

4.0 Projector Adjustments

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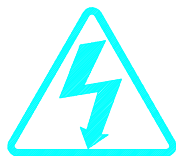
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The Model 370SC projector image can be controlled with:

- A Terminal or PC running terminal emulation software
- A Tethered Technician Remote control with display
- An IR Technician Remote
- An IR Executive Remote

This chapter assumes the use of an IR technician remote. Instructions regarding keys, refer to the IR Remote keys. Use an IR Repeater when the remote is 50' or more from the projector. Prior to starting the actual checkout procedures, a review of Sections 5.1, 5.2, 5.5, and 5.6 in Chapter 5 may be useful. These sections describe the functions of the remote control keys and the menu items.

4.1 Power On Sequence



CAUTION!

Before applying power or starting projector adjustments, thoroughly read all Safety Information at the front of this manual. Note that when the projector is turned off, the Xenon Arc Lamp is turned off but the cooling fans stay on for several minutes to cool the lamp. **Do not** unplug projector until fans have stopped running.

NOTE: Before applying power, verify that the projector is connected to a 208-254 VAC, 30 Amp, 50/60 Hz, single phase power source. If the Status indicator on the rear panel is lit (normal indication is Ø), the projector is in the "standby" mode. This means the AC power plug is connected and the internal circuit breaker is in the ON position.

To turn on projector power:

1. If using a tethered remote control, verify it is connected to the input jack marked "Terminal In" on the rear panel of the projector card cage. The tethered remote displays "POWER OFF" reading on the LCD display. This is the Standby Power mode. The projector is now ready for a power "ON" command.
2. Press the ON key to turn on the projector (on the Tethered remote, press both Power keys simultaneously). The ignitor circuit ignites the arc lamp supplying power to the electronics and the Channel 1, 2 or 3 indicator, on the rear panel, glows. To turn off power, press both Power keys.
3. Allow 60 minutes warmup prior to performing any adjustments.

4.2 Channels (Selecting, Changing, Preparing New)

Displaying the MAIN MENU: Press the MENU key to display the MAIN MENU. If another menu displays, press the ESC key until the screen displays the MAIN MENU.

Selecting a Channel: If the channel number is known, use the number keys and select a channel number, then press Enter. If the channel number is a two number channel, the second number makes the selection and pressing Enter is not necessary.

If the channel number is unknown, select the CHANNEL MENU from the MAIN MENU, then select CHANNEL LIST. Use the arrow keys to highlight the channel number and press Enter to select.

Verify that a source image projects onto the screen.

Selecting a Factory Preset Channel: It is easier to select a factory-preset channel to assist in setup. These channels have preliminary setups performed at the factory. Geometric information on these channels provides a *starting point* if the input format matches one of the factory preset channels listed below. If no match is found, select a new channel and follow "Preparing a New Channel for Setup Procedures" below.

Note: Setups for factory-preset channels are preliminary and should be checked (readjust only as necessary). These channels are also *preshaded*. Before performing any shading adjustments, observe the preshaded channels first. Very little or no shading may be necessary on factory-preshaded channels.

Typical factory preset channels are:

CH 3=31kHz

CH 4=48kHz

CH 5=64kHz

(For MACs-CH 3 is the closest scan frequency.)

Changing Channels: To change channels when there is a menu displayed on the screen:

- Display the CHANNEL LIST and use the arrow keys to highlight the desired channel, then press ENTER.

To change channels while operating in another channel with no menu displayed on the screen:

- Use the number keys and press the desired channel number.

Preparing a New Channel for Setup Procedures:

1. Press MENU and/or ESC to display the MAIN MENU. If the menu is not displayed in green, press the G key to display the menu in green (green menus are easier to read).

2. Select CHANNEL MENU from the MAIN MENU.
3. Select CHANNEL LIST from the CHANNEL MENU.
4. Use the arrow keys to highlight the channel number desired and press ENTER to select that channel.
5. Use the right arrow key and move the highlight to the column immediately to the right of the channel number. Press ENTER to select that column.
6. Press the up or down arrow key to select V, if using a VTR input, otherwise leave this column blank.
7. Use the right arrow key to highlight the input column.
8. Press ENTER to select that column.
9. Use the up/down arrow keys to select the desired input (RGB1, RGB2, CVID, or SVID).
10. Press ENTER to save that input.
11. Use the right arrow key to highlight the sync level (SL) column.
12. Press ENTER to select the SL column.
13. Use the up/down arrow keys to toggle through the various sync levels and select the desired sync level.

Use the following guidelines to help select which SL to use:

- BP (backporch) is used when a back porch exists and is timed for after the sync pulse but before video starts (used in 95 % of all computer and video inputs). Use the up/down arrow keys to select BPE (early), BPL (late), or BPX (extra-late).
 - ST (sync tip) is seldom used but is necessary whenever there is no back porch to clamp on (i.e. where video starts immediately after the sync pulse).
 - TL (tri-level) is only used for HDTV (High Definition Television)-type signals that use a tri-level sync. Use the up/down arrow keys to select TLL (late) or TLE (early).
14. Press ENTER to save the selected sync level.
 15. Use right arrow to highlight the name column.
 16. Press ENTER to activate the first character. The first character displays the current character in red or is blank if no character is selected. The characters will be highlighted in red one at a time.
 17. Use the up/down arrow keys to select the desired character. After selecting the first character, use right arrow key to move the highlight to the next column, then select the next character in the same manner.
 18. Press ENTER to save the selection when the desired name (up to six letters) has been chosen.

19. Press ESC to exit.

The setup procedures from this chapter should now be performed for the new channel.

4.3 Setup Preparation

Reference Information and Definitions: To avoid redundancy in the setup procedures, some general information and definitions are given below. Please read and understand these prior to starting the actual procedures. Refer back to this page whenever necessary.

The procedures in this chapter assume the projector is properly placed and mounted, powered up, and receiving an input signal.

References to R, G, or B---In the procedures in this chapter, the letters R, G, or B refer to Red, Green, or Blue.

View a color---to make the color active (highlighted on the screen) press the color key (R, G or B) *or*, if the color is cut off, press the CUTOFF key and then the color key.

Cutting off a color---press the CUTOFF key, then press the R, G, or B key to cut off that color. The cutoff color's letter no longer appears on the screen and is replaced by a line. If a color is cut off but active, it can not be adjusted. The screen displays "Color is cut off".

Verify a color to be active ---Verify the selected color's letter is highlighted and on the screen. Prior to making *any* adjustments, *always* verify that the color to be adjusted *is* active by noting the screen highlight. Cutoff colors *are* shown by noting dashes on the screen in place of the color's letters.

Active and highlighted: The color that is highlighted on the screen is the "active" color and the one that will be altered during adjustments.

Displaying the Main Menu---Press the MENU key to access the Main Menu. If another menu was previously selected, press the ESC key until the screen displays the Main Menu. Make a selection from any menu by choosing the number of the selection and pressing ENTER *or* highlighting the item and pressing ENTER.

Selecting a Test Pattern: To select a test pattern, press TEST to display the Test Pattern menu, then select the number of the pattern desired.

Picture Setting Defaults: All settings, including Picture Settings, are automatically updated after exiting each procedure. However each channel retains a set of default Picture Settings (Contrast, Brightness, Color, Tint and Sharpness) separately from the saved settings. The operator can use the saved settings in each channel or can revert back to the default settings at any time by pressing the DEFLT key on any remote. If desired, the default settings can be updated to the saved settings by performing the "Update Defaults" procedure, shown in this chapter.

Entering numeric values on projector adjustments---Numeric values may be entered for most adjustments (ILA Bias, Phase-horiz, Size, Keystone, Pincushion, Linearity, Edge Linearity, Contrast, Brightness, and Black/White

Enhance) instead of making the numerous keystrokes that are necessary when the adjustment is way off. To do this press the suitable arrow key for the direction to correct, then pick a numeric value with the number keys and press ENTER.

Help---A HELP statement is available to assist in defining the purpose of some of the adjustments. Press the left or right arrow key to access.

Set Blanking before starting adjustments---Cut off R & B (see *cutting off a color, above*) and select external video from the Test Pattern menu. Set BLANKING so all four edges are unblanked and the entire image is visible. Press BLNK and use the arrow keys to set the blanking level of the left and top edges to 0% and the right and bottom edges to 100%. Press the BLNK key to toggle to all sides. After unblanking, reduce the size of the picture until the entire raster is visible on the screen. **NOTE:** Some applications may need more area (beyond the 100% unblanked edge) at the bottom of the screen. If necessary, this bottom edge can be unblanked to 140%, but this *additional* area may be out of range for shading and/or convergence.

Lens Alignment, Projector Lens Focus, Electronic Focus, CRT Mechanical Focus, and G2 adjustments are channel independent and are required at installation. ILA[®] Bias, Electronic Focus, CRT Mechanical Focus, and G2 are all factory-adjusted and should need minor adjustment at installation only.

Geometry, Convergence, Color Balance, Shading, and Proportional Offset adjustments are required for each new channel setup. **NOTE:** None of these adjustments *may* be required on factory-preset, factory-preshaded channels. Before performing any adjustments, it is important to check the factory-preset channels first, since they may be acceptable "as-is" without any further adjustment. These factory-preset channels can also be "**copied to**" other channels (see *Copy Channel section*) and used as starting points for other sources with similar parameters.

Shorten Setup Time by using the COPY CHANNEL function. After a channel is set up properly, copy the channel-dependent settings to any other channel using the same or similar source parameters (see *Copy Channel Section*) to shorten setup time. To copy only *some* of the adjustment parameters, use the COPY PARAMETERS function from the CHANNEL MENU and select the items to copy to another channel.

On Screen/Off Screen--- This is a user's preference key on the remote. In the On-Screen mode the menus, text, cursor crosshair, and data numbers are visible on the screen. In the Off-Screen mode, only the cursor is visible. The Off-Screen mode has less interference from the on-screen items, and is more commonly used.

Time-Outs---Menus appear on the screen for 30 seconds after which they "time out" and go off screen. If this happens, reselect the menu item. The R, G, B selection bar stays on screen for 10 seconds. A screen query remains on screen for 3 minutes awaiting operator response. Other displays stay on screen for 1 minute.

Table 4-1 shows where R, G and B are independently adjustable.

Table 4-1. RGB Relationship During Setup Adjustments

FUNCTION	RGB INDEPENDENTLY ADJUSTABLE
ILA [®] Bias	YES
Projection Lens Focus**	YES
CRT Electronic Focus**	YES
CRT Mechanical Focus**	YES
G2 Adjustment**	YES
RGB Raster Position*	YES
Phase	NO
Size	NO
Keystone	NO
Pincushion	NO
Pincushion Position	NO
Menu Position	NO
Linearity (Horizontal)	NO
Edge Linearity	NO
Blanking	NO
X/Y Axis Convergence	YES
Color Uniformity (Shading)	YES
Color Balance	YES
Contrast*	YES
Brightness	NO
Color	NO
Tint	NO
Sharpness	NO
Linearity(Vertical)**	YES

*G is used as a master. Whenever G is adjusted, R and B move with G.

When R or B is adjusted alone, R or B move independently.

**These functions are not independently adjustable by the remote control unit but can be adjusted using manual methods.

The following tools and equipment are needed to perform the full setup procedure:

- Hex ball drivers, 2.5mm, for access to yokes and 1/8" for lateral lens adjustment
- Nutdriver, 5mm, for CRT focus
- Small plastic screwdriver for G2, Electronic focus, Vertical size, Vertical linearity and Horizontal size
- Test generator (optional)
- Small flat blade screwdriver for projection lens and cover removal
- Small phillips screwdriver for card cage access

4.4 Test Patterns

The table below lists the internal test patterns available and their suggested uses for projector adjustments.

Table 4-2. Test Patterns.

NUMBER	DESCRIPTION	USE
1	EXTERNAL VIDEO	Adjust Phase, Size, Position and Blanking
2	WHITE X-HATCH <i>(Grid of vertical and horizontal lines)</i>	Convergence, Keystone, Pincushion, Pincushion position and Linearity
3	RGB X-HATCH <i>(Aligned, alternating dots of RGB)</i>	Convergence final adjustments
4	DOT PATTERN <i>(Individual stationary dots, evenly spaced across the screen)</i>	Verify G2 setting for RGB
5	PLUGE <i>(Grid of four squares within four squares)</i>	To set Black/White scale
6	STATIC FLAT FLD <i>(100% white flat field)</i>	To check Arc Lamp uniformity and focus
7	ADJUST FLAT FLD <i>(Flat field that adjusts in 7% increments)</i>	Threshold and Sensitivity Shading adjustments
8	H-GRID <i>(Rows of white H's on screen)</i>	Focus
9	GREY SCALE <i>(Black to white gradation bars)</i>	Color Balance, G2 and Menu Position
0	CONTRAST/BRIGHT <i>(Black and white reference squares)</i>	Reference for Brightness and Contrast settings

To select a test pattern with the remote, press TEST, followed by the test pattern number.

4.5 Projector Positioning

It is critical to position the projector correctly during the initial setup. Correct positioning will improve all later adjustments made to the projector and provide a sharper video image.

HINT: The projector's positioning and location are the two most important steps in the checkout. The closer the projector is to the 15° maximum tilt (see *Chapter 3*), the more correction will be needed for Keystone etc. Ranges are limited—make the projector to screen as square as possible before proceeding to checkout.

NOTE: it may be necessary to perform a *rough* focus of the G projection lens to be able to read menus and see the image edges. If the menus can be read, this is not necessary now. If the menus can't be read due to poor focus, refer to Section 4.6 below, Steps 1-4, to focus the projection lens.

To position the projector:

1. Use the following procedure to increase the green ILA[®] Bias so the entire ILA[®] area is visible on the screen:
 - A. Cover the Blue and Red projection lenses with lens caps.
 - B. Press ESC and MENU to display the MAIN MENU.
NOTE: If the menu times out after a period of time passes without pressing any keys, press MENU again and repeat the menu selections.
 - C. From the MAIN MENU select ILA[®] BIAS MENU.
 - D. At the ILA[®] MENU, select MAX-ON, NO VIDEO.
2. Position the projector perpendicular to the screen. Verify this by measuring from the center of the G projection lens to each side of the screen. The distance to each edge should be the same. While adjusting the perpendicular position, ensure the Green image from the ILA[®] overlaps the screen edges on both sides. If the ILA[®] image does not cover both edges of the screen at the same time, either the throw distance must be increased or the screen size must be reduced so the picture fills the screen (see *Section 3.5, Lens Selection, for throw distance guidance*).
3. Raise or lower the front and/or rear of the projector using shims or a custom mounting device to center the ILA[®] image so that the overshoot above and below the screen is similar (see *Chapter 3 for restrictions on vertical tilt*).
4. Press ESC to exit this function. The ILA[®] Bias settings will automatically return to the previous settings.
5. Remove lens covers from the Red and Blue lenses.

4.6 Projection Lens Focus and Alignment

The Projection Lens Alignment allows the operator to converge the red and blue projection lenses to the fixed green lens. First, verify that green is centered on the screen properly, then adjust red and blue to match green.

For long projection distances, use an assistant to make focusing adjustments. One person can focus while another stands in front of the screen to guide.



BRIGHT LIGHT!!! Use caution around the light path. **DO NOT** look directly into the light near the lamp housing or the projection lens!

To focus the projection lenses:

1. Select the Pluge test pattern.
2. Cover the Red and Blue lenses with lens caps.
3. Using a standard slot screwdriver, rotate the Green lens locking rod 1/4 turn counterclockwise. The lens locking rods are located on top of each projection lens. They can be reached through the opening between the lens and the projector front cover.

NOTE: Turning the rod all the way will allow the lens to slide out for replacement. A 1/4 turn will loosen the lens but not allow it to fall out.



WARNING!!! If the projector is pointed downward, do not loosen lens by turning the locking rod completely. The lens may fall out and cause severe injury to personnel.

4. Move the Green lens slightly back and forth by hand (twisting as you slide makes the lens easier to move), adjusting for the best focus on the screen while an assistant observes the "spacer balls" for the sharpest focus. **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 that are visible throughout the image. When these spots are distinctly defined, the projection lens is focused.
5. When optimal focus is reached, turn the Green lens locking rod clockwise back to the lock position.
6. Verify that the Green lens is still in focus after locking it.
7. Cover the Green lens, and uncover the Red lens.
8. Repeat Steps 3, 4, 5 and 6 for the Red lens.
9. Cover the Red lens, and uncover the Blue lens.
10. Repeat Steps 3, 4, 5, and 6 for the Blue lens.

11. Uncover all lenses, and press ESC to exit this adjustment.

To align the projection lenses:

1. Display the MAIN MENU.
2. Select the **ILA**[®] BIAS MENU.
3. Select MAX-ON, NO VIDEO, then select G on the remote.
4. Verify all lenses are uncovered.
5. Verify the Green **ILA**[®] image is physically centered on the screen. If the image is not centered, repeat Projector Positioning section to center the image.
6. Use a 1/8" allen wrench to laterally adjust the R lens to horizontally match the G lens (there is no vertical adjustment). The lateral adjustment screws are accessed through two holes on the projector bottom base about four inches from the front of the projector.
7. Repeat Step 6 for the Blue projection lens.
8. Press ESC to exit this adjustment.

4.7 **ILA**[®] (Image Light Amplifier) Bias Settings

The **ILA**[®] Bias settings are factory set and should not need adjustment, unless specific maintenance has been performed that requires an **ILA**[®] Bias readjustment. Avoid readjusting the **ILA**[®] Bias settings unless absolutely necessary.

The **ILA**[®] Bias settings adjust the electrical bias levels for each **ILA**[®] assembly to a "just off" threshold point so that even the smallest incoming light from the CRT makes the **ILA**[®] assembly react. When properly set, this adjustment will put each **ILA**[®] assembly at the threshold of operation. If improperly set, image black level will be adversely affected and the **ILA**[®] assembly will not react properly to incoming light.

NOTE: All **ILA**[®] Bias adjustments must be performed in a dark room. If the room cannot be darkened enough to set the **ILA**[®] Biases using the screen, hold a piece of paper a few inches from the lens of the color to be adjusted. Adjust the bias while viewing the entire **ILA**[®] assembly area on the paper.

The CRTs will automatically cut off when the **ILA**[®] Bias mode is entered. Any light on the screen is being reflected by the **ILA**[®] assembly.

To set the **ILA**[®] Bias levels:

1. Select the **ILA**[®] BIAS MENU from the MAIN MENU.
2. Select FREQUENCY ADJUST from the **ILA**[®] BIAS MENU.
3. A frequency of 2KHz is acceptable for general video viewing. A lower frequency (as low as 1.5KHz) provides a brighter image with lower image burn-in. A higher frequency provides higher resolution. For HDTV a

frequency of 2.5-3KHz provides higher resolution with less image lag. Use the UP/DOWN keys to adjust the **ILA®** frequency for the appropriate video source. Generally, 2KHz works well with most sources.

4. Display the **ILA®** BIAS MENU again.
5. Select MAX-ON, NO VIDEO. Don't attempt **ILA®** Bias adjustments on Bias W/ Video. This feature is used for factory quality control only.
6. Press G on the remote to select Green. Place lens caps over the Red and Blue lenses.
7. Use the Up/Down arrows to adjust the Green **ILA®** Bias until the brightest area of the **ILA®** image is gone. Then raise the bias level until the **ILA®** image just starts to illuminate the screen at any point. Finally, slowly lower the bias level again to the threshold point where the **ILA®** image just disappears.

NOTE: To operate the projector at an optimum level, it is crucial to set the bias level to where the selected color just begins to appear on the screen. Find the spot on the screen where the active color first begins to get brighter and use that as the reference point. Go below and above this point to find the setting where one click on the UP key causes an increase in brightness and stop at that point. This will insure that the weakest video signal causes the **ILA®** assembly to respond.

8. Cover the Green lens and uncover the Red lens. Press R to select Red.
9. Repeat Step 7 for the Red **ILA®** Bias.
10. Cover the Red lens and uncover the Blue lens. Press B to select Blue.
12. Repeat Step 7 for the Blue **ILA®** Bias.
13. Press Enter on the remote to save the settings and exit this adjustment.

NOTE: The **ILA®** Bias adjustments affect other projector settings. Whenever **ILA®** Bias is adjusted, verify and readjust, if necessary, all projector adjustments from Chapter 4.

4.8 G2 (Black Level)

G2 sets the threshold on the CRT. Access the G2 adjustment through holes located at the left rear side panel of the projector. The G2 adjustment is factory-set and should need minor readjustment at installation only. G2 needs to be reset only when:

- A major component like a CRT; or **ILA®** has been replaced;
- The high voltage power supply has been repaired; or
- If the picture size or aspect ratio changes.

When the projector is set up for new video sources, the Threshold Offset must be set to the default level of 80 prior to setting G2.

4.8.1 Sensitivity/Threshold Offset

To set or verify the Sensitivity/Threshold Offset for a new video source:

1. Select a channel from the Channel List.
2. Press POS/CONV to access Convergence mode.
3. Press HIDE/MODE and toggle to Sensitivity or Threshold.
4. Press MENU to display the SHADE AXES MENU on the screen.
5. Select CLEAR SHADE AXES (clears Sensitivity to the default level of 128 and Threshold to the default level of 80).

4.8.2 G2 Setting

CAUTION! Resetting G2 affects any previously performed Shading adjustments on all sources. After resetting G2, Shading must be readjusted.

1. Adjust for full size image on the screen. (*Refer to the sections on Position/Phase and Size*).
2. Adjust Menu Position using The Grey Scale and the Timing Setup Menu. (*Refer to the Menu Position section*).

To set G2:

1. Cut off R and B and view G.
2. Select the Grey Scale test pattern. The Grey Scale test pattern has four identical sections of nine color bars each (*see Figure 4-1*), going from black to full brightness (white). Observing the **dark** bars in the **center** of the test pattern, adjust Green G2 for a distinct line between the two **darkest** bars and a *normal transition* from one bar to the other.
3. Select the Dot Pattern test pattern and toggle the HIDE/MODE key. While toggling, verify there is no change in the background raster brightness. (The Dot Pattern will turn on and off as the HIDE/MODE key is toggled but the *background brightness* should not change while toggling.) If the background brightness changes as the

HIDE/MODE key is toggled, G2 is set too high and the procedure should be repeated. When *readjusting* G2, look for a *slightly less* distinct line between the same two dark bars used on the first G2 adjustment.

4. Select the Grey Scale pattern again.
5. Cutt off G and view R.

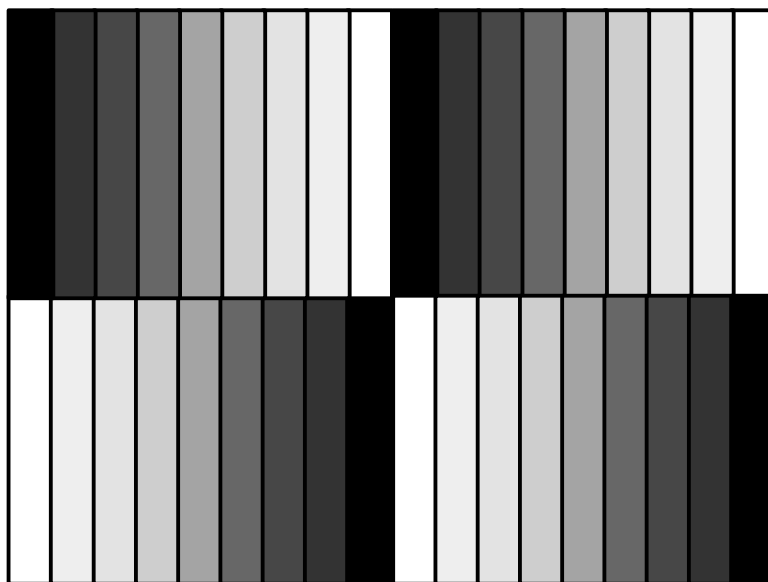


Figure 4-1. The Grey Scale test pattern has four sections of 9 color bars. Use the two darkest bars in the brightest section to set G2.

6. Repeat steps 2, 3 and 4 for the Red G2 level.
7. Cut off R and view B.
8. Repeat Steps 2, 3 and 4 for the Blue G2 level.

NOTE: G-2 adjustments affect Color Balance, Shading, and Proportional Offset. After completing the G-2 setting, verify and readjust these adjustments.

4.9 Focus

Focus adjustments are made individually for G, R and B.

For long projection distances, use an assistant to make focusing adjustments. One person focuses while the other stands in front of the screen to guide.

HINT: If an assistant is not available, use binoculars (not the autofocus type) for close-up focusing. When focusing, it is best to pass through optimal focus, and return, to ensure the sharpest clarity.

4.9.1 CRT Mechanical Focus (RGB)

Prior to performing CRT Mechanical Focus, verify the test pattern is centered and fills the screen. This is to ensure there is something to focus on at the

corners where the CRT Mechanical Focus is concentrated. If the test pattern does not fill the screen or is not centered, perform a preliminary Position and Phase (Sections 4.10.1) or Size (4.10.3) adjustment to accomplish this.

The CRT mechanical focus is factory set and should need minor adjustment at installation only, or when a major component is replaced or repaired. Use the H-Grid test pattern and observe the corners of the screen. If the corners are all in sharp focus, the mechanical CRT focus should not be adjusted. If the image is not sharp enough, proceed with the CRT Mechanical Focus adjustment below.

There are three adjustment rods for each CRT. The rods are accessed through holes in the base and fan casing at the rear of the projector (see Figure 4-2).

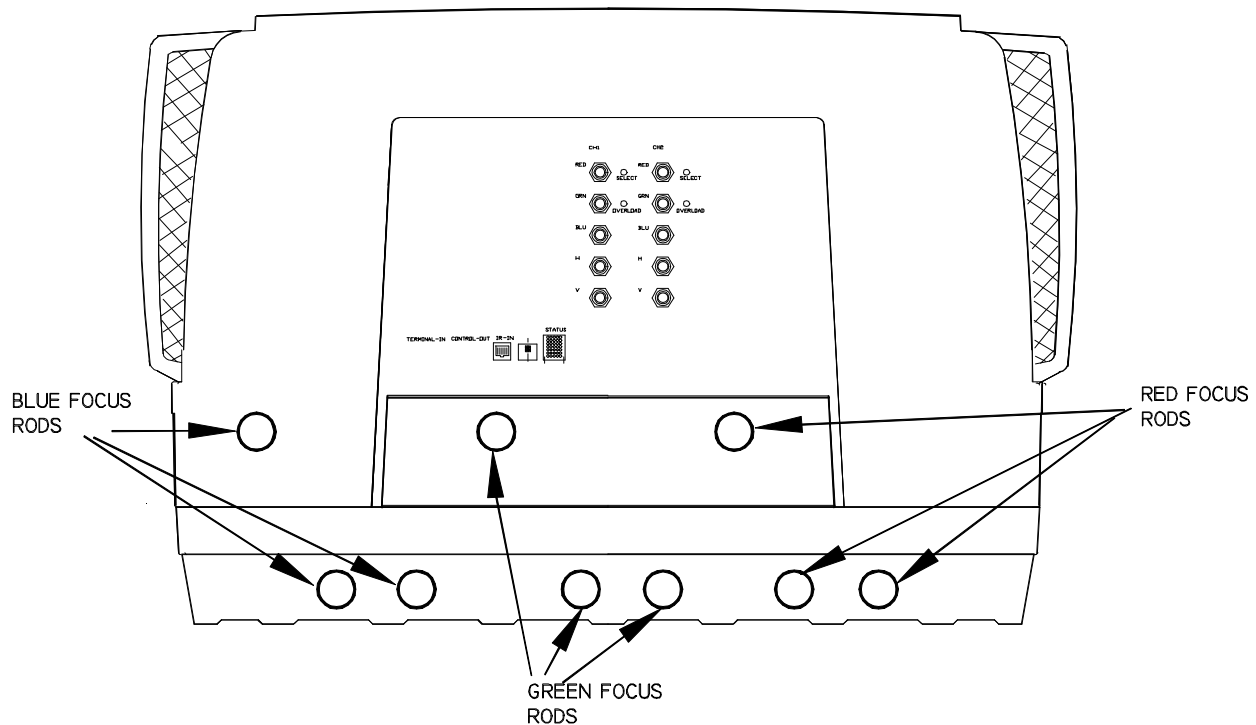


Figure 4-2. CRT Focus Adjustment apertures. Use a 5mm nutdriver to adjust the rods inside the apertures.

The focus rods will be adjusted so that each CRT face is completely parallel to its respective ILA® assembly, (i.e. positioning the CRT screen face planar with the ILA® along the x, y, and z axes).

Each CRT has three focus rods; lower-left, lower-right, and upper-left. The focus rods for **each** CRT work as follows:

- The lower left rod adjusts the CRT to **ILA**® distance (z-axis) for upper right corner and overall focus.
- The lower-right rod adjusts the bottom position of the CRT
- The upper-left rod adjusts left-side position of the CRT.

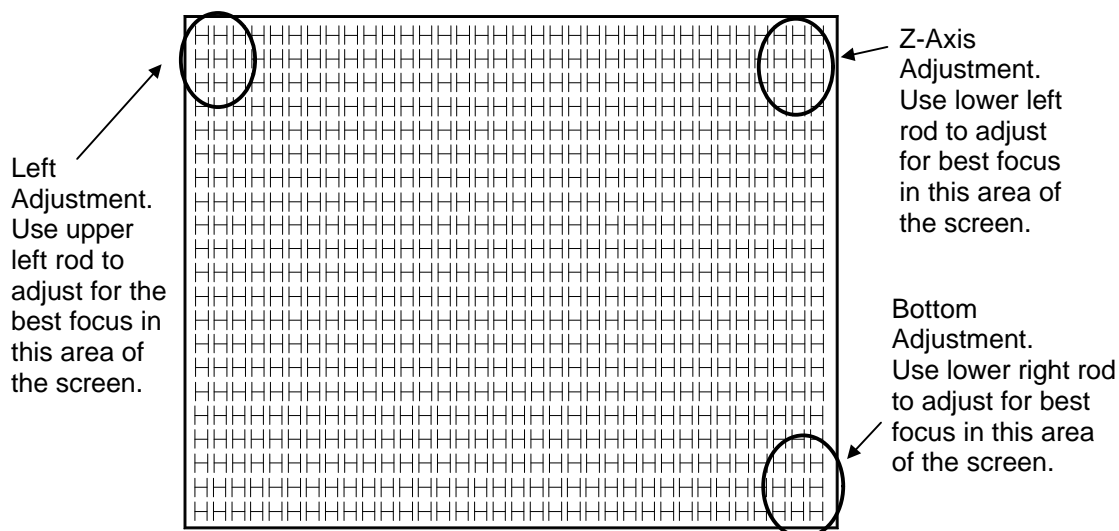


Figure 4-3. Adjust the focus rods (*Figure 4-2*) for best focus at these points on the screen.

Use the H-Grid Test Pattern and adjust the focus rods for the best mechanical focus as follows:

1. Cutoff R and B and view G. Verify that G is highlighted on the screen.
2. Remove the hole caps to gain access to the focus rods. For the Green CRT, use a 5 mm nut driver to adjust the lower-left rod of the Green focus rods (*see Figure 4-2*). Assistant should watch the upper-right corner of the screen for the sharpest focus. This focus rod is the CRT Z-axis position and affects the overall focus. Observe the upper right corner since it is the pivot point for the other two focus rods.
3. Adjust the lower right focus rod of the Green focus rods and look for the sharpest focus at the bottom right.
4. Adjust the upper left focus rod of the G CRT focus rods for the sharpest focus at the upper left of the screen.
5. Cut off G, and view R.
6. Repeat Steps 2-4 for R.
7. Cutoff R, and view B.
8. Repeat Steps 2-4 for Blue.

4.9.2 Electronic Focus(RGB)

The focus adjustment is factory set and should need minor readjustment at installation only. When a major component is replaced, or if the high voltage power supply is repaired, the electronic focus will need readjusting. To adjust, select test pattern 8, H-GRID, and observe the screen for a sharp focus at the center of the screen. If the center appears sharply focused, there is no need to perform the electronic focus. If the electronic focus needs readjustment, follow the procedure below:

NOTE: The electronic focus adjustment focuses the electron beam in the CRT. View one color at a time when making these adjustments. Recheck each color because some interaction between R, G and B may occur. The electronic focus adjustment panel is located through access holes at the left-rear side of the projector.

To adjust the electronic focus:

1. Select the H-Grid Test Pattern.
2. Cutoff R and B.
3. Using a small plastic screwdriver, adjust the electronic focus for Green and observe the center of the screen. An assistant should watch the center of the screen up close while adjusting.

NOTE: Use care when adjusting the Electronic Focus. G2 is in the same area and could be mistaken for Electronic Focus.

4. Cutoff G, and view R.
5. Repeat Step 3 for R electronic focus.
6. Cutoff R, and view B.
7. Repeat Step 3 for B electronic focus.

4.10 Geometric and Image Adjustments

Geometric and image adjustments are performed for each new source. The data for these adjustments may be copied to another channel to use as a starting point for setting up a new channel, or to use as backup (*see Copy Channel*). Some touch-up will be necessary on the "copied to" channel if used as a starting point for different video and/or sync formats. When changing video sources, verify that all the geometric and image settings are correct (perform any necessary touch-up). See *Copy Channel* for instructions on copying the geometric and image adjustment data to other channels.

In the Geometric adjustments below, Green is active. All adjustments are made with G highlighted on the screen since R and B track on Green. Press CUTOFF R, CUTOFF B, and then press G to make G active. Verify G is active and R and B are cut off. This arrangement remains until the R and B POSITION adjustments are performed. Before each Geometric/Image procedure, **always verify G is active and R and B are cut off**. Unless otherwise noted, all adjustments make reference to keys on the IR remote control.

Bear in mind that Green can be restricted by Red or Blue, in some adjustments, where R and B are independently adjustable (Table 4-1). If unable to adjust Green beyond a certain point, check the values of R and B. If R or B is set too high and reaches maximum before G does, G will be restricted from further adjustment beyond that point. If this happens adjust the R or B level up or down so that G has room to progress in the desired direction.

4.10.1 POSITION & PHASE (Use external video)

PHASE adjustment positions the image within the raster. POSITION moves the position of the raster on the CRT without wrapping around. If PHASE is misadjusted, the edges of the image may "wrap around" on the sides.

Adjust the PHASE and POSITION as follows (refer to Figure 4-4):

1. Use an external video image.

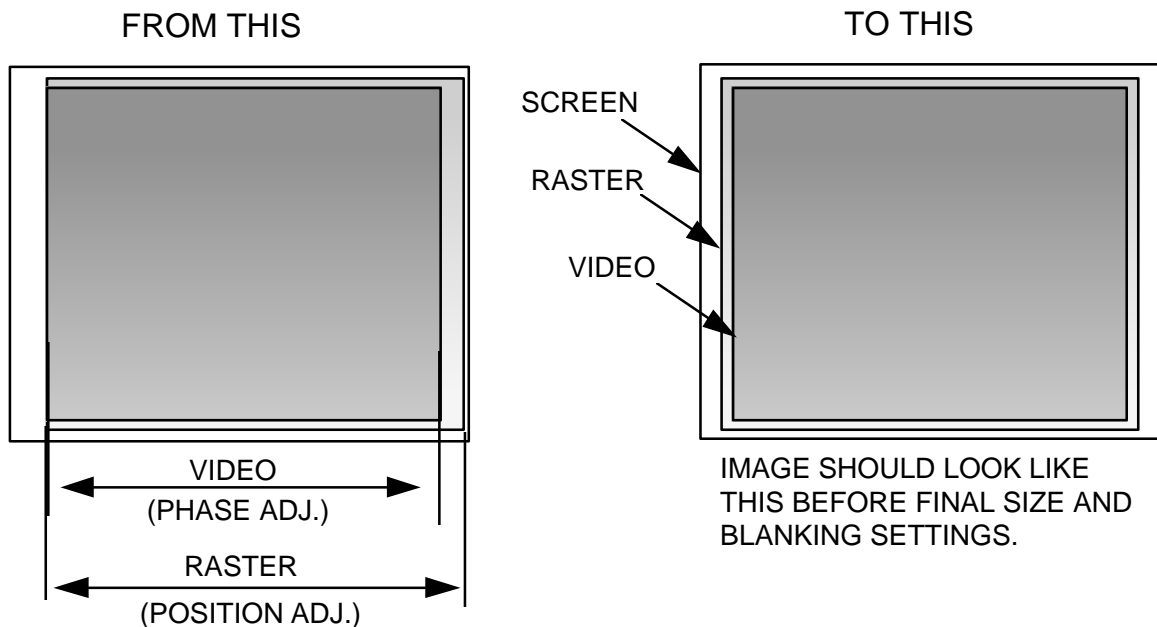


Figure 4-4. **POSITION and PHASE adjustment.**

2. Increase the BRIGHTNESS level to 100% (to allow viewing of the entire raster and video).
3. Select SIZE and adjust to underscan the video so that the *entire* raster is visible on both sides.
4. Select POS and adjust the vertical and horizontal position of the raster so that it is centered on the screen.
5. Select PHASE and adjust the horizontal position of the video so that it is centered on the raster. Adjust vertical phase to center the raster – overadjusting causes retrace lines in the video image.
6. Reduce BRIGHTNESS to 50%.

NOTE: Horizontal PHASE affects MENU POSITION and PINCUSHION POSITION. When PHASE is adjusted, MENU POSITION and PINCUSHION POSITION must be adjusted (see below).

4.10.2 MENU POSITION

The MENU POSITION adjustment centers the screen menus *and* the convergence and shading correction “window” on the screen.

To center the position of the menus and convergence/shading window on the screen (*refer to Figure 4-5*):

1. Select the Grey Scale test pattern.
2. Display the MAIN MENU.
3. Select the TIMING SETUP MENU.
4. Select MENU POSITION. At the screen warning, press ENTER to continue.
5. Use arrow keys to horizontally center the Grey Scale Test Pattern.
NOTE: When using HDTV, recheck the MENU POSITION adjustment by viewing the X-Hatch test pattern. If a wide line is visible on the right or left side of the screen, use the arrow keys to horizontally center the test pattern on the screen.

NOTE: PHASE affects MENU POSITION. Whenever PHASE is adjusted MENU POSITION must be readjusted.

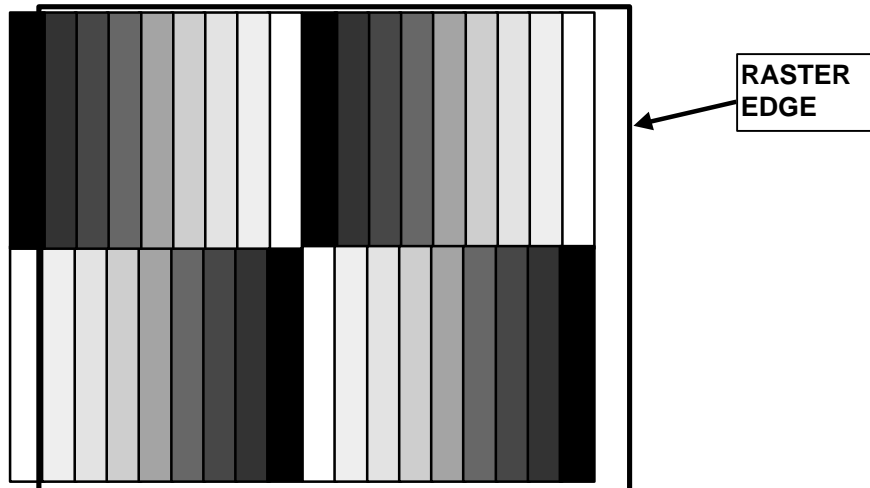


Figure 4-5. Menu Position adjustment. Use arrow keys to center Grey Scale on the screen.

4.10.3 SIZE

The image size adjustment fits the size of the projected image to the screen size (within the limits of the CRT and ILA[®] size).

To adjust image size:

1. Use an external video image.
2. Press SIZE.
3. Use the arrow keys to size the projected image to the screen horizontally and vertically.
4. If necessary, readjust PHASE as shown previously to maintain the picture in the center of the screen.

NOTE: Adjust the picture to be slightly smaller than the screen size. This makes other geometric adjustments easier. After performing other geometric adjustments, retouch the size adjustment.

4.10.4 BLANKING

BLANKING is used to mask out unwanted anomalies on the picture edges. An unblanked image allows the entire image raster to be displayed on the screen. Each image edge can be blanked from 0% to 100%. The left and top edges are unblanked at 0% with maximum blanking at 100%. The right and bottom edges are unblanked at 100% with maximum blanking at 0%. Unblanked sides may cause the raster edges to wrap around into the image causing extra brightness in the image edges.

NOTE: If necessary, the bottom edge can be unblanked to 140% for applications that need to view that level. However, this additional area may be out of range for shading or convergence.

To adjust BLANKING:

1. Continue with an external video image.
2. Press BLNK (BLANKING) and use the arrow keys to move the masking toward or away from the image edges one side at a time. The active edge (top, bottom, left, right) changes with each press of the BLNK key.

4.10.5 KEYSTONE Adjustment

The KEYSTONE adjustment corrects lines closest to the screen edge to make them parallel to the center line of the test pattern or square to the screen edge as shown in Figure 4-6.

To correct for keystone distortion (*see Figure 4-7*):

1. Select the White X-Hatch test pattern.
2. Press KEY (Keystone) on the remote. Use the LEFT/RIGHT arrow keys to correct horizontal keystone. Use the UP/DOWN arrow keys to correct for vertical keystone. If vertical keystone correction is needed, be sure to check PINCUSHION POSITION.

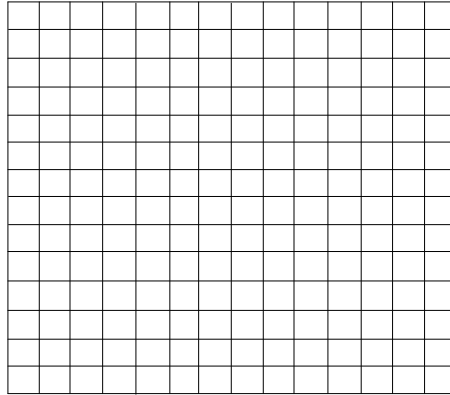
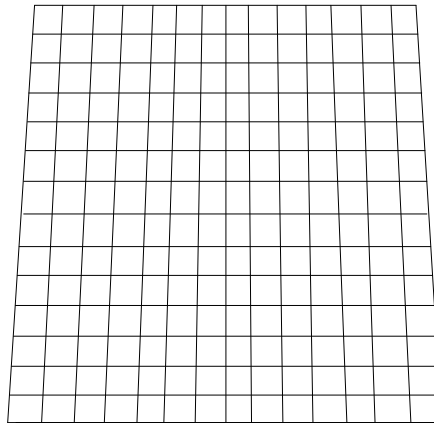
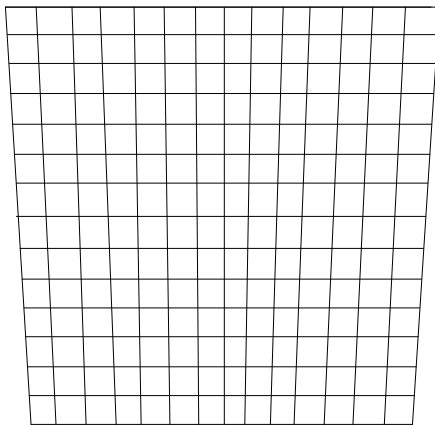
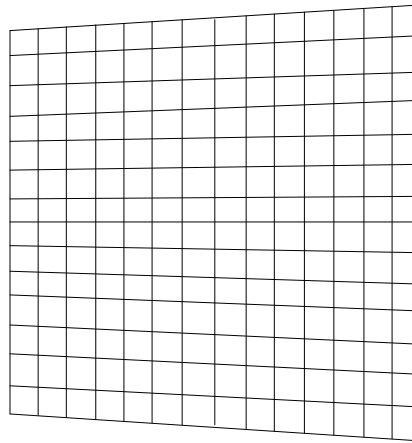
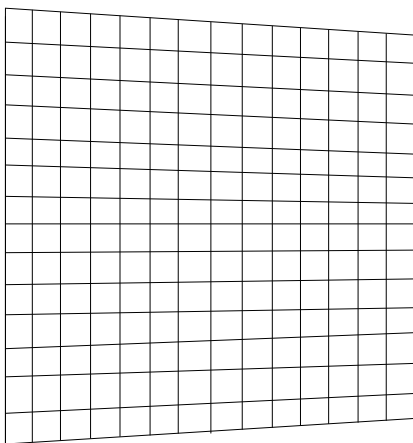


Figure 4-6. Undistorted White X-Hatch test pattern.



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



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

Figure 4-7. Horizontal and Vertical Keystoning.

4.10.6 PINCUSHION

The Pincushion adjustment corrects for warped distortion at the sides or top and bottom of the image (*Figure 4-8*).

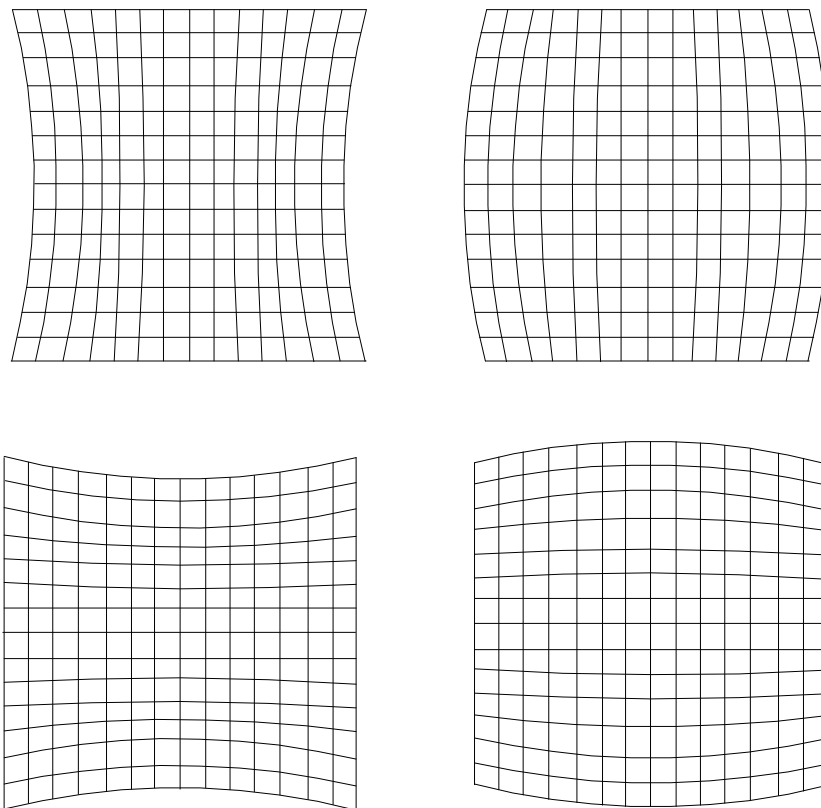


Figure 4-8. Four views of Pincushion Distortion. Use left/right keys for distortion shown at top and up/down keys for distortion shown at bottom.

To correct for pincushion distortion:

1. Select the White X-Hatch test pattern.
2. Press PIN on the remote.
3. Use the left/right arrow keys to correct for warped horizontal pincushion. Use the up/down arrow keys to correct for warped vertical pincushion. Recheck and readjust PINCUSHION POSITION if necessary.

4.10.7 PINCUSHION POSITION (Menu Selection)

The PINCUSHION POSITION adjustment horizontally positions several of the correction functions. These are Top/Bottom PINcushion, T/B KEYstone, Horizontal LINearity, and EDGE Linearity. PINCUSHION POSN is used to center these corrections to the image.

To set PINCUSHION POSITION:

1. Select the White X-Hatch test pattern.
1. Display the MAIN MENU.
2. Select the TIMING SETUP MENU from the MAIN MENU.
3. Select PINCUSHION POSN.
4. Use Left/Right arrow keys to horizontally center the pincushion error at the top and bottom of the image.

HINT: As PINCUSHION POSN is moved toward one edge of the screen, notice that the edge begins to stretch and bend. Move the PINCUSHION POSN in the opposite direction until the same bending and stretching begins to take place at the other side of the screen. To minimize pincushion distortion, set the PINCUSHION POSN midway between the two points where each side begins to stretch. Use the screen data numbers as an aide.

NOTE: PHASE affects PINCUSHION POSN. Whenever PHASE is adjusted, readjust PINCUSHION POSN.

4.10.8 LINEARITY (Horizontal)

The Linearity adjustment corrects for improper horizontal grid spacing on an image. With distorted linearity, lines in the grid are spaced closer together on one side of the image and farther apart on the other (*Figure 4-9*).

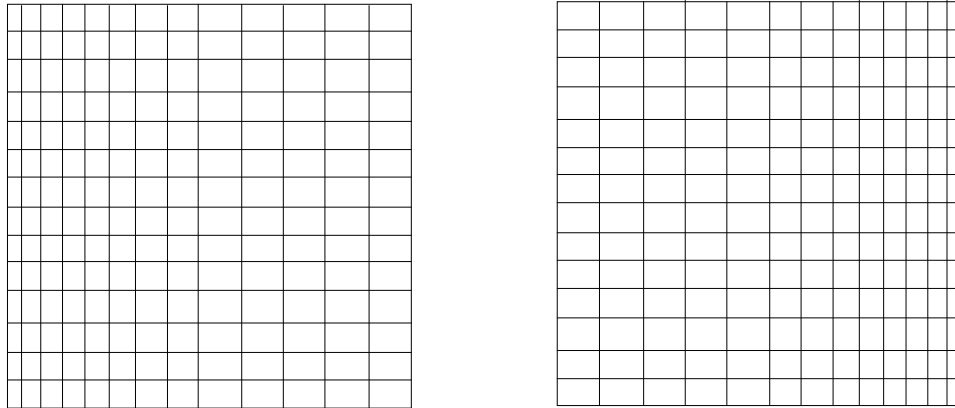


Figure 4-9. Horizontal Linearity Distortion (use left/right keys).

To correct for horizontal linearity distortion:

1. Select the White X-Hatch test pattern.
2. Press LIN (Linearity) and use the left/right arrow keys to correct for horizontal linearity distortion. Make the grids the same width on the left and right of the screen.
3. For further linearity correction, use the EDGE LINEARITY adjustment below.

NOTE: Vertical KEYSTONE, vertical PINCUSHION, PINCUSHION POSITION, LINEARITY and EDGE LINEARITY are all interactive. Some back and forth repeat adjustments may be necessary to get the best image geometry.

4.10.9 EDGE LINEARITY

The EDGE LINEARITY adjustment corrects for improper grid spacing at the left and right edges of the image (see Figure 4-10).

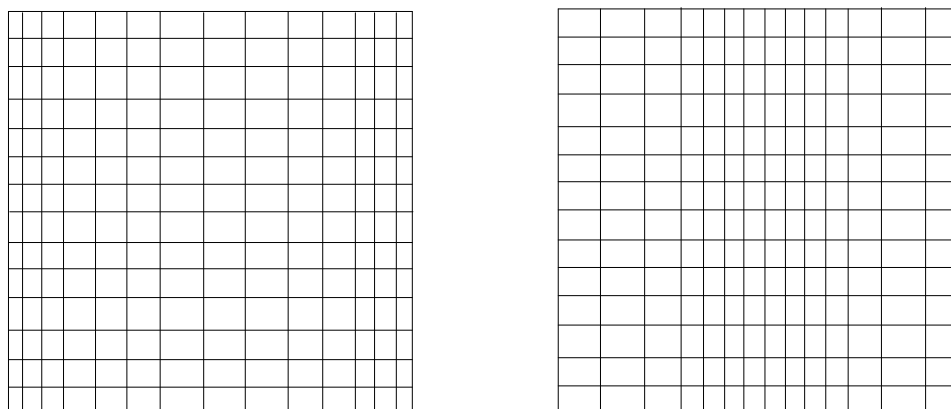


Figure 4-10. Horizontal Edge Linearity distortion (use left/right keys).

1. Select the White X-Hatch test pattern.
2. Press EDGE (EDGE Linearity) and use left/right arrow keys to correct for edge linearity distortion. Make edge grids the same width as the center grids.

NOTE: If the level is set below 25%, a dark edge may appear on the left edge of the video.

4.10.10 Red and Blue POSITION

The Geometry and Image adjustments (made above) were based on Green because Red and Blue track on Green. The Red and Blue position will now be adjusted to match Green.

To position Red:

1. Select the White X-Hatch test pattern.

2. Cut off B and view R and G.
3. Press POS.
4. Press R to select Red. Use arrow keys to position the Red grid to match the Green grid as closely as possible.

NOTE: When positioning R or B over G, split the difference in the left/right and top/bottom errors instead of trying to match the lines in the center. Trying for the smallest possible error over the entire screen and splitting the errors from top to bottom and right to left will make convergence easier. Matching the center may cause larger errors at the edges that will make convergence very difficult.

To position Blue:

1. Continue with the White X-Hatch test pattern.
2. Cut off R and view B and G.
3. Press POS.
4. Press B to select Blue and use the arrow keys to position the Blue grid to match the Green grid as closely as possible.

4.11 Convergence/Shading Cursors and Keys

Performing XY Registration convergence or Sensitivity/Threshold shading uses the same cursors and Technician remote keys. A brief description is provided in this section to familiarize the operator with the functions of these cursors and keys prior to performing any actual adjustments.

When performing Convergence or Shading, bear in mind that the greatest corrections are achieved at the center area of the cursor. Avoid making corrections at the edges of the cursor. Always move the center of the cursor over the area that needs converging.

Convergence and Shading adjustments are made using a cursor on R, G and B individually. Before beginning the Convergence or Shading procedures, verify the proper color is selected. The cursor color is the color being converged or shaded (i.e., if only G is on screen, and G is selected, the cursor is green—if only G is on screen and R is selected, the cursor will be black).

4.11.1 Cursors

The cursor size is selected from the largest to the smallest. Five cursor sizes are available for Convergence and Shading:

- Full screen
- 1/4 screen (Default size)
- 1/16 screen
- 1/64 screen
- 1/256 screen

The cursor is always rectangular and is moved around the screen to accomplish Convergence or Shading. All cursor sizes are capable of overlapping the edges of the screen on the left, right, top or bottom.

This allows the center of the cursor to be placed along any of the four edges. Figures 4-11 and 4-12 illustrate some of the possible screen coverages for a 1/4-screen cursor.

NOTE: If the Menu "times out" (about 30 seconds elapses with no keys pressed) while adjusting, reselect the XY REGISTRN MENU or SHADE AXIS MENU as shown in the procedures below. Also, reverify the active color is still active and not cut off.

To enter the Convergence or Shading mode:

1. Access either the White X-Hatch or RGB X-Hatch test pattern for XY Convergence or the 80% Sensitivity or 20% Threshold selection from the VIDEO QUICKSET menu for shading.
2. Press the "POS/CONV" (Position/Convergence) key. A cursor appears on the screen and the on-screen text indicates which convergence mode is currently active.
3. Use the HIDE/MODE key and toggle to the XY, SENS, OR THRESH mode depending on what is to be adjusted.

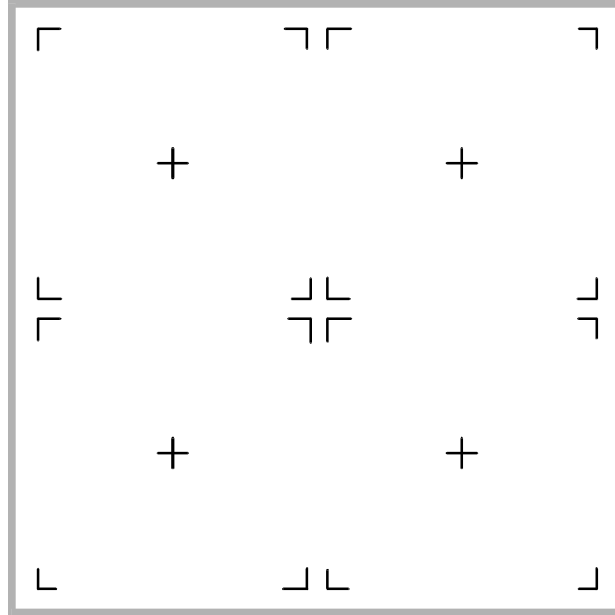


Figure 4-11. The 1/4 screen cursor shown in four on-screen positions.

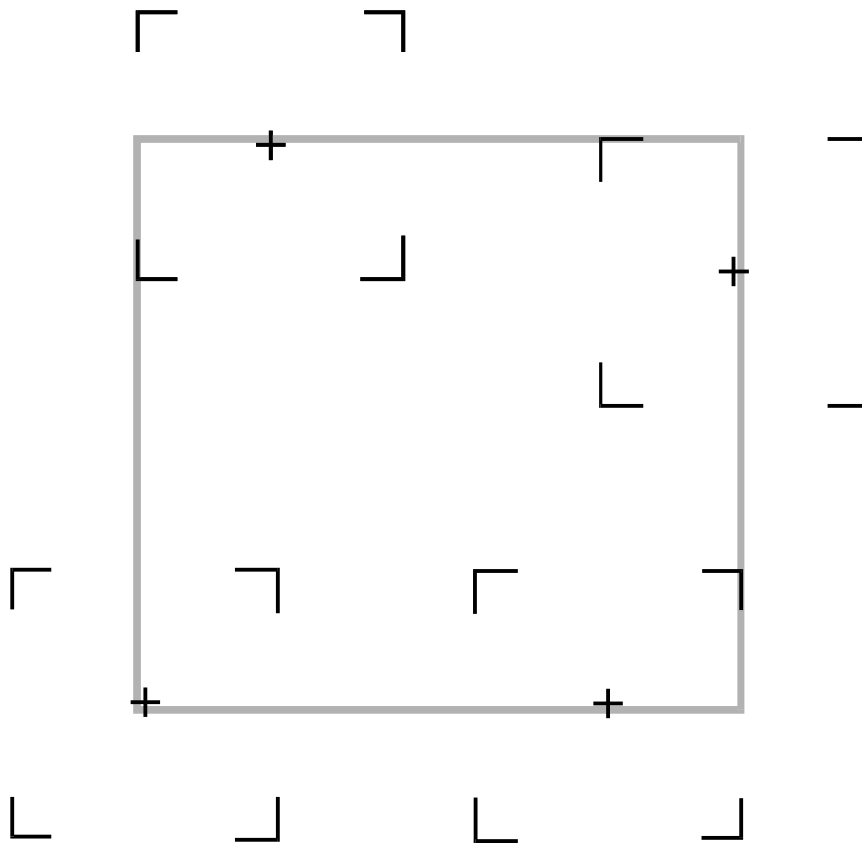


Figure 4-12. The 1/4 screen cursor shown in four off-screen positions above, below, and over the side of the visible screen. There are 25 possible placements for the 1/4 cursor.

4.11.2 Keys

The following provides a brief explanation of the keys used for Convergence and Shading.

POS/CONV

Enters Convergence mode (for XY or Sens/Thresh) when pressed. Then serves as dual-purpose key by toggling between 1) cursor position and 2) data adjust. When in cursor position mode, on-screen text displays "POSTN" and the cursor has a center crosshair. The crosshair disappears when pressing POS/CONV again to enter the data adjust mode (see *Figure 4-13*).

1. In POSTN mode, use the arrow keys to position the cursor on the screen.
2. For XY Convergence Data mode use any of the arrow keys for XY-axis convergence. For Sens/Thresh data mode use the up/down arrow keys to increase or decrease the level of shading.

CURS SIZE

The CURS SIZE key allows the operator to select the size of the convergence cursor with the up/down arrow keys.

Always start with a larger cursor, make adjustments wherever **necessary**, then select a smaller cursor, if needed.

To decrease the size of the cursor:

1. Press CURS SIZE on the remote.
2. Press the Down arrow key to decrease the cursor size.

To increase the size of the cursor:

1. Press CURS SIZE on the remote.
2. Press the UP arrow to increase the cursor size.

CAUTION! If a larger cursor is selected, convergence data from any smaller cursor settings on the active color being converged is lost *if* the larger cursor area overlaps the smaller cursor area and adjustments are made. An on-screen message warns of this if a larger cursor is selected. If a larger cursor is selected by accident, the screen warning will ask the operator to press ESC to avoid losing the smaller cursor data.

3. When the Data Loss Warning appears on the screen, press ENTER to continue if losing smaller cursor data is unimportant. **DO NOT** increase cursor size if adjustments have been made with the smaller cursor under the larger cursor and that data is important to keep!

HIDE/MODE

When in the Convergence mode, this dual-purpose key toggles through the three modes to adjust; X,Y Registration, Threshold, or Sensitivity. This key functions as a video hide (mute) control when not in the Convergence mode.

MENU

Pressing the MENU key at any time while in the XY Registration mode displays the XY REGISTRN MENU below:

XY REGISTRN MENU

1. OFFSET THIS AXIS
 2. CLEAR THIS AXIS
 3. CLEAR CONV AXES
 4. CLEAR ALL AXES
 5. SEE X AXIS VALUES
 6. SEE Y AXIS VALUES
1. OFFSET THIS AXIS---Adjusts all points on the screen equally by setting in an X or Y offset for the selected color. Used when Position can't adjust far enough to correct. Can also be used as a fine adjustment for POS.
 2. CLEAR THIS AXIS---Clears all data from the XY axis for the active color.
 3. CLEAR CONV AXES---Clears all XY axes data from the active channel for all colors.
 4. CLEAR ALL AXES---Clears ALL data for all colors from the active channel (XY, Sensitivity, and Threshold) except Proportion values. Be careful to use this function only when it is necessary to clear ALL data (XY and Shading) from the active channel.
 5. SEE X AXIS VALUES---Enables the operator to see the X axis values in each cell when the projector is connected to a VT-100 terminal using a program such as Procomm® with 40 or more lines of display.
 6. SEE Y AXIS VALUES---Same as #5 for Y axis values.

Press MENU at any time while in the SENS or THRESH mode to display the SHADE AXIS MENU below:

SHADE AXES MENU

1. OFFSET THIS AXIS
 2. CLEAR THIS AXIS
 3. CLEAR SHADE AXES
 4. PROPTN THIS AXIS
 5. INIT THIS AXIS
 6. INIT ALL AXES
 7. SEE AXIS VALUES
 8. FILTER AXIS
1. OFFSET THIS AXIS---Adjusts all points on the screen equally for the Sensitivity or the Threshold axis, for the color selected, by an offset amount set by the operator.

2. CLEAR THIS AXIS---Clears Sensitivity to the default level of 128 or Threshold to the default level of 80 for the active color in the active channel.
3. CLEAR SHADE AXES---Clears all shading data (Sensitivity and Threshold) to the default levels from the active channel.
4. PROPTN THIS AXIS---Allows operator to offset all cells in one axis by a percentage of their individual values, i.e. cells at higher values are offset more than cells at lower values.
5. INIT THIS PROPTN---Resets the current mode (Sens or Thresh) for the current color to the default level of 230. Can be used when the operator wants to reset *only* Sens or Thresh for *one* color.
6. INIT ALL PROPTNS---Resets Sensitivity and Threshold for all colors to the default level of 230. This must be done when starting up with a new System Controller Board or when updating software.
7. SEE AXIS VALUES---Enables the operator to see the Sensitivity or Threshold axis values in each cell when projector is connected to a VT-100 terminal using a program such as Procomm® with 40 or more lines of display.
8. FILTER AXIS---Eliminates "Blotchiness" in a shaded image by averaging shading values over the screen to smooth out bright and dark areas. Primarily for factory use when using the smallest cursor (1/256).

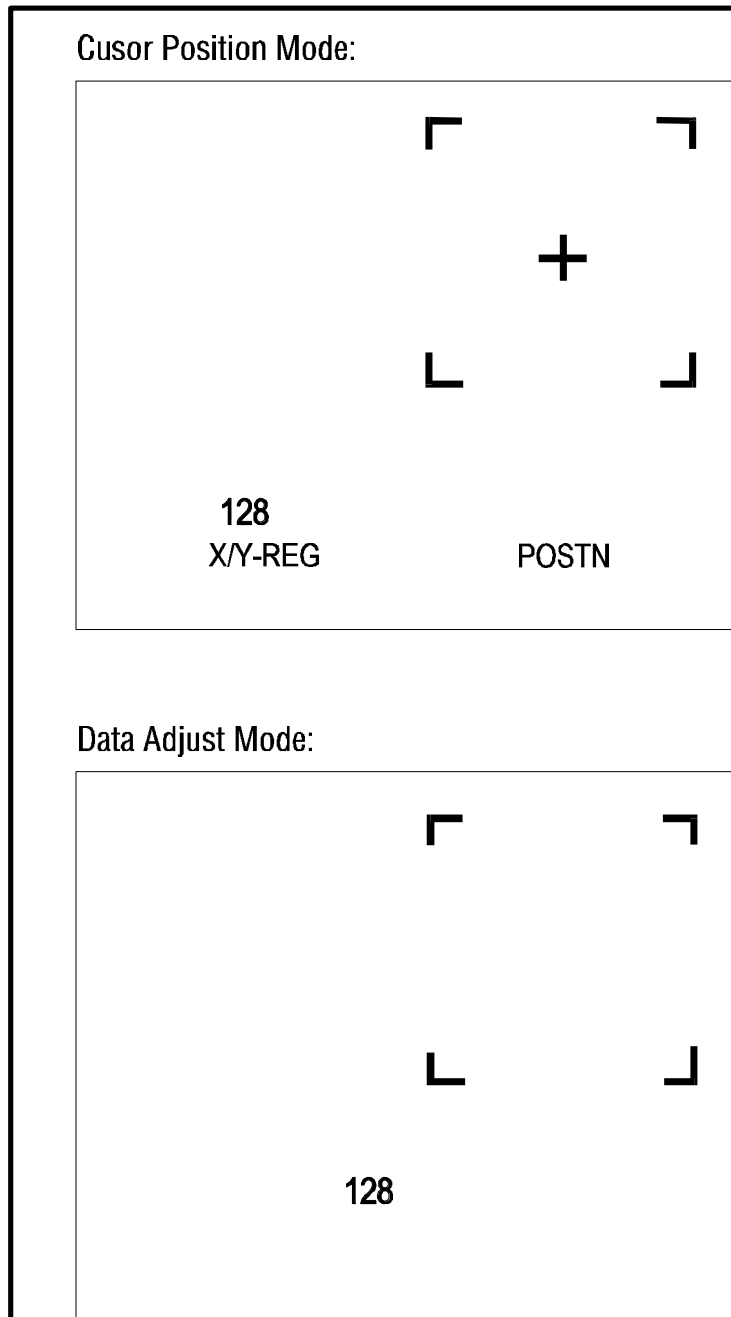


Figure 4-13. On-screen text and crosshair indicates the projector is in Cursor Position mode (top). The Data Adjust mode, at bottom, shows only the cursor outline and the data value. If the Off-Screen mode is selected the data value is not shown.

4.12 XY-Axis Registration Adjustment

The XY Axis adjustments are made to converge or overlay the red, green and blue CRT images over the entire image area. The adjustment procedure consists of individually converging blue and red over green.

Prior to adjusting XY Convergence, it may be useful to clear all data from the active channel as shown below. **CAUTION!** This procedure clears *all* XY Registration and Shading data and should be selected only when setting up a new channel *if* none of the existing or factory-preset channels can be used for preliminary setup data. If starting from a factory-preset channel or a copied channel, **do not** perform the CLEAR ALL AXES procedure below as this will clear all the factory-preset or copied channel data. Data from either a factory-set channel or a copied channel may need only minor XY and Shading corrections and should not be cleared.

To clear all axes:

1. Select a channel from the CHANNEL LIST.
2. Press POS/CONV to enter the Convergence mode.
3. Press HIDE/MODE and toggle to XY.
4. Press MENU to display the XY REGISTRN MENU.
5. Select CLEAR ALL AXES.
6. Press ENTER.

To adjust XY Registration:

1. Select the WHITE X-HATCH test pattern. (RGB X-HATCH can also be used, if preferred).
2. View G and cutoff R and B.
3. Verify that Green is geometrically correct on the screen. If the G image is not satisfactory, make corrections now because G is the reference to which Red and Blue will be matched. If necessary, repeat any of the Geometry/Image corrections from earlier in this section.
4. View G and R.
5. Press POS/CONV to enter the convergence mode.
6. Press HIDE/MODE to toggle to the XY-REG mode.
7. Press POS/CONV again to toggle to XY-REG POSTN.

NOTE: If there are large areas to adjust use the full-size or $\frac{1}{4}$ screen cursor. Avoid going to a larger cursor after making adjustments with a smaller cursor (data will be lost if the larger cursor overlaps the adjusted area).

8. Press CURS SIZE and select the largest or ¼ screen cursor size. The crosshair (+) will be at the center of the cursor. If using the largest cursor, the corners of the cursor will be off screen and not visible.
9. If the screen displays data loss warning, press ENTER to disregard.
10. Press the R key on the remote to select convergence control of red (if R is cut off, press CUTOFF and press R again). The cursor will turn red to show that Red is the active color. Verify that Red is selected by observing that R is highlighted on the screen.
11. Use the arrow keys to position the cursor to be centered over the area to converge.

NOTE: XY axis adjustments are made within the cursor area only and have their greatest effect at the center of the cursor.

12. Press POS/CONV key to toggle to the data adjust mode.
13. Use the arrow keys to move the convergence of Red within the cursor area so that it perfectly overlaps Green at the center of the cursor. Concentrate on the cursor center where the greatest effect is, not the edges (see *Figure 4-14*). If the convergence is way off, a number value may be entered to save time (see *Section 4.9, Reference Information*). If convergence was started at a corner or an edge and the same amount of correction performed applies to an area directly above or below, the "EXTEND" mode may apply (see *USING THE EXTEND MODE below*).

USING THE "EXTEND" MODE: The EXTEND mode allows the operator to "extend" the same correction to other areas on the screen in a direct line horizontally or vertically from the original correction. For example, assume that R is out of convergence with G *by the same amount* all along the right edge of the screen.

To use the EXTEND mode:

- Using the ¼ screen cursor, the operator starts at the upper left corner and converges R over G properly. This same amount of correction applies to the entire left side of the screen.
- Press Enter once to complete the convergence for that corner.
- Press Enter again to go into the EXTEND mode.
- Press the down arrow key now to automatically "extend" the same amount of correction to the next cursor position below.
- Press the down arrow key repeatedly to automatically correct the the left side of the screen as far as needed.
- When finished, press any number key or change direction to leave the EXTEND mode and return to the POSTN mode.

14. After converging one area of the screen, press POS/CONV and use arrow keys to move to the next position to converge. Press POS/CONV again to converge.

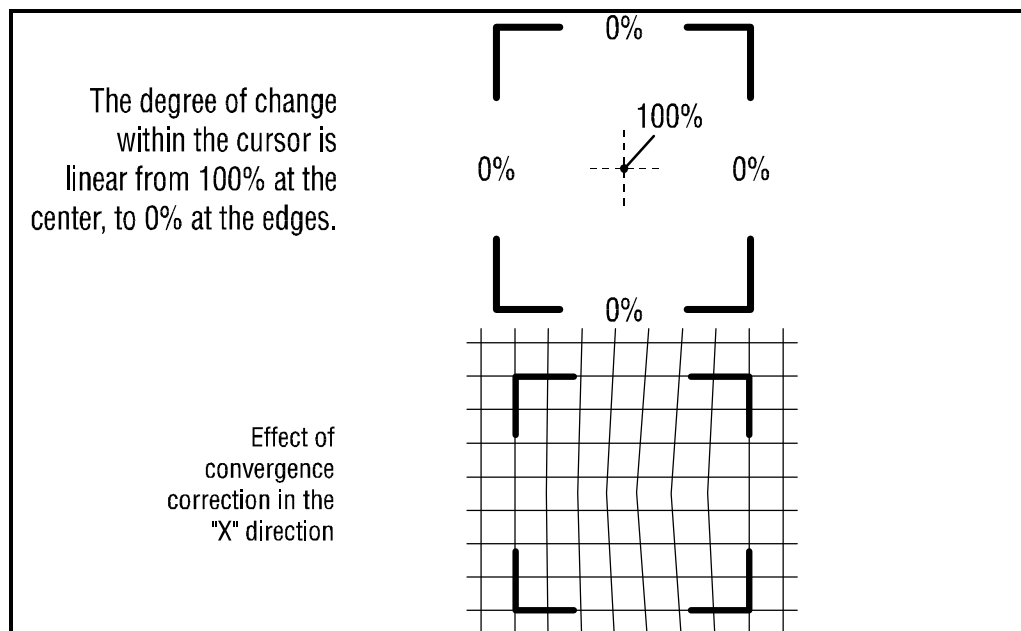


Figure 4-14. The degree of change within the cursor area is greatest in the center, zero on the edges and linear in between.

15. Continue moving the cursor around the screen and adjusting convergence in the above manner. Converge the entire image with each cursor size before moving to a smaller cursor.
16. When ready, change to the next smaller cursor size. Press CURS SIZE and press the down arrow once. Perform the convergence adjustment procedure on the entire screen for this new cursor size and repeat for a smaller cursor size again, if necessary, for fine tuning small areas.
17. Repeat Steps 9-17 for converging blue to green.

4.13 Shading

Shading adjustments correct for uneven color and brightness to obtain a uniform brightness level across the screen. The unevenness is caused by a non-uniform response across the face of the ILA[®] assembly. Shading problems are corrected by applying slight video corrections over the full screen one color at a time. First, the Sensitivity and Threshold axes are cleared of any Shading data. Next, the Color Balance procedure is performed using the Sensitivity and Threshold Offsets to obtain the best Grey Scale. Then, Sensitivity uniformity and Threshold uniformity are adjusted over the entire screen area with the Flat Field test pattern to correct for any inconsistencies and brightness differences in the CRTs and ILAs[®]. Finally, if any color is still too prominent or deficient, the

Proportional Offset adjustment is performed to get the best looking Grey Scale test pattern.

NOTE: SENSITIVITY (White Level) shading is adjusted to get a flat, even brightness at high (white) video levels. THRESHOLD (Black Level) shading is adjusted to get a flat, even brightness at low (black) video levels. SENSITIVITY shading is performed using the ADJUST FLAT FIELD test pattern with a Flat Field setting of 80%. THRESHOLD shading uses a 20% Flat Field setting with the ADJUST FLAT FIELD test pattern.

4.13.1 Clearing SENSITIVITY and THRESHOLD Data

NOTE: This procedure may not be necessary on Factory-set channels or Copied channels. These channels may only need minor shading corrections. In these cases, skip ahead to the Green Shading or the Red and Blue Shading procedures. It can be useful to clear Sensitivity or Threshold data when adjustments have been improperly performed and to start Sensitivity or Threshold from the default levels.

Before starting the shading process it may be necessary to clear SENSITIVITY and THRESHOLD shading data from memory. Shading data was already cleared if the "CLEAR ALL AXES" function was used when performing the XY Registration procedure previously. The "CLEAR ALL AXES" function in the XY Registration section clears XY REGISTRATION, SENSITIVITY and THRESHOLD data for *all* colors in the active channel. SENSITIVITY and THRESHOLD shading data can be cleared separately without affecting any XY Registration data (this may be useful if the projector has already been converged and shaded but shading is in need of some readjustment).

To clear shading data, without affecting XY Convergence, for the active channel:

1. Cut off R and B and view G.
2. Press POS/CONV.
3. Press HIDE/MODE and toggle to the SENSITIVITY mode.
4. Press MENU to display the SHADE AXIS MENU.
5. Select CLEAR SHADE AXES.
6. Verify the SENSITIVITY data on the screen defaults to 128. Toggle to THRESHOLD and verify it defaults to 80.

4.13.2 Color Balancing (Sensitivity and Threshold Offset)

Color Balancing is performed to obtain the best balance between R, G, and B prior to shading. The preferred method of accomplishing this is to use the Grey Scale test pattern as shown below.

NOTE on Sensitivity and Threshold Offsets: After the Offset adjustments have been performed and shading has been started, it will not be possible to perform offset adjustments again. If an Offset adjustment is attempted after some shading has been performed, the following message appears on the screen

"SHADING IS PRESENT
CANNOT CHANGE OFFSET

USE PROPORTIONAL" .--- This means that shading data has been detected and the Proportional Offset adjustment (*shown below in Section 4.14*) should now be used to proportionately offset each level of the screen by a percentage value instead of a linear amount for the entire screen. Proportional Offset results in a more accurate offset adjustment. To perform the Sensitivity and Threshold Offset adjustments, Sensitivity and Threshold data must be cleared to delete all previous shading values. Then, the Sensitivity and Threshold Offsets can be performed.

Darken the room as much as possible. Sensitivity adjustments cannot be performed in a bright environment. Stand as far from the screen as possible to see the screen without too much eye movement.

1. Select the Grey Scale test pattern.
2. Notice the Grey Scale test pattern contains four sections of grey bars as shown in Figure 4-1.
3. Ensure all three colors are selected, and are on screen.
4. Observe the center area of the screen (the 2 or 3 bars to the left and right of the middle of the Grey Scale). The darkest and brightest bars should have no color that is prominent or deficient. The bars should be white, grey, or black.
5. If any color is too prominent or too deficient in the brightest bars in the center area of the screen, adjust the Sensitivity Offset as follows:
 - A. Select the appropriate color key to adjust.
 - B. Press POS/CONV to enter the Convergence mode.
 - C. Press HIDE/MODE and toggle to Sensitivity.
 - D. Press MENU to display the SHADE AXIS MENU.
 - E. Select OFFSET THIS AXIS
 - F. Use the arrow keys and adjust the selected color up or down, as appropriate, so there is no prominent or deficient color in the brightest bars at the center of the Grey Scale.
 - G. Select another color, if necessary, and repeat the above steps.

- H. Press Escape to exit this adjustment.
- 6. If any color is too prominent or deficient in the darkest bars in the center area of the screen, adjust the Threshold Offset as follows:
 - A. Select the appropriate color to adjust.
 - B. Press POS/CONV to enter the Convergence mode.
 - C. Press HIDE/MODE and toggle to Threshold.
 - D. Press MENU to display the SHADE AXIS MENU.
 - E. Select OFFSET THIS AXIS.
 - F. Use the arrow keys and adjust the selected color up or down, as appropriate, so there is no prominent or deficient color in the darkest bars at the center of the Grey Scale.
 - G. Select another color, if necessary, and repeat the above steps.
 - H. Press Escape to exit this adjustment.

4.13.3 GREEN SHADING

1. Darken the room as much as possible.
2. Cut off R and B and view G.
3. From the MAIN MENU, select VIDEO QUICKSET.
4. From the VIDEO QUICKSET menu, select 80% SENSITIVITY. The ADJUST FLAT FIELD test pattern is automatically selected at the 80% level. The Convergence mode and Sensitivity axis are also selected automatically. The operator goes directly to the arrow keys to adjust shading.



READ THIS BEFORE PROCEEDING

The cursor defaults to the 1/4 screen size if this is the first time adjusting this color in this channel. Shading is normally started at this cursor size. The cursor can be increased to the largest size (full screen) if shading has not been started at the default cursor size.

Use the full-screen size cursor to shade large areas in the corners and along the edges. To use the full screen cursor, press CURS SIZE and use the UP arrow to select the full screen cursor. If the screen displays a warning of possible data loss, press the UP arrow to ignore the warning if the loss of smaller cursor data is not important.

Use the center of the screen as the reference for the rest of the screen areas. Don't overlap this center-screen reference area with the cursor while making adjustments, or the reference brightness level could change.

5. Use the arrow keys to position the cursor to any area of the screen that does not match the reference area.
6. Press POS/CONV to toggle to the data adjust mode.
7. Use the UP/DOWN arrows to bring the darker areas up to match the reference area's brightness. Remember that the area being adjusted is *within* the cursor and the greatest effect is at the center. If shading was started at a corner or an edge, and the same amount of correction performed applies to an area directly above or below, the "EXTEND" mode below may apply (see *NOTE following*).

NOTE ON THE "EXTEND" MODE: The EXTEND mode allows the operator to "extend" the same correction to other areas on the screen in a direct line horizontally or vertically from the original correction. For example, assume that G must be corrected by the same amount all along the left edge of the screen.

To use the EXTEND mode:

- Using the $\frac{1}{4}$ screen cursor, the operator starts at the upper left corner and shades G properly. This same amount of shading correction applies to the entire left side of the screen.
 - Press ENTER once to complete the correction for that corner.
 - Press ENTER again to enter into the EXTEND mode.
 - Press the down arrow key now to automatically "extend" the same amount of correction to the next cursor position below.
 - Press the down arrow key again to automatically correct the next cursor position. Continue pressing the down arrow to correct each cursor position along the left side of the screen as far as needed.
 - When finished, press any number key (or change direction with the arrow key) to leave the EXTEND mode and return to the POSTN mode.
8. Using the default cursor ($\frac{1}{4}$ screen), adjust for the best possible uniformity over the entire screen (don't use a smaller cursor size than $\frac{1}{4}$ screen yet).
 9. Achieve the best possible uniformity with this cursor, then select 20% THRESHOLD from the VIDEO QUICKSET menu. The ADJUST FLAT FIELD test pattern will come on the screen automatically set to 20%.
 10. Press POS/CONV to enter the Convergence mode.
 11. Press HIDE/MODE and toggle to the THRESHOLD mode.
 12. Use arrow keys to position cursor over area to adjust.
 13. Press POS/CONV to toggle to the data adjust mode.

NOTE: Use the same center-screen reference area as the reference area for Threshold shading. Adjust all other areas of the screen to match this reference area.

14. Use the up/down arrows to bring the darker areas up to match the reference area's brightness.
15. Use the default cursor (1/4 screen) to adjust for the best possible uniformity for the entire screen.
16. Recheck SENSITIVITY level at the 80% Flat Field. THRESHOLD adjustments affect SENSITIVITY and vice versa. Several rechecks and touch-ups may be necessary to get the best possible uniformity at both the 20% and 80% Flat Field levels.
17. Perform all functions with the larger cursor before selecting a smaller one. Don't go back to a larger cursor after making adjustments with a smaller cursor. Data from the smaller cursor will be lost if the larger cursor overlaps the same area. Achieve the best possible uniformity with this cursor. Then press CURS SIZE and the DOWN arrow once to select the next smallest cursor size.
18. Repeat the above steps for the next smallest cursor size.
19. It is usually not necessary to go below the 1/16th screen cursor. If there are still areas that need adjustment that can only be reached with a smaller cursor, use the 1/64th cursor to adjust these areas.

4.13.4 RED AND BLUE SHADING

1. Cut off G and B, and View R.
2. Adjust Red SENSITIVITY for the entire screen with the default (1/4 screen) cursor (i.e. repeat GREEN SHADING Steps 2-10 for Red). Use the center of the screen again as the reference area for matching all the other areas of the screen.



READ THIS BEFORE PROCEEDING

Before continuing to the next step, view Red and Green together and make touch-up adjustments to Red, if necessary, to achieve matching uniformity with Green. Perform touch-up adjustments for Red with Red and Green together on the screen, or with Green cut off and Red only on the screen. Either method can be used. Uniformity is matched when a particular hue is viewed consistently across the entire screen. Note that the reference area identified for Red is the hue reference for the entire screen (Red and Green together produce Yellow; Blue and Green together produce Cyan).

3. Adjust Red THRESHOLD for the entire screen with the default cursor (repeat the GREEN SHADING Steps 11-20 for Red).

NOTE: The same center-screen reference area from above is used again as the reference area for Red Threshold shading. Adjust all other areas to match this reference area.

4. Recheck back and forth between SENSITIVITY and THRESHOLD until a good matching uniformity of Red and Green is achieved both at the 80% SENSITIVITY level and at the 20% THRESHOLD level.
5. Cut off R and G, and view B.
6. Repeat the above steps for Blue.

4.14 Proportional Offset

A projected Grey Scale image should now be “Grey” throughout the entire screen area. There should be a normal gradual brightness transition from bar to bar with no perceived coloration.

If there is still some coloration in the Grey Scale test pattern "Proportional Offset" adjustments should now be made to SENSITIVITY and THRESHOLD to obtain a proper Color Balance for the bright and dark areas.

To check for correct SENSITIVITY color balance:

1. Select the Grey Scale test pattern.
2. View R, G, and B.
3. Observe the two or three brightest grey bars in the each of the four sections in the test pattern. If any color is too prominent in these two or three bars, adjust the Sensitivity PROPORTIONAL OFFSET as shown below.

To adjust the PROPORTIONAL OFFSET for best SENSITIVITY color balance:

4. Press POS/CONV.
5. Press HIDE/MODE and toggle to the SENSITIVITY mode.
6. Select the color that is too prominent in the bright bars.
7. Press MENU to display the SHADE AXIS MENU.
8. Select PROPTN THIS AXIS. “SENSIT PROPTN” appears on-screen.
9. Use the UP/DOWN arrow keys to adjust the selected color so that the bright bars of the Grey Scale are without color, i.e. Grey. For example, if the bright areas of the Grey Scale look a little blue, reduce the Blue Proportional Offset until there is no longer a coloration in the bright areas. Do not overadjust the Proportional Offsets for Red, Green or Blue. Be careful not to saturate any of the colors. There should always be a normal, gradual brightness transition between the two brightest bars.

To check for THRESHOLD Color Balance:

1. Select the Grey Scale test pattern.
2. View R, G, and B.

3. Observe the two or three darkest color bars in each of the four sections in the test pattern. If any color is too prominent in these two or three bars, adjust the Threshold PROPORTIONAL OFFSET as shown below.

To adjust the PROPORTIONAL OFFSET for the best THRESHOLD color balance:

4. Press POS/CONV.
5. Press HIDE/MODE and toggle to the THRESHOLD mode.
6. Select the color that is too prominent in the dark bars.
7. Press MENU to display the SHADE AXIS MENU.
8. Select PROPTN THIS AXIS. "THRESHOLD PROPTN" appears on-screen.
9. Use UP/DOWN arrow keys to adjust the selected color so that the dark bars of the Grey Scale are without color, i.e. Grey. If the dark areas of the Grey Scale look a little blue, reduce the Blue Proportional Offset until there is no longer a coloration in the dark areas. Do not overadjust the Proportional Offsets for Red, Green, or Blue, or saturate the colors.
10. Repeat the SENSITIVITY color balance or the THRESHOLD color balance procedures to achieve the best grey scale. Ideally, the bars should have distinct lines between them and the pattern should go from white to grey to black in equal steps.

NOTE: If the THRESHOLD Proportional Offset for one of the colors is at the end of its limit and will not adjust down to a lower level, bring the other two colors up to match. If the transition of the two darkest bars of the Grey Scale is still too great, then G2 may not be set properly and may have to be readjusted. *Refer to Section 4.7 for the procedure on adjusting G-2.* If significant offset adjustments are made, recheck the shading settings.

4.15 Picture Settings (Use External Video)

CONTRAST, BRIGHTNESS, COLOR, TINT and SHARPNESS are controls that affect image quality. BRIGHTNESS and CONTRAST can be adjusted for any video input regardless of whether it is RGB or composite video. COLOR, TINT and SHARPNESS are **only** active with composite or S-Video inputs. Do not adjust these settings until SHADING and PROPORTIONAL OFFSETS are completed.

4.15.1 CONTRAST SETTING

1. Adjust Green CONTRAST for the normal setting of 50%.
2. Select Red, then Blue, and if necessary, use the arrow keys and set the CONTRAST level for both to the same level as Green.

3. View Red, Green and Blue together and compare the Grey Scale test pattern with the external video image. If the Grey Scale has good color balance but external video does not, press CONTRAST and use the arrows to adjust Red or Blue contrast to balance the external video image.

4.15.2 BRIGHTNESS SETTING

1. Select the CONTRAST/BRIGHT REF test pattern.
2. Press BRIGHTNESS.
3. Use the arrow keys to adjust Brightness for good black level while still maintaining detail in dark areas (a normal Brightness setting is 50%). Use the black boxes in the test pattern as a black level reference. If the BRIGHTNESS setting is much different than the 50% level, recheck the GREY SCALE and source video level.

NOTE: Brightness adjusts the black level of the picture. It should not be used to set the light output from the projector.

4.15.3 COLOR, TINT and SHARPNESS

The adjustments for COLOR, TINT and SHARPNESS are only active with Composite or S-Video sources.

To adjust COLOR: Press COLOR on the remote control and use the up/down arrows to set the desired level.

To adjust TINT: Press TINT on the remote control and use the up/down arrows to set the desired level.

To adjust Sharpness: Press SHARP on the remote control and use the up/down arrows to set the desired level.

4.16 Graphic Enhance

When a source contains high resolution graphics (48kHz) and small detail (such as text), the Graphic Enhance feature may be used to increase resolution. This function should be used only when necessary to achieve the detail needed for high resolution graphics. If used with normal video, overshooting can occur between extreme changes in colors such as an abrupt change from white to black. Graphic Enhance can be set to a different level for each channel.

To use Graphic Enhance:

1. Select a high detail graphics source or use a Test Pattern Generator and select the SMPTE Test Pattern.
2. From the Main Menu, select GRAPHIC ENHANCE.
3. Select Black Enhance or White Enhance.
4. On the remote, select G. R and B will move with G. If necessary, R and B can be moved independently of G if further enhancement is desired.

5. Use the arrow keys to increase the level of resolution as needed. Adjust for sharp verticals in text or graphics. The text should become easier to read.
6. Some trial and error may be necessary to determine the best settings for Graphic Enhance.

4.17 Update Defaults

Each channel contains its own set of default settings for the Picture Setting parameters (contrast, brightness, color, tint, and sharpness). Though these settings are saved automatically, just like other settings, their default settings do not change. These default settings can be updated to the currently saved settings by performing "Update Defaults." These updated settings then become the new default settings. Pressing the DFLT key on any remote at any time reverts the saved settings back to their current default levels.

To update the default settings:

1. Select UPDATE DEFAULTS from the Channel Menu.
2. Press ENTER.

4.18 Copy Channel/Copy Parameters

A channel is a set of data values on adjustments that have been completed. The COPY CHANNEL function is used to copy the information in the current channel's data bank to another channel. Copying the data from one channel to a new channel makes it easier to set up the new channel. Copy the previous Geometry, Image, Convergence, Shading and Picture setting adjustments from the initial channel to any of the 30 input channels by using the Copy Channel function. This permits loading of the majority of the required correction data into the other channel. Touch-up adjustments for the "copied-to" channel are then necessary, and depend on the source's scan frequency.

To copy channel information from one channel to another:

1. Verify the projector is in the channel it is copying the data from.
2. Select Channel Menu from the MAIN MENU.
3. Select Copy Channel.
4. Enter the target channel number.
5. Press ENTER to copy the data to the target channel.
6. Verify the copied data in the target channel. Touch-up the settings as required. In particular, check PHASE, SIZE, PINCUSHION, PINCUSHION POSITION and MENU POSITION. If any settings need readjustment, follow the procedures in this chapter and note that some adjustments, like PHASE, affect other settings.

If desired, selected parameters of individual channels can also be copied to other channels instead of copying all of the channel's data. These parameters are listed in the Copy Parameters item from the Channel Menu. Use the above procedure to do this but select Copy Parameters instead of Copy Channel for Step 3 and then select the parameters to copy.

The parameters that may be copied are:

1. XY REGISTRATION---copies XY registration only.
2. SHADE & PROPORNTNS---copies Sensitivity, Threshold, Offset, and Proportion data.
3. PROPORTION VALUES---copies Proportion factors only.
4. SHADE, NO PROPTNS---copies Sensitivity and Threshold data only (includes offsets).
5. BIAS & FREQUENCY---copies ILA® Bias settings and Bias Frequency for all colors.
6. GEOMETRY SETTINGS---copies all geometry settings.