

5.0 Setup Adjustments

Contents

5.5-1	Test Patterns.....	5-2
5.2	Projection Lens Focus (Rough).....	5-3
5.3	Setup Preparation.....	5-3
5.3.1	Editing a Channel, Source, and VIC.....	5-5
5.3.2	Factory Preset Channels/Sources.....	5-8
5.4	Timing Settings and Adjustments.....	5-9
5.4.1	Clamp Type.....	5-9
5.4.2	VTR Mode.....	5-9
5.4.3	Blanking.....	5-10
5.4.4	Phase.....	5-10
5.5	Geometric Adjustments.....	5-11
5.5.1	Centering (Green).....	5-11
5.5.2	Size.....	5-11
5.5.3	Bow.....	5-13
5.5.4	Pincushion Balance.....	5-14
5.5.5	Skew (G).....	5-15
5.5.6	Keystone Balance.....	5-16
5.5.7	Linearity (G).....	5-19
5.5.8	Edge Linearity (G).....	5-20
5.5.9	Keystone.....	5-21
5.5.10	Pincushion.....	5-20
5.5.11	Centering (Red and Blue).....	5-23
5.5.12	Linearity (R and B).....	5-23
5.5.13	Edge Linearity (R and B).....	5-24
5.5.14	Skew (R and B).....	5-24
5.5.15	Projection Lens Focus (Fine).....	5-25
5.6	Electronic Focus.....	5-25
5.7	ILA® Sensitivity and Bias.....	5-26
5.8	Convergence (XY Registration).....	5-27
5.9	Black Level (G2) and Sensitivity Offset.....	5-33
5.9.1	Black Level.....	5-32
5.9.2	Sensitivity Offset.....	5-34
5.10	Uniformity (Shading).....	5-35
5.10.1	Color Balance.....	5-35
5.10.2	Threshold Uniformity.....	5-37
5.10.3	Sensitivity Uniformity.....	5-37
5.11	Picture Settings.....	5-38
5.11.1	Brightness.....	5-39
5.11.2	Contrast.....	5-39
5.11.3	Color, Tint, Sharpness.....	5-40
5.11.4	Black Boost.....	5-40
5.11.5	VIC Settings.....	5-40

5.12 Backing up Settings5-40
 5.13 Video Input Cards (VICs)5-42
 5.14 Updating Software5-50

This chapter assumes the operator is using a remote control and accessing setup functions through the menu tree. All instructions are given with reference to using the menu tree for setup functions. If using a PC or laptop computer to control the projector refer to Table 4-2 for the equivalent key functions.

Chapter 4 covered mainly operation for projectors that are already positioned, set up, and ready for operation. This chapter covers the complete projector setup procedures. Prior to starting the setup procedures in this chapter, the operator should review Chapter 4 to become familiar with navigating the menu and using the remote control keys.

Prior to performing any adjustments, allow the projector to warm up for at least 60 minutes.

5.1 Test Patterns

Table 5-1 lists nine test patterns used to perform adjustments on the projector. Test patterns are accessed through the Main Menu and System Menu.

Table 5-1. Test Patterns.

TEST PATTERN	DESCRIPTION	PURPOSE
1	Off (External)	External Image. Used to adjust Phase, Centering, Blanking, and Size.
2	RGB X-hatch	XY Convergence.
3	Cont/Bright	Adjust proper Contrast and Brightness while viewing external image.
4	Variable Flat	Adjust Threshold and Sensitivity.
5	X-hatch	Adjust Linearity, Edge Linearity, Keystone, Keystone Balance, Pincushion, Pincushion Balance, Bow, and Skew.
6	Focus	Adjust Projection Lens and Electronic focus.
7	Grey/Pluge	Adjust Black level (G2) and Color Balance.
8	Center/Lin	Use for Size adjustment when using Internal source only.

9	Grey	Color Balance.
---	------	----------------

5.2 Rough Focus of Projection Lens

For the Timing and Geometry setup procedures below, it is necessary to obtain a rough focus of the projection lens in order to read menus and do the adjustments. If the focus is adequate to read the menus, this procedure can be skipped until after the Timing and Geometry adjustments are finished. When the Timing and Geometry adjustments are complete, *and prior to starting convergence*, the Projection Lens focus adjustment should be repeated and a sharp focus obtained.

To obtain a rough focus of the projection lens:

1. Press Menu to display the Main Menu on the screen. If necessary, use the Escape key to back out to the Main Menu.
2. Select System, from the Main Menu.
3. Select Test Pattern, from the System menu.
4. Select Focus from the Test Pattern menu. This test pattern consists of rows and columns of the letter H.
5. Select Projection Lens from the System menu. A small window displaying Focus and Zoom arrows appears on the screen.
6. Use the up/down arrow keys to zoom the picture to the desired size before continuing. The raster and image should be smaller than the screen. If using a fixed lens, the projector must be moved backward or forward to fill the screen.
7. Ensure the Focus Enable box in the Preferences menu is checked. Use the right/left arrow keys to get a rough overall focus to read the screen menus. A sharper focus will be obtained later after the geometric procedures are completed.
8. Press Enter to complete this adjustment.
9. Press Escape twice to display the Main Menu.

5.3 Setup Preparation

In the Timing and Geometric adjustments below, green is the active, on-screen color. Red and blue are hidden because they track on green. When the Timing and Geometric adjustments in this section are finished, red and blue is then centered to match green and converged onto green in the Convergence procedures. To hide red and blue, toggle the RGB key to red, press Hide, then toggle to blue and press Hide. Green is now the only color displayed on the screen. Toggle the RGB key to highlight green.

To avoid redundancy in the procedures in this chapter, some general information, instructions, phrases, and definitions are given below:

- References made to **R**, **G** or **B** refer to Red, Green or Blue.
- “**Toggle to Red/Green/Blue**” means to press the RGB key repeatedly until the desired color is selected by observing the highlight on the RGB window on the screen.
- “**Access an item from the menu**” means to press the Menu and/or Escape keys to display the Main Menu, and then, press the number of the menu or item desired.
- “**Hide a color**” means to highlight that color with the RGB toggle, then press the Hide key.
- Adjustments can be performed on individual colors if the RGB letters are in the window on the screen. Selecting one color makes it adjustable but all three colors still remain on the screen (unless hidden by the Hide key).
- Pressing Escape immediately removes RGB displays.
- An “**Active**” channel is the one on the screen (see Figure 5-1). A “**Highlighted**” channel is one that has been selected by pressing a channel number but has not been activated by pressing Enter. Pressing the channel number “**Highlights**” the channel on the channel list. Pressing Enter makes it “**Active**” on screen. Figure 5-1 illustrates an “**active**” and “**highlighted**” channel.
- An “**Inactive**” channel is one that has either no input connected or no signal coming in to its input or is not active (on screen).
- For any adjustment, pressing Mode speeds up the adjustment by a 4 to 1 ratio. Press Mode again to toggle back to the single digit adjustment rate.
- At the end of any Timing or Geometry adjustment, press Enter or Escape to exit. For convergence adjustments, pressing enter while performing Convergence changes the Move/Size mode to the Adjust mode. When performing convergence procedures, press escape to exit the adjustment.
- Verify that Onscrn key is toggled to On if the screen does not show the window or menu correctly.
- When performing ILA[®] Sensitivity and Bias, Black Level (G2), Sensitivity Offset, and Uniformity (Shading), verify that the "Shutters on Hide" box under the System-Preferences menu is checked. Checking this box activates the shutter mechanism to hide the ILA[®] images and provides easier, more accurate settings of these adjustments.
- On single-axis adjustments such as Picture Settings, G2, Threshold, Sensitivity, ILA[®] Bias etc. up/down arrow keys are shown on the screen. Left/right arrow keys, though not shown, will also accomplish the same adjustments.

After completing the timing, geometric, and convergence adjustments for one graphics source, the adjustment data may be backed up by copying it to another of the 99 channels. (**NOTE:** When backing up a channel-see *the Backing up Settings function from Section 5.12*-ensure that the “copied to” channel is either

blank or has no valid setup data. All data will be deleted on the “copied to” channel). This provides backup for a previously set up channel and a good starting point for setting up other channels. Also ensure that the “copied to” channel uses the same type of VIC as the “copied from” channel. If the projector uses only one VIC, this is not applicable. If the projector uses more than one type of VIC, the type can be determined by accessing the System-Maintenance menu and selecting Status List. Each VIC slot will be displayed with the type of VIC in each slot.

Complete the Timing section first, Geometry next, and Convergence last. They are performed in this order because Geometry depends on proper Timing settings and Convergence depends on correct Geometry.

Ensure that the projector is installed and positioned correctly at the outset so that all later adjustments will be at their optimal levels and the graphics image will be the sharpest possible. Positioning the projector is the most important step in the setup procedures. The projector-to-screen alignment should be as square as possible before starting setup procedures in order to accomplish Timing, Geometric, and Convergence adjustments properly.

Prior to starting the procedures, a channel and source (source file) must be selected for the setup adjustments. This is covered below in Section 5.3.1.

5.3.1 Editing Channels, Sources, and VICs

Select channel and source files from the channels and sources lists (see Section 4.6). Edit the Channels’ and Sources lists to select a name for the new channel, VIC, and source. Figures 5-1 and 5-2 illustrates the channels and sources’ lists showing “active” and “highlighted” channels and sources. Verify that the projector is receiving the appropriate source.

CAUTION! If the active channel receives a source that does not have an exact match in a source file, the projector will match the source to the source file that is closest to the new source parameters. If adjustments are attempted, the following statement appears on the screen: “Adjustments are inhibited on an approximate match.” The projector will not allow adjustments to a source file that has been set up for one source and is only being used now as an approximate match for the new source. If allowed, the adjustments would corrupt the data in the current source.

To edit a channel source (*refer to Figure 5-1*):

1. Select #2, Channels from the Main Menu.
2. From the channels list, select a new channel number by pressing the channel number, and Enter. This highlights the channel for editing purposes but does not make it active. The channel can also be highlighted with the arrow keys.
3. Press Mode. This brings up a sub-menu for editing. (This is a toggle key. Pressing Mode again removes the submenu).
4. Use the up/down arrow keys to select Edit and press Enter.

5. The Name field should be highlighted. If not, use the left/right arrow keys to highlight the Name field.
6. Press Enter to edit the Name field.
7. Use the up/down arrows to move the characters in the first letter of the Name field. When the desired letter/number is shown, press the right arrow key. This enters the selection and moves to the next column.
8. Select the next letter/number in the same manner as in Step 11 above. Repeat the above two steps for the remainder of the columns. When complete, press Enter.
9. When the channel name is complete, press right arrow to move to the VIC column (see NOTE after Step 10).
10. In the VIC column, press Enter, and then edit the VIC number (if more than one VIC, a Quad VIC, or a decoder is being used). Refer to Section 5.13 for details on how to set up for optional VICs.

NOTE: If only one single-port VIC is being used without a switcher, this VIC number defaults to 1.1. The first number indicates which VIC slot is being used. The second number indicates which VIC port is being used (for multi-port VICs and decoders). If switchers are being used, the third number indicates the switcher port #. If using only one single-port VIC, press Enter to accept the VIC number.

The screenshot shows a menu titled 'MAIN' with a sub-menu 'CHANNELS'. The sub-menu title is 'CH 3 [SVGA2]'. Below the title is a table with columns '#', 'Name', 'VIC', and 'Sources'. The table lists six channels. Channel 3 is highlighted. The 'Sources' column for Channel 3 shows 'VGA', 'SVGA1', and 'SVGA2', with 'SVGA2' being the active source. Annotations with arrows point to these elements: 'Highlighted channel-not selected yet. Move the highlight with the arrow' points to the number '1' in the first row; 'Pointer shows the active (on screen) channel provided it is visible on the screen list.' points to the number '3' in the third row; 'Indicates active channel (3) and active source (SVGA).' points to the 'CH 3 [SVGA2]' title; and 'Pointer shows active source (SVGA) for Channel 3. Pointer changes to tilde (~) for an approximate' points to 'SVGA2' in the sources list.

#	Name	VIC	Sources
1	VTR-1	1.1	NTSC
2	CAM-1	1.2	NTSC
3	PC	3.1	VGA SVGA1 SVGA2
4	MAC	3.2	MAC33 MAC45
5	HD-LD	1.3.14	HDTV
6	CABLE	2.1	NTSC

Figure 5-1. Channels Menu. **NOTE:** If a channel has more sources than can be shown on the list above, the last line indicates this with three periods (...).

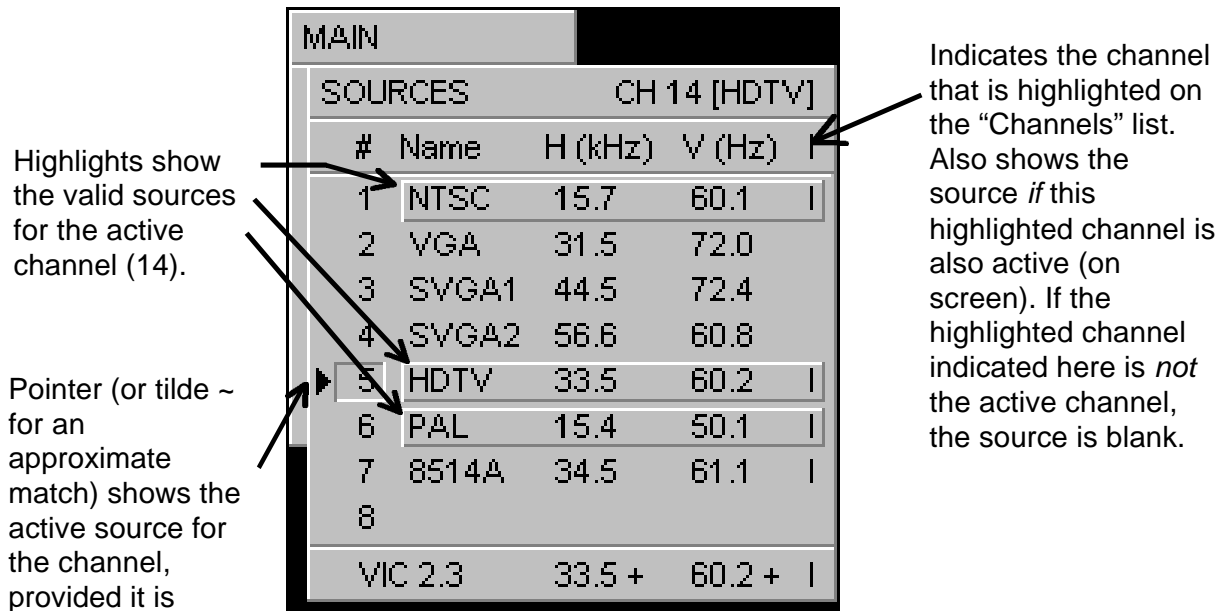


Figure 5-2. Sources Menu.

11. Press Escape to exit the Edit mode.
12. Press the right arrow key to move to the Sources list.
13. Use the up/down arrow keys to select a blank line for a new source or suitable existing source. If using an existing source, use the arrow keys to highlight. Press enter to attach the source to the highlighted channel. If setting up for a new source, add the new source (refer to procedure for adding a channel name). Press enter to attach the new source *name* to the channel highlighted.

NOTE: The only item in the Sources list that can be edited is the source name. All other columns and items are sensed by the projector and added automatically when the source is received.
14. Press Enter when finished naming or attaching a source.
15. Press the left arrow key to move back to the Channels list. Verify that the new source is listed in the highlighted Channel.

5.3.2 Factory-preset Channels and Sources

Some channels have factory-preset source files. The operator can select one of these preset source files for faster setup. These preset source files should be checked for proper timing, geometry, and convergence and readjusted, if necessary. The factory-preset sources listed below are attached to Channel 1:

15kHz	64kHz
31.5kHz	37kHz
HDTV	48kHz

90kHz

To use a factory-preset source file, highlight the channel with the desired source file and attach it to the highlighted channel (see *Section 4.7*). Note that any adjustments to the “attached” source will also alter the data from the original factory source file. To use a factory-preset source file and keep it intact for future use, copy it to the channel desired. Use the “backing up settings” procedure from *Section 5.12*.

Internal Source: Every channel has a preset internal source shown as Channel 0 on the Channels list. This is factory set “default timing” for the projector with scanning rates of 33.3KHz (horizontal) and 59.3Hz (vertical). This internal source is used to read menus when there is no source input connected to the projector. To use this internal source, select Channel 0, then press ENTER. Internal Source 0 on Channel 0 cannot be cut or edited or detached but can be attached or copied and pasted to any other channel.

5.4 Timing Settings and Adjustments

Each type of source requires timing settings and adjustments. Perform these prior to geometry because the geometry adjustments are dependent on the proper timing of raster scanning. The Timing adjustments are universal to RGB and color selection is not necessary.

NOTE: Although pincushion and keystone balance are also raster timing adjustments, they are both performed in the Geometry section because bow and skew must be performed first for Pincushion and Keystone Balancing to be adjusted correctly.

5.4.1 Clamp Type

Clamp type sets the type of clamping used with the sync pulse. There are three types of clamping; BP (Back Porch), used in 95% of all computer and image inputs, ST (Sync Tip), seldom used, but is necessary when there is no back porch to clamp on, and TL (Tri-Level) which is used mainly for HDTV and WVHS.

To set the Clamp Type:

1. Access the Timing menu.
2. Press #4, Clamp Type from the Timing menu.
3. Highlight BP, ST, or TL using arrow keys.
4. Press Enter to select.

5.4.2 VTR Mode

Set VTR mode to ON position if the projector's input comes from a VTR source. This setting stabilizes the VTR sync input. Otherwise, set the VTR mode to OFF.

To set the VTR Mode:

1. Select VTR Mode from the Timing menu.

2. Press Enter to toggle the VTR Mode to Off (unchecked box) unless using a VTR as a source.
3. Press Escape to return to the Timing menu.

5.4.3 Blanking

Use blanking to mask out unwanted anomalies on the picture's edges. An unblanked image allows the entire image to be displayed on the screen. If Blanking is adjusted incorrectly, the raster may "blank out" at the right or left edges of the image. Adjust Blanking to the *edge* of the active image.

To adjust Blanking:

1. Select Test Pattern #1 from the Test Pattern menu.
2. Select the Brightness adjustment from the Picture menu.
3. Use the arrow keys to increase the brightness level to view the entire raster and image (see *Figure 5-3*). Press Escape when finished.
4. Select T/L (Top/Left) Blanking, from the Timing menu.
5. Verify that the input image and raster are smaller than the screen (refer to *Figure 5-3*). If not, access the Size adjustment from the Geometry menu and use the arrow keys to size the image just smaller than the screen size. Press Escape or Enter when finished.
6. Use the arrow keys to move the masking toward or away from the top and left edges of the screen. When finished press Enter or Escape
7. Select B/R (Bottom/Right), Blanking from the Timing menu.
8. Use the arrow keys to move the masking toward or away from the bottom and right edges of the screen.
10. Press Enter or Escape to exit the adjustment.

NOTE: Blanking, Phase, Size, and Centering are functions that contribute to the entire image. If one function is adjusted, the others need to be rechecked and readjusted, if necessary.

5.4.4 Phase

The Phase adjustment positions the *input image* within the raster. To adjust phase:

1. Use an external image.
2. Access #1, Phase adjustment, from the Timing menu.

3. Use the arrow keys and adjust the horizontal and vertical phase so that the image folds over on either side or at the top and bottom. Center the input image on the raster (see Figure 5-3).

NOTE: Overadjusting vertical phase may cause vertical retrace lines to appear in the input image.

4. Press Escape or Enter to exit this adjustment.
5. Recheck the Blanking adjustment.

5.5 Geometric Adjustments

Geometric adjustments are performed for each type of input source. Timing settings must be completed before geometry can be performed correctly.

NOTE: Toggle the “Reg Enable” box to the unchecked mode in the Geometry menu (#9). This ensures that any previous convergence corrections will not influence the Geometry adjustments

5.5.1 Centering (G)

Centering moves the position of the *raster* on the CRT without wrapping around. To center (G):

1. Use an external image.
2. Access #2, Centering, adjustment from the Geometry menu.
3. Use the Hide key and hide R and B. (Toggle the RGB key to select R only and press Hide then toggle the RGB key to select B only and press Hide.)
4. Toggle the RGB key to select G only.
5. Use the arrow keys and position the Green raster vertically and horizontally so that it is centered on the screen (*Refer to Figure 5-3*).
6. Recheck Phase and Blanking and readjust, if necessary.
7. Press Escape or Enter to exit.

5.5.2 Size

The size adjustment fits the size of the image to the screen size within the limits of the ILA[®] and CRT. To adjust size:

1. Continue with an external image.
2. Access #1, Size, from the Geometry menu.
3. Use the arrow keys and adjust the size of the image to the screen horizontally and vertically (*refer to Figure 5-3*).
4. Recheck and readjust centering, phase, and blanking, if necessary, to keep the entire picture in the center of the screen.

NOTE: Make the picture slightly smaller than the screen size. This makes other geometric adjustments easier. After completing geometric adjustments, slightly readjust size, if necessary.

5. Press Escape or Enter to exit.

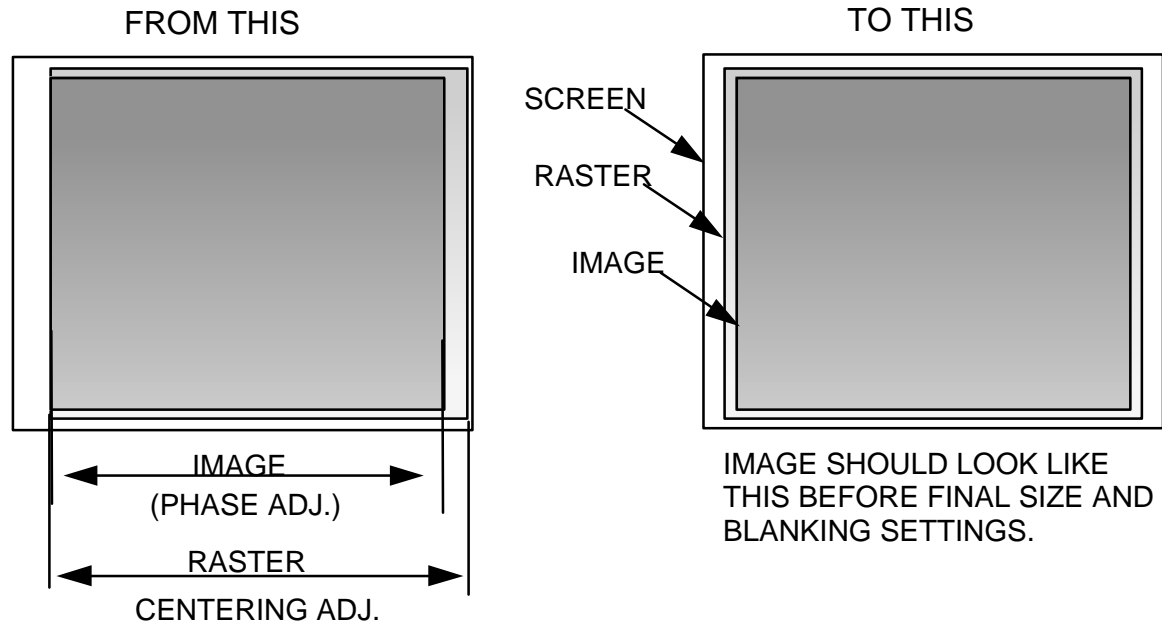


Figure 5-3. Phase, Size and Centering adjustments.

Use the X-hatch test pattern (Figure 5-4) as a reference for the next twelve projector adjustments (Bow, Pincushion Balance, G-Skew, Keystone Balance, G-Linearity, G-Edge Linearity, Keystone, Pincushion, R/B-Centering, R/B-Linearity, R/B-Edge Linearity, and R/B-Skew). These procedures are all somewhat interactive. Some back and forth repeat adjustments *may* be necessary to get the best geometry.

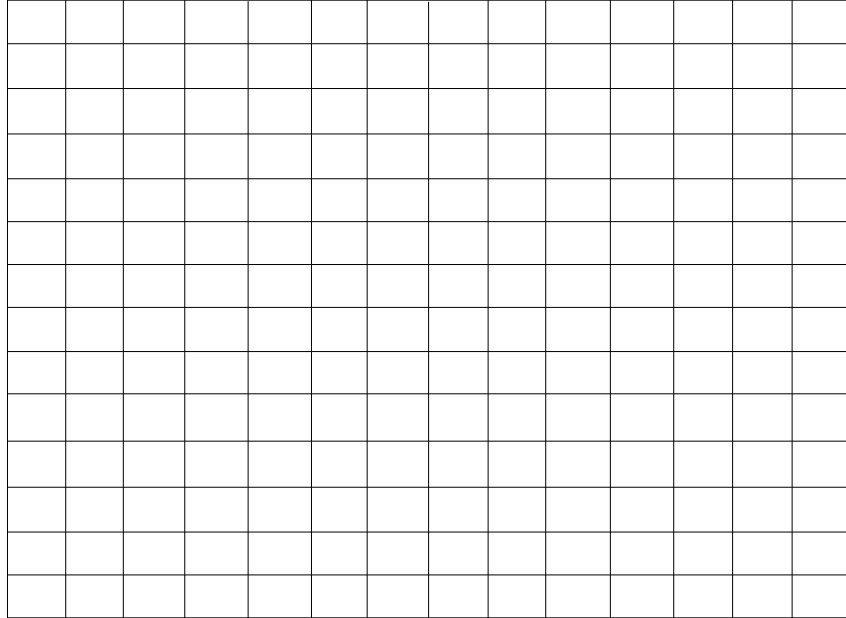


Figure 5-4. Undistorted Test Pattern 5 (X-hatch).

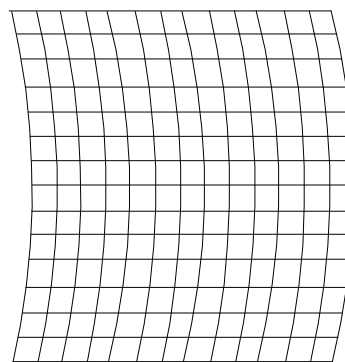
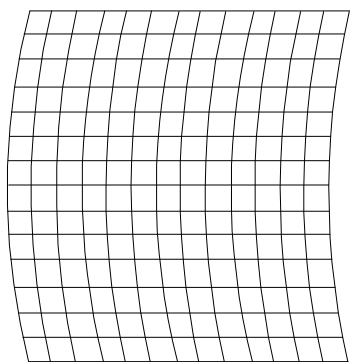
5.5.3 Bow

NOTE: Skip this procedure if the vertical centerline is vertical and the horizontal centerline is level (see Figure 5-4).

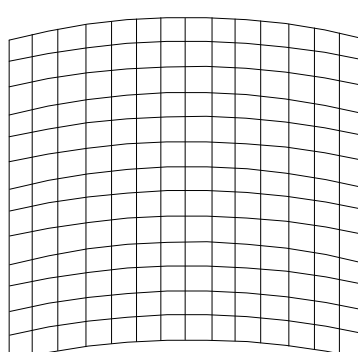
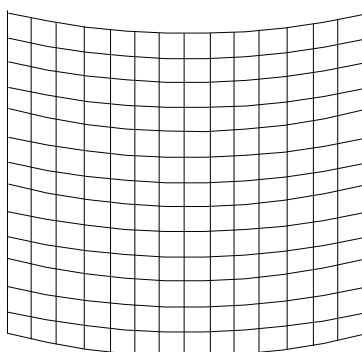
With bow distortion, the picture bends in the same direction on the edges and in the center of the test pattern. This means that the vertical or horizontal centerline is bowed in one direction causing the entire pattern to bend in that same direction (see Figure 5-4). Use test pattern #8 to spot Bow distortion.

To correct for Bow distortion:

1. Select Test Pattern #8 from the Test Pattern menu.
2. Access #5, Bow, from the Geometry menu.
3. Use the up/down arrow keys to correct for vertical bow distortion. Adjust to make the centerline exactly horizontal (not bending upward or downward).
4. Use the left/right arrow keys to correct for horizontal bow distortion. Adjust to make the centerline vertical.
5. Press Escape/Enter to exit.



Horizontal bowing (vertical centerline off) -use left/right arrow keys to correct.



Vertical bowing (horizontal centerline off) -use up/down arrow keys to correct.

Figure 5-5. Bow distortion.

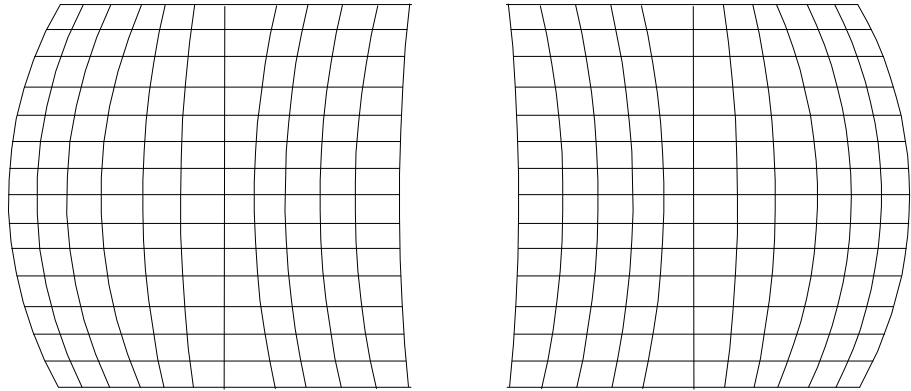
5.5.4 Pincushion Balance

NOTE: Pincushion balance is normally within range, so check carefully before performing adjustment.

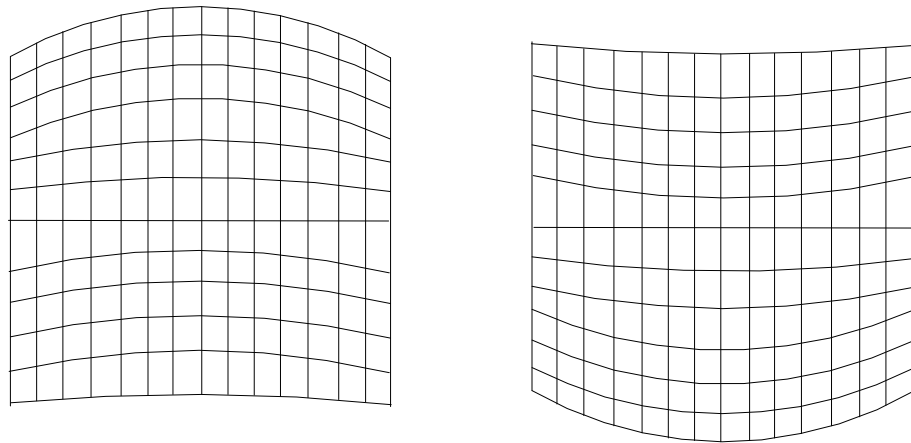
The Pincushion Balance adjustment balances the pincushion error (see *Figure 5-6*) equally on both sides or top and bottom. Although the centerlines are straight, too much pincushion distortion on any side prevents the pincushion adjustment from correcting the error. Balance the error equally so the result looks like one of the pincushion illustrations in *Figure 5-12*.

To balance the pincushion distortion:

1. Select the X-hatch test pattern (#5).
2. Access Pincushion Balance from the Timing menu.
3. Use the left/right arrow keys to balance pincushion error on the left and right. Use the up/down arrow keys to balance pincushion error at the top or bottom.
4. Press Escape/Enter to exit.



Horizontal Pincushion imbalance. Use right/left keys to balance error.

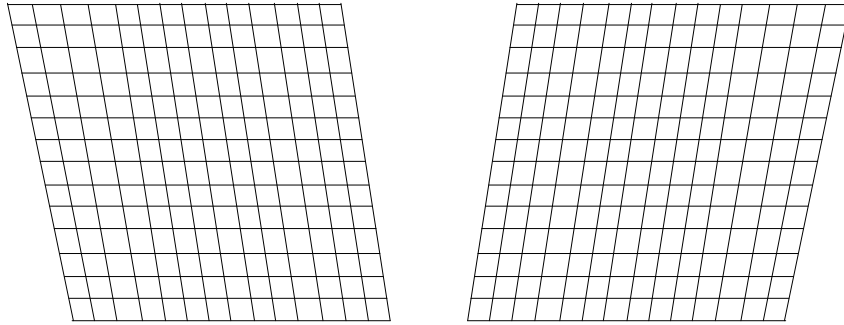


Vertical Pincushion imbalance. Use up/down keys to balance error.

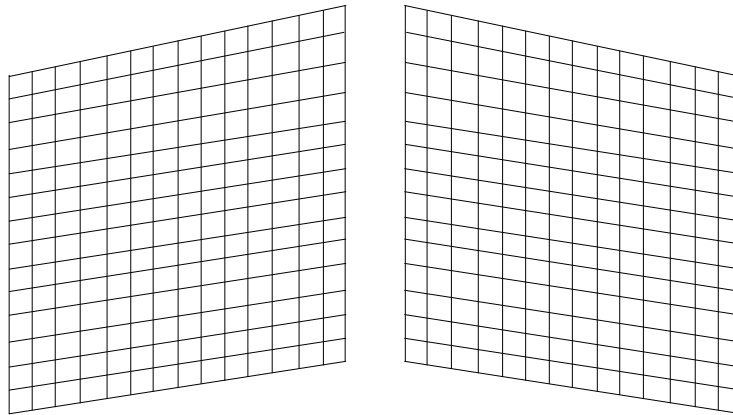
Figure 5-6. Improper pincushion error. Use arrow keys to balance.

5.5.5 Skew (G)

Skew distortion “leans” horizontally or vertically like a trapezoidal pattern. This means the vertical or horizontal centerline is skewed in one direction or another causing the entire pattern to lean in the same direction (see *Figure 5-7.*). Use test pattern #8 to spot any skew distortion. If the vertical centerline is vertical and the horizontal centerline is level, the Skew setting is correct and should not be changed.



Horizontal skew (vertical centerline tilted)-use left/right arrow keys.



Vertical skew (horizontal centerline slanted)-use up/down arrow keys.

Figure 5-7. Skew distortion.

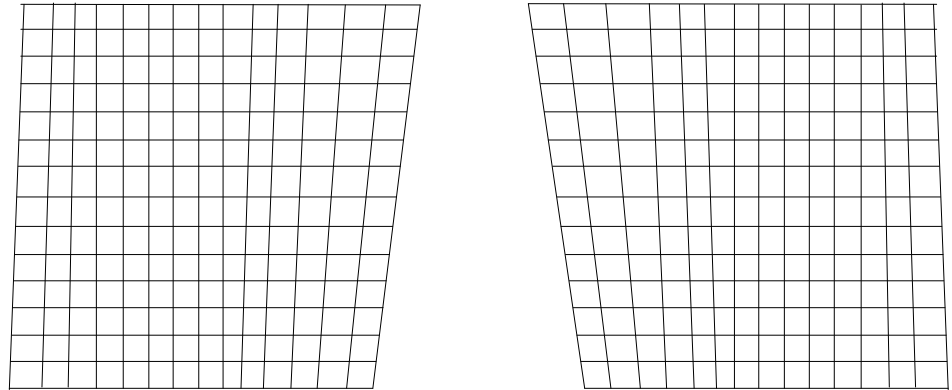
To correct for Skew:

1. Select Test Pattern 5 or 8.
2. Access #6, Skew, from the Geometry menu.
3. Toggle the RGB key to select G only.
4. Use the Hide key and hide R and B.
5. Use the left/right arrow keys to correct for horizontal skew and the up/down arrow keys to correct for vertical skew.
6. Press Escape/Enter to exit.

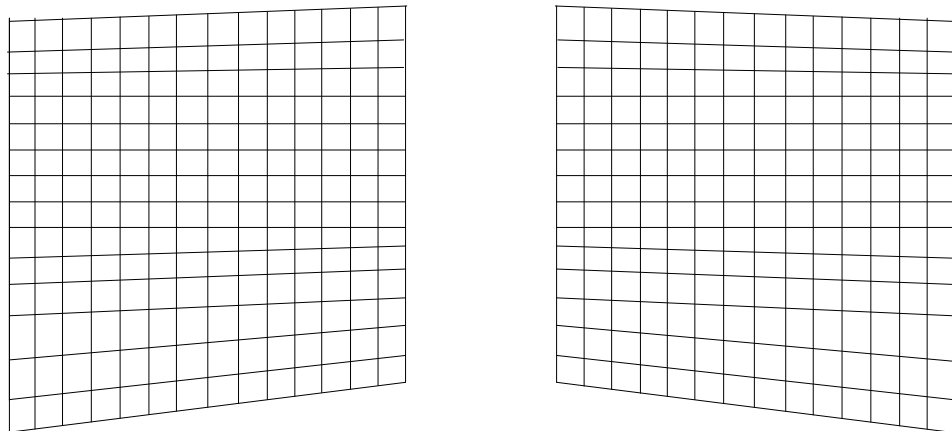
5.5.6 Keystone Balance

NOTE: Keystone Balance is normally within range so observe closely before performing adjustment.

Balances the keystone error equally on both sides or top and bottom to perform the Keystone adjustment properly. Too much keystone distortion on one side prevents the Keystone adjustment from correcting the error. (Refer to Figure 5-8, below, for examples of *Keystone imbalance*.)



Horizontal keystone imbalance. Use left/right arrow keys to balance error.



Vertical keystone imbalance-use up/down arrow keys to balance error.

Figure 5-8. Improper Keystone Balancing.

To balance the keystone distortion:

1. Continue with the Crosshatch test pattern.
2. Access #7, Keystone Balance, from the Timing menu.
3. Use the left/right arrow keys to balance any keystone distortion on the left and right. Use the up/down arrow keys to balance any keystone distortion at the top or bottom.
4. Press Escape/Enter to exit.

The projector automatically saves adjustment data once every hour. If power fails, valuable adjustment data will be lost since the last automatic save. It is advisable to save changes after completing every 6 or 7 procedures. Perform save any time during the procedures below.

To save the above data:

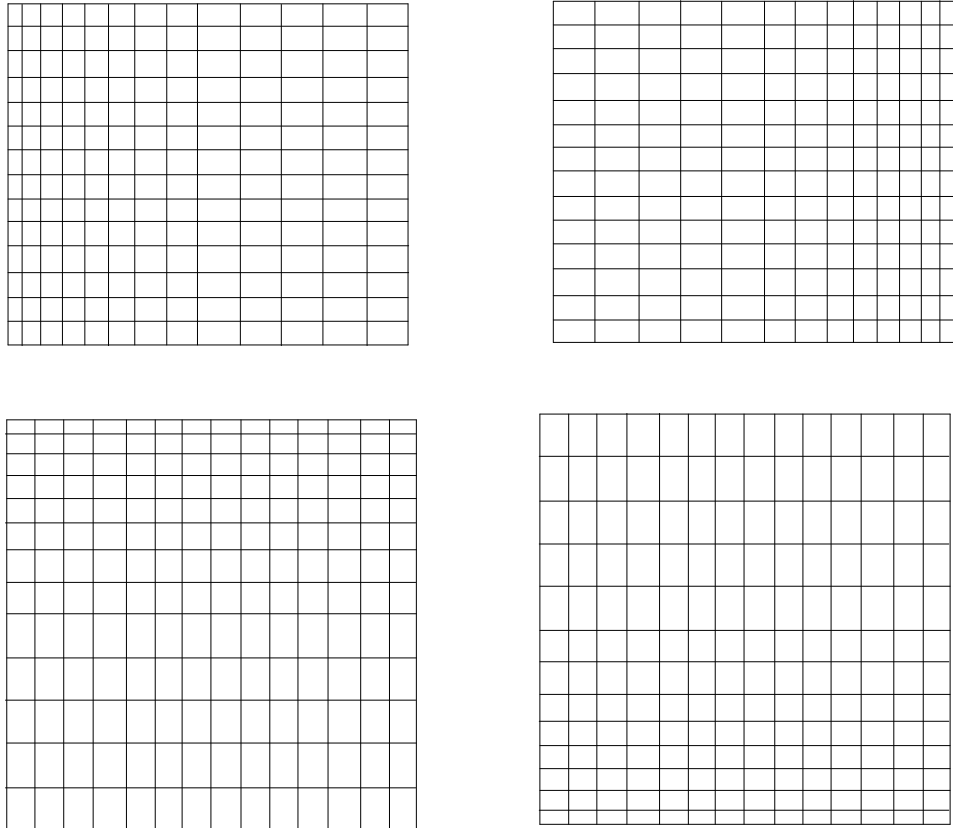
1. Access the Main menu.
2. Use the arrow keys and select #8, Save Changes Now.
3. Press Enter to save the changes.

5.5.7 Linearity (G)

The Linearity adjustment corrects for improper horizontal or vertical grid spacing on an image. With distorted linearity, lines in the grid are spaced closer together on one side and farther apart on the other (see *Figure 5-8*).

To correct for linearity distortion:

1. Access #7, Linearity from the Geometry menu.
2. Toggle the RGB key to select G only.
3. Use the Hide key and hide R and B.
4. Use left/right arrows to correct horizontal linearity distortion and up/down arrows to correct vertical linearity distortion. Make grids the same width on the left/right side and the same height at the top and bottom.
5. Use Edge Linearity adjustment to perform additional linearity correction.
6. Press Escape/Enter to exit.

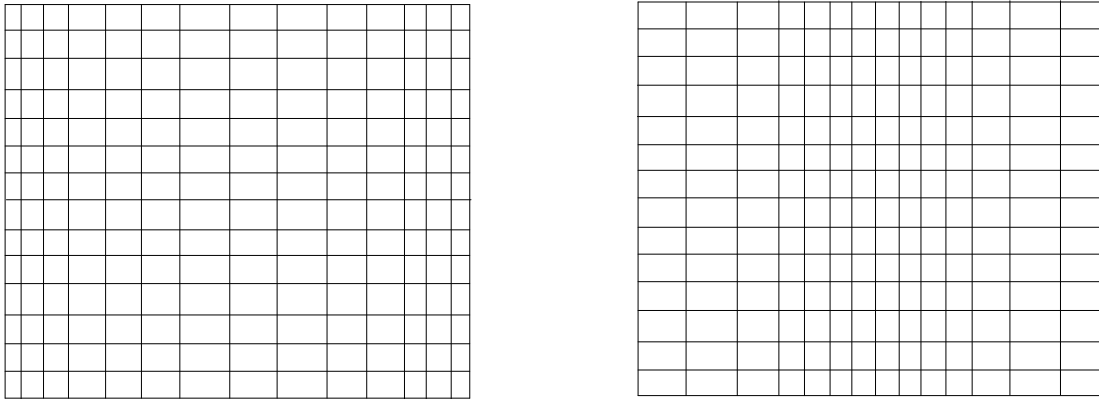


Vertical Linearity Distortion. Use up/down arrow keys to correct.

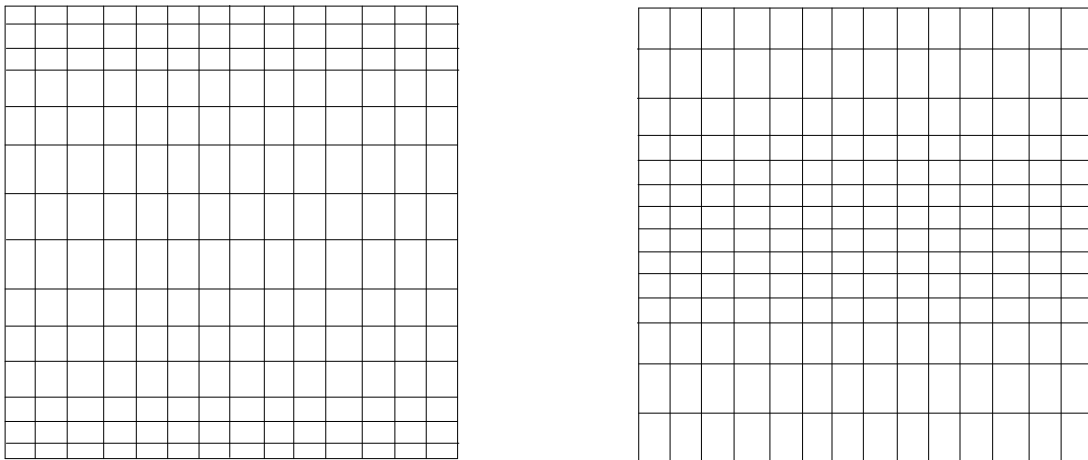
Figure 5-9. Linearity Distortion.

5.5.8 Edge Linearity (G)

Edge linearity adjustment corrects for improper grid spacing at the left/right edges and top/bottom of the image (see *Figure 5-10*).



Horizontal Edge Linearity Distortion. Use left/right arrow keys to correct.



Vertical Edge Linearity Distortion. Use up/down arrow keys to correct.

Figure 5-10. Edge Linearity distortion.

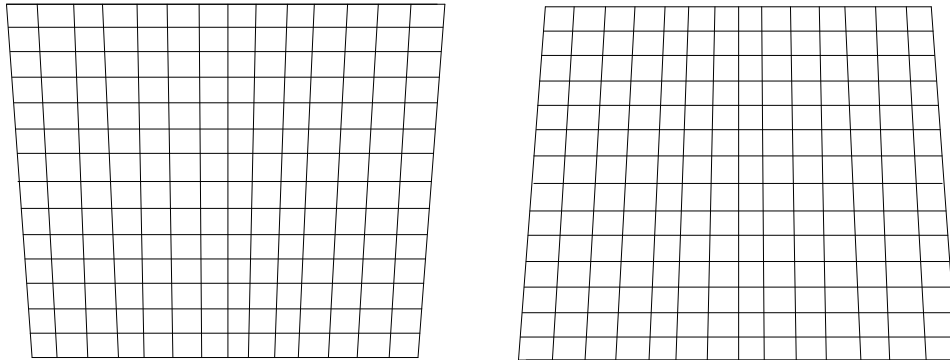
To correct for edge linearity distortion:

1. Access #8, Edge Linearity, from the Geometry menu.
2. Select only G with R and B hidden.
3. Use the left/right or up/down arrow keys to correct for Edge Linearity distortion. Make the edge grids the same width as the center grids.
4. Press Escape/Enter to exit.

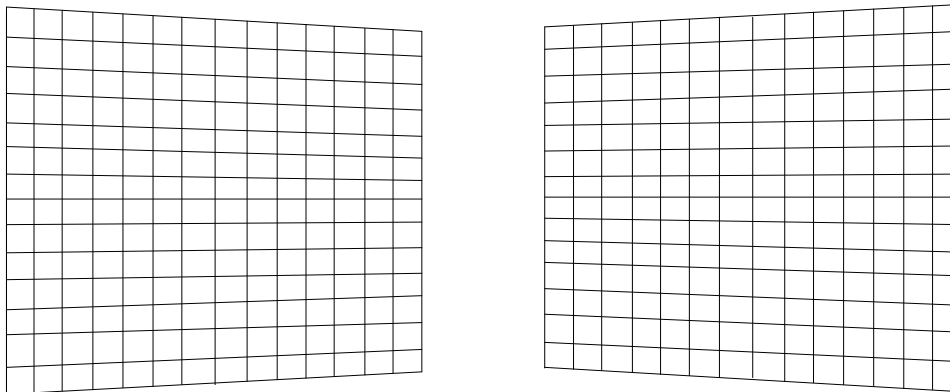
5.5.9 Keystone

The Keystone adjustment corrects the lines closest to the screen's edge. This adjustment makes lines parallel to the centerline of the test pattern or square to the screen edge (see Figure 5-11).

NOTE: If the keystone distortion is not balanced equally on the left/right or the top/bottom of the image, perform Keystone Balance before Keystone adjustment adjustment (see Section 5.5.6).



Horizontal (side to side) Keystone Distortion-Use Left/Right arrow keys.



Vertical (top/bottom) Keystone Distortion-Use Up/Down arrow keys.

Figure 5-11. Horizontal and Vertical Keystoning.

To correct for horizontal and vertical keystone distortion:

1. Access #3 Keystone from the Geometry menu.
2. Use the left/right arrow keys to correct for horizontal keystone distortion. Use the up/down arrow keys to correct for vertical keystone distortion.
3. Press Escape/Enter to exit. **NOTE:** Recheck and readjust (if necessary) Pincushion Balance after correcting Keystone distortion.

5.5.10 Pincushion

The Pincushion adjustment corrects for warped distortion at the sides or top and bottom of the image.

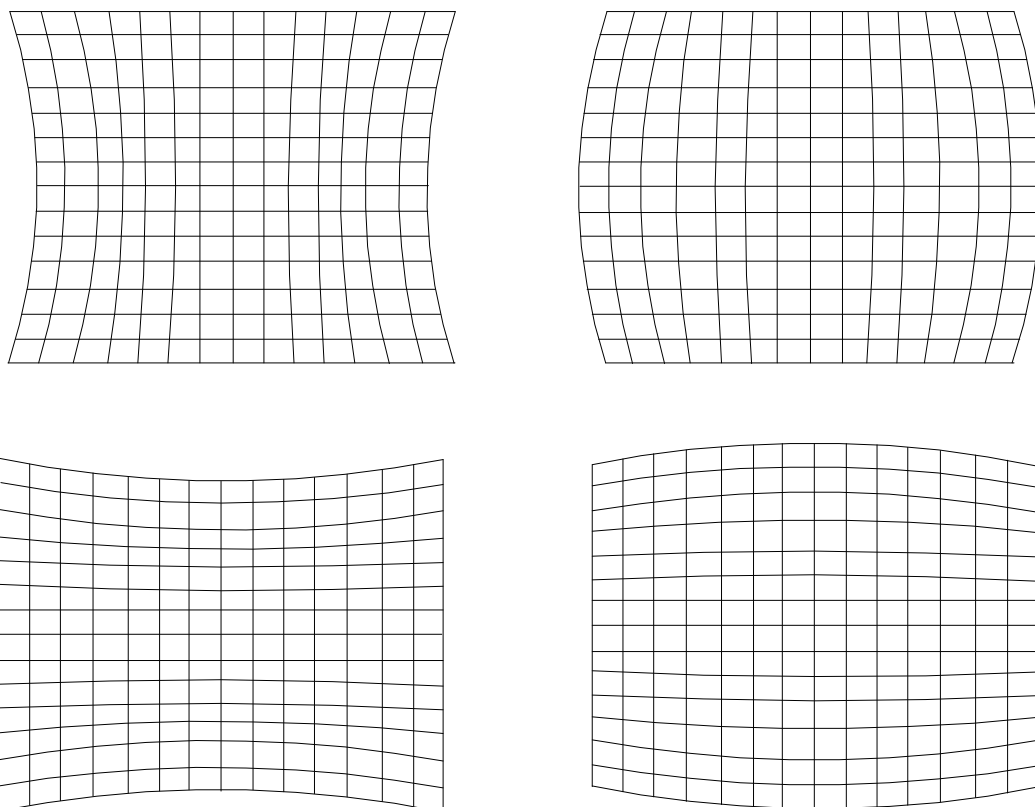


Figure 5-12. Four views of Pincushion Distortion. Use left/right keys for distortion at top and up/down keys for distortion at bottom.

NOTE: If the pincushion error is not balanced on both sides of the test pattern, the Pincushion Balance adjustment must be performed before doing the Pincushion correction (see Section 5.5.4).

To correct for pincushion distortion:

1. Access the Pincushion adjustment from the Geometry menu.
2. Use the left/right arrow keys to correct pincushion distortion as shown on the top two patterns in Figure 5-12. Use the up/down arrow keys to correct pincushion distortion as shown on the bottom two patterns in Figure 5-12.
3. Press Escape/Enter to exit.

Some of the previous Geometry adjustments were performed for Green only (Centering, Linearity, Edge Linearity, and Skew). The next procedures will align Red and Blue to Green for those previous adjustments. If Red and Blue are aligned to Green as closely as possible now, convergence will be much easier to accomplish later on, resulting in a better image.

5.5.11 Centering (Red and Blue)

Red and blue are now centered horizontally and vertically to match green as closely as possible.

To center red and blue:

1. Use the Hide key to unhide R. Verify that R and G are both on the screen with B hidden.
2. Access centering from the Geometry menu.
3. Toggle the RGB key to select R.
4. Use the arrow keys and center red to overlay the green as closely as possible. If there is an error between the red and green lines, use the arrow keys to adjust red. Differences between the sides or top and bottom errors will be split. Balancing this error makes it easier to perform convergence later. Strictly matching the center may cause a larger error on one side than the other making convergence harder.
5. Toggle the RGB key to select B.
6. Use the Hide key to unhide B. All three colors should now be on the screen. This step can also be performed with only B and G on screen.
7. Use the arrow keys and position the Blue lines to overlay the Green and Red lines.
8. When finished centering Red and Blue to Green, press Escape/Enter to exit the adjustment.

5.5.12 Linearity (R and B)

Red and Blue Linearity are now adjusted to match Green as closely as possible.

To adjust the Red and Blue Linearity:

1. Access Linearity from the Geometry menu.
2. Use the Hide key and hide B. Be sure that R and G are both on the screen with B hidden.
3. Toggle the RGB key to select R.

4. Use the arrow keys and adjust the Red Linearity to match Green as closely as possible. If there is an error between the Red and Green lines, adjust Red to split the error difference between the sides or top and bottom.
5. Toggle the RGB key to select B.
6. Use the Hide key and unhide B. All three colors should now be on the screen. (**NOTE:** This step can also be performed with B and G only on screen.)
7. Use the arrow keys and adjust the Blue Linearity to match the Green and Red lines. Refer to Step 4 to balance any error.
8. When finished matching the Red and Blue Linearity to Green, press Escape/Enter to exit the adjustment.

5.5.13 Edge Linearity (R and B)

Red and Blue Edge Linearity are now adjusted to match Green as closely as possible.

To adjust the red and blue edge linearity:

1. Access edge linearity from the geometry menu.
2. Use the Hide key to hide B. Verify that R and G are both on the screen with B hidden.
3. Toggle the RGB key to select R.
4. Use the arrow keys and adjust the Red Edge Linearity to match Green as closely as possible.
5. Toggle the RGB key to select B.
6. Use the hide key and unhide B. All three colors should now be on the screen. (**NOTE:** This step can also be performed with B and G only on screen.)
7. Use the arrow keys and adjust the Blue Edge Linearity to match the Green and Red lines.
8. Press Escape/Enter to exit the adjustment.

5.5.14 Skew (R and B)

Adjust Red and Blue Skew to match Green as follows:

1. Access Skew from the Geometry menu.
2. Hide B. Verify that R and G are both on the screen with B hidden.
3. Toggle the RGB key to select R.
4. Use the arrow keys and adjust the Red Skew to match Green as closely as possible.
5. Toggle the RGB key to select B.

6. Use the hide key and unhide B. All three colors should now be on the screen. (**NOTE:** This step can also be performed with B and G only on screen.)
7. Adjust the Blue Skew to match Green and Red.
8. Press Escape/Enter to exit the adjustment.

Save changes by selecting "Save Changes Now" from the maintenance menu. In the geometry menu, reset "Reg Enable" back to On (checked box).

5.5.15 Projection Lens Focus (Fine)

Projection lens must be focused sharply to perform Convergence properly. To focus projection lens:

1. Access #7, System from the Main Menu.
2. Select Test Pattern from the System menu.
3. Select Focus from the Test Pattern menu.
NOTE: H pattern is preferred for focusing the Projection Lens.
4. Press right arrow to move to #2, Projection Lens. Press enter to select.
5. A small window displaying Focus and Zoom arrows appears on screen.
6. Use the right/left arrow keys to get a sharp focus at the center of the screen using green "spacer balls" to focus on. **NOTE:** "Spacer Balls" can be seen from directly in front of the screen in the bright areas of the image. They are tiny, random, irregularly shaped spots seen throughout the image. When these spots are distinctly defined, the projection lens is in sharp focus.
7. Press Enter to complete this adjustment. **NOTE:** The H pattern should also be in sharp focus. If not, the Electronic Focus may need readjusting (follow Section 5.6 to reset focus). This factory-setting does not normally require readjustment. The Focus Enable box in the Preferences menu *may* now be unchecked to prevent accidental defocusing.

5.6 Electronic Focus

The Electronic Focus is factory set and does not normally require adjustment. It may need touch-up after replacing components, maintenance; or when temperature variations exist between the factory, and the field environment; or between different projector locations. Once set it is set for all channels and sources and should not need to be reset when changing channels.

The Electronic Focus adjustment focuses the electronic beam in the CRT. The adjustments are located on the right side of the projector (see *Figure 5-13*). View one color at a time for these adjustments. Start with Blue since it is the weakest

color. Recheck the focus for each color. Some interaction between R, G, and B may occur.

To set the Electronic Focus:

1. From the Test Pattern menu select Focus.
2. Use the RGB key and toggle to Blue.
3. Use the Hide key and hide Red and Green.
4. Adjust the Electronic Focus (see *Figure 5-13*) for a sharp focus of the H pattern at the center of the screen.
5. Repeat the above steps for the other two colors.

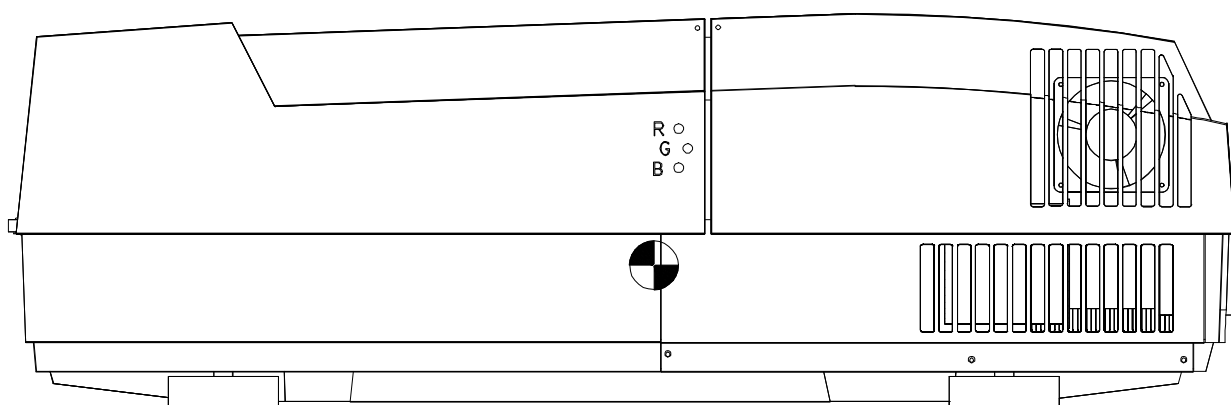


Figure 5-13. Electronic Focus adjustment screws.

5.7 ILA[®] Sensitivity and Bias

ILA[®] Sensitivity and Bias are factory-set and will not normally require adjustment. Readjustments may be required due to variations between the factory and the field environments.

ILA[®] Sensitivity is not color-specific and is adjusted for all 3 colors together. ILA[®] Bias is adjusted for each color separately. Start adjusting ILA[®] Bias using blue since blue is a weaker color to observe than red or green. ILA[®] Sensitivity is the ILA[®] biasing frequency that affects the resolution and brightness on the screen. ILA[®] Bias settings adjust the electrical bias levels to each ILA[®] assembly to a “just off” threshold point. The smallest incoming light from the CRT will cause the ILA[®] assembly to react. When properly set, this adjustment will put each ILA[®] assembly at the threshold of operation. If set incorrectly, the black level will be adversely affected and the ILA[®] assembly will not react properly to incoming light. Perform all ILA[®] Bias adjustments in a darkened room.

To set ILA[®] Sensitivity:

1. Access ILA[®] Sensitivity from the Factory Adj. menu.
2. Use the up/down arrow keys to select an ILA[®] Sensitivity of 11 as indicated in the screen window. This is the default setting and

should be acceptable for general viewing. A lower number may be preferred for HDTV. A higher setting results in higher brightness but greater image lag and possibly lower resolution. The ILA[®] Sensitivity setting depends on the type of viewing environment. Some trial and error may be needed to get the exact setting for each environment.

3. Press Escape when the setting is complete.

To set the ILA[®] Bias:

1. Toggle the RGB key to highlight blue.
2. Under the System-Preferences menu, verify that the "Shutters on Hide" box is checked.
3. Use the HIDE key to hide red and green.
4. Access ILA[®] Bias from the Factory Adj. menu.
5. Use the up/down arrow keys to decrease the ILA[®] Bias so the brightest area of the ILA[®] image just extinguishes. Then increase the bias level until the ILA[®] image just begins to appear on the screen.

NOTE: It is crucial to set the bias level so the selected color *just begins* to appear on the screen. Find the spot on the screen where the selected color first begins to get brighter and use that as the reference point. Adjust the bias level above and below this point to find the setting where one click causes an increase in brightness and stop at that point. This insures that the weakest signal will cause the ILA[®] assembly to respond properly.

Repeat the above ILA[®] Bias procedures for red and green. Save the changes.

5.8 Convergence (XY Registration)

Convergence (XY Registration) overlays the CRT beams onto each other. XY Registration procedures are required to align the red, blue, and green CRT beams together on the screen.

NOTE: For a better understanding of what is being accomplished, take the time now to read the entire XY Registration section before making any adjustments.

Purpose of Convergence: The XY Convergence adjustments are used to converge or overlay the red, green and blue CRT images over the entire screen area. The Model 230 projector handles many different sources and convergence is tied directly to a source. One channel can contain up to 20 different sources with different formats. Each of these source must have its own set of convergence data.

Cursor Shapes and Sizes: Three different cursor modes (see Figure 5-15) are used to make adjustments:

1. *Move* mode moves the cursor around the screen;
2. *Size* mode increases or decreases the cursor size; and
3. *Adjust* makes the actual convergence adjustments.

Various cursor sizes are available to adjust areas. Some areas may require odd shaped cursors. If a long thin area appears out of convergence, use a long thin cursor shaped like the area. Use the cursor size that best fits the area. Some areas may be satisfactory and will not need any convergence corrections.

Bear in mind that the greatest convergence corrections are made at the center of the cursor. Avoid making corrections at the edges of the cursor. Move the center of the cursor over the area that needs correcting. A cursor with a long centerline is affected equally all along its centerline by the adjustments.

Convergence Profiled:

1. Start with the $\frac{1}{4}$ screen cursor with the *center* of the cursor at the upper left corner (number 1 in Figure 5-14). Note that cursor is off the screen at the top and left.
2. Make corrections to the area then, move the *center* of the cursor to the next area shown (number 2) in Figure 5-14.
3. Move down and across the screen in the sequence shown in Figure 5-14. In most cases it will not be necessary to use a smaller cursor than the one shown in Figure 5-14.
4. If there are still some smaller areas that need convergence, size down to a cursor that encloses about nine of the rectangles. Use the same general pattern as with the previous cursors.

Before beginning adjustments, experiment with the different cursors in *Size* or *Move* modes. **CAUTION!** If the *Adjust* mode cursor is displayed (Figure 5-15), pressing the arrow keys will alter the convergence settings. Experiment with the arrow keys only when in the *Move* or *Size* modes, not while in the *Adjust* mode.

1. Access Registration from the Convergence menu
2. Press Mode to change cursor type.
3. Use the arrow keys to see the various cursor sizes in *Size* mode.
4. Use the arrow keys to move the cursor around the screen In *Move* mode.

Start converging with the $\frac{1}{4}$ screen cursor at the upper left corner. Then move the center of the cursor through the points in the sequence shown.

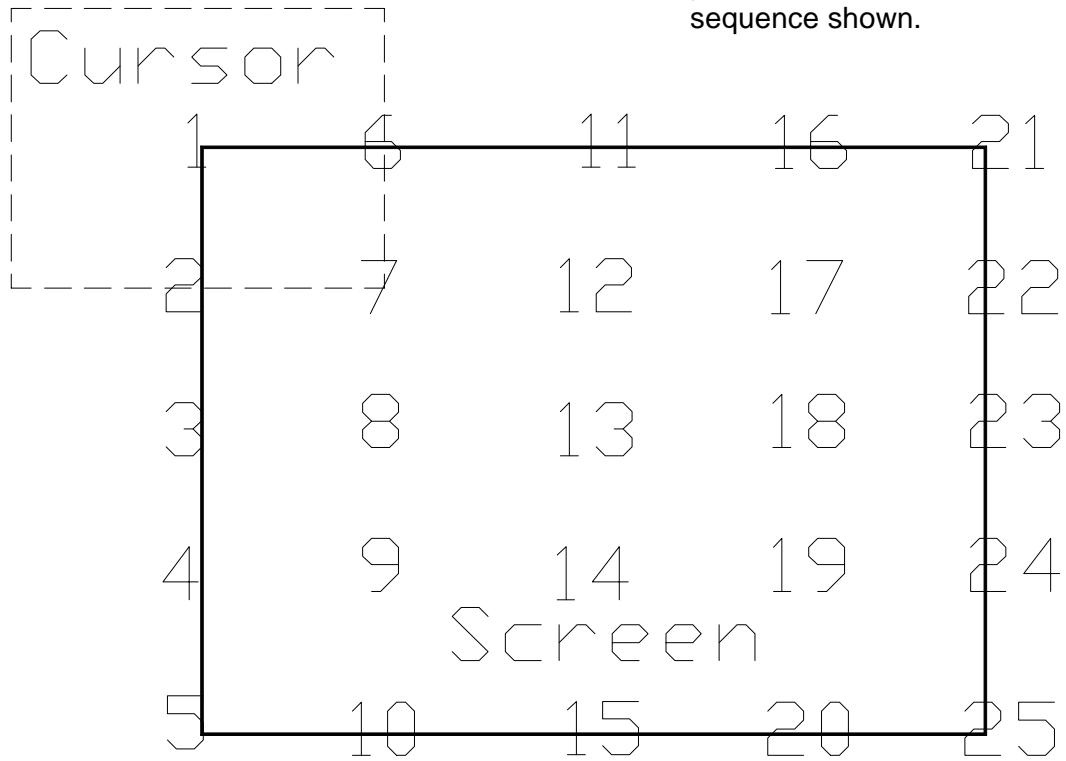
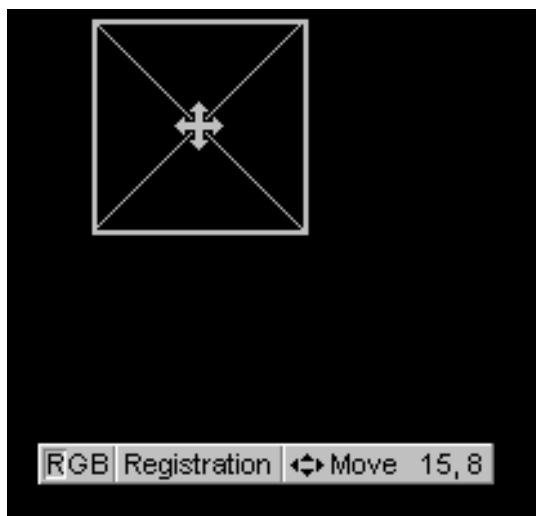
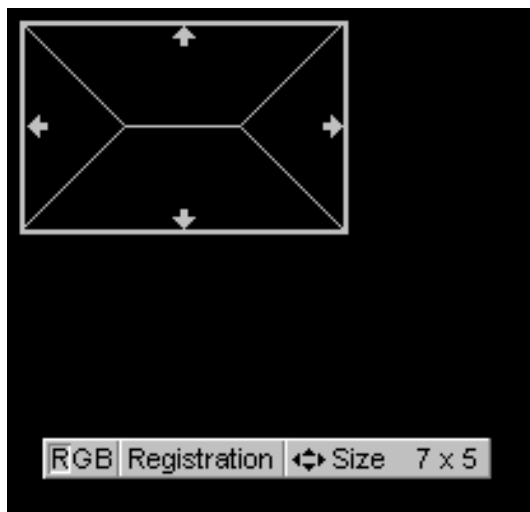


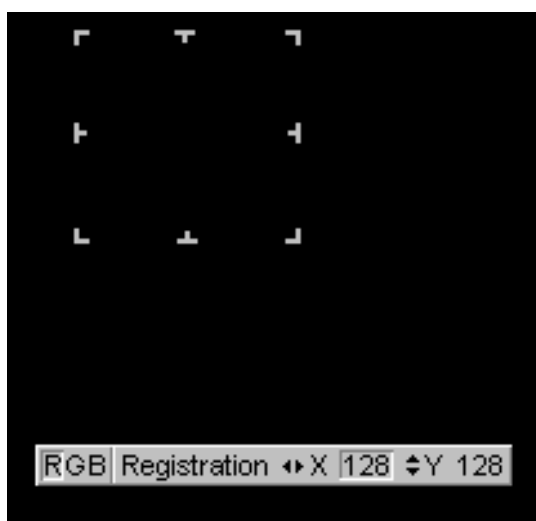
Figure 5-14. The $\frac{1}{4}$ screen cursor at starting point 1.



Move mode with the arrow pattern in the center. Use the up/down and right/left keys to move the cursor to the area of the screen that needs convergence. When the cursor is in the area desired, press Mode to change the cursor to the Size mode below.



Size mode with the arrows at the edges. Use the left/right and up/down arrow keys to adjust the cursor to the size needed.

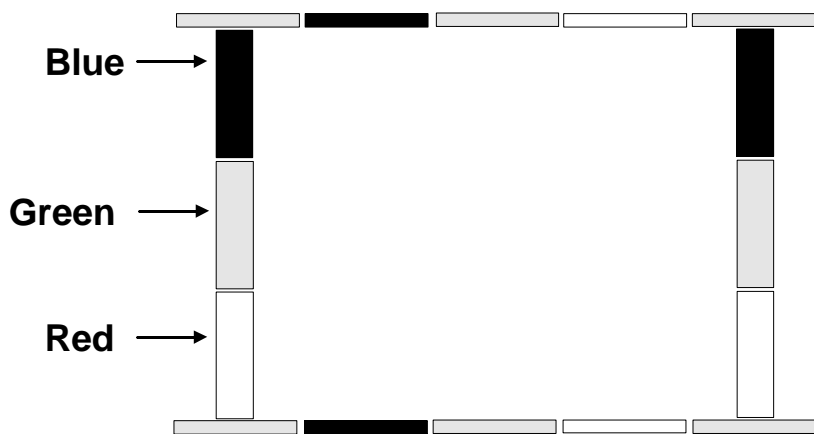


Adjust mode. The area to be adjusted is enclosed in a rectangular border. Areas outside the rectangle are not affected. The area most affected is the center of the rectangle. Do not try to make large adjustments at the edges of the rectangle. Move the cursor so that the center is over the area to be corrected.

Figure 5-15. The three modes of Cursors.

To adjust XY Registration:

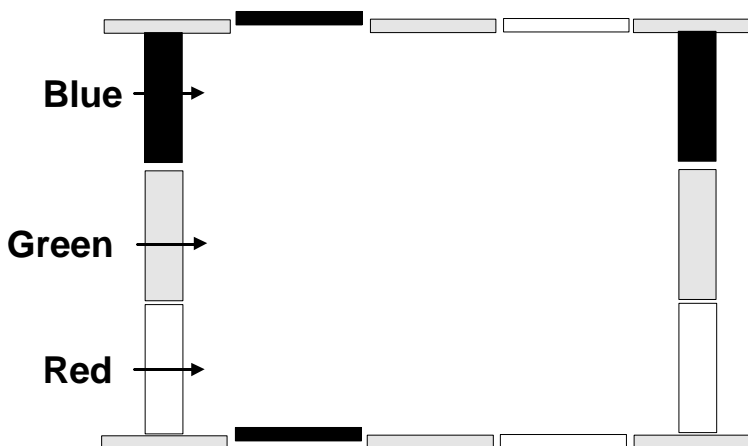
1. Access the Geometry menu.
2. Verify that the reg enable box is checked. This toggle is normally On and is toggled to Off only for maintenance.
3. Use the RGB toggle and the Hide key to hide red and blue.
4. If green geometry looks good, unhide red and blue. *OR*
 - a. If green geometry is questionable, recheck it now.
 - a. Use the Standard Crosshatch test pattern to verify.
 - b. If geometry is not satisfactory, make touch-up corrections.
 - c. Green geometry must be correct before proceeding because green is used as a reference to converge red and blue.
 - d. If necessary, repeat any timing or geometry adjustments from Sections 5.4 and 5.5.
5. Access the Test Pattern menu and select RGB X-hatch. This test pattern is a series of red, green, and blue bars that form small rectangles on the screen. Figure 5-16 shows what one of these rectangles looks like in three different situations. In this black and white illustration, red is shown as white, green as shaded, and blue as black.
6. Access the Convergence menu and select #1, Registration. The convergence screen displays one of the cursor modes shown in Figure 5-15.
7. Use Size mode first. If the Move mode displays, press Mode to toggle to the Size mode. If the Adjust mode displays, press Enter to toggle to the Move/Size mode then, if necessary, press Mode to toggle to the Size mode.
8. Use the Size mode to display a $\frac{1}{4}$ screen cursor.



Correctly converged RGB pattern.



Red not correctly converged in horizontal direction. Use right/left arrows.



Blue not correctly converged in vertical direction. Use up/down arrows.

Figure 5-16. Examples of correct and incorrect convergence.

9. Toggle the Mode key to the Move mode with the cursor size at $\frac{1}{4}$ screen.
10. Use the arrow keys to move the center of the cursor to the upper left position (see Figure 5-14).
11. Determine if the area needs horizontal or vertical convergence using the illustrations in Figure 5-16.
12. If converging is needed, press Enter to go into the Adjustment mode.
NOTE: XY convergence can be performed with all 3 colors on the screen or with Red or Blue hidden and converging one color at a time to Green. (either method can be used). Verify convergence over the entire screen area with all three colors showing.
13. Toggle the RGB key to the color that needs to be converged.
14. While observing the test pattern, use the up/down arrow keys to converge vertically and the left/right arrow keys to converge horizontally (*refer to Figure 5-16*). Note that the area most affected is the center of the cursor. Avoid corrections near the edges of the cursor. Instead, move the cursor center over the area where corrections are needed.
15. When the upper left corner is converged satisfactorily, press Enter to return to the Move/Size mode. Toggle the Mode key to the Move mode. Refer to Figure 5-14 and center the cursor over each of the positions shown, sequentially, wherever convergence is required.
16. Repeat Step 15 for each area that needs convergence.
17. Move through the screen in the sequence shown in Figure 5-14 repeating the Move/Size/Adjustment steps.
18. When finished using the $\frac{1}{4}$ screen cursor, press Enter and toggle the Mode key to the Size mode.
19. If necessary, use the arrow keys to size down to the next smaller cursor.
20. Select the areas to be converged and converge the entire screen in the sequence shown in Figure 5-14.
21. Save the changes when finished with XY Registration.

5.9 Black Level (G2) and Sensitivity Offset

G2 sets the threshold of the CRT image and is adjusted, along with the Sensitivity Offset adjustment, using the Grey/Pluge test pattern. Together, these adjustments determine the level of the darkest and brightest areas of the image. The G2 adjustment is preset at the factory and may need little or no adjustment. These adjustments are made in sequence, one color at a time. It is preferable to start with Blue because it is the weakest color of the three to observe. When the

Blue settings are complete, the same adjustments are performed for Green and Red.

5.9.1 Black Level (G2)

To set the Black Level for Blue:

1. Use the RGB and Hide keys to hide R and G. Verify that the "Shutters on Hide" box under the Systems-Preferences menu is checked.
2. Toggle the RGB key to select B only.
3. Access Convergence menu and select Reset (read Caution below first).

CAUTION! Ensure that only the color to be adjusted is highlighted. Otherwise all colors are reset and good data from a previous setup will be deleted.

4. Use the arrow keys to highlight Sensitivity from the selection window, then press Enter. This resets the Blue Sensitivity level to 128.
5. Use the arrow keys to highlight Threshold, then press Enter. This resets the Threshold level to 128.
6. Access the Grey/Pluge test pattern.
7. Access Black Level (G2), from the Convergence menu.
8. Use the up/down arrow keys to adjust the black level so the small, black square in the center of the larger black square is *just barely* visible (refer to Figure 5-17). Press Enter when finished.

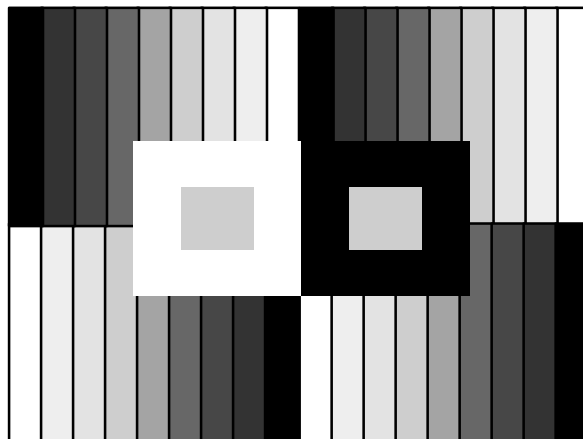


Figure 5-17. Grey/Pluge Test Pattern.

5.9.2 Sensitivity Offset

To adjust the Sensitivity Offset for Blue:

1. Access Sensitivity Offset from the Convergence menu (Blue should still be the only color on the screen with the Grey/Pluge test pattern still selected).
2. A screen will appear with a Sensitivity window and cursor displayed. The window shows that red and green are hidden (greyed out) and blue is the active color to be adjusted (if not, repeat Steps 1 and 2 from Section 5.9.1).
3. The window shows arrow keys to adjust Sensitivity Offset. Data numbers are also displayed.
NOTE: Sensitivity offset sets the brightest level for the overall screen image.
4. Use the up/down arrow keys to adjust the Sensitivity Offset so the small, white square is just barely visible inside the larger white square (see *Figure 5-17*).
5. Press Enter when finished.

Repeat the above Black Level and Sensitivity Offset adjustments for Green and Red.

5.10 Uniformity (Shading)

Uniformity adjustments correct inconsistencies and brightness differences in the CRT and ILA[®] assemblies.

5.10.1 Color Balance (Grey Scale)

Color balancing sets the color balance over the entire screen. The Grey Scale test pattern should be “Grey” throughout the entire screen area with a normal, gradual brightness transition from bar to bar. (no perceived coloration). If not, color balancing is necessary. Read the entire Color Balance Section before making adjustments.

Threshold and Sensitivity “Offsets” can be made for the entire screen to get proper color balance for the bright and dark areas.

To check for proper Color Balance:

1. Access Grey Scale from the Test Pattern menu.
2. Toggle the RGB key and verify all colors are selected and on screen.
3. Observe the two or three **darkest** bars in each of the four sections of the test pattern. If any color is too prominent in these two or three bars, adjust the Threshold Offset (see *below*) for that color.
4. Observe the two or three **brightest** bars in each of the four sections of the test pattern (see *Figure 5-17*). If any color is too prominent in these two or three bars, adjust the Sensitivity Offset (see *below*) for that color.

NOTE: A color may appear too weak, due to the other two colors being too dominant. If so, slightly increase sensitivity offset for the weak color.

To adjust the **Sensitivity Offset** for the best Color Balance:

1. Toggle the RGB key and select the color that is too prominent or deficient in the brightest bars .
2. Access Sensitivity Offset from the Convergence menu.
3. Use the up/down arrow keys to increase or decrease the Sensitivity Offset slightly so that the brightest bars in the test pattern are without color, i.e. grey. Make a note of the offset data number before making any adjustments in case an error is made and the original setting is needed. Recheck the test pattern for a normal, gradual transition from bar to bar. If increasing the Offset, avoid overadjusting any of the colors. Leave a normal, gradual brightness transition between the two brightest bars.
4. If necessary, recheck and readjust threshold color balance.

NOTE: The two numbers that appear in the box on the screen represent the lowest and highest Sensitivity settings on the screen. If either of these settings is at the minimum (0) or maximum (255), there will be no adjustment range available to adjust the Offset. This means that one area on the screen has been adjusted too high or too low during the Sensitivity adjustment and is restricting the Offset adjustment. Before the Offset can be adjusted, this area must be increased or decreased to allow for more range to perform the Offset adjustment. Recheck the Sensitivity adjustment to locate this specific area, if possible, and increase or decrease its level accordingly. If this is not possible, the Shading procedure may have to be repeated.

To adjust the **Threshold Offset** for the best color balance:

1. Toggle the RGB key and select the color that is too prominent or deficient in the dark bars.
2. Access Threshold Offset from the Convergence menu.
3. Use the up/down arrow keys to slightly increase or decrease the Threshold Offset so the darkest bars in the test pattern are without color, i.e. grey. Make a note of the offset setting before making any adjustments in case an error is made and original setting is needed. Recheck the test pattern for a normal, gradual transition from bar to bar. If increasing the Offset, avoid overadjusting any of the colors. Leave a normal, gradual brightness transition between the two brightest bars.

The **NOTE** below Step 3 in the Sensitivity Offset procedure above is applicable to the Threshold procedure at this point.

4. Recheck and, if necessary, readjust the Sensitivity Color Balance.

5.10.2 Threshold Uniformity

Threshold sets the brightness at low (black) levels to achieve a flat, uniform brightness in the black areas. Perform adjustments one color at a time.

To adjust the Threshold for Blue:

1. Darken the room as much as possible.
2. Use the RGB and Hide keys to hide R and G. Verify that the "Shutters on Hide" box under the Systems-Preferences menu is checked.
3. Toggle the RGB key to select B only.
4. Access Variable Flat from the Test Pattern menu.
5. Use the right/left arrow keys and select a Flat Field level of about 50.
6. Access the Convergence menu and select Threshold. The Threshold cursor and window appear on the screen showing the reset value of 128.
7. Use the center screen as the reference area for the Threshold Uniformity adjustment. Avoid overlapping this reference area with the cursor when adjusting or the reference brightness level could change.
8. Select a 12 X 12 cursor (as shown in the Cursor Size window).
9. Use the Move Cursor to move the cursor to an area of the screen that is darker than the reference area observed in Step 7.
10. Press Enter to display the Adjustment Cursor.
11. Use the arrow keys to bring the darker areas of the screen up to match the reference area. Note that the area most affected is at the *center* of the cursor. Avoid making adjustments at the edges of the cursor. Move the center of the cursor over the area that needs to be adjusted.
12. Obtain the best possible uniformity over the entire screen, then repeat Steps 9-11 with an 8 X 8 cursor.
13. When Step 12 is complete, select a 4 X4 cursor and repeat Steps 9-11 again for this cursor. If necessary, reduce the cursor size again to adjust smaller areas.
14. Press Enter to complete this adjustment. Save all changes.

5.10.3 Sensitivity Uniformity

Sensitivity sets the brightness at high (white) levels. Performed one color at a time, this adjustment gets a flat, uniform brightness in the white areas.

To adjust the sensitivity for blue:

1. Darken the room as much as possible.

2. Use the RGB and Hide keys to hide R and G. Verify that the "Shutters on Hide" box under the Systems-Preferences menu is checked.
3. Toggle the RGB key to select B only.
4. Access Variable Flat from the Test Pattern menu.
5. Use the arrow keys and select a Flat Field level of about 160.
6. Access the convergence menu and select Sensitivity. The Sensitivity cursor and a window are displayed. The sensitivity level's data value for the entire screen is displayed. This value is the reset value of 128 plus or minus the amount of offset from the Color Balance adjustment.
7. Use the same center screen area as in Threshold Uniformity for the reference area to match the rest of the screen. Avoid overlapping this reference area with the cursor when adjusting or the reference brightness level could change.
8. Select a 12 X 12 cursor as shown in the cursor size window.
9. Toggle the Mode key to the Move Cursor. Move the cursor to an area of the screen that is not as bright as the reference area observed in Step 7.
10. Press Enter to display the Adjustment Cursor.
11. Use the arrow keys to bring the darker areas of the screen up to match the reference area. Avoid making adjustments at the edges of the cursor. Move the center of the cursor over the area that needs to be adjusted.
12. Obtain the best possible uniformity over the entire screen, then repeat Steps 9-11 with an 8 X 8 cursor.
13. Then, select a 4 X4 cursor and repeat Steps 9-11 again for this cursor. If necessary, reduce cursor size to adjust smaller areas.
14. Press Enter to complete this adjustment.

Sensitivity and Threshold may need readjusting for good Blue uniformity. Repeat the above Sensitivity and Threshold Uniformity adjustments for Green and Red. Select one color at a time when resetting to avoid losing valid data from a previously adjusted color.

5.11 Picture Settings

Picture settings affect the image quality. Brightness and Contrast can be adjusted for any type of input source. Color Tint, and Sharpness are only active with Composite or S-Vid inputs. The section on Color Balancing should be completed prior to adjusting any Picture Settings. Note that **Black Enhance** and **White Enhance** are not required for the Model 230.

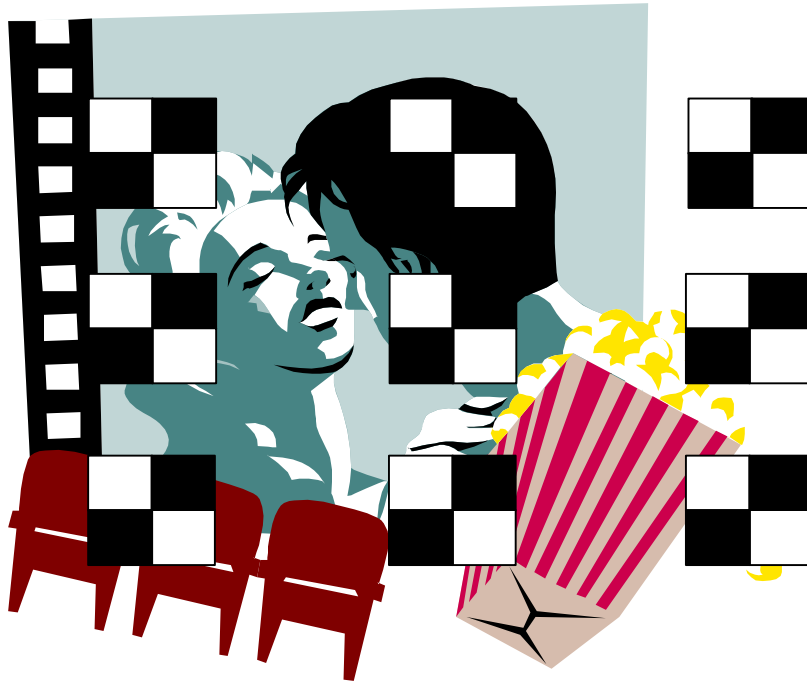


Figure 5-18. Cont/Bright Test Pattern. The nine black and white squares overlay the input image on the screen.

5.11.1 Brightness

To adjust Brightness:

1. Display an external image.
2. Access the Cont/Bright test pattern from the Test Pattern menu.
3. Access Brightness from the Picture menu.
4. Use the up/down arrow keys to increase or decrease the Brightness setting so the blackest part of the input image is equal to the black squares in Figure 5-18.
5. Press Escape to leave the Brightness adjustment.

5.11.2 Contrast

To adjust Contrast:

1. Using external image and Cont/Bright test Pattern from previous step, access contrast from the picture menu.
2. Use the up/down arrow keys to increase or decrease the Contrast setting so the whitest part of the external image is equal to the white squares in Figure 5-18.

NOTE: Contrast can be adjusted for individual colors as well as all colors combined. To adjust only one color, toggle the RGB key to the color desired. Hide the other two colors, and use the left/right

arrow keys to adjust. Access Test Pattern 1 (Off) to remove the Cont/Bright overlay pattern.

5.11.3 Color, Tint, Sharpness

The Color, Tint, and Sharpness settings are only active with Composite (NTSC) or S-Vid inputs. Display an external image.

To adjust Tint:

1. Access Tint from the Picture menu.
2. Use the up/down arrow keys to set the desired Tint level.

To adjust Color:

1. Access Color from the Picture menu.
2. Use the up/down arrow keys to set the desired Color level.

To adjust Sharpness:

1. Access Sharpness from the Picture menu.
2. Use the up/down arrow keys to set the desired level.

5.11.4 Black Boost

The Black Boost feature increases the black detail in the dark areas of the image. If after completing the other Picture Settings, the dark areas of the image still do not show enough detail, adjust Black Boost as follows:

1. Select Black Boost from the Picture menu.
2. Use the arrow keys and adjust the Black Boost as needed.
3. Select the setting that provides the best detail in the dark areas.

5.11.5 VIC Settings

1. Access VIC Settings from the Picture menu. A submenu appears to allow the operator to select specific VIC option settings when setting up new channel.
2. Press escape if the projector uses only one VIC. If the projector is using a Graphics Enhancer #2 VIC or a Quad Standard Decoder VIC, refer to Section 5.13, below, for details on how to set up for these VICs.
3. VNR (Video Noise Reduction) is available in the submenu. This option reduces noise in the image but also reduces detail because it narrows the bandwidth. Use trial and error to determine if this VNR option is appropriate for the image being viewed.

5.12 Backing up Settings

The source file parameters previously set up (and any other source files attached to one channel) can be copied to another channel. Copy parameters if the

source has the same basic parameters but different picture settings. A channel can be set up for a source with picture settings specific to that source, then copied to another channel. The channel receiving the copied information can have the picture settings adjusted for the source that will be received on that channel. Two channels are now set up for the same type of source but with different picture settings. This function saves time and also backs up the settings from the original channel. When copying from one channel to another channel, verify that both channels use the same type of VIC. This can be determined by accessing the System-Maintenance menu and selecting Status List. The VIC types are shown there.

To copy settings from one channel to another channel:

1. Access the Channels menu and highlight the channel that is to be copied (highlight by pressing the number or scroll with arrow).
2. Press MODE on the remote.
3. Select COPY from the submenu. This copies the channels' name, VIC path, and all attached sources into a Paste Buffer.
4. Move the cursor to the channel to copy the data to (**See CAUTION below**).
5. Press the MODE key.
6. Select PASTE from the submenu.

CAUTION!!! Verify that the channel copied to is blank or does not contain any valid source setup data information. **Copying a channel deletes all of the sources and their setup data from the “copied to” channel.**

VORSICHT!!! Der für den Kopiervorgang vorgesehene Zielkanal muß leer sein bzw. darf keine Quelldaten enthalten, die noch benötigt werden. Beim Kopieren eines Kanals werden im Zielkanal alle Quellen mit ihren Einstellungsdaten gelöscht.

PRUDENCE !!! S'assurer que le canal sur lequel la copie est faite est vide ou ne contient pas de données de la source nécessaires. Copier sur un canal efface toutes les données et les paramètres du canal sur lequel la copie est faite.

7. If all of the sources that were copied from the first channel are not needed in the second channel, they can be detached from the second channel. Select the unwanted sources with the arrow keys, then deselect by pressing enter.
8. These “copied” sources can be adjusted to match any incoming source for the new channel without affecting the original source from the first channel.

HINT: For convenience store a list of all available sources in one specific channel. This can be used as a source “master” list. For example, have all available sources attached to Channel 99. Use this as a master list from

which any source can be attached at any time. Having all available sources in 1 “master” channel avoids having to remember where any specific source is located and the time involved in hunting through various channels to find a particular source.

5.13 Video Input Cards

The five types of Video Input Cards (VICs) available for use with the projector are:

- **Graphic Enhancer Plus RGBHV VIC.** Provides graphic enhanced features for applications where fine detail (like text) must be viewed.
- **Wide Bandwidth RGBHV VIC.** Used with standard RGBHV inputs such as VGA, SVGA, and Line-Doubled Video.
- **Quad RGBHV Video Mux Input Card.** Same type as the above RGBHV except for having four separate RGBHV input ports allowing for more source connections.
- **HDTV YPbPr VIC.** Can be set up for YPbPr or RGB (sync on green) signals (refer to part 2 of this section, below).
- **Quad Standard Decoder VIC.** The connector on the right is used for NTSC 3.88, PAL, SECAM, and NTSC 4.43 sources. The two connectors on the left are for S-Vid with separate Y/C components. The sources are selectable through VIC SETTINGS in the Channels menu (see VIC SETTINGS, below).

Illustrations of all VIC input panels and connections are shown in Figures 5-20 to 5-23 at the end of this section.

The following must be accomplished prior to using a VIC.

1. *Install* the VIC into one of the three slots at the rear of the projector.
2. *Connect* the source input cables from a compatible input source.
3. *Edit* the VIC for use in a designated channel.
4. *Select* the proper mode under VIC SETTINGS (this step is necessary for Quad Standard Decoder and Graphic Enhancer Plus VICs only).
5. *Select* Clamp Type (Section 5)

1. INSTALLING (or REMOVING):

To install a VIC:

1. Turn projector power off with the remote.
2. Slide the VIC into the appropriate VIC slot at the rear of the projector. **NOTE:** The VIC will not push in all the way until the holding screws are tightened in Step 3.

3. Tighten the two holding screws (four screws on the Quad Standard VIC) on the left and right side of the VIC (see illustrations).

To remove a VIC:

1. Turn projector power off with the remote.
2. Disconnect all input connectors (label them, if necessary).
3. Loosen the two holding screws on the left and right sides of the VIC (see illustrations). These screws must be completely loose to remove the VIC.
4. Grasp the VIC connector bracket and pull the VIC out (wiggle the VIC a little, if necessary, to extract it).

2. CONNECTING SOURCE CABLES:

Connect the input source cables to the input connectors as marked on the rear of the VIC.

- For **RGBHV and Graphic Enhancer VICs**, connect the RGBHV cables to the appropriately marked input jacks (*Figure 5-19*).
- For **Quad RGBHV Video Mux (multi-port) VICs**, connect the RGBHV cables to the input connectors on the port(s) to be used (*Figure 5-20*). Due to their physical dimensions, these multi-port VICs can only be installed into Slot 2 or 3. If installed in Slot 2, another VIC can be installed in Slot 3 only. If installed in Slot 3, another VIC can be installed in Slot 1 only.
- For **HDTV YPbPr VICs**, connect the three input cables to the appropriate input jacks (*Figure 5-21*). Note that the Red, Green, and Blue input jacks are in a different order from the RGBHV VIC with Green at the left, Blue in the middle, and Red on the right. The HDTV YPbPr VIC uses the same circuitry and input jacks to process two different type of inputs; the GBR input and the YPbPr input. Only one of these inputs may be selected at any one time. The selection of one of these inputs is made by editing the second number in the VIC column (see editing VICs below) and using separate channels for their sources.
- For **Quad Decoder VICs**, there are two distinct input connections (*Figure 5-22*). The input connector at the right, labeled Video is for Composite (C-VID). The two connectors at the left, labeled Y and C are for S-Vid. The selection of one of these inputs is made by editing the second number in the VIC column (see editing VICs, below) and using separate channels for their sources.

3. EDITING

The VIC column in the Channels menu must now be edited so the sources coming into the projector follow the correct path through the correct VIC input. An editing example for three VICs is shown at the end of this section.

To edit a VIC:

1. Select Channels from the Main Menu.

2. Select a blank channel. **NOTE:** If there are no blank channels, don't edit an existing channel for a new VIC—press MODE and cut the entire channel entry and start from a blank channel.
3. Press the MODE key to display the EDIT submenu.
4. Select EDIT.
5. Press the right arrow to move to the VIC column, then press Enter.
6. Use the up/down arrows to select the VIC number (the number of the slot the VIC resides in—upper slot=1, middle=2, bottom=3).
NOTE: For RGBHV and Graphic Enhancer VICs, this is the only VIC editing required. The second VIC column defaults to 1.
7. Press the right arrow again to move to the second VIC column. Use this column to select the VIC port # for the Quad RGBHV Video Mux (multi-port) VIC, the VIC input # for the HDTV YPbPr VIC, or the YC or C-VID input for the Quad Standard Decoder VIC as shown below:
 - 7.1. If using a Quad RGBHV Video Mux VIC, select the appropriate port #. The corresponding LED (1, 2, 3, or 4) will light when this channel and source are active.
 - 7.2. If using an HDTV YPbPr VIC, select 1 or 2. The corresponding LED (#1 on the left for YPbPr and #2 on the right for RGB) on the VIC panel lights.
 - 7.3. If using a Quad Standard Decoder VIC, select 1 or 2. When selecting #1, the LED on the left side for Y/C (S-Video, Figure 5-22) lights when this channel is active. When selecting #2, the LED on the right side, Composite (labeled "Video") of the VIC lights when this channel is active. Only one of these LEDs can light at any one time. **NOTE:** When activating a Quad Standard Decoder VIC, be sure to have a proper source connected to the inputs on the rear panel. The projector will not select an appropriate source without a proper input source.
8. The channel and an appropriate source should now be named and edited in the Channels list. This is covered in "Editing Channels and Sources" in Chapter 5 in the User's Guide.

HINT: When the projector uses more than one type of VIC, use two of the letters in the VIC type when naming the channel so it can be seen at a glance which type of VIC is used in any channel. For example; use QR when using a **Quad RGBHV** VIC, HD for an **HDTV YPbPr** VIC, or DE for a **Quad Standard Decoder** VIC. Three letters remain to name the channel itself.

NOTE: If Switchers are used with the projector, the switcher's port number is edited in the third **VIC column**. **Press the right arrow key to access this column, press Enter and use the up/down keys to select a switcher port #.**

Editing example:

Slot 1 contains an **RGBHV** VIC.
Slot 2 contains a **Quad Standard Decoder** VIC.
Slot 3 contains an **HDTV YPbPr** VIC.

Possible combinations for the above VICs:

VIC 1 = RGBHV VIC

1.1= Default for Standard RGB VIC.

VIC 2 = Quad Standard Decoder

2.1= VIC slot #2, input #1 (YC, S-Vid).

OR

2.2= VIC slot #2, input #2 (Composite C-Vid).

VIC 3 = HDTV YPbPr

3.1= VIC slot #3, input #1 (RGB).

OR

3.2= VIC slot #3, input #2 (YPbPr).

4. VIC SETTINGS

VIC SETTINGS is necessary only when using a Graphics Enhancer Plus VIC or a Quad Standard Decoder VIC. After editing the VIC, the source mode or format must be selected by using VIC SETTINGS from the Picture menu.

For the Graphics Enhancer Plus VIC:

1. Select a channel/source that has been edited for use by the Graphic Enhancer Plus VIC with text displayed such as a Windows[®] screen. **NOTE:** If a variety of material (such as a lot of black text on a white background *and* a lot of white text on a black background) will be viewed using this source, it is best to use similar material when setting up the VIC.
2. From the Picture menu, select VIC SETTINGS.
3. The Graphic Enhancer menu below appears.

Black Peaking
White Peaking
Red Black Peak Trim
Blue Black Peak Trim
Red White Peak Trim
Blue White Peak Trim
Auto Peaking

These settings must be set for each source to be viewed. All factory settings will be at the recommended or nominal settings mentioned below

4. Auto Peaking: If the projector will be displaying a variety of images, the Auto Peaking mode is the best choice. If this box is not checked, the peaking controls are solely a function of the menu setting. When this box is checked, the peaking control action is dependent on the image being viewed. The result is to increase black peaking and decrease white peaking for

predominantly black on white text and graphics and to automatically decrease black peaking and increase white peaking for predominantly white on black text and graphics. Auto Peaking affects the entire image at the one time. Recommended setting is ON.

5. **Black Peaking:** This control mainly peaks the black details. A proper setting is a tradeoff that depends on the material to be viewed. Higher settings tend to make black text and graphics (on white background) darker. If set too high, white text and graphics (on black background) will have a loss of brightness in the details. If using the SMPTE test pattern, the vertical closely spaced lines in the center of the pattern will get noticeably darker overall when this setting is increased. Use a setting that has the best balance of text enhancement and an acceptable degree of darkening of the closely spaced vertical lines in the center of the SMPTE test pattern. Recommended setting is 128 to 180.
6. **White Peaking:** This control peaks the white details. Raising the setting improves white on black but results in a loss for black on white. The setting of Black Peaking affects White Peaking (White Peaking setting does not directly affect Black Peaking). It is usually best to leave this control at the recommended setting of 128.

NOTE: In some cases, the Trim controls below may have limited effect. These controls have no effect on vertical detail coloration and only partial effect on diagonal detail coloration.

7. **Red Black Peak Trim.** This is a trim to the black peaking in the red areas and helps to color balance the black details. Display a black text on a white background. Adjust the Red Black Peak Trim for the closest approximation to neutral coloration of the text. Nominal=128.
8. **Blue Black Peak Trim.** This is a trim to the black peaking in the blue areas and helps to color balance the black details. Display a black text on a white background. Adjust the Blue Black Peak Trim for the closest approximation to neutral coloration of the text. Nominal=128.

NOTE: It is usually best to set the Red White and Blue White peaking trims below while using the SMPTE test pattern.

9. **Red White Peak Trim.** This is a trim to the white peaking in the red areas and helps to color balance the white details. Use the closely spaced vertical lines in the SMPTE test pattern to reduce coloration in the white details. Nominal=128.
10. **Blue White Peak Trim.** This is a trim to the white peaking in the blue areas and helps to color balance the white details. Use the closely spaced vertical lines in the SMPTE test pattern to reduce coloration in the white details. Nominal=128.

12. Press ESC to exit.

For the Quad Standard Decoder VIC:

1. Select the channel that has been edited for use by the Quad Standard Decoder VIC.
2. From the Picture menu, select VIC SETTINGS.
3. Select Quad Decoder mode. The decoder mode list below is displayed.

NTSC
PAL
SECAM
4.43 NTSC
B/W 50Hz
B/W 60Hz

4. From the list displayed, use the arrow keys and highlight the decoder mode desired for this channel, and then press Enter to select.
5. Repeat Steps 1-4 to set the decoder mode for any other channel. Be sure the other channels also have the Quad Standard Decoder VIC selected. The Quad Standard Decoder VIC can process only one decoder mode per channel. A switcher, set up for decoder modes, can be used to increase the number per channel. If not using a switcher, assign only one decoder mode per channel.
6. The other choice under VIC SETTINGS is VNR (Video Noise Reduction). This feature is not commonly used. It is intended to decrease the signal noise level but also reduces image sharpness. If the image has a significant amount of noise this item can be selected. The operator can evaluate the image and decide to check this box or leave it unchecked.

5. Clamp Type

Clamp Type sets the type of clamping used with the sync pulse. There are three types of clamping; BP (Back Porch) is used in 95% of all inputs, ST (Sync Tip) is seldom used but necessary when there is no back porch to clamp on, and TL (Tri-Level) which is used mainly for HDTV and WVHS.

To set the Clamp Type:

1. Access the Timing Menu.
2. Select #4, Clamp Type from the Timing Menu.
3. Highlight BP, ST, or TL using the arrow keys.
4. Press ENTER to select.

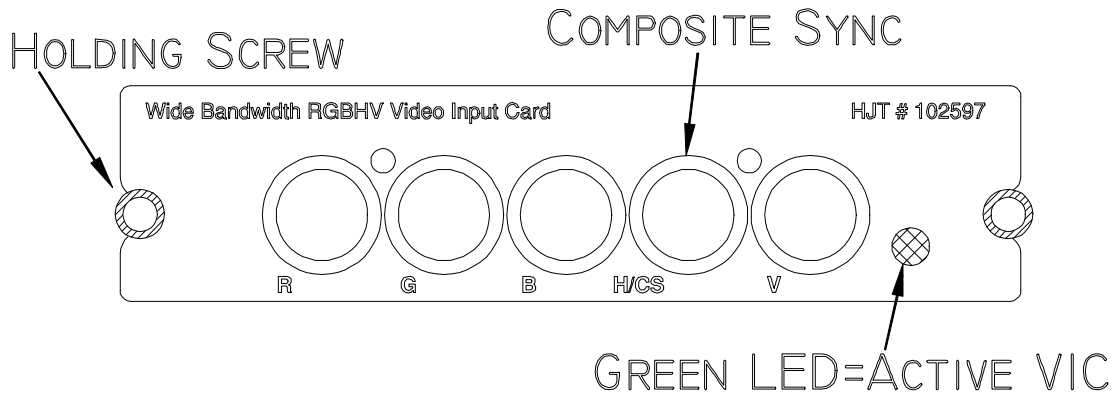


Figure 5-19. RGBHV VIC. The illustration above also applies to the Graphic Enhancer Plus VIC. Differences are name & part number (Graphic Enhancer Plus p/n = 106183).

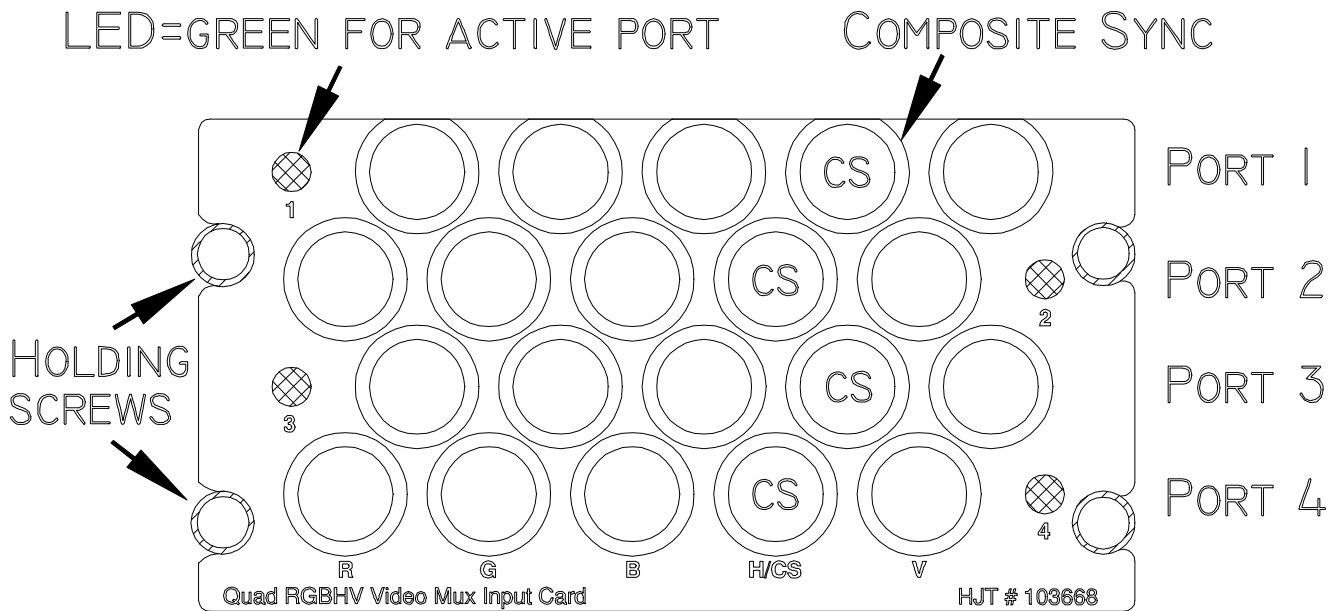


Figure 5-20. Quad RGBHV Multi-Port VIC.

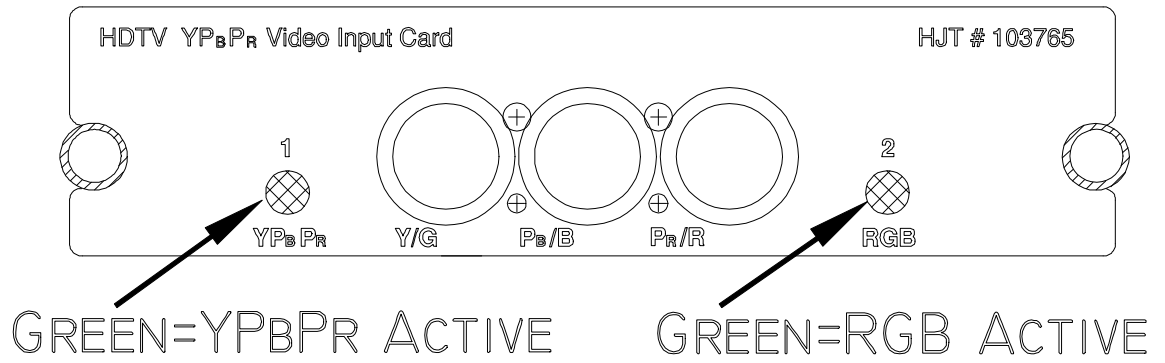


Figure 5-21. HDTV VIC.

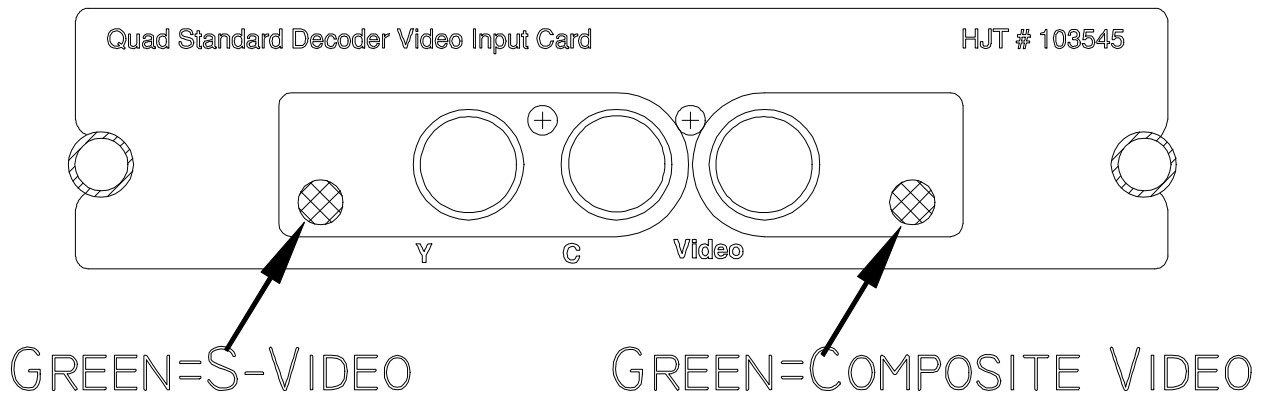


Figure 5-22. Quad Standard Decoder VIC.

5.14 Updating Software

The projector's software resides in Flash Memory and is updated via the projector's serial Port A. To perform an update, a disk containing the updated Boot Software (boot.hex) and/or System Software (zsys.hex) and a PC with Windows 3.1 (VT-100 Emulator) is required to perform update.

Boot Manager Software and System Software are separate products. Each may be updated independently. The System Software will depend on a specific version of the Boot Manager. Refer to the System Software release bulletin for Boot Manager version dependencies.

To perform software upgrade:

1. Use a Null Modem cable to connect a PC to the projector's Serial Port A.
2. Start Windows 3.1.
3. Click on the terminal icon from the Accessories Directory.
4. From the Terminal menu, select Settings-Terminal Emulation and click on DEC-VT-100(ANSI). Select OK.
5. Under Settings choose Terminal Preferences.
6. Under Terminal Preferences the following selections are appropriate; Terminal Modes=Sound, CR->CR/LF=Both off, Columns=80, Cursor=Block & Blink, Terminal Font=Fixedsys 15, Translation=None, Show Scroll Bars=On, Buffer Lines=100, Use Function Arrow & Control Keys for Windows=Off. Select OK.
7. Under Settings select Text Transfer=Standard Flow Control. Select OK.
8. Under Settings select Communications and choose; Connector=select the PC port being used, Baud Rate=9600 or 19200 (depending on the System Controller Switch block Pos 4- see note below this step), Data Bits=8, Stop Bits=1, Parity=None, Parity Check=Off, Carrier Detect=Off, Flow Control=XON/XOFF. Select OK.
9. Press CTRL+SHIFT+_ to reboot the "Boot Manager". The Power On LED stays Red.

NOTE: The switch block at the edge of the System Controller Board controls the baud rate for Serial Port A for the Boot Manager and System Software. This switch is factory-set DOWN for switch positions 1, 2, and 3 and UP for switch position 4. If new software will not load correctly and it becomes necessary to check this switch, contact HJT Field Service.

10. The following should be displayed on the Windows Terminal screen (where x.x.0 is the currently loaded Boot Manager version (e.g. 0.9.0 or 1.1.0).

```
-Boot Manager Ver x.x.0 (Service Mode Startup)
-Copyright (c) 1994 Hughes JVC Technology
-Command: _
```

11. Verify that the Boot Manager version is correct. If it is necessary to update the Boot Manager, perform the following steps. If the Boot Manager is already up to date, skip to Step 12 to update the System Software.

11A. Enter the command "loadboot" at the prompt. You should see the following output:

```
Command: loadboot

Boot Manager software update procedure

***WARNING: IMPROPER USE MAY MAKE THIS SYSTEM
UNBOOTABLE*** (This warning relates to the
Flash Memory updating that occurs in Step
11D. Do not turn projector power off while
the Flash Memory is updating)

Memory buffer reset to 0xff

Begin your S-Record upload now (Esc to
abort).
```

11B. From the Windows Terminal Menu (normally in Accessories window), select "Transfers/Send Text File", then select "List Files of Type:All Files", and select the disk and/or directory with the projector software. You should see a file named "boot.hex". Select this file and press the OK button to begin the upload.

11C. During upload, a progress indicator updates the number of records received. At the completion of the upload, the system will display the following (numerical values are for example only and depend on the Boot Manager version):

```
S-Records processed: 823

Upload Successful

Address Range: 0x00000000-0x00006687

Bytes Loaded: 26248

***WARNING: FLASH WILL NOW BE UPDATED***

Press Enter to continue, Esc to abort.
```

11D. The system has verified that the load module is correct and is ready to update the Flash. Press Enter to perform the update (press Esc now to abort the update with no changes). While the Flash memory is being updated (15-30 seconds), DO NOT turn off the projector circuit breaker or the machine could be made unbootable, requiring a new set of flash chips to be installed. When the update is complete, the system will display the following:

```
Reprogramming Flash Sector 0 1
Boot Manager software update successful
Command: _
```

The Boot software has been successfully updated. To restart the projector under control of the updated boot manager, type in "reboot", then press CTRL+SHIFT+^ . The projector will now restart with the updated boot manager software. The following will be displayed (where y.y.0 is the updated Boot Manager's version).

```
Boot Manager Ver y.y.0 (Service Mode
Startup)
Copyright (c) 1994-1996 Hughes-JVC
Technology
Command: _
```

12. To update the System Software from the Boot Manager prompt:

12A. Type in the command "loadsys" at the prompt. The following should be displayed:

```
Command: loadsys

System software update procedure
***WARNING: IMPROPER USE MAY MAKE THIS
SYSTEM UNBOOTABLE*** (NOTE: This warning
relates to the Flash Memory updating that
occurs in Step 12D below. Do not turn
projector power off while the Flash
Memory is updating.)

Memory buffer reset to Oxff

Begin your S-Record upload now (Esc to
abort)
```

12B. Select "Transfers/Send Text File" from the Windows Terminal Menu (normally in Accessories window). In the "Send Text File Dialog" box, select "List Files of Type: All Files" and select the disk and/or directory with the Model 230 software. Select file named "zsys.hex". Press OK to start upload.

12C. During upload, a progress indicator updates the number of records received. When the upload is complete, the system will display the following (numerical values are for example only and depend on the System Software version):

```
S-Records processed:11282
Upload Successful
Address Range: 0x00020000-0x000781cf
Bytes Loaded:360912

***WARNING: FLASH WILL NOW BE UPDATED***

Press Enter to continue, Esc to abort
```

- 12D. At this point the system has verified that the load module is correct and is ready to update the Flash memory. Press Enter to perform the update (Esc will abort the update process with no changes). While the Flash is being updated (approx 15-30 seconds), DO NOT turn off the projector circuit breaker, this may make the machine unbootable, requiring a new set of flash chips to be installed. When the update is complete, the system will display the following:

```
Reprogramming Flash Sector 2 3 4 5 6 7 8
9
System software update successful
Command: _
```

The software update is complete. To restart the projector, type in "reboot", then press Enter. The projector will now restart with the updated System Software.

