Cinema Source™

CRT Video Projector Calibration Procedure

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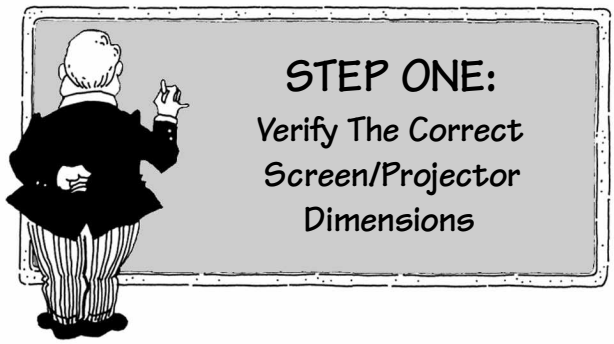
CRT Projector Calibration Procedure

SONY VPH-D50Q

In this section we outline a procedure that CinemaSource has written for aligning the Sony VPH-D50Q CRT projector. The procedure that Sony outlines in their technical documentation uses a method of converging that relies on “merging” the colors during the convergence procedure. We have another method which we feel is more accurate. This method relies on separating the two colors being converged by one line width and then matching the two images. In our experience this results is a more tightly converged image and higher resolution.

Note that this procedure, while specifically written for the Sony D50Q projector, is generally applicable to other CRT projectors. In particular the method of aligning the green reference (Step 7) and aligning the colors to each other (Steps 9 and 10) are universally applicable to all CRT projectors.



STEP ONE:

Verify The Correct Screen/Projector Dimensions

Overview: CRT Video projectors are designed to be positioned a specific distance from the the screen and "square" to it's surface. In the diagram below we show an overhead view of a projector in a home theater room. If you examine the drawing you will see that when a projector is "square" to the screen, it will be positioned along the screen's centerline and the distances X and Y will be approximately equal. The actual distance that a projector is positioned back from the screen (F or C) is determined by the manufacturer and is stated in their installation manual.

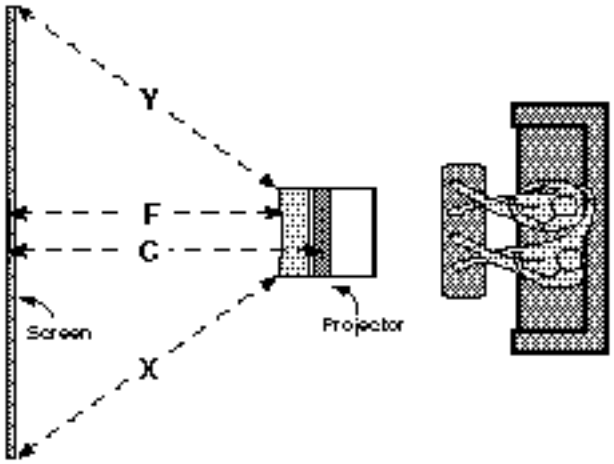
Procedure: 1) Verify that the projector is positioned the proper distance from the screen by measuring the "C" or "F" dimension and compare it to the manufacturers specifications. The margin of error allowed in this measurement is generally 1-2 inches. (In other words, if the installation manual says that the "C" dimension should be 103" and you place it at 105", you should still be able to converge the projector.)

2) Verify that the projector is "square" to the screen by measuring the "X" or "Y" dimensions. These should be within approximately 1" of each other.

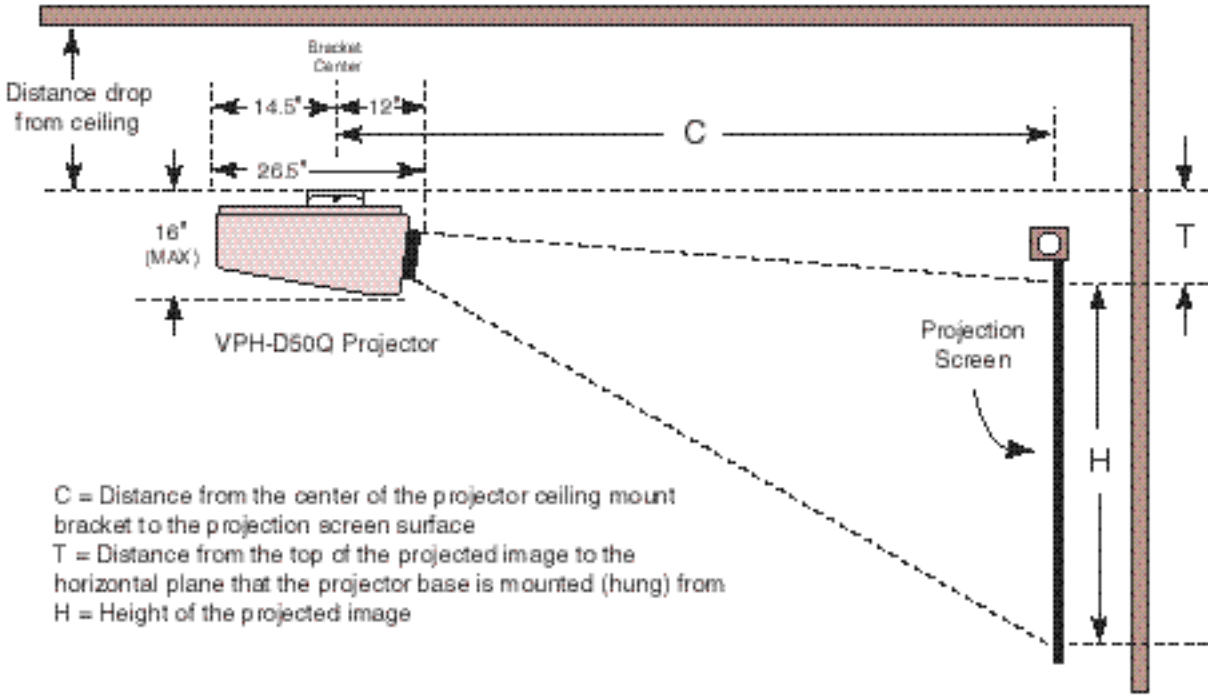
3) Make sure that the downward angle of the projector (see the diagrams on the following page) is not too severe. If your installation is off the charts (pointing down the wall too far) you may have a problem adjusting the convergence because the controls will run out of range.

The relationship of a video projector to the projection screen

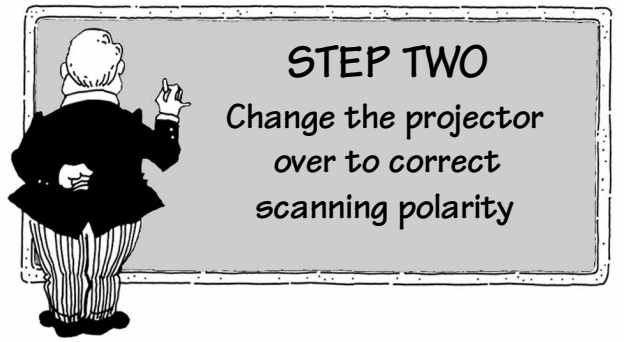
The F and C dimensions come from the manufacturers installation literature

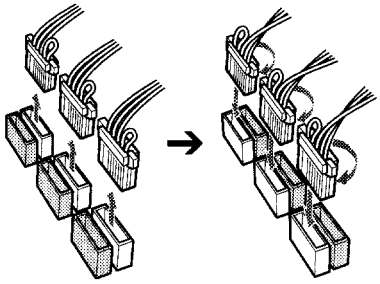


SONY D50Q INSTALLATION DIMENSIONS

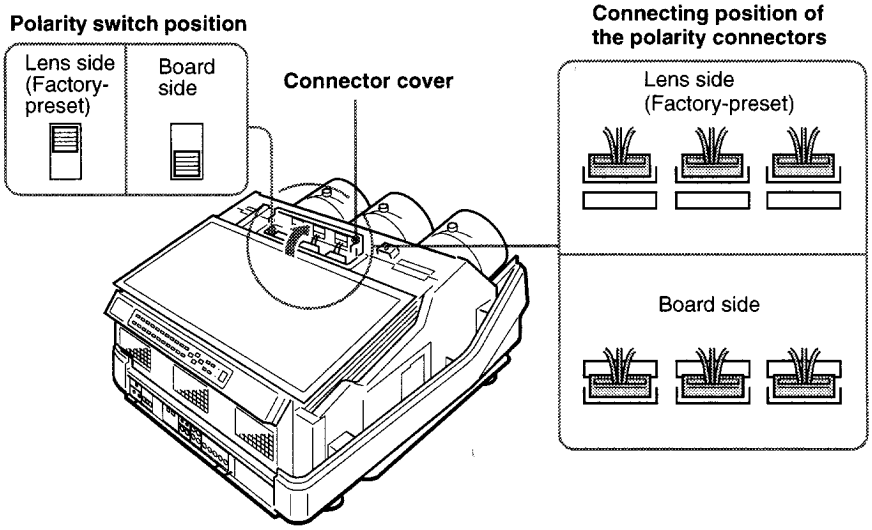


SCREEN SIZE (diagonal)	ASPECT RATIO	H	SCREEN WIDTH	C	T
84"	4:3	50"	67"	112"	14"
100"	4:3	60"	80"	129"	13"
120"	4:3	72"	96"	151"	12"
100"	16:9	49"	87"	141"	13"
106"	16:9	52"	92"	146"	12.5"
110"	16:9	54"	96"	151"	12"
119"	16:9	58"	104"	162"	11.5"

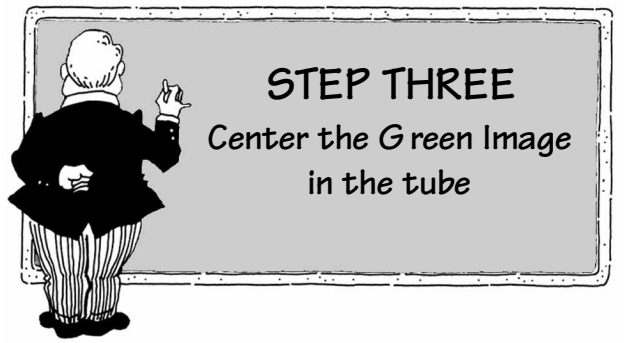




Switching The Scan Connectors 180 Degrees



Installation methods	Position of the switch	Connecting position of the connectors	On-screen display by default (See the next page.)
Front projection, floor	L	L	Correct
Front projection, ceiling	B	B	C
Rear projection, floor	L	B	A
Rear projection, ceiling	B	L	B
Others	Display letters on the screen so that you can determine which changes to make.		



STEP THREE

Center the Green Image in the tube

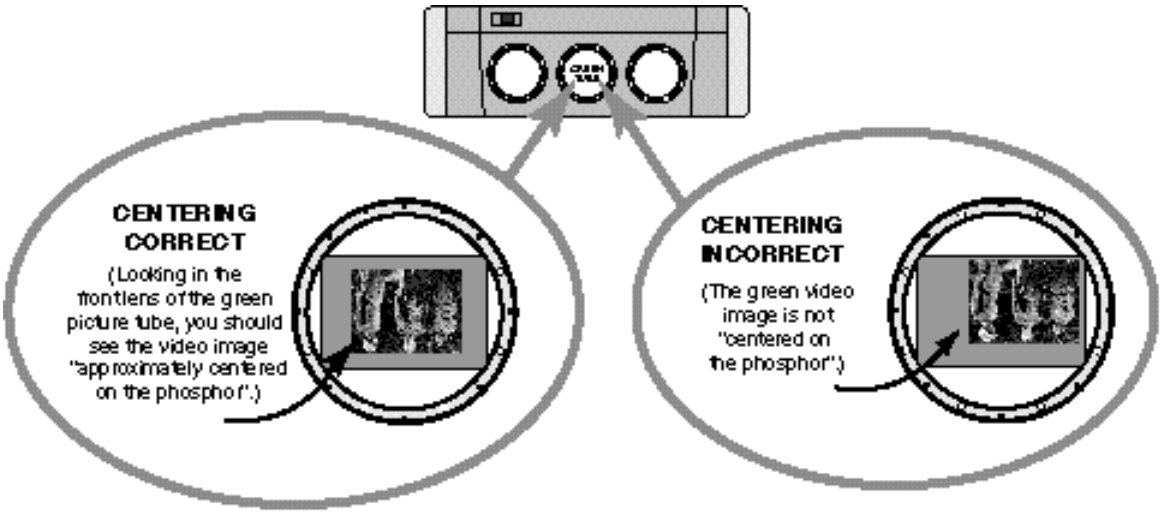
Overview: The video images scanned in the projector tubes should be roughly in the middle of each tube. If an image scans off center too much (as illustrated below) it may be difficult to convergence the projector. In the worst case, if the image scans off the phosphor and strikes the glass envelope, it can cause all sorts of problems and possibly shorten the life of the tube.

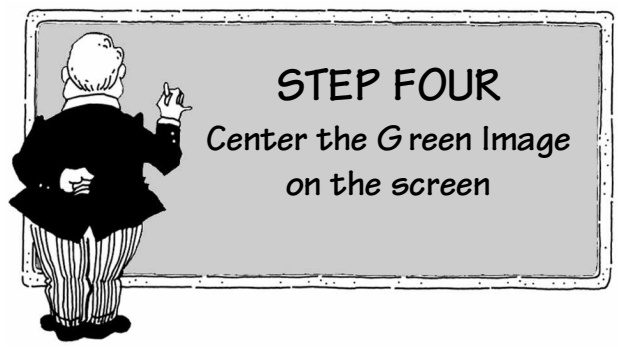
Procedure: 1) With the projector turned on, turn the brightness and contrast controls down so a very dim image is projected.

2) Look in the front lens on the green tube and verify that the green raster is approximately centered in the middle of the phosphor target (refer to diagram below.) If the image is approximately in the center, then verify that the red and green images are roughly in the center also.

3) If the green image is NOT in the center then use the centering controls (Zone Adjustments) to center them.

4) Repeat the same procedure with the red and blue tubes if their images are also not centered.





STEP FOUR

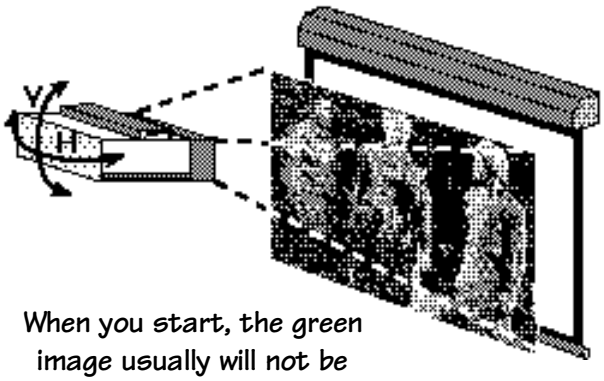
Center the Green Image on the screen

Overview: The next step after verifying that the green images is centered in their picture tubes is to physically move the projector so the image centered on the screen. If the projector is ceiling mounted then loosen the horizontal and vertical adjustment hardware (most projector ceiling mount brackets allow a limited amount of horizontal and vertical movement) and swing the projector until it is approximately centered on the screen.

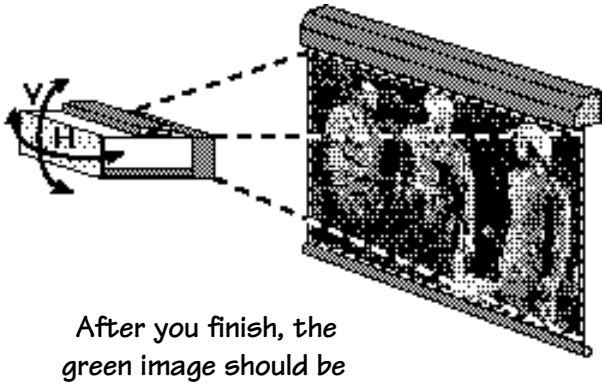
Procedure: 1) With the projector turned on and displaying a steady video image (a laserdisc or DVD on freeze frame, for example), turn off the red and blue tubes so that only the green is projecting.

2) Move the projector around, horizontally and vertically, so the green image is centered on the screen. The figures below illustrates this. (Note: a favorite installers trick used to center the green image on the screen is to underscan the borders with the height and width controls. This allows you to easily see the position of the image)

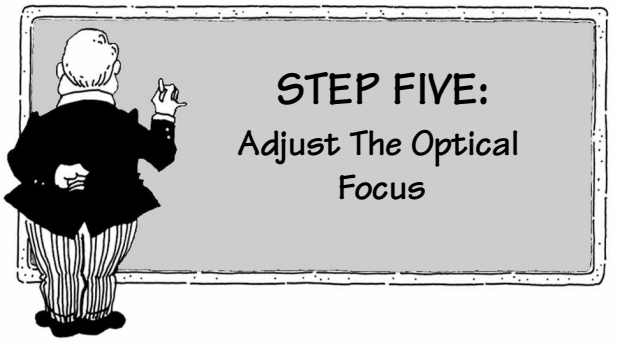
3) If the projector is ceiling mounted, tighten the projector pivoting hardware to hold the projector in place. but don't tighten the hardware down permanently because you may come back later to do some fine adjusting of the projector position.



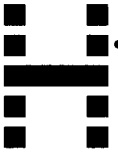
When you start, the green image usually will not be centered on the screen



After you finish, the green image should be centered on the screen



STEP FIVE:
Adjust The Optical Focus



Adjust For Segmentation in Vertical Lines

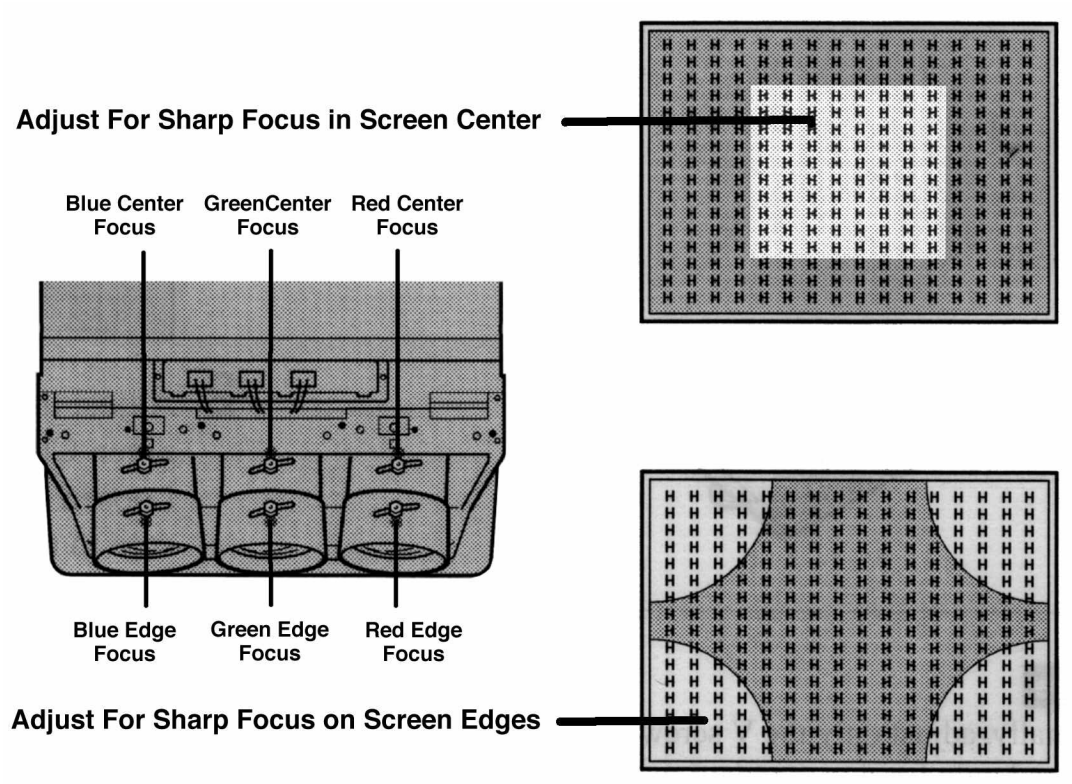
Focus Hint: *Vertical Segmentation*

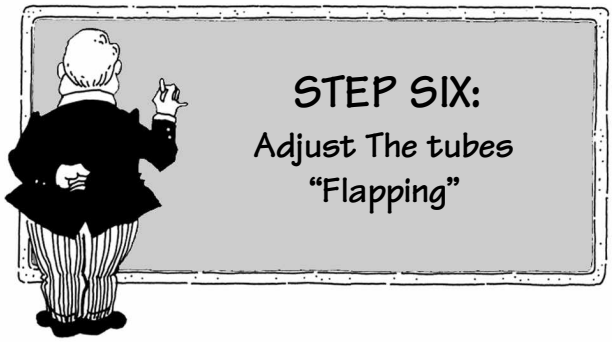
Overview: The video images scanned in the projector tubes are optically focused onto the screen via the projection tubes lenses. These need to be precisely adjusted in every installation.

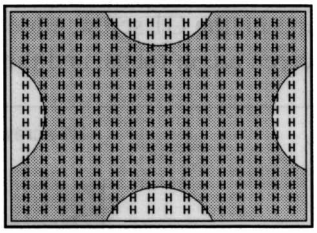
Procedure: 1) Turn the projector on and display the “H focussing” test pattern.

2) Adjust the rear lens focusing screw for the best focus in the screen center.

3) Adjust the front lens focusing screw for the best focus on the screen edges.







The flapping adjustments allow you to map the tube faceplate precisely to the screen for best focus

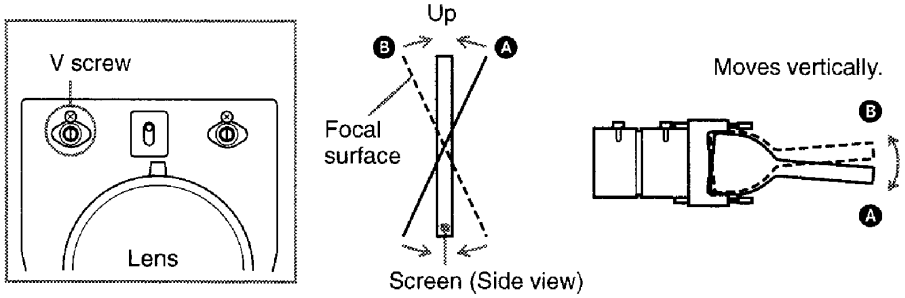
Overview: The video images scanned in the projector tubes are optically focused onto the screen via the projection tubes lenses. After the tubes are optically focussed, the angle of the lenses needs to be adjusted for best focus.

Procedure: 1) Turn the projector on and display the "H focussing" test pattern.

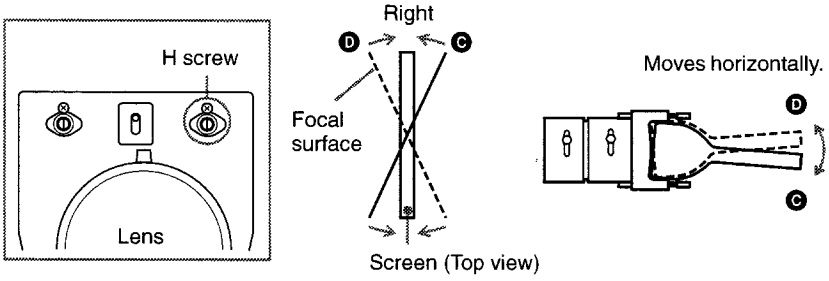
2) Adjust the green "V screw" for the best focus across all four screen edges (see diagram above). Normally you will not have to adjust the green "H Screw"

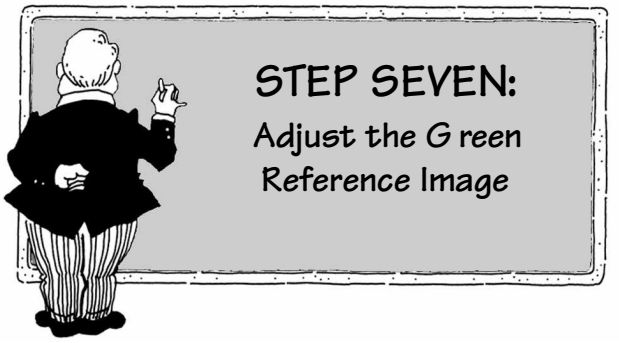
3) Adjust the red and blue "V screw" and "H Screw" for the best focus across all four screen edges (see diagram above).

Vertical Flapping Adjustment

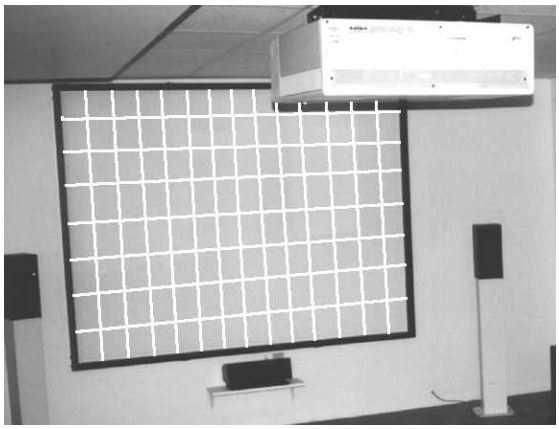


Horizontal Flapping Adjustment





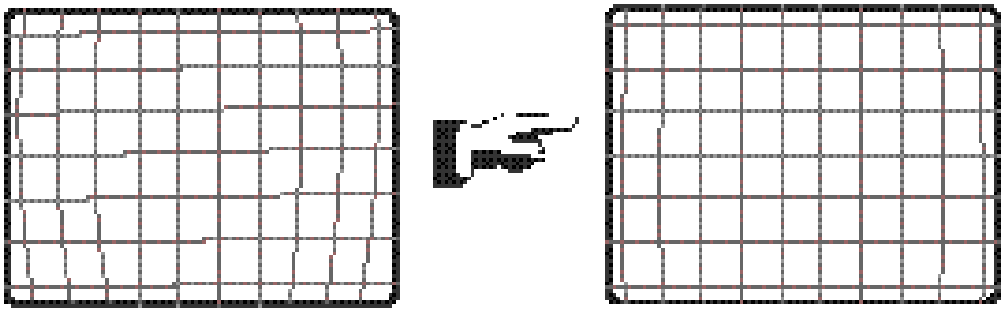
STEP SEVEN:
Adjust the Green Reference Image



Overview: In this section we will do the final aligning of the green image to the screen. The reason that the green is done before the other colors is, the green is the center tube and has the least "geometrical distortion" to compensate for. It thus becomes the reference color that the red and blue images are matched to. After this procedure is completed, the green image, as viewed via a crosshatch pattern, should be level and parallel to all four edges of the screen.

Procedure: 1) With the projector turned on and displaying a crosshatch pattern, press the CUT OFF R,B to prevent the red and blue tubes from projecting.

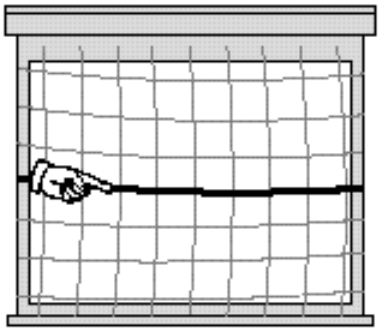
2) Follow the steps outlined in the following pages.



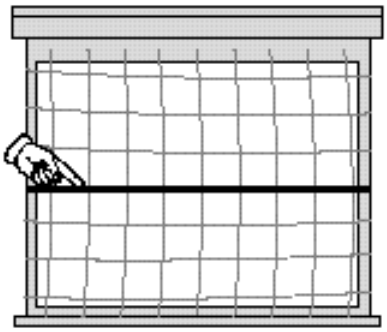
Before adjusting The reference green: every line will be unlevel, tilted a possibly bowed small degree

After adjusting the reference green, every line will be level referenced to a screen edge

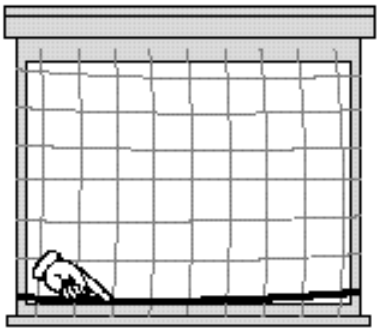
Start Here



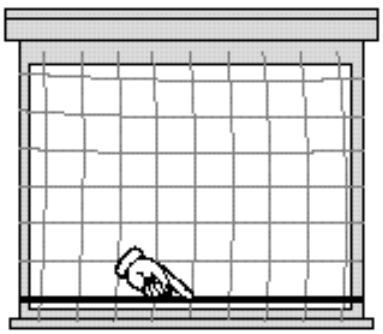
Level this horizontal line with the SKEW Control



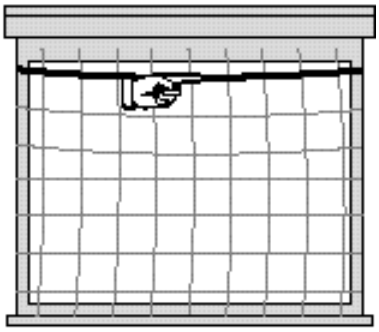
Then remove the bow with the BOW Control



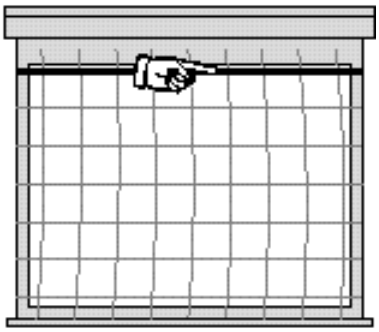
Level this horizontal line with the KEY Control



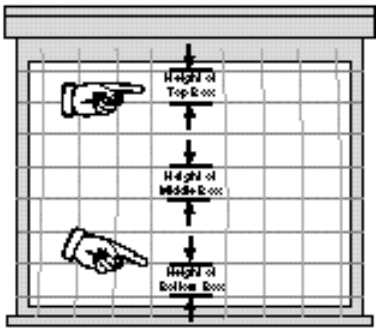
Then remove the pincushion with the PIN Control



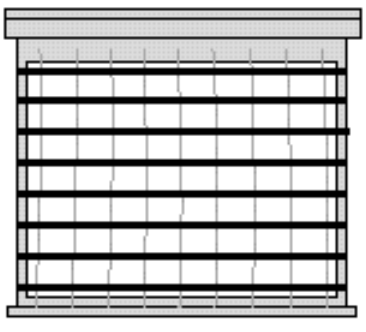
Level this horizontal line with the KEY (Balance) Control



Then remove the pincushion with the PIN (balance) Control



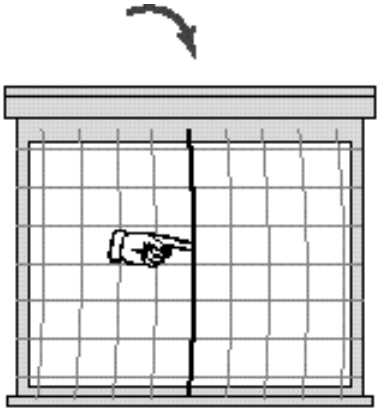
Make the height of the boxes from top to bottom the same with the LIN Control



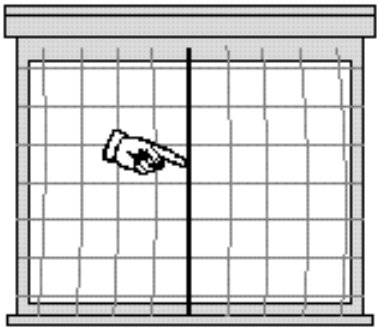
RESULT:

All the horizontal lines should be straight and parallel

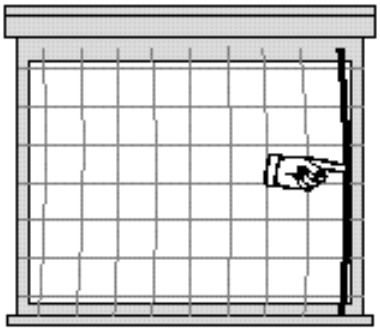
Level this vertical line with the SKEW Control



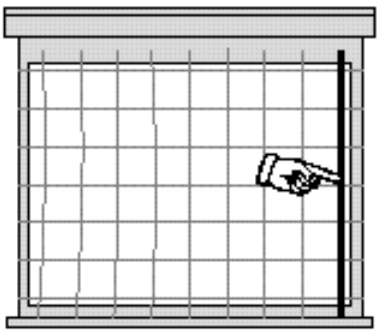
Then remove the bow with the BOW Control



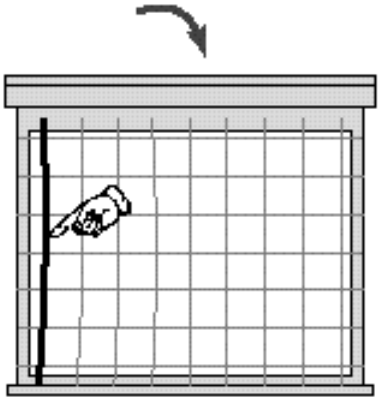
Level this vertical line with the KEY Control



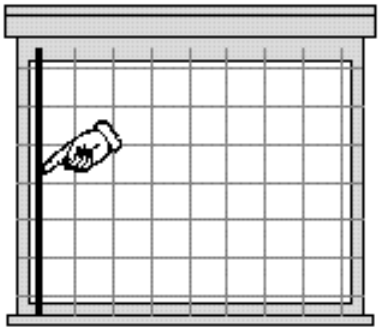
Then remove the pincushion with the PIN Control



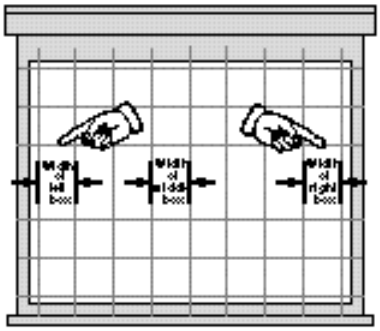
Level this vertical line with the KEY (balance) Control



Then remove the pincushion with the PIN (balance) Control

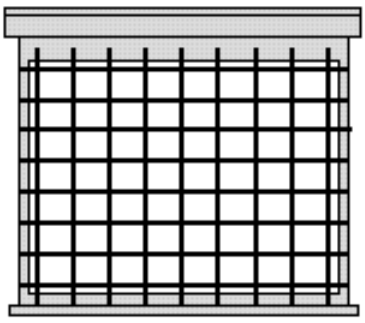


Make the width of the boxes from right to left the same with the LIN Control



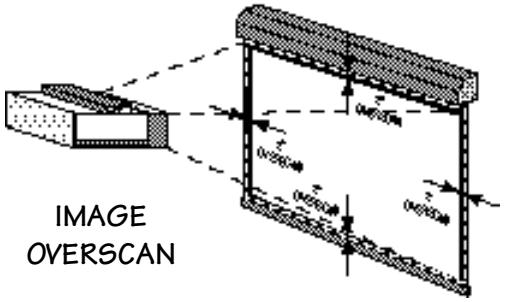
END RESULT:

All the horizontal and vertical lines should be straight and parallel



STEP EIGHT:

Adjust the Green Image Overscan



Overview: **"**Overscan" refers to the amount of video picture that runs off or **overscans** the borders of the picture. The general rule is that you want approximately 2" of overscan (on all four sides) so that image artifacts, such as bright lines and digital data, are not seen. The figure below illustrates this.

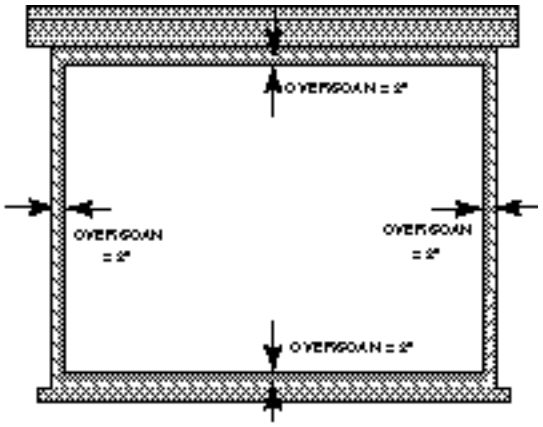
Procedure:

1) Display a steady video image (not a crosshatch pattern) and cover the red and blue tubes so that the green image only is projecting.

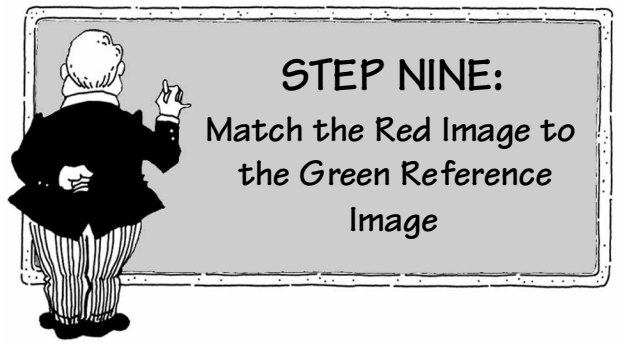
2) Adjust the SIZE control so that the image overscans 1.5" to 2" onto the black borders, left and right.

4) Adjust the SIZE control so that the image overscans 1.5" to 2" onto the black borders, top and bottom.

Screen with projected image overscanning onto the screen black borders 2" on all sides (The edge of the picture is shown as a white dotted line)



Same screen without projected image but white dotted picture edge still shown. Note the overscan is 2" on all sides



STEP NINE:

Match the Red Image to the Green Reference Image

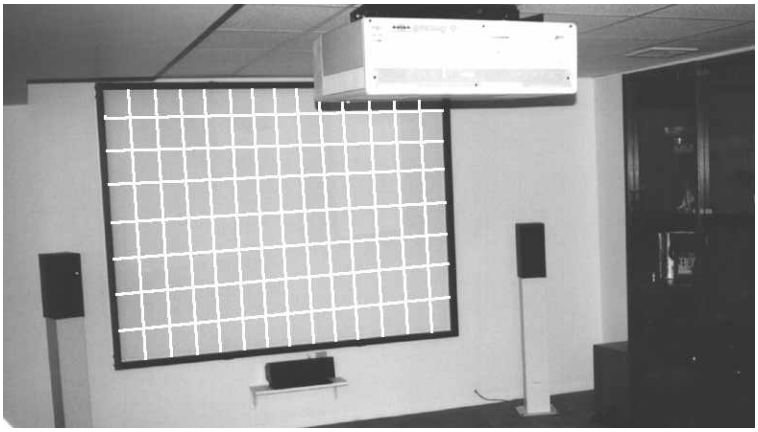
Overview: In Step Seven, you adjusted the green image so that it matches the screen. The green image now becomes your reference standard to which you match the red image to. This procedure is usually called "Dynamic Convergence, " however, we prefer the somewhat less technical term "matching". The procedure that you are going to undertake here is somewhat lengthy. It will probably take you a hour or so to go through it. We recommend that you take your time and perform this part with the room as dark as you can get it.

Procedure:

1) Turn off the blue tube so that only the green and red are projecting and put on a crosshatch pattern.

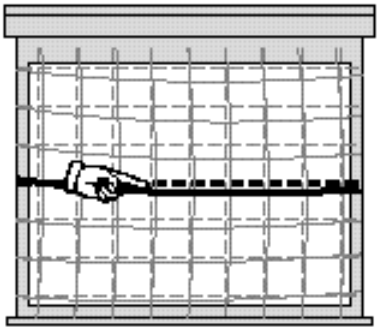
2) Closely follow the steps on the following three pages. When you have finished this red matching procedure, you should have a yellow crosshatch pattern with a minimum of color fringing in the corners.

Note: Take your time! Our experience is that few are good at converging a video projector the first time around but do a lot better after a few attempts.

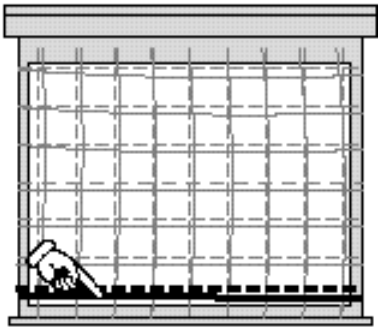


Start Here

Separate the middle red and green horizontal lines by a few line widths with the CENT R control

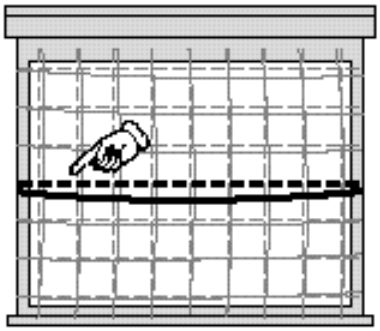


Then remove the pincushion with the PIN control

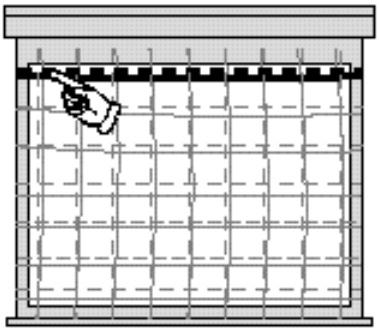


= Green line(s)
= Red line(s)

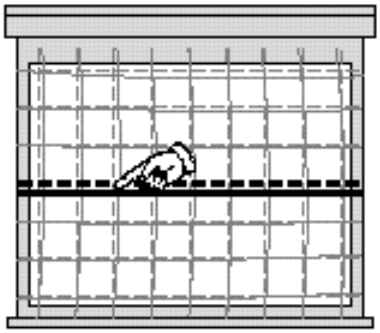
Match the slope of the red line to the green with the SKEW control



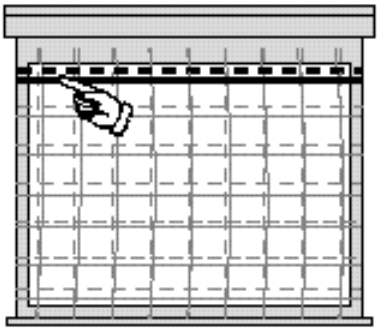
Match the slope of the top red horizontal line to the green with the KEY (BALANCE) control



Remove the bow with the BOW control

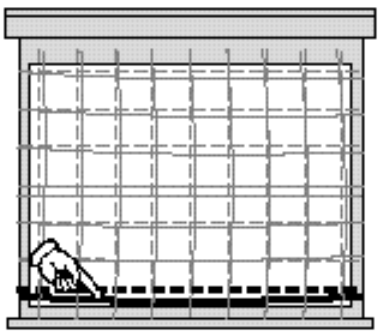


Remove the pincushion with the PIN (BALANCE) control

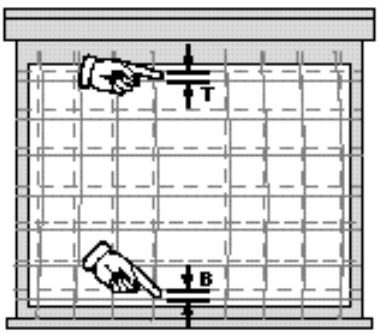


= Green line(s)
= Red line(s)

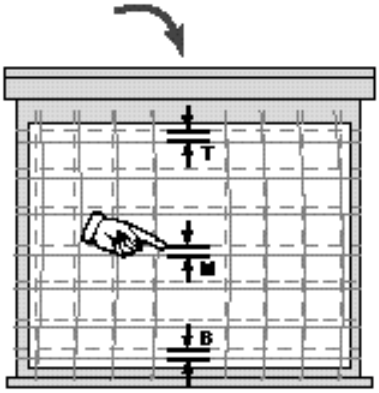
Match the slope of the red bottom line to the green with the KEY control



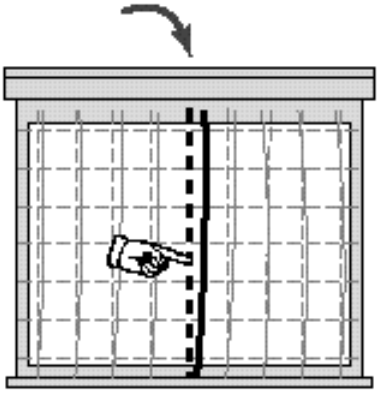
Make the separation of the red and green lines, on the top (T) and the bottom (B) equal with the SIZE control



Make the separation of the red and green lines in the middle (M) equal to the top(T) and bottom (B) with the LIN control

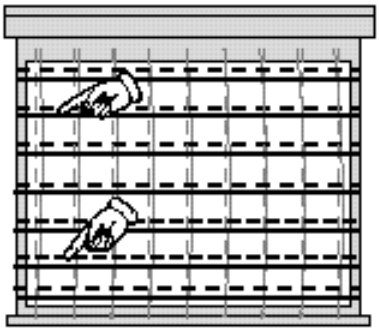


Separate the middle red and green vertical lines by a few line widths with the R CENT control

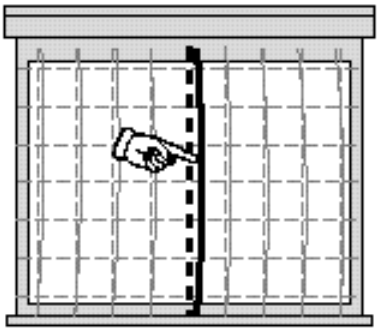


= Green line(s)
= Red line(s)

Move the red lines directly over the green with the R CENT control

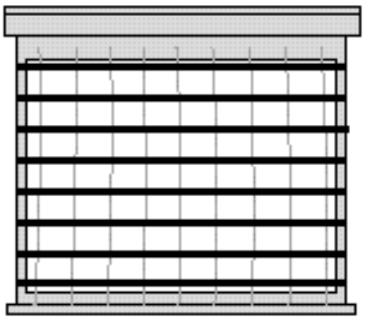


Match the tilt of the red line to the green with the SKEW control

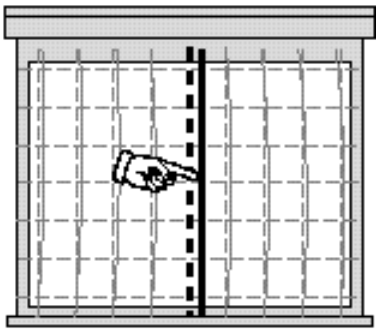


RESULT:

All the red and green horizontal lines lay on top of each other to form horizontal yellow lines

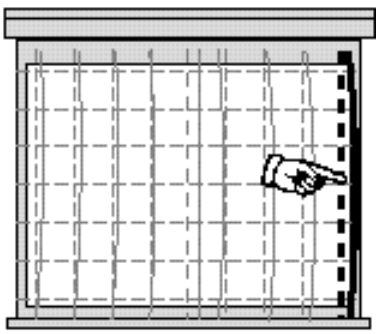


Remove the bow with the BOW control

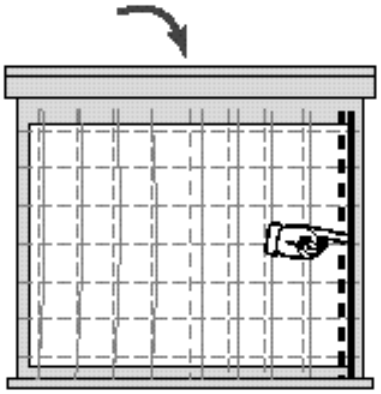


= Green line(s)
= Red line(s)

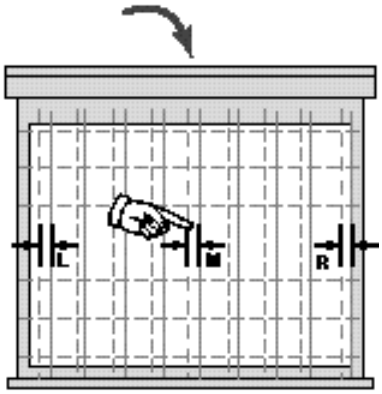
Match the tilt of the right red horizontal line to the green with the KEY control



Then remove the pincushion with the PIN control

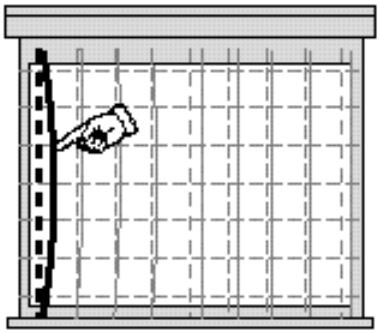


Make the separation of the red and green lines in the middle (M) equal to the left(L) and right (R) with the LIN control

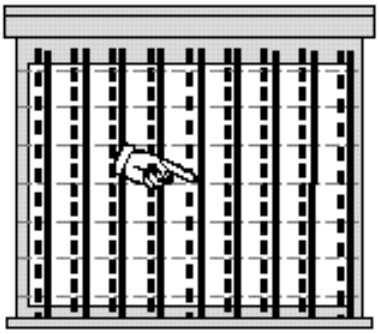


= Green line(s)
= Red line(s)

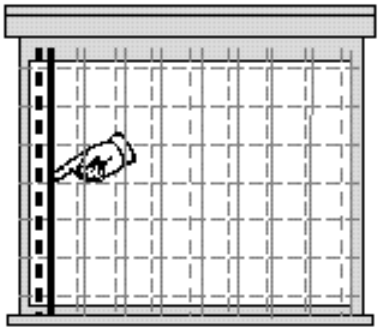
Match the tilt of the left red vertical line to the green with the KEY (BALANCE) control



Move the red lines directly over the green with the R CENT position control

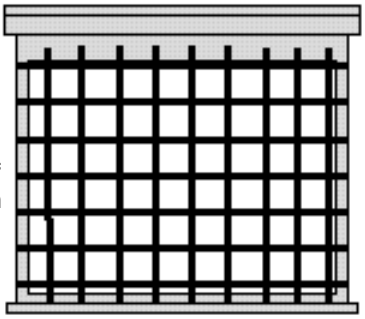


Remove the pincushion with the PIN (BALANCE) control



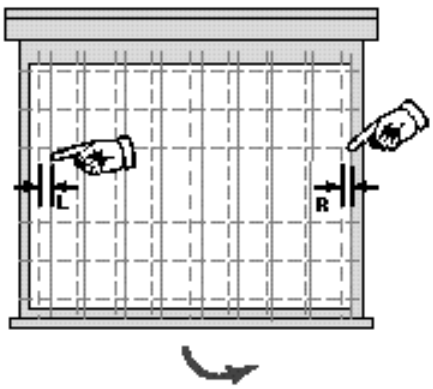
FINAL RESULT:

All the red and green horizontal lines lay on top of each other to form horizontal yellow lines



= Green line(s)
= Red line(s)

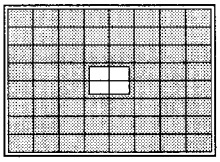
Make the separation of the red and green lines, on the Left (L) and the right (R) equal with the SIZE control



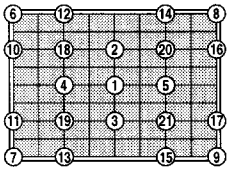
Fine Tuning Is Done Via The Zone Adjustments

Adjust red ZONE after the red lines have converged with the green lines by performing the adjustments **6** to **10**.

1 Press the ZONE key.
The 9 × 9 HATCH pattern and the cursor appear.



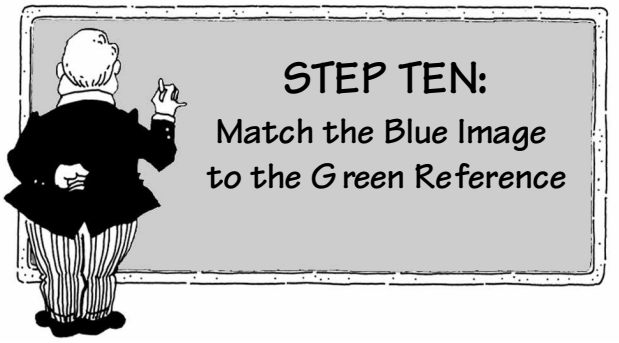
2 Press the POSITION +/– keys to select the part to be adjusted.
When you press the + key, the cursor moves in the numerical order as illustrated.
When you press the – key, the cursor moves in the reverse order.
The selected position number appears at the upper right corner.



If you press the ZONE key again in ZONE adjustment mode, you can move the cursor to the desired position with the ↑, ↓, ←, → keys. When you press the ZONE key again after selecting the position, the projector enters the adjustment mode of that postion.

3 Adjust the red line distortion in the cursor positioning area with the arrow keys.

4 After the adjustment is complete, press the MEMORY key to save the adjustment data.



STEP TEN:
Match the Blue Image to the Green Reference

Overview: The object of this step is to match the blue image to the green reference crosshatch. The procedure is exactly the same as matching the red except the blue convergence controls are used.

Procedure: 1) Cut off the red tube so that only the green and blue are projecting

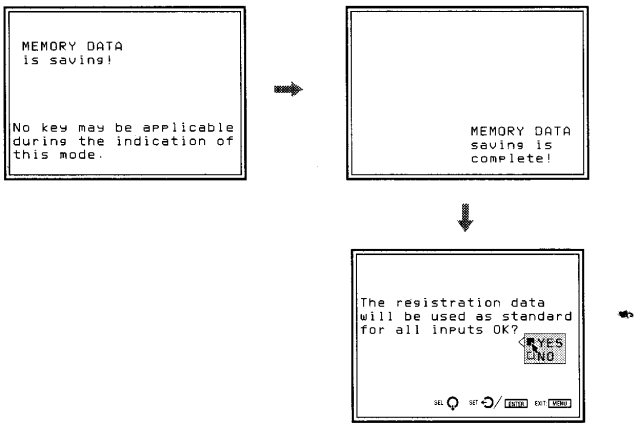
2) Use the same procedures as used in the red to green matching section. When you have finished this blue matching procedure, you should have a light blue (actually Cyan) crosshatch pattern with a minimum of color fringing in the corners.

When you are finished the convergence:

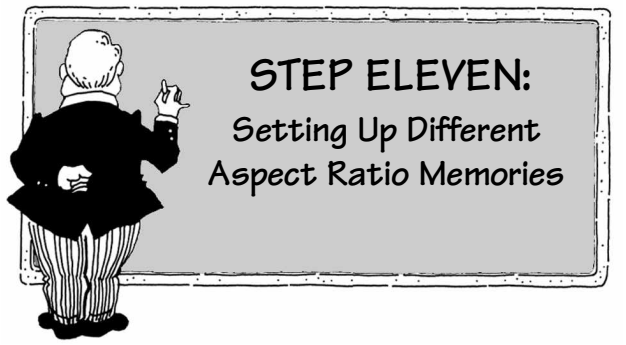
Save The Final Adjustments!

After adjusting all the registrations for the green, red and blue signals, save the adjustment data as the standard data for the projector.

1 Hold down the MEMORY key for more than 5 seconds.
The adjustment data is saved in the memory as the data for the frequency selected in INT. OSC PATTERN of the SERVICE SETTING menu, and the projector enters the standard data saving mode.



2 Press the ↓ or ↑ key to select YES, then press the ENTER key.
All the registration data will be converted into internal signal data and are saved as standard data.



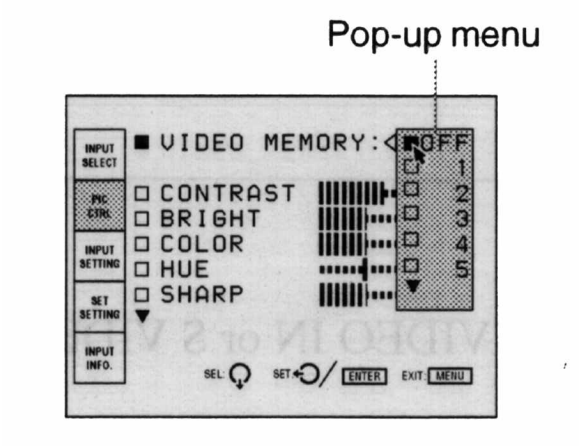
STEP ELEVEN:
Setting Up Different Aspect Ratio Memories

A graphics projector show be adjusted for a minimum of three aspect ratios:

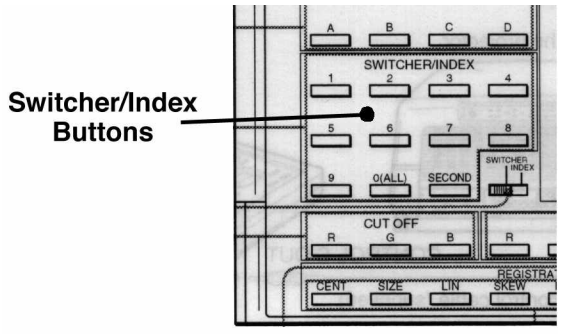
1) Standard 4:3 images
2) 16:9 Letterboxed images
3) 16:9 anamorphic images

Others may be needed for wider letterboxed and anamorphic images and DTV

When using the Sony D50Q is used to project video signals through the composite or s-video input, ten memories are available . Each of these can be used for a separate aspect ratio.



When using the Sony D50Q is used to project RGB video signals (from a video processor), the projector is used in "5BNC Mode". This allows you use the Switcher/Index buttons on the remote control for different aspect ratio memories



Video Display Calibration

Imagine it's a cool summer night, the stars scintillate brilliantly in the sky overhead and the campfire is blazing away. You've just finished a hearty meal of roast mastodon and you, and the rest of your loinskin-clad band, are settling in for a good round of story telling. After everyone quiets down, shadowy figures wearing animal masks and draped in fur emerge from the forest and begin telling tales of adventure, bravery and sorrow. For the rest of the evening barely a grunt is heard from the audience.

Today, instead of using rocks, sticks, and dead animal parts, filmmakers generally prefer to use motion picture film and movie sets to tell their stories. What's interesting, though, is that while the technology has changed just a bit, the essence of story telling remains the same. Filmmakers still use the best technology at their disposal to tell their story. However, in contrast to the storytellers of Paleolithic times, contemporary filmmakers rely on technology not only to create their vision, but to reproduce it for the audience. And they count on the A/V reproduction technology employed to recreate their vision intact. This is why calibration as a principle is important. Calibration of audio, video and film equipment is a way of insuring that the director's vision is being reproduced in exactly the way he or she intended it to be. In this article we will look at the calibration of video display devices in home theaters and examine some of the tools available to complete the task.

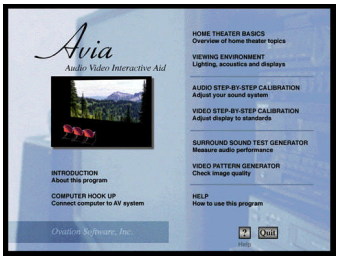
Who Ya Gonna Call

Calibrating a video display requires adjusting many controls and it is important to know that there are two levels of expertise involved. The first involves adjusting user controls that are easily accessible via the remote control or from the front panel of the television monitor itself. These controls generally include functions such as: brightness, contrast, color, tint, and sharpness. On some video displays you may find additional functions, such as color temperature, image centering and picture size adjustments (on some widescreen displays). All of these controls are referred to as "user controls" for good reason; they are designed for easy access so that the user can adjust the display's image to suit his or her tastes.

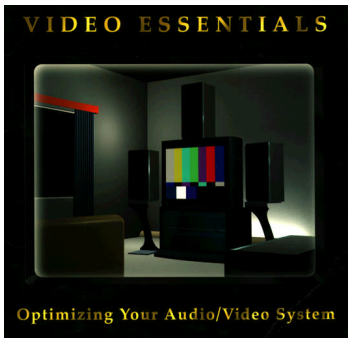
The second level of adjustment involves controls that are NOT easily accessible to the user. These "factory" adjustments are either located on hidden on-screen service menus or are physically located inside the cabinet of the display device. The reason that these controls are not user accessible is that they are designed for use by trained technicians during the display's manufacturing process and/or during any necessary repair procedures. However, as you probably surmise, adjusting some of these factory controls may be necessary to calibrate a video display for best image reproduction. This presents a dilemma - is it necessary to call an A/V professional to calibrate your home theater display, or can you do it yourself?

Well, it depends. Having an audio/video professional calibrate your display is probably the best route if you are unfamiliar with electronics and video technology. A/V professionals practice the art frequently and have often received specialized training via professional seminars. Yes, it can be expensive, from $150 to $400 for a complete job (the factors involved are what kind of display you have, whether you a want a tune-up or an overhaul, and how far the technician has to travel), but the results can be well worth it. On the other hand, for those who want to save money, or just prefer to adjust their electronic gear themselves, there's no reason not to proceed with the display's user controls. You can calibrate these controls easily using many of the available software packages.

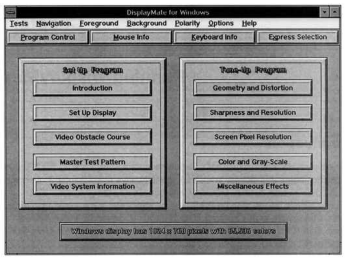
As for the internal factory controls or service controls on hidden menus? As you probably anticipated, we've got to toss in the boilerplate about adjusting factory controls: Attention: Do-It-Yourselfers, even though factory controls can effect the level of performance of your video display, they are hidden for good reason. They can be very complex to adjust and may require special instrumentation



AVIA is available from
OVATION SOFTWARE
200 Putnam St., Marietta, OH
45750 614-373-6212



VIDEO ESSENTIALS is available from the
IMAGING SCIENCE FOUNDATION
3257 Harrington Dr., Boca Raton, FL
33496 561-997-9073



DISPLAYMATE is available from
SONERA TECHNOLOGIES
PO Box 565, Rumson, NJ
07760 908-747-6886

to calibrate properly (you can literally cause more harm than good if you adjust these controls "by eye"). Also, all of today's CRT-based displays and televisions contain some pretty high voltages, and combined with the fact that you may cancel your factory warranty by opening up the set -Well, you get the picture.

The Calibration Tool Chest

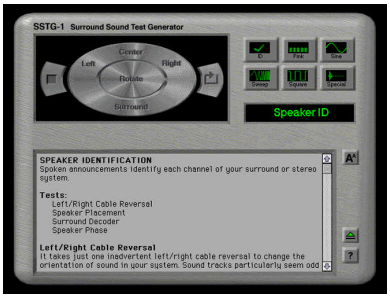
Not to long ago, audio and video calibration procedures could only be performed by professionals who had access to expensive video test pattern and audio test tone generators. Today that situation has changed because almost all of the test signals needed for calibration can be reproduced in the home via laserdiscs, DVD discs and computer software programs. The good news for do-it-yourselfers and A/V professionals alike is that these programs are easily available and reasonably priced. Here are three we recommend you look at.

Video Essentials™ - Available from the Imaging Science Foundation (ISF), Video Essentials™ is the best known program for audio and video calibration. Founded several years ago by industry veterans Joe Kane and Joel Silver, the ISF is one of the first organizations to promote video quality issues in the consumer marketplace. Video Essentials™, which the ISF offers on laserdiscs and DVDs, is a wonderfully produced program. It starts off by illustrating the need for audio and video calibration and then runs through several well-animated technology tutorials. After the proper ground work is laid, it steps through the complete setup of a home theater's audio system, and then a full video calibration procedure. One of the nice features of the Video Essentials™ disc is that it also has a large collection of excellent video clips to view the finished work on. The Video Essentials™ laserdisc and DVD are available for $49.95.

AVIA™ - AVIA (Audio Video Interactive Aid) is calibration software available from Ovation Software. It currently is available as a CDROM-based program that runs on PCs, Macs and Windows NT machines and a DVD The AVIA program is powerful and multifaceted. It is chock full of

Video Test Pattern Generator

Ovation Software's AVIA program has two on-screen interactive test signal generators for calibrating an entire home theater A/V system



Audio Test Tone Generator

version of the AVIA program will be available on DVD). Because AVIA is a computer program, one must have a way to connect a computer to the A/V system being calibrated. (Note: this is commonly done with via interface cards or scan converters). The AVIA program is powerful and multifaceted. It is chock full of everything from highly detailed audio/video technology tutorials to completely interactive test pattern generators. Of special interest to those involved in home theater construction are two sections. One is an interactive on-screen calculator in which you plug in your video system specifications (size of display, aspect ratio, etc) and it calculates the proper seating locations for the audience. Another is a calculator which calculates and plots sound resonance modes in home theater rooms of different dimensions. For those who simply want to calibrate their home theater, AVIA will step you through the entire procedure interactively. Advanced users and professionals can skip right to two on-screen test signal generators; one for video test patterns, the other for audio signals. The AVIA software program is priced at $59.95 for the computer software and DVD versions.

DisplayMate™ - Sonera Technologies are the folks that produce the test patterns used in the famous INFOCOMM™ projector shootouts. Their DisplayMate test pattern software is very popular in the computer industry. It is used by virtually every computer publication for the testing of computer monitors and by most manufacturers of computer display devices. Their product line currently consists of four packages: DisplayMate™, DisplayMate for Windows™, DisplayMate for Windows -Video Edition™, and DisplayMate Professional™. DisplayMate for Windows -Video Edition™ (the version of interest to most home theater enthusiasts) is basically a ultra-talented test pattern generator. It offers 116 test patterns, many of which are available nowhere else. A very handy feature is that each of DisplayMate's test patterns includes an information window that explains what the pattern is for, how it works and what effects to look for. With the convergence of TV and PCs coming closer every day, DisplayMate is a way of assuring that the two work together well. DisplayMate for Windows -Video Edition™ retails for $99.95.

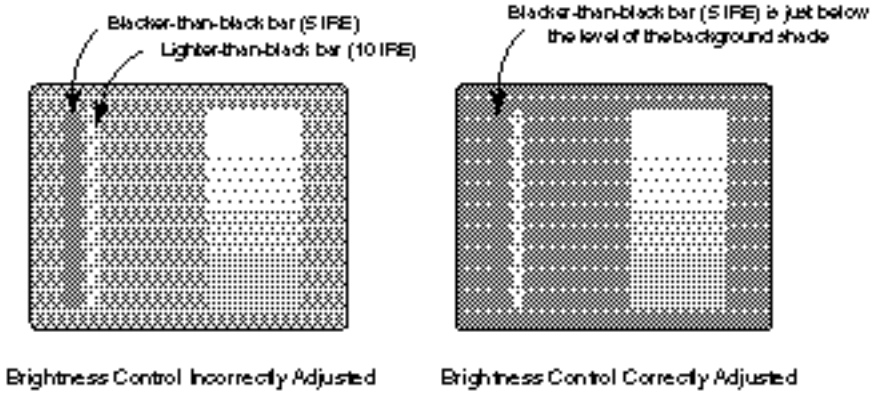
Video Calibration, Control by Control

Video displays are remarkable complex devices. To calibrate them requires the adjustment of many user controls, and if an A/V professional is involved, the adjustment of potentially dozens of internal controls. Here are some of the ones you should know about:

• Brightness Control. If you are a film buff you know that many directors thrive on dark scenes. They often have shadowy figures appearing and disappearing into murky darkness. It is therefore critical to have a video image's black level match the film release's black level or you can miss story details. Thankfully control of the black level of the picture is a close as your monitor's "Brightness" or "Black Level" control. The standard pattern for adjusting black level is PLUGE (Picture Line Up Generating Equipment) pattern that allows you to set the black level properly. The procedure is simple. Adjust the brightness/black level control until you can just see the “darker-than-dark” bar melt into one to the next to it.

• Contrast Control. When you adjust the contrast control on a CRT-based video display device for best peak whites, you aren't actually calibrating the display's contrast range; what you are doing is making sure the monitor behaves itself. The problem is that when the user contrast control is set too high, the high voltage power supply can run out of it's linear operating range, and when this happens bright images can lose focus and picture geometry can shift. The standard pattern used to visualize a high voltage supply's linear range is a needle pulse pattern (see our diagram). Adjusting the contrast control for best peak whites with this pattern is simple. Just turn up the contrast until the pulse starts to distort. However

Adjusting the brightness control of a video display device is very important for proper black level reproduction. If adjusted incorrectly, important shadow details can be lost from the image.



don't be surprised if your contrast control setting isn't near the top of the range. Most monitors and televisions cannot display a linear picture in the upper contrast ranges. If you find this is the case with your monitor, you have three options. You can reduce the ambient light in the room, you can stack another projector (if you are using a front projector) or you can turn it up anyway and run it out the linear range (Many people do this anyway).

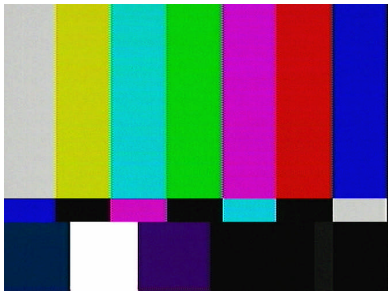
• Color Saturation. Filmmakers spend lots of time on color issues, not only in the creation of a film but back in the lab during processing too. They know that the color saturation level of images can be very important and is an essential element in the "look" of a movie. When adjusting a display for proper color level by eye, one is at a disadvantage because it's hard to tell what the director had in mind. Fortunately calibrating for proper color saturation is easy. What is required is a color bar pattern, preferably a SMPTE color bar pattern. Using a blue filter to view the color bars, one can adjust the user color control so the relative brightness of the two outer pairs of bars (white and blue) match the small patches below them (blue and white) in intensity.

• Tint. The tint control of your monitor adjusts parameters in the color decoding circuitry for accurate color hues. Most people adjust their tint controls for "good flesh tones", and actually this approach isn't so bad because the human eye is very good at judging flesh tones. However there are test patterns to objectively set tint controls. The most common is, again, the SMPTE color bar pattern with the blue filter. Adjust the tint control so the cyan and magenta bars match the magenta and cyan patches, located directly below them, in brightness. When this is accomplished you should find that your flesh tones are right on the money.

• Sharpness. In a pure sense, you actually want the sharpness control to be off -period. Sharpness controls add extraneous information to a video images in an attempt to make them look sharper. An analogy would be the tone controls on an audio receiver. Tone controls do nothing more than boost certain frequency ranges so the audio sounds "better", certainly not more accurate. Video sharpness controls do the same thing, they peak certain frequency ranges in order to create the illusion of a sharper picture. To view what happens with your sharpness control, put on a luminance multiburst pattern. As you adjust the control, you'll notice that the middle frequency bands become brighter and brighter. This is because the sharpness control is actually boosting the middle picture frequencies. So, how do you adjust the sharpness control? Adjust it as little as possible, and look for a subjectively better image without extraneous edges on vertical details.

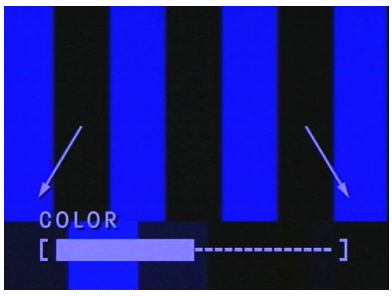
• Color Temperature. You have probably noticed this term all over the video and home theater press the last few years and wondered what it really means. Color temperature is the "color shading" of the black and white portion of a video image. The term is borrowed from the academic physical sciences and relates to the color spectrum emitted by objects when they are heated to high temperatures. For example: some objects will glow red/yellowish ("red hot") when they are heated to high temperatures and white/bluish ("white hot") at even higher ones. Because these objects glow different colors at different temperatures, the term "color temperature" is used to describe the phenomena.

The color temperature of a video display is determined by the settings of the picture tube's drive controls. These controls can be adjusted so the black and white image looks "warm" (a low color temperature) or a "cool" (a high color temperature). The resultant image can then be measured with a color analyzer the exact color temperature obtained. The standard color temperature for NTSC broadcast in the United States is 6500° Kelvin. Unfortunately, adjusting the color temperature of a video display is not a do-it-yourselfer task. It's best done by a professional because it requires special instrumentation, a color analyzer, and knowledge of how to make the gray scale track evenly at different brightness levels.



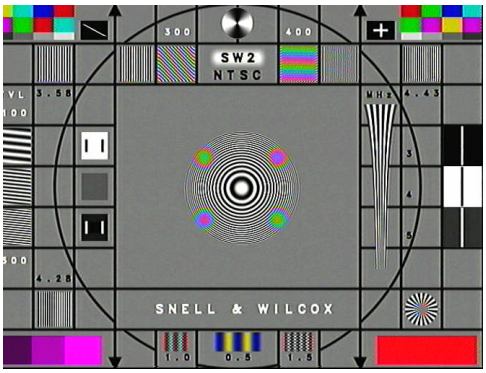
SMPTE Color Bars

Adjusting a monitor for correct color saturation and hue reproduction is easily done with SMPTE color bars and a blue filter .



Color Bars viewed through Blue filter

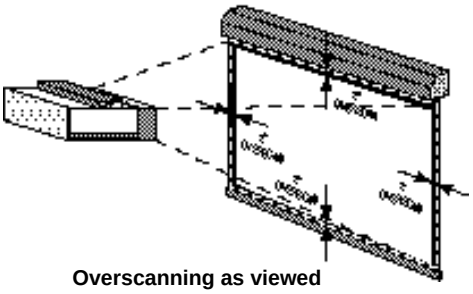
• Overscan. How would you feel if someone were to tell you that 15 to 20% of your video picture is missing? Well, this is exactly what happens with excessive raster overscan. Video display manufacturers typically overscan their displays to hide the uneven edges of the raster, it's normal practice. Of course, the amount of picture information you lose depends on your particular monitor or television. Some picture-tube type displays overscan a great deal of the image (usually inexpensive ones). With rear screen televisions, less is usually lost because the scanning circuitry is more advanced and the overscan can be adjusted tighter. With front projectors you lose the least because you can project 100% of the raster (you only lose what actually scans onto the black borders of the screen, see our diagram). To judge the overscan of your monitor, use an overscan pattern. Adjusting it, however, generally requires a professional; the controls are sometimes on on-screen menus, but usually are located deep inside the cabinet.



The Video Essentials discs hav e some specialized patterns which are useful to judge color decoder performance. This Snell and Wilcox Zone Pattern is one of them.

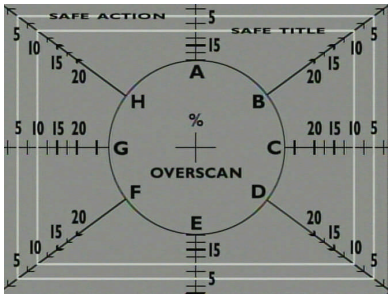
• Convergence. The method by which modern color television works is by adding three primary colors of light; red, green and blue, in different proportions, to create the full spectrum we see on the display. In order to produce a sharp, tightly-converged image, the three colors need to "map" each other precisely across the entire screen. Technicians generally use a crosshatch pattern to view the color mapping and look for convergence errors. Now, before we start a witch hunt, a disclaimer is necessary: All video displays have some amount of misconvergence; particularly in the corners. If you put up a crosshatch pattern and see color fringing, don't be terribly alarmed. It is normal on CRT-based devices, and LCD and DLP videoprojectors, and could well be with in the factory specifications for convergence error. However, if your display is a rear screen television or a CRT-based front projection monitor, and you see a severe amount of color fringing; call in an A/V technician. He or she should be able to tighten it up for you.

• Focus. All CRT-based video displays have focus adjustments; in fact, some have two different types. Let's start with direct-view monitors. Inside the picture tube of all direct view monitors is a series of electron gun elements designed to focus the electron beam so it produces a sharp image. This is commonly referred to as the set's "electronic focus" adjustment. Here again, adjusting electronic focus is best done by a technician. It is usually an internal control, and on some projectors may require special techniques. Rear screen and front screen projectors not only have three of these electronic focus adjustments, one for each tube, they also have "optical focus" adjustments. Optical focus refers to the adjustments performed on the projection lenses. LCD and DLP-based projectors are designed for user adjustment, but CRT-based units are not.

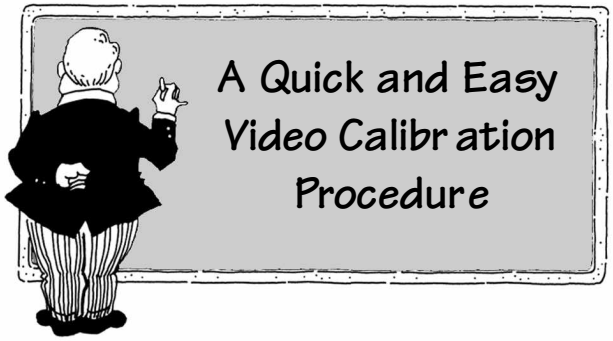


Overscanning as viewed on a front video projector

The overscan of a video monitor is the amount of image that is lost off the edges of the screen. Properly adjusted monitors should have 10% overscan or less



An Overscan Pattern



On your video projector you have several user controls (brightness, color, contrast, tint and sharpness) that can be adjusted for the best video picture. You can adjust these for personal preference but in reality the settings of these video parameters are tightly defined on the creative end of television programming. If you want to calibrate your video projector to the studio settings get a copy of the Video Essentials LD or DVD test disc and proceed as such :

1) Brightness Control:

The brightness control on your monitor adjusts the overall brightness of the video image. Often referred to as “the black level control”, It affects the entire image from the deepest blacks to the peak whites.

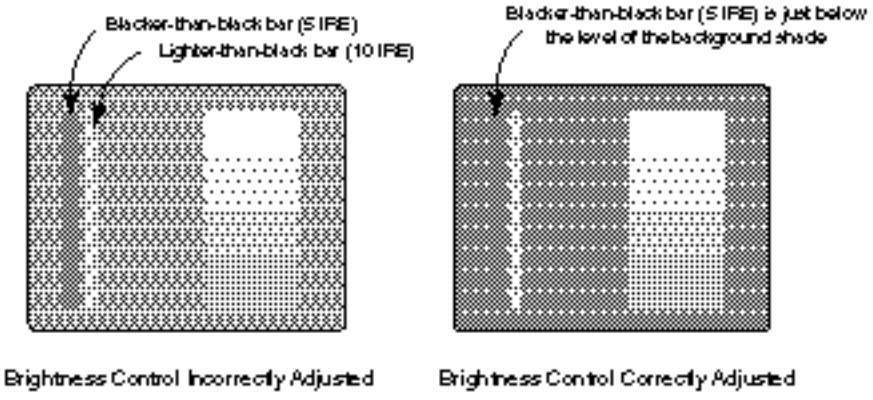
Generally the manufacturers of video display devices set the brightness control so when they are in the middle of the adjustment range (mid-range) when they are “calibrated for proper blacks”. You can check the accuracy of the manufacturers settings by freeze-framing the Video Essentials Disc on the Picture Line Up Generating Equipment (PLUGE) pattern. The procedure is to adjust the brightness control until you can just see the “darker-than-dark” bar melt into one to the right of it. At this point you have the set calibrated properly for black level. See the illustration below. Note: Many DVD players are set to 7.5 IRE and cannot display the “darker than dark” bar.

2) Contrast Control:

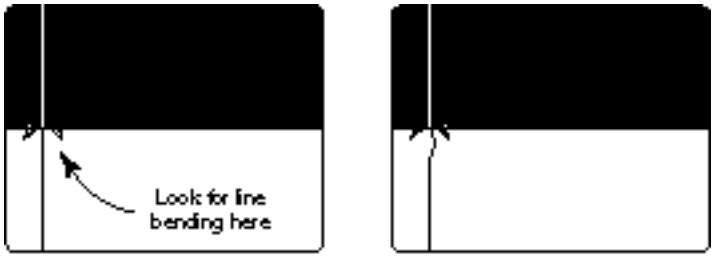
The contrast control can be set using the Needle Pulse Pattern. This pattern has a large black area on top and a white area on the bottom. Start with the contrast control turned down and slowly adjust it until the thin line on the left of the image starts to bend. At this point the set is having HV sag problems and the setting of the control should be restricted to this level.

Don’t be surprised if your contrast control setting isn’t even near the top of the range. Most monitors and televisions cannot display a linear picture in the upper contrast ranges. A properly calibrated set will have the contrast control set at the point just before the bending occurs and you may find this is too dim a picture for you. If this is the case you have three alternatives:

Proper Brightness Control Adjustment



Proper Contrast Control Adjustment



Proper Adjustment of the Contrast Control

Improper Adjustment of the Contrast Control

1) Reduce the ambient light in the room
2) If you are using a front projector add another one
3) Turn it up any way and run out of calibration (Many people do this anyway).

3) Color Control:

Advance the Video Essentials disc to the SMPTE color bar pattern as illustrated below. Those of you late night television junkies will recognize this pattern.

The color control of your monitor adjusts parameters in the color decoding circuitry. Most people adjust it for "good flesh tones". This approach actually isn't so bad because the human eye is, in fact, very good at judging flesh tones with accuracy. However from a professional broadcasting standpoint, subjective measurements like this must be standardized and the reference recording disc provides a way to do this.

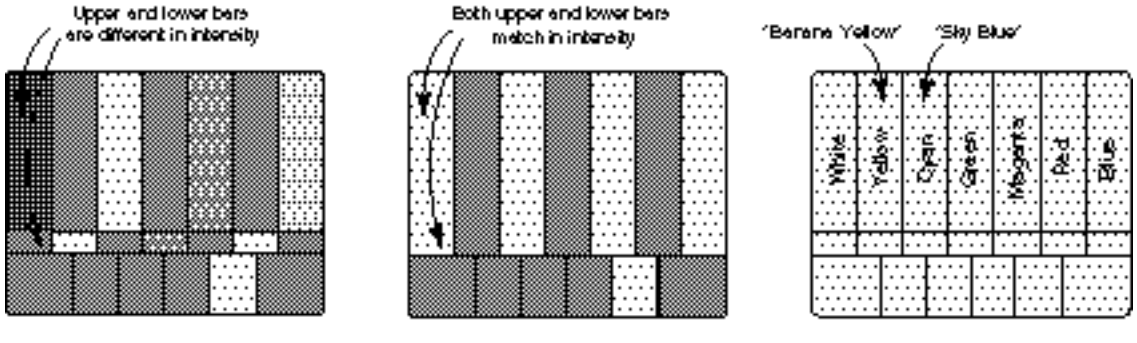
Pull out the blue filter supplied with the disc. The blue filter is designed to block the red and green images so you see just the blue one. Now adjust the color control so the relative brightness of the outer pairs of the large and small bars match in intensity. See the diagram below.

4) Tint Control:

Setting the hue control uses the same pattern as the color saturation adjustment but what you do here is adjust the tint control so that all the bars indicated are the same brightness (see below). When this is accomplished you should find that your flesh tones are right on the money.

5) Sharpness Control:

Adjusting the sharpness control is more subjective than the other controls. In a pure sense you actually want the

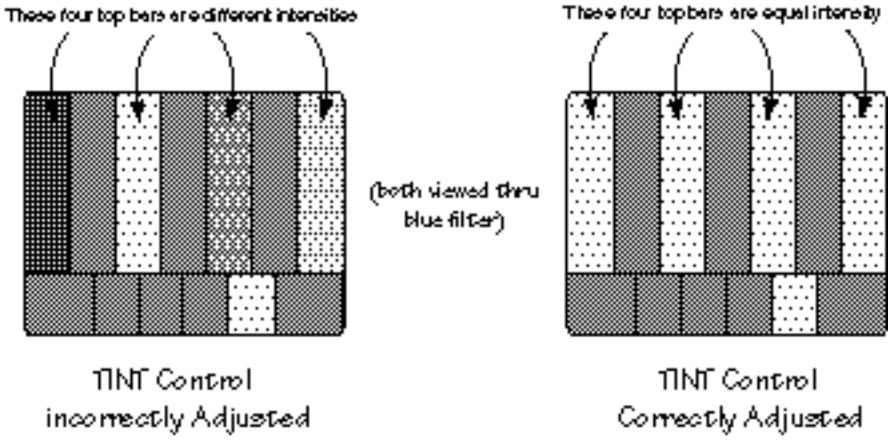


COLOR Control Incorrectly Adjusted (viewed thru blue filter)

COLOR Control Correctly Adjusted (viewed thru blue filter)

COLOR Control Correctly Adjusted (viewed with no filter)

Proper Tint Control Adjustment



sharpness control to be off because it behaves like tone controls on a receiver. (Tone controls distort the audio so it sounds better, *not* more accurate. Video sharpness controls do the same thing but most people simply like the effect they provide; a subjectively sharper image.)
To view what happens with your sharpness control advance the Video Essentials disc to a standard multiburst pattern. You'll notice that the middle bands start to become brighter when you turn the control up. This is because the sharpness control is actually boosting the middle picture frequencies in this area. Well designed picture controls do not boost the higher frequencies because this would boost fine pitch picture noise in addition to picture details.

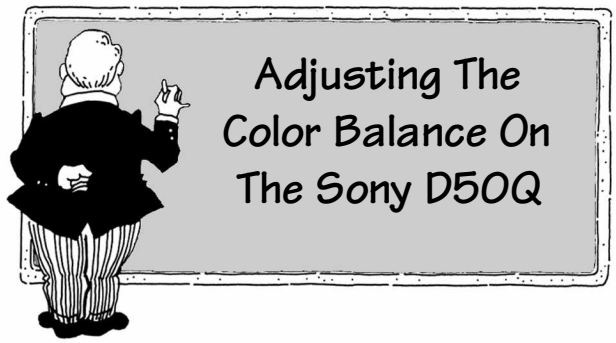
So, how do you adjust the sharpness control? Adjust it for a subjectively best image with least "over-enhancement".

Exactly What Is Color Temperature Anyway?

You have probably seen the term "Color Temperature" all over the home theater consumer press the last few years. Here's what it means: the color temperature is the "color shading" of the black and white portion of a video image. The term color temperature is borrowed from the academic physical sciences and relates to the color spectrum emitted by an object when it is heated to a high temperature. For example, some objects tend to look white/bluish (as in "white hot") and others tend to look red/yellowish (as in "red hot") depending on how much they are heated. Because these objects glow a different color at different temperatures, the term "color temperature" is used.

If you take a television and adjust the user color control to a minimum you will see a picture that seems black and white but really isn't; it is colored ever so slightly. The color you see is determined by the settings of the picture tube's drive controls. These controls can be adjusted so the black and white image is just a little warm (by adding some red) or a little cool (by adding some blue). The resultant image can then be measured with a color analyzer and a specific color temperature given for each setting. The standard color temperature for NTSC broadcast in the United States is 6500° Kelvin.

Most video projectors allow you to change the color temperature internally. This is difficult to do without a reference, however, so we recommend that you only adjust these controls if you are doing fine adjustments.



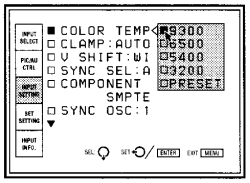
SONY VPH-D50Q

Setting the white balance

1 Press the MENU key, select INPUT SETTING with the ↑ or ↓ key, then press the ENTER key.
The INPUT SETTING menu is displayed.

2 Press the ↑ or ↓ key to select COLOR TEMP, then press the ENTER key.

3 Press the ↑ or ↓ key to select the desired color temperature, then press the ENTER key.



Normally set to 6500.
Select the appropriate color temperature according to your application and the picture source.

4 Press the MEMORY key to save the adjustment data.

Adjusting the white balance

If you wish to make the color of a particular input signal (eg. HDTV system picture) uniform to that of the color monitor, you can adjust the white balance.
Display the same input signal on the projector and the monitor.

Adjusting the black level (BIAS adjustment)

1 Reset the CONTRAST level to 80 and BRIGHT level to 50.
For details, see "Adjusting the Picture Quality" on page 103 (EN).

2 Press the W/B BIAS key.
The PLUGE pattern appears. Press the PATTERN key repeatedly to display the external signal.

3 Press the ADJ R, G or B key to select the color to be adjusted.
When selecting the color, pay attention to the black part of the picture displayed on the screen and note which color stands out compared to that of the monitor.

4 Press the ← or → key so that the black part in the picture on the screen looks the same as that of the monitor.
If the brightness of that part does not look the same as that of the monitor, adjust the other colors by pressing the ADJ R, G or B key and the ← or → key.

5 Press the MEMORY key to save the adjustment data.

Adjusting the white level (GAIN adjustment)

1 Reset the CONTRAST level to 80 and BRIGHT level to 50.
For details, see "Adjusting the Picture Quality" on page 103 (EN).

2 Press the W/B GAIN key.
When the GAIN adjustment is followed by the BIAS adjustment, the external signal appears automatically.
When you start with the GAIN adjustment, the stair step pattern appears. Press the PATTERN key repeatedly to display the external signal.

3 Press the ADJ R, G or B key to select the color to be adjusted.
When selecting the color, pay attention to the white part of the picture displayed on the screen and note which color stands out compared to that of the monitor.

4 Press the ← or → key so that the white part in the picture on the screen looks the same as that of the monitor.
If the brightness does not look the same as that of the monitor, adjust the other colors by pressing the ADJ R, G or B key and the ← or → key.

5 Press the MEMORY key to save the adjustment data.

When using multiple projectors

Input the same signal to the base projector and the projector to be adjusted. Set COLOR TEMP in the INPUT SETTING menu to the same position on both projectors, and then follow the procedures described above to make the black and white colors uniform between the base projector and the projector to be adjusted.

Notes

- When adjusting the white balance, use the external color monitor for the reference of the color.
- To adjust the white balance easily without the on-screen display, press the STATUS OFF key on the remote control or set the STATUS option in the SET SETTING menu to OFF.
- You can adjust the white balance more easily if you set the color level to MIN to display the black and white picture.

NOTES: