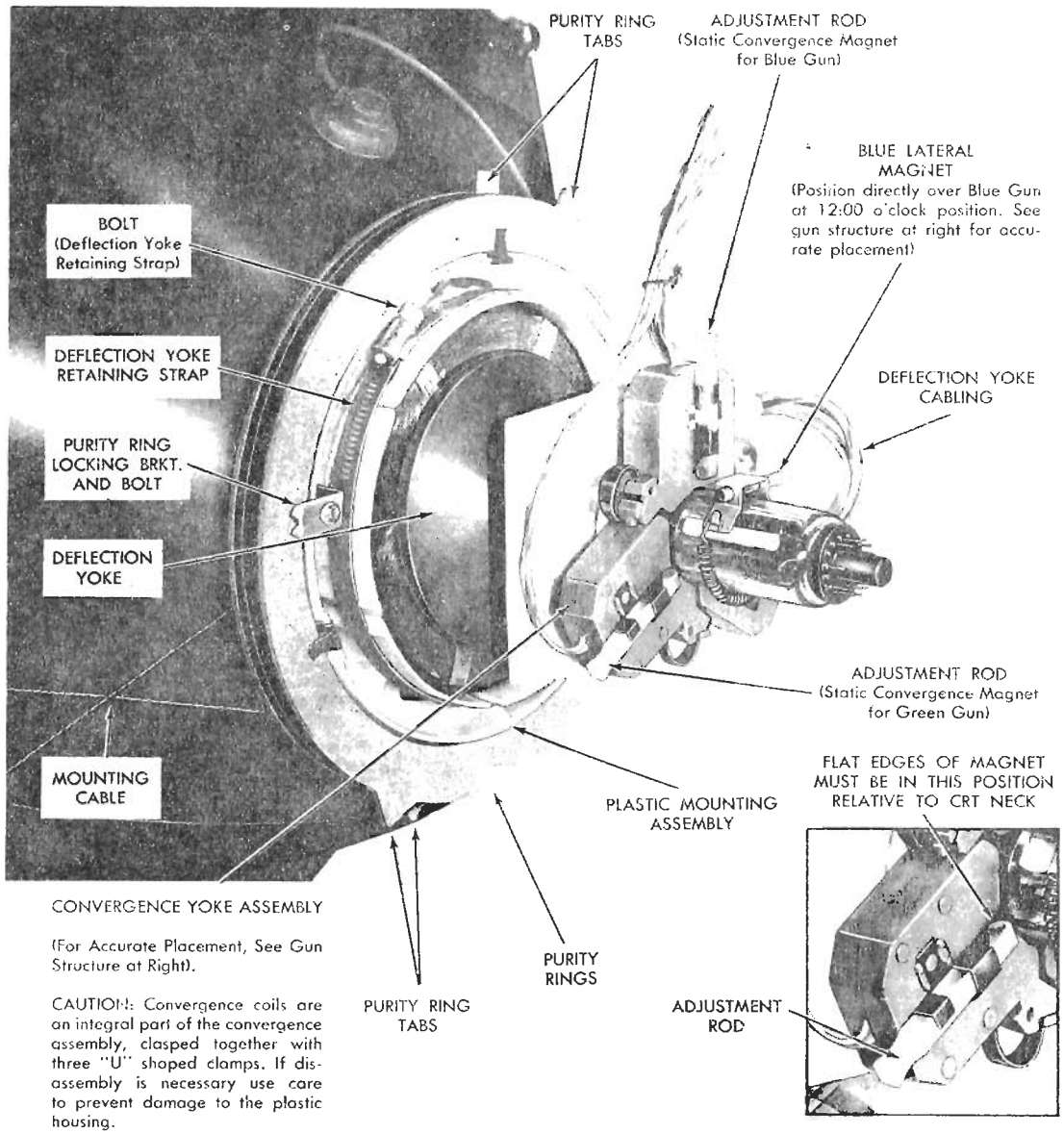


Figure 3A—Location of Components on Neck of Round Picture Tube.



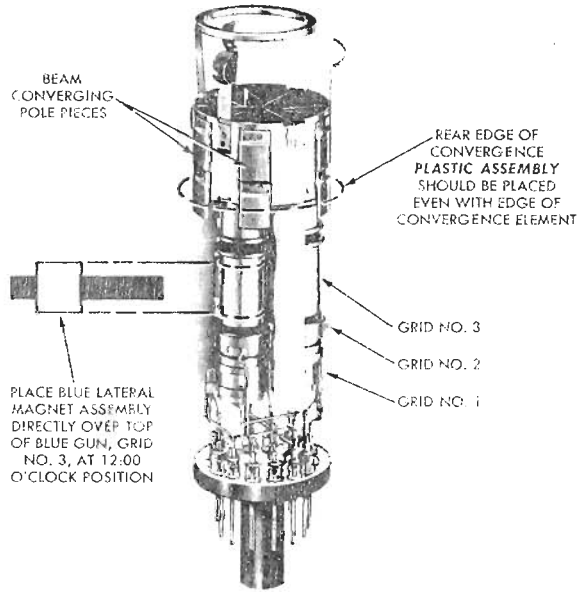


Figure 3B—Location of Components on Neck of Rectangular Picture Tube.

which the 2nd Color Amplifier will conduct as a result of incoming color signal.

HIGH VOLTAGE ADJUSTMENT

This adjustment is pre-set at the factory to insure efficient operation of the horizontal sweep section. It should not require readjustment, unless it is necessary to replace a tube in the horizontal sweep section. Refer to "Horizontal Sweep Alignment" under "Alignment" for proper adjustment procedure.

AUTOMATIC COLOR CLARIFIER

(Not used on some chassis)

The automatic degaussing circuit used on most chassis eliminates the necessity of degaussing in the usual manner except under severe or abnormal magnetic conditions. This circuit automatically degausses the picture tube and surrounding metal frame during the first few seconds of warm-up each time the set is turned on. Under normal operating and installation conditions, it is unnecessary to degauss the set by any other method.

Electrically, the Color Clarifier circuit is incorporated in the power supply circuit. For example, refer to the 25MC36 schematic. When the receiver is first turned on, the thermistor is cold (assuming the receiver was off for at least 5 minutes) and its resistance is high. Thus, maximum current flows through the varistor (low impedance) and the two coils on the shield assembly and minimum current through the thermistor.

As the thermistor heats, its resistance decreases, causing an increase in current flow through it. Simultaneously, the current through the varistor decreases, and its impedance increases. The thermistor continues to heat until its temperature stabilizes and current through it reaches maximum. At this time, current through the varistor reaches a minimum state (negligible) and its impedance becomes very high. For all practical purposes, current "ceases" through the varistor and the two coils, and maximum current flows through the thermistor after approximately 12-15 seconds. Degaussing is then completed. Since it takes approximately 30 seconds warm-up of the receiver (tubes, etc.) before a picture appears on the screen, the demagnetizing cycle is not visible.

If it becomes necessary to check the automatic degaussing system during service, connect a temporary jumper lead across the thermistor with the receiver off. If set was **on** prior to connecting the jumper lead, wait five minutes for the thermistor to cool. Then, turn on set and when raster or picture appears, carefully remove jumper wire while set is on. A rainbow whirling pattern should be seen on the screen for about 12-15 seconds. This indicates the system is working correctly.

PURITY ADJUSTMENT

Before attempting a *complete* purity adjustment, a purity *check* should be made *first*. Be sure to allow 5-10 minutes for receiver warm-up before proceeding with purity adjustments.

To *check* purity, turn the Red Screen control to maximum, and Blue and Green Screen controls to minimum. If red raster is pure, perform steps 8, 9, and 10. If red raster is impure, perform the following adjustments for *complete* purity procedure.

1. Check position of components on neck of picture tube as shown in Figure 3. With dot-crosshatch generator set for RF output, connect to the antenna terminals and tune in white dot or crosshatch pattern.
2. Loosen the locking hardware of the deflection yoke. See Figure 3 for location. Grasp the deflection yoke and slide the deflection yoke *back* toward the convergence clover leaf assembly as far as possible **without disturbing the position of the convergence yoke** or tilting the deflection yoke.
3. Alternately adjust vertical and horizontal centering controls until pattern is centered. See Figure 3A or 26 for location of centering controls. Temporarily remove generator signal.
4. Turn Blue and Green Screen controls to minimum.
5. Rotate each Purity Ring (spreading the tabs apart) until the purest red raster is obtained in the **center** area of the screen (red cloud in center area).

   *Degauss picture tube and if red cloud changes position, re-set purity rings. Continue setting purity rings and degaussing until further degaussing has no effect on position of red cloud.

   *Rectangular tubes with Post-deflection purity only.
6. Carefully slide the deflection yoke forward to achieve **outer edge** purity, until the entire raster is pure red.

   Purity in the central area of the raster is achieved by adjustment of the Purity Rings. Outer edge purity is achieved by deflection yoke positioning.

7. Using generator pattern, recheck centering controls for proper picture centering and yoke positioning so raster is not tilted. If necessary, check and/or adjust Vertical Size and Linearity for correct adjustment. Remove signal pattern.
8. Check the green raster by turning the Red Screen adjustment to minimum and turning up the Green Screen adjustment. The raster should appear green over the entire screen area.
9. Check the blue raster by turning the Green Screen adjustment to minimum and turning up the Blue Screen adjustment. The raster should appear uniformly blue over the entire screen area.
10. Perform black and white tracking as described under the "Black and White Tracking" procedure.

CONVERGENCE

In most instances upon installation, a complete convergence procedure will not be required. If initial observation reveals that convergence is good throughout the raster area (up to within approximately one to two inches of the raster edges, top, and bottom) do not reset any of the dynamic convergence adjustments. However, in some instances, a mere touch-up of only the static convergence adjustments may be required.

A complete procedure is usually only required if components are moved or replaced which have a decided effect upon convergence such as resetting of picture centering, height, or linearity, convergence assembly, picture tube, etc.

If a complete convergence procedure is required, be certain that Color Purity, Picture Centering, Vertical Size and Linearity are properly adjusted. There are sixteen convergence adjustments. Four of these adjustments are shown in Figure 3. Three are on the convergence yoke assembly (static convergence magnets) and one, the blue lateral magnet, near the base of the picture tube. The blue lateral magnet permits a lateral shift of the blue beam in opposition to the lateral shift of the red and green beams. These four magnets are positioned for center area convergence *only*, even though they affect the entire raster.

The dynamic convergence adjustments are located on a removable panel that can be placed on two mounting screws on the rear of the cabinet for accessibility from the front (if desired) during adjustment. Movement of the entire convergence panel does not affect convergence in any way. The convergence panel layout(s) is shown in Figure 4.

Figure 4—Convergence Panel.

Test Equipment

A cross-hatch generator that produces narrow vertical and horizontal lines and/or white dots is required for convergence. The generator signal must provide a stable RF output, or satisfactory convergence may be impossible to achieve.

To set some of the dynamic convergence adjustments, a non-metallic alignment tool with a hexagonal tip for the core slug adjustments (Zenith Part No. 68-26) is required. This same type alignment tool is used for alignment of Zenith black and white receivers.

Convergence Procedure

Apply the RF cross-hatch signal to the receiver antenna terminals and, if necessary, make a coarse adjustment of the Black and White Tracking adjustment. See procedure in this manual. For best results, room light or outside light should not reflect or shine directly on the picture tube face plate during convergence. Low ambient lighting conditions are recommended.

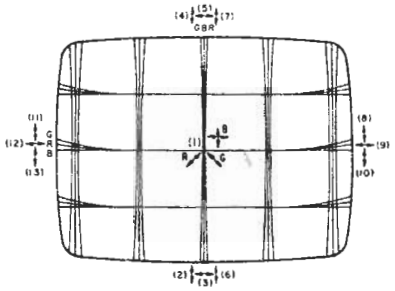


Figure 5—Convergence Pattern.

Brightness and Contrast controls should be set at a level normally used for picture viewing.

NOTE: Before proceeding with convergence adjustments, recheck the exact position of the neck components. If the neck components are not properly positioned, convergence may be difficult to achieve.

1. Perform static convergence by converging pattern at center of screen, adjusting the blue lateral magnet and sliding the permanent magnet adjusting rods in or out. See Figures 3 and 5. If range is inadequate, remove rod, rotate 180° and reinsert.
2. Merge the red and green horizontal lines at bottom center of pattern using **R&G Horiz. Lines, bottom** adjustment.
3. Merge the red and green vertical lines at bottom center of pattern using **R&G Vert. Lines, bottom** adjustment.
4. Merge the red and green horizontal lines at top center of pattern using **R&G Horiz. Lines, top** adjustment.
5. Merge the red and green vertical lines at top center of pattern using **R&G Vert. Lines, top** adjustment.

   Repeat adjustments 1 through 5 to achieve best vertical red-green convergence from top center to bottom center. Recheck static convergence (step 1).
6. Merge the blue horizontal line with red and green lines at bottom center of pattern using **Blue Horiz. Lines, bottom** adjustment.
7. Merge the blue horizontal line with red and green lines at top center of pattern using **Blue Horiz. Lines, top** adjustment.

   Repeat adjustments 6 and 7 to achieve convergence of blue line with red and green lines from top center to bottom center. If necessary, repeat step 1 to converge the blue beam with the red and green beams.
8. Merge the red and green horizontal lines at right center of pattern using **R&G Horiz. Lines, right side** adjustment.
9. Merge the red and green vertical lines at right center of pattern using **R&G Vert. Lines, right side** adjustment.
10. Merge the blue horizontal line with the red and green lines at right center of pattern using **Blue Horiz. Lines, right side** adjustment.
11. Merge the red and green horizontal lines at left center of pattern using **R&G Horiz. Lines, left side** adjustment.
12. Merge the red and green vertical lines at left center of pattern using **R&G Vert. Lines, left side** adjustment.
13. Merge the blue horizontal line with red and green lines at left center of pattern using **Blue Horiz. Lines, left side** adjustment.

    If necessary, repeat adjustments 8 through 13 to achieve best horizontal convergence from left side center to right side center. Although the degree to which color receivers can be converged will vary, good convergence should be achieved within an area out to approximately 2″ from the edges, top and bottom of the raster. Some misconvergence may exist at extreme edges of the raster which is normal and undetected at normal viewing distance (approximately 8 feet).

BLACK and WHITE TRACKING

If a color set is to have good black and white tracking, it must produce black and white pictures within the normal usable range of both the Contrast and Brightness controls. The three Screen Grid adjustments, the B and G Gain, the CRT Bias adjustment, plus the Brightness and Contrast controls, are used for adjusting black and white tracking. During this procedure, the voltages on the cathodes, control grids, and screen grids of the picture tube guns are adjusted to produce black and white pictures throughout the usable range of the Brightness and Contrast controls.

To adjust, tune in a monochrome picture that displays an adequate range of light levels, light and grey objects, dark objects, etc. Set the Brightness and Contrast controls for a normal picture.

1. Set the CRT Bias and the three Screen adjustments to minimum (fully counter-clockwise). See Chassis Layout Diagrams in this manual.

2. Set the BW Switch to Set-Up position. In this position the vertical sweep is removed to facilitate adjustments.
3. Advance each Screen adjustment to produce a white horizontal line of medium brightness through the center of the screen.

   (a) In some instances, the Red, Green, and Blue lines may not completely overlap to form a white line due to the removal of the vertical sweep and necessary vertical convergence waveforms. In such cases, adjust the three screen controls for Red, Green and Blue lines of approximately equal intensity.

   (b) If one or more of the Screen adjustments fail to produce a line, leave that particular Screen adjustment at maximum. Advance the CRT Bias setting to produce a line of medium brightness for that particular Screen adjustment(s). Adjust remaining Screen adjustments for a white line, or lines of approximately equal intensity.

   IMPORTANT: The CRT Bias adjustment should always be set at **minimum** if tracking can be performed satisfactorily. It should only be turned when a particular Screen adjustment(s) fails to produce a line and *only* according to step 3(b).
4. Return the BW Switch to "Normal" position.
5. Alternately adjust the Blue and Green Gain adjustments to produce a normal black and white picture.

Check overall black and white tracking throughout the normal brightness and contrast range. Accuracy of Screen adjustments is important. If difficulty is encountered in obtaining good black and white tracking, refer to "Picture Tube Drive Connections" below.

PICTURE TUBE DRIVE CONNECTIONS

As shown on the schematics, the red cathode of the picture tube is connected directly from the Y amplifier output at test point D and the blue and green cathodes are connected to two gain adjustments. These connections are made through a slip connector and terminal lug arrangement from the three separate gun cathodes. However, this particular arrangement of these picture tube drive connections *may not* be the same on every receiver. The particular arrangement of these connections for the specific picture tube used in a given receiver is determined at the factory. The arrangement depends upon which of the three picture tube phosphors is least efficient with respect to the other two.

The cathode of the gun with the least efficient phosphor is connected directly from the Y Amplifier output at test point D.

If a new picture tube is installed, the cathode lead of the gun having the least efficient phosphor should be connected to the R terminal. Generally, if a new picture tube is installed, the lead from the red cathode gun should first be connected to the terminal marked R.

As shown in Figures 23, 26 and 29 the three cathode leads of the picture tube are connected to a terminal strip near the rear center of the chassis. These terminals are indicated R, B, and G.

If a black and white picture cannot be achieved during the tracking procedure, it may be necessary to interchange the connections, placing the connector lead from the gun with the least efficient phosphor on the terminal indicated R. The other two cathode leads should be connected to the two remaining terminals.

If the picture appears cyan, change the connector from the red gun cathode to the terminal indicated R.

If the picture appears yellow, change the connector from the blue cathode to the terminals indicated R.

If the picture appears magenta, change the connector from the green gun cathode to the terminal indicated R.

The connectors slip over lugs on the terminal strip providing a proper electrical connection. Soldering is not required.