

**FIELD ALIGNMENT
MANUAL**

**CGC 7900 SERIES
COLOR GRAPHICS COMPUTERS**



DOCUMENT NUMBER: 070204
PUBLICATION DATE: 9/81

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TABLE OF CONTENTS

I.	INTRODUCTION.1
II.	SAFETY PRECAUTIONS.2
	A. ADJUSTMENT PRECAUTIONS.2
	B. X-RADIATION PRECAUTIONS . . . . .	.2
	C. CATHODE-RAY TUBE HANDLING . . . . .	.2
	D. GENERAL PRECAUTIONS . . . . .	.3
III.	FIELD ADJUSTMENTS . . . . .	.4
	A. TOP COVER REMOVAL . . . . .	.4
	B. FOCUSING. . . . .	.4
	1. FOCUSING ADJUSTMENT TEST PATTERN. . . . .	.4
	2. FOCUSING ADJUSTMENT . . . . .	.4
	C. PURITY. . . . .	.5
	1. PURITY ADJUSTMENT TEST PATTERN. . . . .	.5
	2. PURITY ADJUSTMENT . . . . .	.5
	a. DEGAUSSING. . . . .	.5
	b. TOUCH-UP METHOD . . . . .	.6
	c. CLASSIC METHOD. . . . .	.6
	D. PICTURE SIZE AND CENTERING. . . . .	.8
	1. SIZE/CENTERING ADJUSTMENT TEST PATTERN. . . . .	.8
	2. VERTICAL SIZE ADJUSTMENT. . . . .	.8
	3. HORIZONTAL SIZE ADJUSTMENT. . . . .	.8
	4. VERTICAL CENTERING ADJUSTMENT . . . . .	.9
	5. HORIZONTAL CENTERING ADJUSTMENT . . . . .	.9
	6. FINAL ADJUSTMENT. . . . .	.9

TABLE OF CONTENTS

E.	PINCUSHION.	10
1.	PINCUSHION ADJUSTMENT TEST PATTERN.	10
2.	VERTICAL PINCUSHION ADJUSTMENT.	10
3.	HORIZONTAL PINCUSHION ADJUSTMENT.	11
F.	CONVERGENCE	11
1.	CONVERGENCE ADJUSTMENT TEST PATTERN	11
2.	STATIC CONVERGENCE ADJUSTMENT	12
3.	DYNAMIC CONVERGENCE ADJUSTMENT.	12
G.	COLOR TEMPERATURE	13
1.	COLOR TEMPERATURE ADJUSTMENT TEST PATTERN	13
2.	COLOR TEMPERATURE ADJUSTMENT.	14
H.	INTENSITY	15
1.	INTENSITY ADJUSTMENT TEST PATTERN	15
2.	INTENSITY ADJUSTMENT.	16

I. INTRODUCTION

This manual gives detailed instructions for the simple adjustments which may be required prior to initial operation of the system or caused by the normal ageing of components.

In general, installation adjustments are not necessary, since the CRT display terminal is calibrated and adjusted at the factory prior to shipment. However, due to shipping, handling, severe environmental changes, and different magnetic field orientations (from the earth and the proximity of other equipment), these field adjustments are provided.

Each adjustment can be done separately, or the entire sequence can be completed as written. If all the adjustments in the manual are to be performed, they should be done in the order in which they appear, since a haphazard order may distort a previously adjusted component.

Adjustments not discussed in this manual are considered factory adjustments and have already been done, or should be done only by a Chromatics field service technician.

II. SAFETY PRECAUTIONS

A. ADJUSTMENT PRECAUTIONS

All of the adjustments described in this manual are accomplished by way of potentiometers with screwdriver slots. It is recommended that only non-metallic or non-conductive adjustment tools be used (fiber-glass or plastic alignment tools). This will prevent the possibility of damage to the equipment should the screwdriver slip from the potentiometer slot, and prevent electrical shock to the operator.

WARNING: LETHAL VOLTAGES ARE PRESENT WITHIN THE TERMINAL. HANDS AND TOOLS SHOULD BE KEPT FROM COMING IN CONTACT WITH ALL PRINTED CIRCUIT BOARDS (MODULES), WIRES AND CONNECTIONS.

The following precautions should also be observed:

B. X-RADIATION PRECAUTIONS

The primary source of X-Radiation in this terminal is the picture tube. The picture tube is specifically constructed to limit X-Radiation emissions.

For continued X-Radiation protection, the replacement tube must be the same type as the original, including suffix letter, or a Chromatics approved type.

NOTE: THE HIGH VOLTAGE FOR THE CGC SERIES COMPUTER IS SET AT 25,000 VOLTS. THE VOLTAGE MUST NOT, UNDER ANY CIRCUMSTANCES, EXCEED 26,000 VOLTS.

Operation within the 26KV High Voltage rating insures that X-Radiation is below the Federal regulation of 0.5 milliroentgen/hour.

C. CATHODE-RAY TUBE HANDLING

Do not install, remove, or handle the picture tube in any manner unless shatterproof goggles are worn. Personnel not so equipped should be kept

away while picture tubes are handled. Keep the picture tube away from the body while handling. This will avoid scratches to the face plate due to buttons, zippers, or belt buckles.

D. GENERAL PRECAUTIONS

As with any electrical equipment, extreme caution should be used when performing adjustments with the power on. This is especially true for this manual, since all of the adjustments require full power.

III. FIELD ADJUSTMENTS

A. TOP COVER REMOVAL

The top cover must be removed for several of the adjustments. To do this, remove the two screws on the back of the top cover and slide it backwards away from the machine.

The top cover can be replaced by reversing the above procedure: slide the top cover back toward the front of the unit, remembering to insert and tighten the two screws.

B. FOCUSING

Focusing is an adjustment performed to optimize the sharpness of the displayed picture on the viewing screen.

1. FOCUSING ADJUSTMENT TEST PATTERN

When adjusting focus, a full page of white letters should be used as a display screen pattern. To do this, depress the following keys in the indicated sequence:

RESET
SOFT BOOT
TEST
H

2. FOCUSING ADJUSTMENT

The focus control is the one-inch white nylon shaft located on the front of the High Voltage Power Supply Module. This module is the rectangular metal box visible on the right side of the machine (when facing the machine with the top cover removed). Optimum image sharpness can be obtained by turning the focus control clockwise or counterclockwise.

Adjust the focus control until a sharp image is obtained in the corners as well as in the center of the display screen.

C. PURITY

Purity refers to the uniformity of a desired color throughout the face of the display screen. This adjustment is accomplished using the color red, because variations in this color are more readily apparent than in blue or green test colors.

1. PURITY ADJUSTMENT TEST PATTERN

In order to test for purity, depress the following keys in the indicated sequence:

RESET
SOFT BOOT
SHIFT SET
RED
ERASE PAGE

2. PURITY ADJUSTMENT

If purity is properly adjusted, the screen should display a solid red picture with no other hues present. If it does, no further adjustment is necessary and the picture size and centering adjustment (page 8) should be completed next. If the screen displays a picture which varies in either color or intensity, then proceed to degauss the screen before attempting the other purity adjustments.

a. DEGAUSSING

Degaussing will properly correct purity if a disturbing magnetic field is present or has previously caused a distortion of purity.

To degauss the screen, press the DE-GAUSS button found behind the door to the right of the screen. Colors on the screen will shimmer for a moment as the degaussing process occurs.

NOTE: The system must be turned on for at least fifteen minutes before the degaussing button can be depressed. Once the button has been depressed, it cannot be depressed again for another fifteen-minute period. If the button is depressed before fifteen minutes have passed, degaussing will not occur, and an additional fifteen minutes will have to pass before the button can be depressed again.

If a disturbing field was causing a lack of purity, it will be neutralized and no further purity adjustment will be necessary; therefore, go to the picture size and centering adjustment on page 8. If there is still a lack of purity, proceed to the touch-up method.

b. TOUCH-UP METHOD

A touch-up adjustment is done by adjusting the purity rings while observing the screen for a homogeneous red color. The two purity rings (shown in Figure 1) are moved in relation to each other circularly on the neck of the picture tube.

To use the touch-up method, first note the original position of the purity ring tabs, so that they can be returned to this position if desired. This is easily accomplished since the purity rings are torque sealed at the factory and the patches of torque seal, once broken, can be used to indicate the original position.

Then using the ring tabs and observing the display screen, move the tabs alternately, one at a time. If the screen is satisfactory, go to the picture size and centering adjustment on page 8. If a solid red picture has still not been obtained, proceed to the classic method.

c. CLASSIC METHOD

To initiate this procedure, loosen the deflection yoke screw (the black

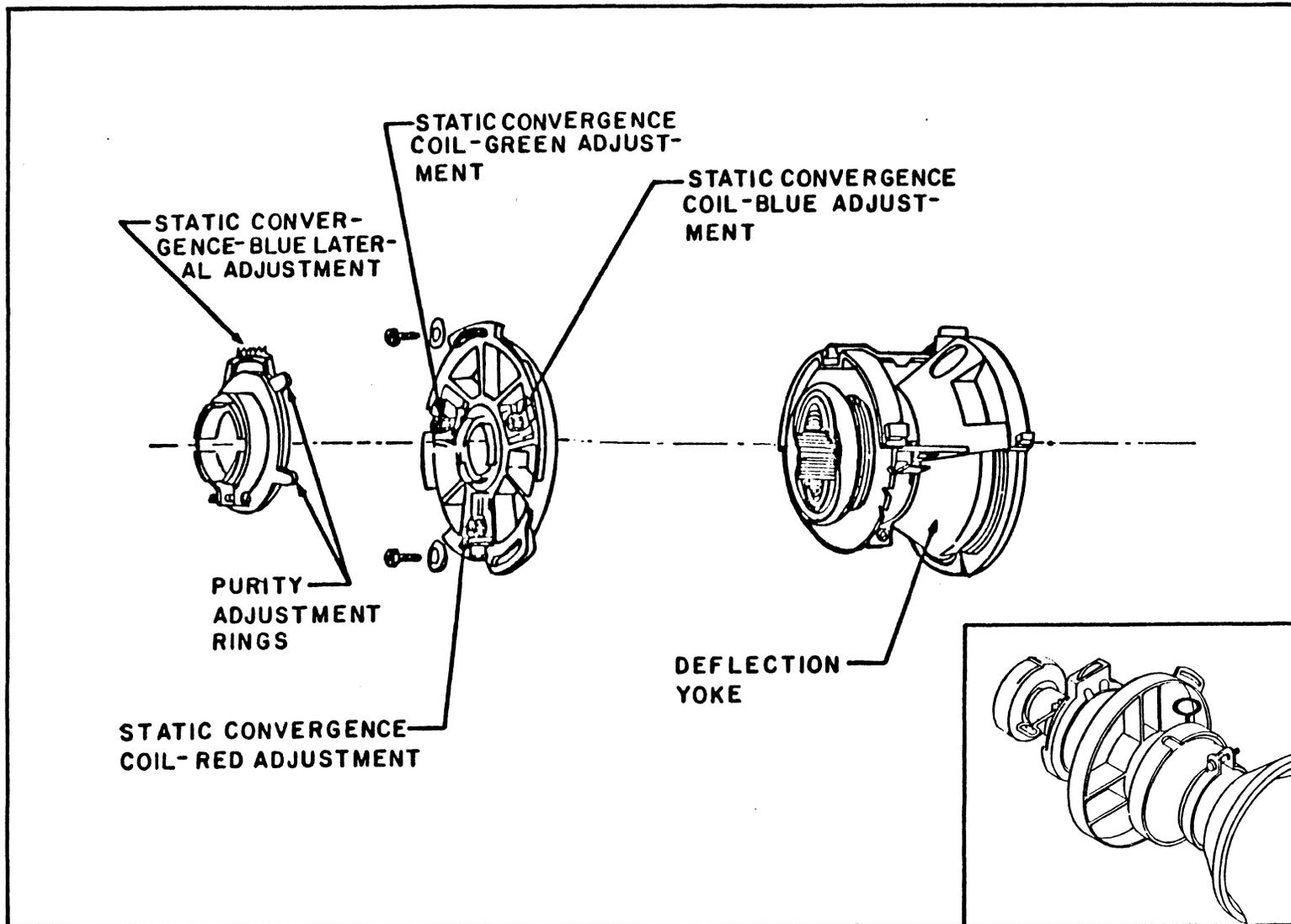


FIGURE 1

thumbscrew in the inset diagram of Figure 1) and slide the deflection yoke forward toward the face of the tube. A multicolored image should be present on the screen, including an off-centered reddish splotch. Observe the red splotch on the screen and adjust the purity adjustment rings, observing the vertical and horizontal movement of the red splotch. (As before, the two purity rings are moved in relation to each other circularly on the neck of the tube, one at a time.) This aligns the magnets to vary the purity alignment field. With the yoke pushed forward, the effect of each ring movement can be observed. Alternately moving the two rings, adjust the red splotch to the center of the screen.

Now slide the deflection yoke backwards away from the face of the tube until a uniform red raster is achieved. If the raster appears tilted to either side, rotate the deflection yoke, carefully but firmly, until the raster is straight. Tighten the screw on the deflection yoke.

CAUTION: EXCESSIVE TIGHTENING OF THE YOKE SCREW CAN CRACK THE NECK OF THE CRT.

Once the red field is established, it should be examined to ascertain that no areas of impurity are present. At this time, the purity can be "fine"-adjusted by rotating the purity adjustment rings slightly.

Uniformity of the green, blue, and white fields may now be checked. Depress the following control settings respectively:

<u>SHIFT SET</u>	<u>SHIFT SET</u>	<u>SHIFT SET</u>
<u>GREEN</u>	<u>BLUE</u>	<u>WHITE</u>
<u>ERASE PAGE</u>	<u>ERASE PAGE</u>	<u>ERASE PAGE</u>

All of the above colors should be pure. If any is unsatisfactory, return to the Purity Adjustment section (page 5) and repeat the entire process.

D. PICTURE SIZE AND CENTERING

The picture size should be adjusted to the indicated dimensions in order to obtain a proper aspect ratio for the graphics information.

CRT SIZE(DIAGONAL)		RECTANGULAR DISPLAY AREA	
<u>Inches</u>	<u>Centimeters</u>	<u>Inches</u>	<u>Centimeters</u>
19	48.3	10.25 x 14.5	26.0 x 36.8

When measuring picture size, a plastic straight edge or ruler should be used in order to conform to the curvature of the picture tube and to avoid scratching the face plate.

1. SIZE AN CENTERING ADJUSTMENT TEST PATTERN

Depress the following keys in the indicated sequence:

RESET
SOFT BOOT
SHIFT OVERLAY
TEST
H
FILL
SET
RED
CIRCLE
512, 383, 383,

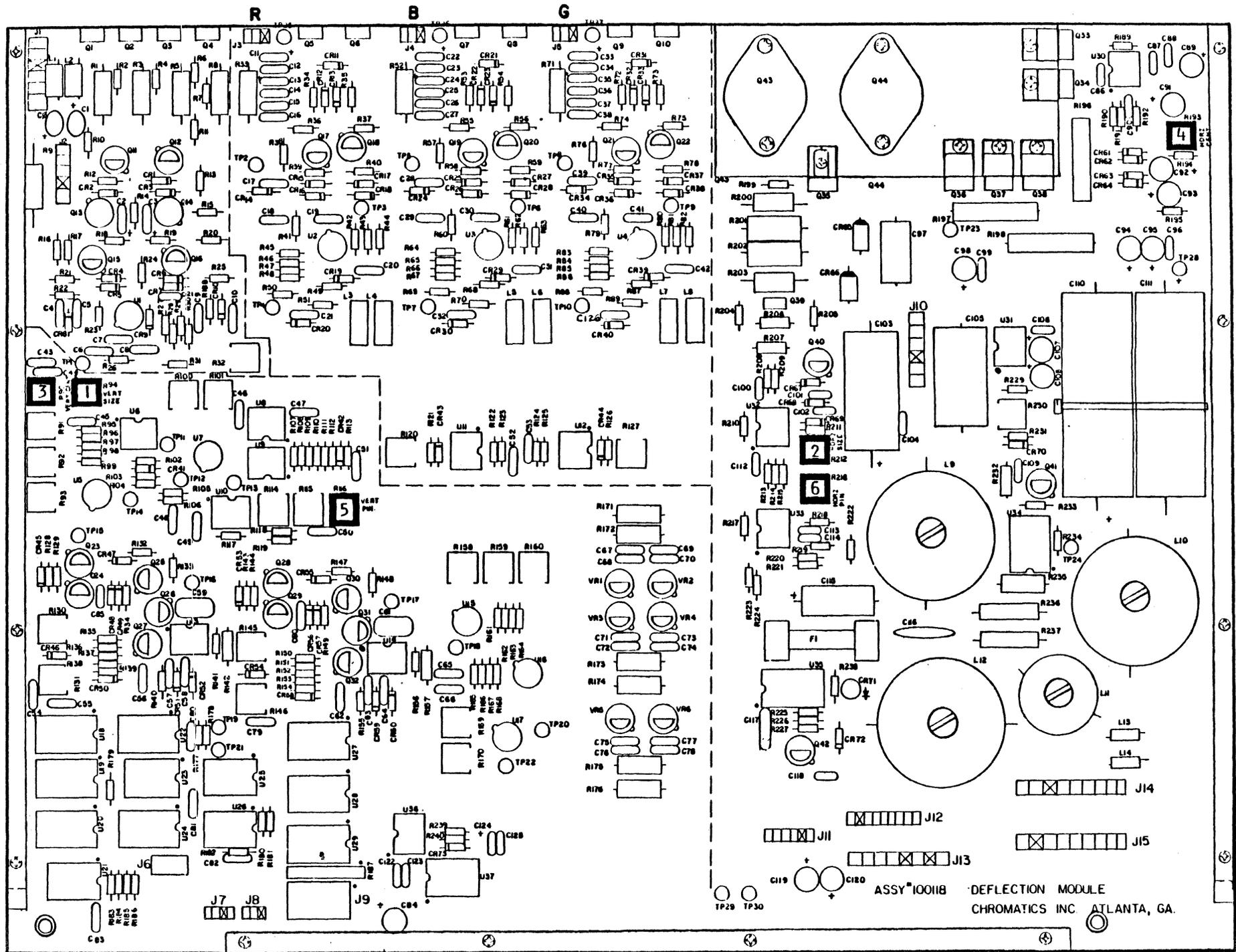
2. VERTICAL SIZE ADJUSTMENT

The vertical size control adjusts the overall height of the display screen. The vertical picture size control is R94 (#1 in Figure 2), located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of the unit.

Adjust R94 until the desired height of the display screen area is obtained (see the dimensions chart above).

3. HORIZONTAL SIZE ADJUSTMENT

The horizontal size control adjusts the overall width of the display screen area. The



ASSY 100118 DEFLECTION MODULE
 CHROMATICS INC ATLANTA, GA.

horizontal picture size control is R212 (#2 in Figure 2), located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of the unit.

Adjust R212 until the desired width of the display screen area is attained (see the dimensions chart on the previous page).

4. VERTICAL CENTERING ADJUSTMENT

The vertical centering control adjusts the display screen up or down on the face of the viewing screen without affecting vertical size. The vertical centering control is R90 (#3 in Figure 2) located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of the unit.

Adjust R90 until the display screen area is centered vertically.

5. HORIZONTAL CENTERING ADJUSTMENT

The horizontal centering control adjusts the display screen area to the left or right on the face of the viewing screen without affecting horizontal size. The horizontal centering control is R193 (#4 in Figure 2), located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of the unit.

Adjust R193 until the display screen area is centered horizontally.

6. FINAL ADJUSTMENT

In some instances, the sum of the adjustment procedures does not equal the total adjustment required. Look at the shape of the red circle and adjust any of the previously mentioned controls in order to make the circle round.

E. PINCUSHION

Pincushioning refers to the stretching out of all four corners of a raster (rectangular area) on the display screen (Figure 3). Vertical and horizontal pincushion adjustments eliminate concave and convex edges in order to refine the rectangular shape of the display screen area. The horizontal pincushion control straightens the top and bottom edges of the screen, while the vertical control straightens the sides.

Pincushion distortion causes the corners of a rectangular area to extend outward. If this condition is over-corrected, it can result in barrel distortion, which is the opposite of pincushion distortion because it causes the corners to curve inward. Both of these distortions can be seen as exaggerated illustrations in Figure 3.

1) PINCUSHION ADJUSTMENT TEST PATTERN

Depress the following keys in the indicated sequence:

RESET
SOFT BOOT
TEST
H

2) VERTICAL PINCUSHION ADJUSTMENT

The vertical pincushion control adjusts the top and bottom sides of the display screen area. The vertical pincushion control is R116 (#5 in Figure 2), located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of the unit.

Adjust R116 until the top and bottom edges of the display screen area appear horizontally straight, without concave or convex edges.

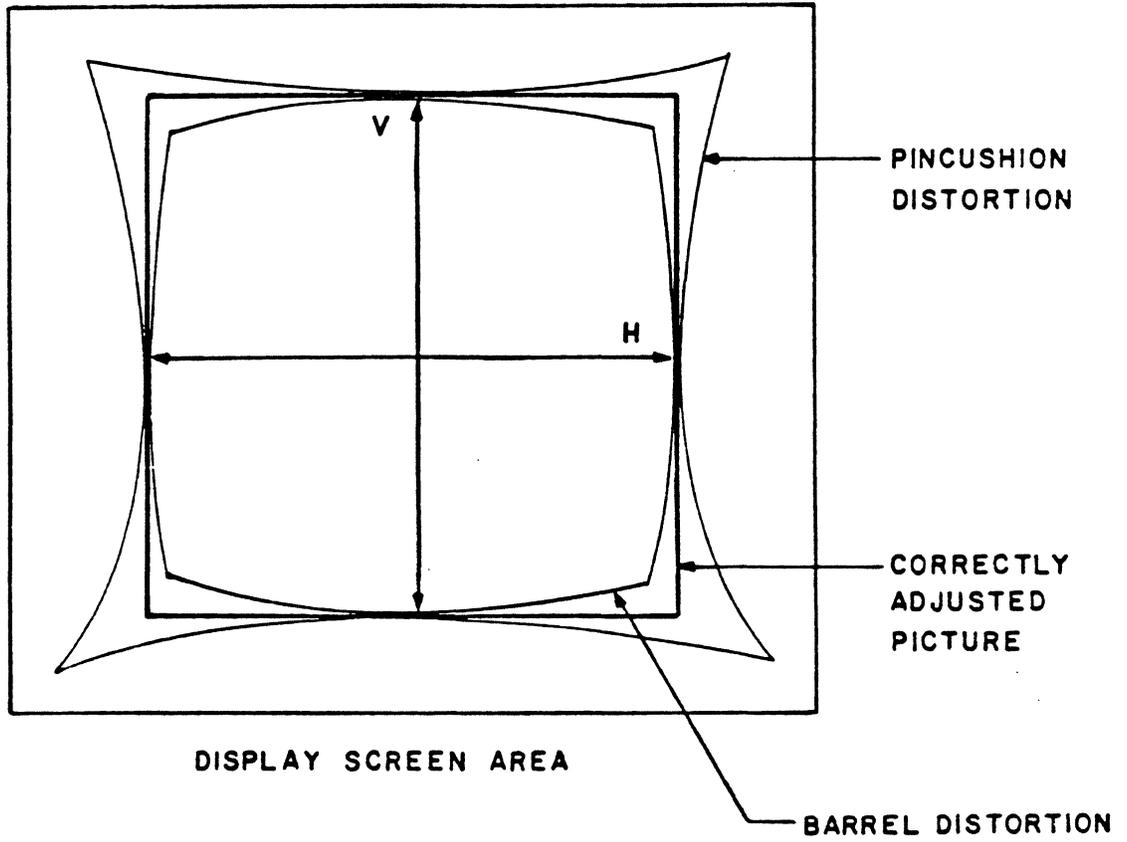


FIGURE 3: VERTICAL AND HORIZONTAL PINCUSHION DISTORTION AND CORRECTION.

3) HORIZONTAL PINCUSHION ADJUSTMENT

The horizontal pincushion control adjusts the right and left sides of the display screen area. The horizontal pincushion control is R216 (#6 in Figure 2), located on the Deflection Module. The Deflection Module (PN 100118) is located on the floor of the analog (top) section of unit.

Adjust R216 until the left and right sides of the display screen appear vertically straight, without concave or convex edges.

F. CONVERGENCE

Convergence in a color CRT (cathode-ray tube) refers to the function of having the three electron beams (red, green, and blue) focus at the same point. For example, if the beam bundle (all three electron beams) is deflected to a given location on the CRT display screen, the spot on the screen should show the resultant color of the three over-lapping electron beams, namely, white. If the beams did not converge to the same spot, there would be three distinct spots: a red one, a green one, and a blue one, as seen in Figure 4.

Total convergence is accomplished in two parts: static and dynamic convergence. Static convergence adjusts the center of the screen, while dynamic convergence "fine-tunes" the entire screen. If only an easy touch-up process is desired, dynamic convergence should be performed.

NOTE: CONVERGENCE SHOULD NOT BE ATTEMPTED UNTIL THE UNIT HAS HAD SUFFICIENT TIME TO WARM UP (APPROXIMATELY TWENTY MINUTES).

1. CONVERGENCE ADJUSTMENT TEST PATTERN

Depress the following keys in the indicated sequence:

RESET
SOFT BOOT
TEST
. (Period key)

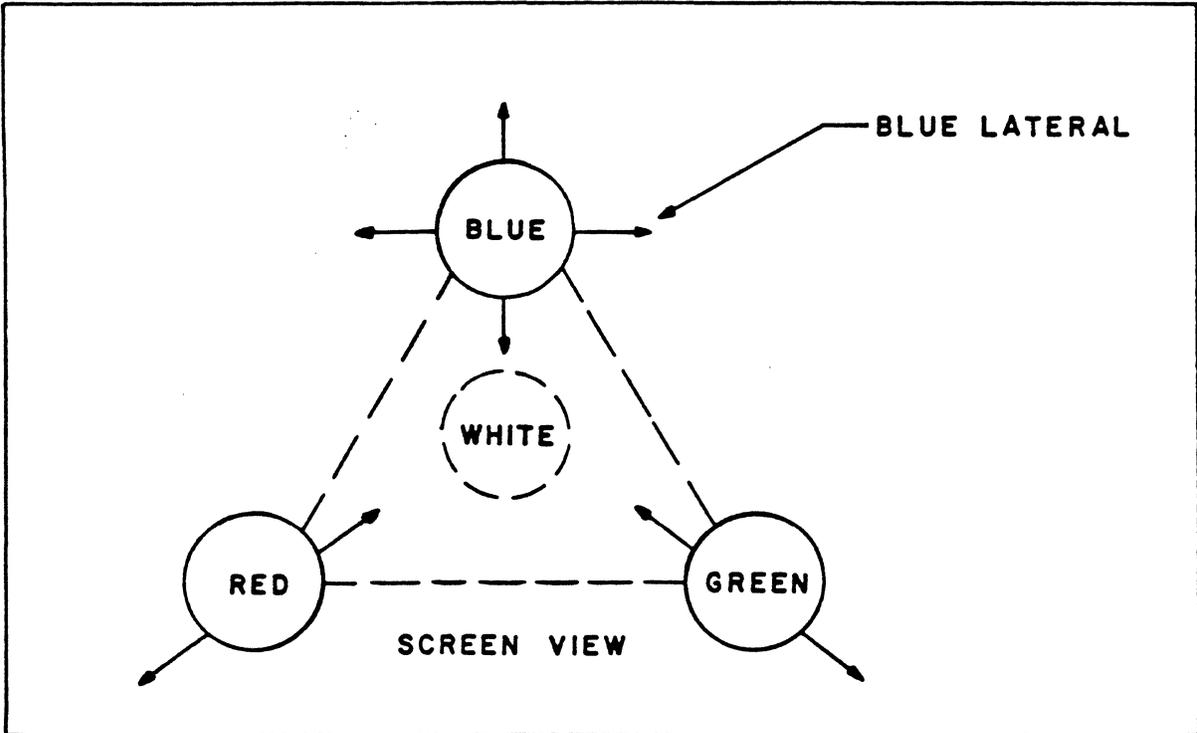


FIGURE 4: HORIZONTAL AND VERTICAL DOT MOVEMENT CAUSED BY ADJUSTING THE GREEN, RED, BLUE AND BLUE LATERAL ELECTROMAGNETS.

This will fill the screen with dots as shown in Figure 5. To complete the test pattern, use the cursor control keys (the arrow keys) to move the cursor to the indicated positions and depress:

+ (Plus key)

Continue this process until all five plus signs are completed.

2. STATIC CONVERGENCE ADJUSTMENT

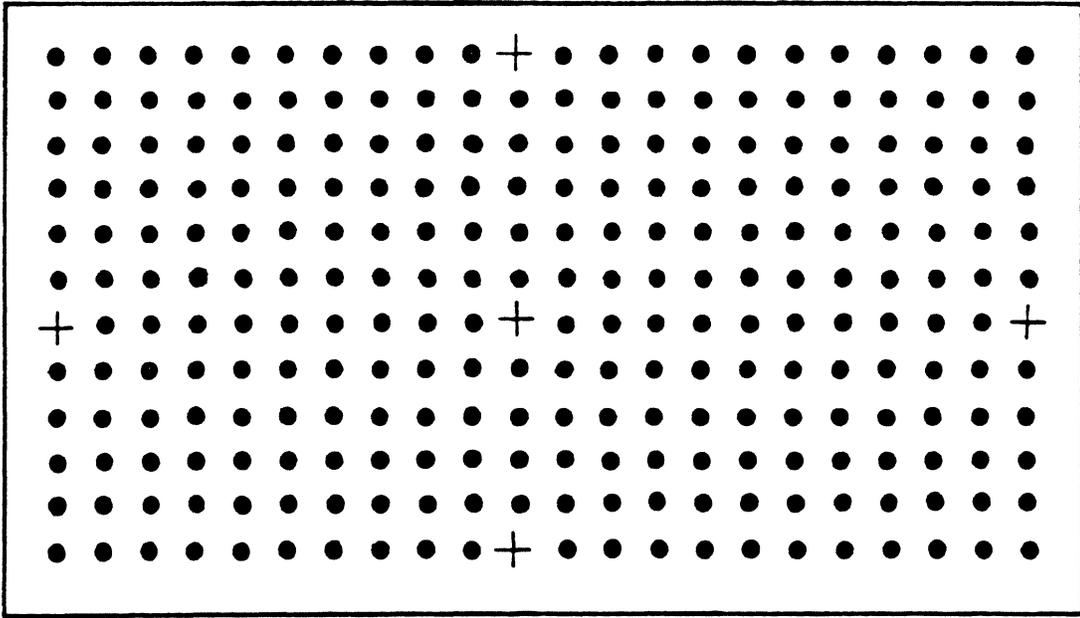
The static convergence adjustment controls consist of the blue, green, and red electromagnets found on the convergence yoke assembly (Figures 6 and 1) and the static convergence blue lateral adjustment control located on the same assembly as the purity rings (Figure 1).

To begin static convergence, open the door to the Convergence Adjustment Panel, which is located to the right of the CRT screen. Using a non-metallic screwdriver, adjust the center control group (R16) so that the potentiometer slots are straight up and down, as in Figure 7.

Keep in mind that static convergence is only concerned with converging the center of the screen. Now, while observing the test pattern on the display screen, adjust the blue, green, and red magnets (Figure 6) and the blue lateral adjustment control (Figure 1) until one plus symbol is obtained at the center of the screen. Leave the test pattern on the screen and do not attempt to adjust the corners at this time.

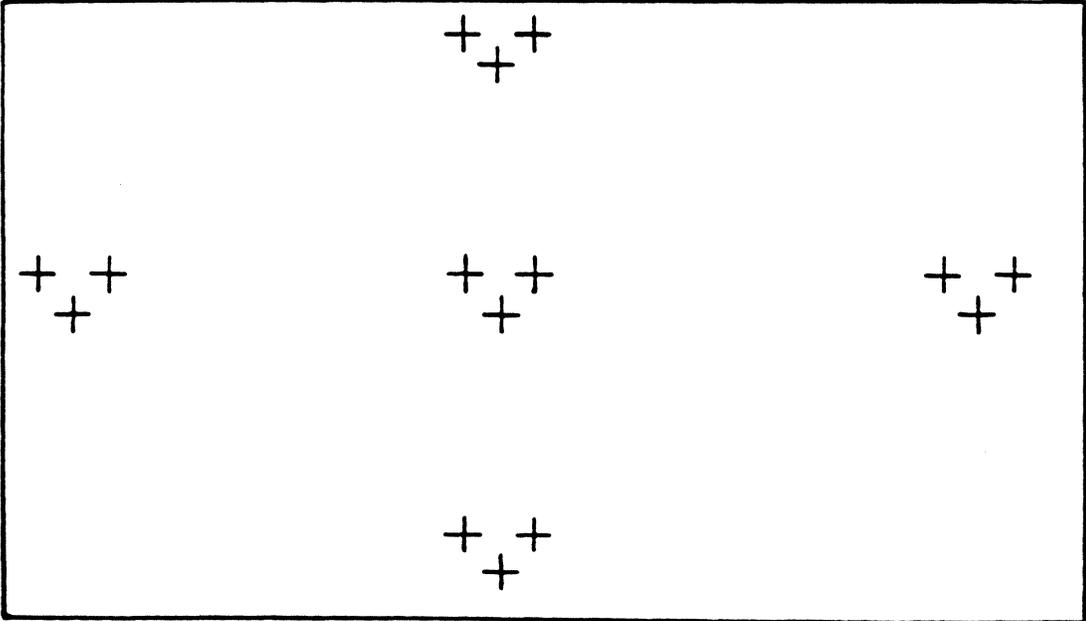
3. DYNAMIC CONVERGENCE ADJUSTMENT

The dynamic convergence controls are the controls located on the Convergence Adjustment Panel to the right of the CRT screen (Figure 7). There are nine groups of controls, each group corresponding to the face of the display screen. For example, the center control group controls the center of the screen, while the right upper group controls the right upper corner of the screen.



DISPLAY SCREEN AREA

FIGURE 5: CONVERGENCE TEST (DOT) PATTERN.



DISPLAY SCREEN AREA

FIGURE 5.1: MISCONVERGED "+" (PLUS) SYMBOLS.

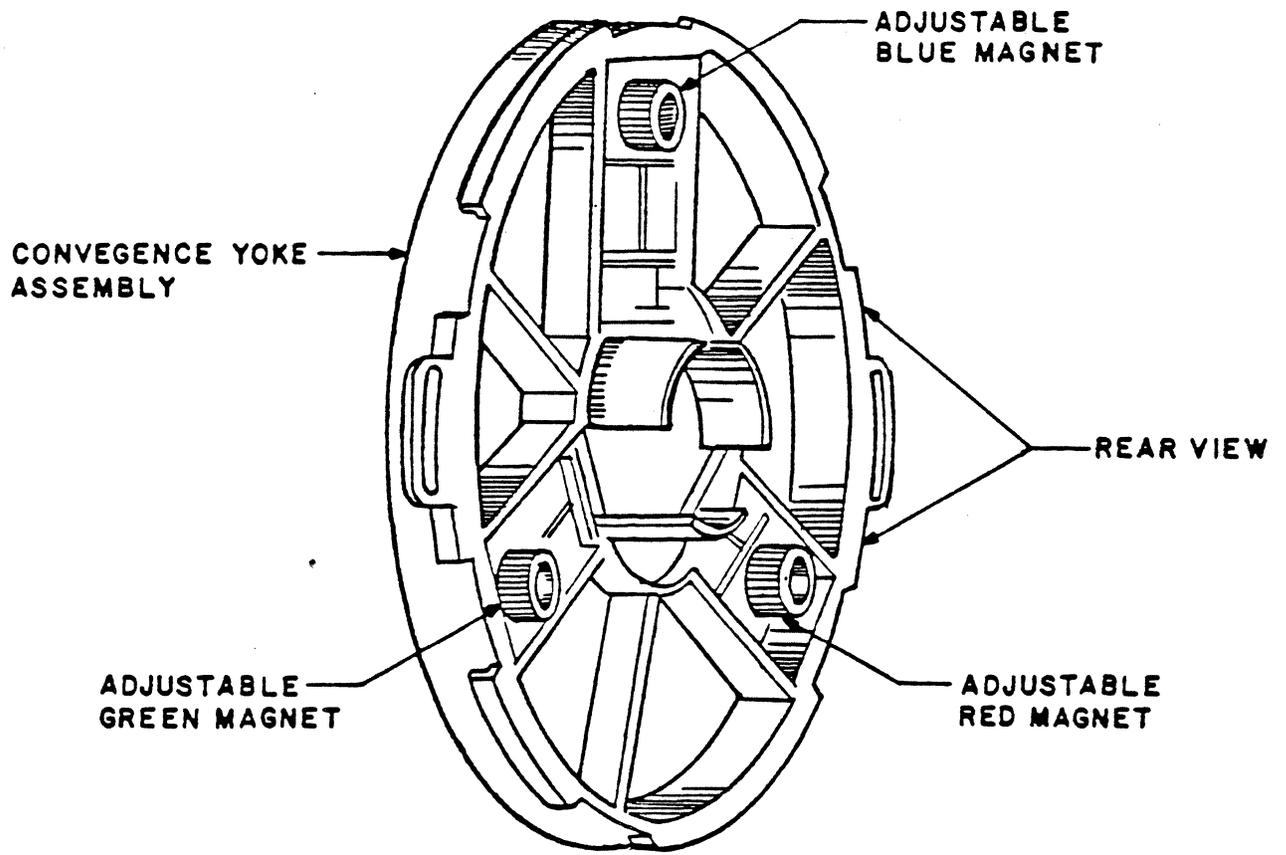


FIGURE 6: BLUE, GREEN AND RED ELECTROMAGNETS FOR STATIC CONVERGENCE.

DYNAMIC CONVERGENCE CONTROLS

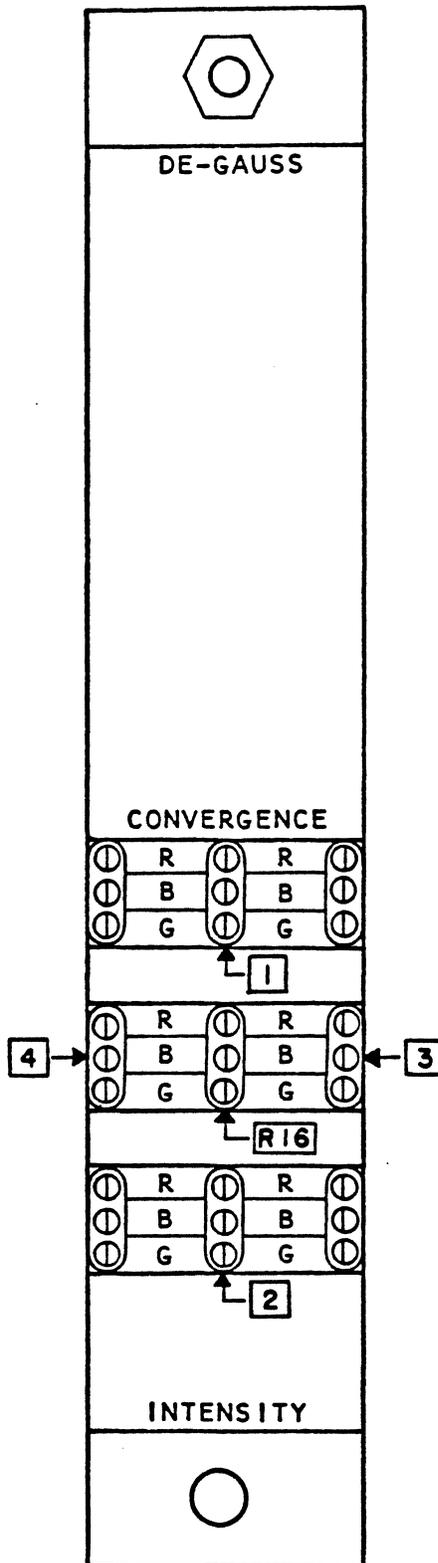


FIGURE 7

Each group consists of three potentiometers, one for the control of each color. The top control is for red, the center control for blue, and the bottom control for green.

While observing the test pattern on the display screen, use the center control group (R16 in Figure 7) to converge the plus sign in the center of the screen until it is completely white with no colored shadows.

Next, converge Sections 1, 2, 3, and 4 (in that order), using that same procedure. The four corners should then be converged (starting with the upper right corner) using the dots for convergence rather than the plus signs used previously.

To "fine-adjust" the convergence settings, repeat the entire process as just completed.

It is important to note that the reason behind using plus symbols when converging is to ensure that the same point from each field will become superimposed. If only dots were used, it would be possible to superimpose the wrong dots, thereby making convergence impossible to adjust (see Figure 5.1).

G. COLOR TEMPERATURE

The color temperature adjustments are used to adjust the screen grid voltages of the CRT. In essence, this is an adjustment of the brightness of the colors on the CRT screen.

1. COLOR TEMPERATURE ADJUSTMENT TEST PATTERN

Depress the following keys in the indicated sequence:

RESET
SOFT BOOT
SHIFT SET
WHITE
ERASE PAGE

2. COLOR TEMPERATURE ADJUSTMENT

The color temperature adjustment controls consist of the intensity control (Figure 7) located behind the door to the right of the CRT, three screen controls (R36, R37, and R38 in Figure 8), and the brightness limiter (R62 in Figure 8). The screen controls and brightness limiter are located on the High Voltage Power Supply Module (PN 100105), which is the rectangular metal box visible on the right side of the machine (when facing the machine with the top cover removed).

First, adjust the three screen controls so that they are set midway between fully clockwise and fully counter-clockwise. Then adjust the brightness limiter (R62) fully counter-clockwise, and the intensity control on the front of the machine fully counter-clockwise.

Perform the test pattern sequence and then turn the intensity control on the front of the machine clockwise until the picture becomes lightly visible on the display screen. The screen should be near-white solid color. Now "fine-adjust" the screen controls (R36, R37, R38) until a satisfactory white raster (rectangular area) is visible on the display screen. Increase the intensity by turning the intensity control clockwise a little more while observing that the display color remains white. Then depress the following keys in the indicated sequence:

SHIFT OVERLAY
BLINK
SHIFT SET
WHITE
ERASE PAGE

This should make the screen blink a solid white raster at 1.9 Hz.

Now turn the intensity control fully clockwise. Adjust the brightness limiter (R62) clockwise until the blinking picture

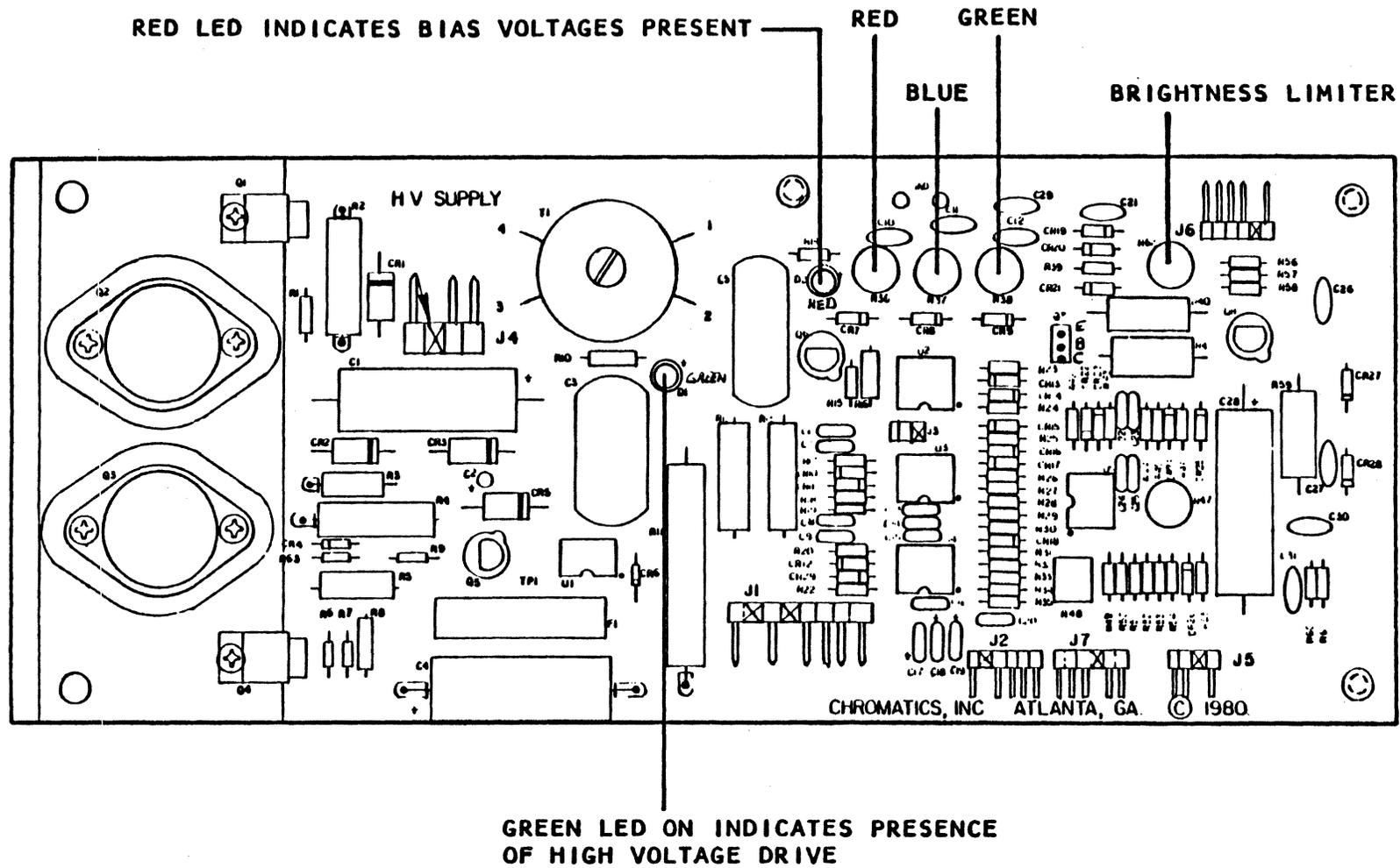


FIGURE 8

just begins to increase in size, and then back off (counter-clockwise) slightly. This will properly adjust the range of the intensity control.

If the blinking picture begins to grow in size before the intensity control is fully clockwise, then it is necessary to slightly alter the midway position of the screen controls and repeat the entire procedure.

After a satisfactory color balance has been obtained, depress the following keys in the indicated sequence:

RESET
SOFT BOOT
TEST
H

A dim white background may be present behind the white H's. If this is the case, turn the brightness limiter (R62) counter-clockwise until the background is black.

NOTE: The display should not be operated at high brightness for extended periods with a fixed picture on the screen. This condition can cause a permanent imprint in the phosphor. As a precaution, any time a static picture is left on the screen for extended periods (days), the brightness should be turned down to dim.

H. INTENSITY

The intensity control allows the operator to change the level of display brightness when viewing the CRT screen under different ambient lighting conditions.

1. INTENSITY ADJUSTMENT TEST PATTERN

Depress the following keys in the indicated sequence:

RESET
SOFT BOOT
TEST
H

2. INTENSITY ADJUSTMENT

The intensity control is located in the Convergence Adjustment Panel to the right of the CRT screen. Adjust the brightness to the desired level by twisting the control in a clockwise or a counterclockwise direction.

INDEX

adjustment precautions,2
aspect ratio,8

barrel distortion,10
brightness,13,15
brightness limiter,14

cathode ray tube handling,2
centering(picture),8
classic method,6
color temperature,13
 test pattern,13
convergence,11
 dynamic,12
 static,12
 test pattern,11
convergence adj. panel,12,16
convergence yoke assembly,12

deflection module,8,9,10,11
deflection yoke,7
deflection yoke screw,6
degaussing,5
dynamic convergence,12

electron beams,11
electromagnets,12

focus control,4
focusing,4

high voltage power supply
 module,4,14
horizontal centering,9
horizontal pincushion,11
horizontal size,8

intensity,15
 adjustment,16
 control,14
 test pattern,15

picture size/centering,8
 test pattern,8
pincushion,10
 horizontal adjustment,11
 test pattern,10
 vertical adjustment,10
pole magnets,7nt,10
potentiometers,2,12,13
purity,5
 adjustment,5
 classic method,6
 degaussing,5
 test pattern,5
 touch up method,6

raster,14
ring tabs,6

safety precautions,2
screen controls,14
static convergence,12
static convergence blue
 lateral adj. control,12

top cover removal,4
touch up method,6

vertical centering adj.,9
vertical size adj.,8

X-radiation,2

