Sony 1270Q Setup and Operation Manual

Wes Hill

February, 2002

Sony 1270Q CRT Projector Setup Manual.

Table of Contents:

1. Thoughts and Experiences

I've been playing with this projector for some time now and have come to a few conclusions. First, this is a great projector for the price. Second, electron beam focus is paramount to the quality of the image. And third, the lower the video bandwidth that you put through the PJ, the better the picture will be, relatively speaking.

1.1.   Scan Lines and Resolving Power

There has been some discussion about the maximum resolution that the Sony 1270Q, or the entire 12xx series, can resolve. The resolving power of a CRT PJ is controlled by a lot of factors, but the principal factor on the Sony 1270Q is the electron beam focus. The electron beam is focused by 2 sets of magnets, a 2 pole set and 4 pole set. This isn't the most accurate way to control the electron beam, higher end projectors use a combination of magnets and Electromagnetic beam focusing, which allows for a much smaller beam, allowing for much higher resolutions. This is the reason that some PJ's with the same Sony 07MP tubes that the 1270Q uses can resolve more scan lines.

The projector has a limited amount of phosphor in which to draw the image. The number of lines which can be resolved is, in theory, the phosphor height divided by the beam diameter. This number is the number of lines that the projector can resolve without overlapping scan lines. Anything above this number of scan lines will not be resolved and the picture will begin to appear soft.

Ideal Situation (0 overlap, 0 gaps)

Scan Line

Excessive Scan lines (overlap)

Scan Line
Overlap
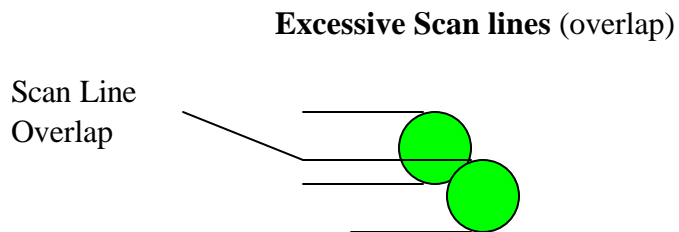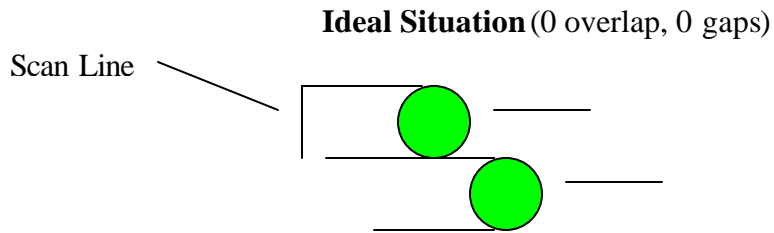
Some people prefer this "soft" picture, but I have found that 600P-666P looks very sharp and 3 dimensional. Keep in mind that when displaying 16:9 material, you are using a smaller phosphor area than a 4:3 image and therefore can resolve 25% less scan lines.

With my projector setup the best that I have been able to do, it can resolve 666 scan lines or 666P. I can see scan lines if I am less than about 6 feet away from the screen and the picture is very sharp. I have run at 540P, 600P, 666P, 720P and 768P, with 666P being the highest resolution I can make it resolve. There has been some discussion on the AVS Forum which gives a mathematical solution to this exact topic with the verdict being about 600 to 700 scan lines being the maximum (in 16:9 mode). This depends on a lot of things, one being how close the projector is to the screen (this is covered later).

1.2.   Refresh Rate

Most of the video material which I watch, and that most people watch, is DVD. This video material has a native refresh rate of 23.997 frames per second, or fps. The logical, and best way to display such material is at some multiple of the native refresh rate. This refresh rate is the equivalent of a computer monitor refresh rate. Naturally, one would think that a higher refresh rate would be better. Most people run their HTPC refresh rates at 72 Hz, or 3 times the video fps. What some people, including me, are doing now is running the refresh rate at 48 Hz, or 2 times video refresh rate. If you are familiar with computers you know that 48 Hz looks terrible on a computer monitor, very flickery. I believe this is due largely due to the properties of the phosphor of the computer CRT monitor. The computer monitor phosphor returns to it's non-excited state very quickly and therefore goes from light to dark very quickly and hence the appearance of flicker. Movie theatres (also 48 Hz, I believe) are different than this as they are passing light through a translucent media and therefore doesn't appear to flicker very badly. A CRT projector (well, Sony 12xx anyway) seems to be somewhere in the middle, as 48 Hz refresh does not flicker, with the exception of a bright static windows desktop. We all know that a bright static image on a CRT projector is a very bad thing to do, so in my opinion is a moot point.

The result of running a lower refresh rate is a lower video bandwidth going to the projector. With all of the electronics being taxed so much less (1/3rd less), they operate in a more predictable and stable fashion, resulting in a more stable, higher quality image. When I first ran my Sony 1270Q at 48Hz, it was the first time I had really seen the 3D effect that I hear people with higher end projectors speak of. The improvement was drastic and my opinion of my projector increased drastically also. Any of the problems I had before with drifting convergence and a flickering Red tube disappeared completely.

1.3   Screen Size

The output of the Sony 1270Q is noted to be 650 lumens, or about 200 ANSI lumens. ANSI refers to a measurement standard, eliminating the bogus values you sometimes see in literature. I've read that a screen brightness of 10-12 foot lamberts is a good value to shoot for, giving good brightness in a light controlled environment. The calculation of this is quite simple:

Ft – Lamberts = (ANSI lumens * Screen Gain) / Screen Square Feet

Example: My Setup (200 * 1.3) / (45/12 * 80/12) = 10.4 ft-lamberts

As you can see, my screen/PJ is on the low end of the brightness spectrum, so to speak. I would really like to go to a 54 x 96 screen, with a 1.5 gain screen material. I've been looking at screen materials and have seen absolutely no hot spotting and a very wide field of view with a Stewart 1.5 gain. This will be my screen of choice with my new projector, which will be a 9" with at least an output of 275 ANSI lumens to reach 11.5 or so ft-lamberts.

2. Projector Setup

There are at least five major/separate general setup procedures. They are as follows:

- Mechanical Setup
- Electron Beam Focus (astigmatism)
- Mechanical and Electrical Focus
- Geometry adjustments / Convergence
- Grey Scale (I won't touch this one)

Optimizing each of these in the order stated will result in the easiest, and I believe the best setup (with my limited knowledge and skill).

2.1. Mechanical Setup

Setting up the projector physically is likely the most important step in setting up a CRT PJ as the quality of all subsequent setup hinges on this.

2.1.1. Throw Distance

First, the proper distance must be determined. PJCalc (use version 1.8) will give you the throw distance for your PJ for whatever screen width you desire. The consensus with most Sony 12xx owners, the people who set them up and me is that 80″ wide is about as big as you should go, without sacrificing brightness and sharpness. This results in a throw distance of approximately 109″ from the screen to the green tube.

I've moved my projector closer to the screen to use more of the phosphor area. This gives a brighter image and allows for a larger number of scan lines to be resolved. The following is the method I used to maximize my phosphor use:

- Set the projector on a table
- Center the image on the green (see later notes)
- Project an image with the projector
- Set it up roughly (focus)
- Cut off the red and blue tube (as you move the PJ they'll need to reconverged anyway)
- Look into the lenses and set the width of the image so it's close to the edge of the phosphor area. Ensure you have at least 1/4″ of unused phosphor on each side.
- Move the projector so that the image fills the screen with a slight amount of over scan; say 1″ on edge side of the screen.

- Measure the distance from the green tube to the screen or wall, this is your projection distance.

2.1.2.Mount Setup

This second order of business is to get the projector pointing in the right direction. There are a few parameters which need to be addressed. The PJ needs to be pointing perpendicular to the screen horizontally and vertically, if a standard setup is being used. Using the focus techniques described later, you can point at different angles, if you like. I use a 4' level on top of the projector (hanging from the ceiling) to ensure that the PJ is level. This, of course assumes that your screen is vertical. Next, you need to ensure the green tube is projecting and image perpendicular to the screen. The way I do this is to measure from the wall to the center hole in the bottom of the projector. Next I mark the front and rear of the projector along the center line. I ensure that both of these marks are the same distance from the side wall. I also mark this same distance on the screen or screen wall. With the cross hair test screen projected from the green tube only, (ensure you center it on the phosphor with the lens removed prior to all of this, this is included later) ensure that it hits the wall on this mark. Fine tune as needed. The projector should now be set up reasonably well. The success of this all hinges on whether your walls are straight and square. I don't know of a better way to do this.

2.1.3. CRT Mechanical Setup

An important part of the setup process is getting the CRT's all centered at the same point on the screen. My method of doing this is to pull all of the lenses off of the PJ. Next, place some scotch tape on the CRT face along the center of the face in both directions. Mark the center of the CRT face on the tape.
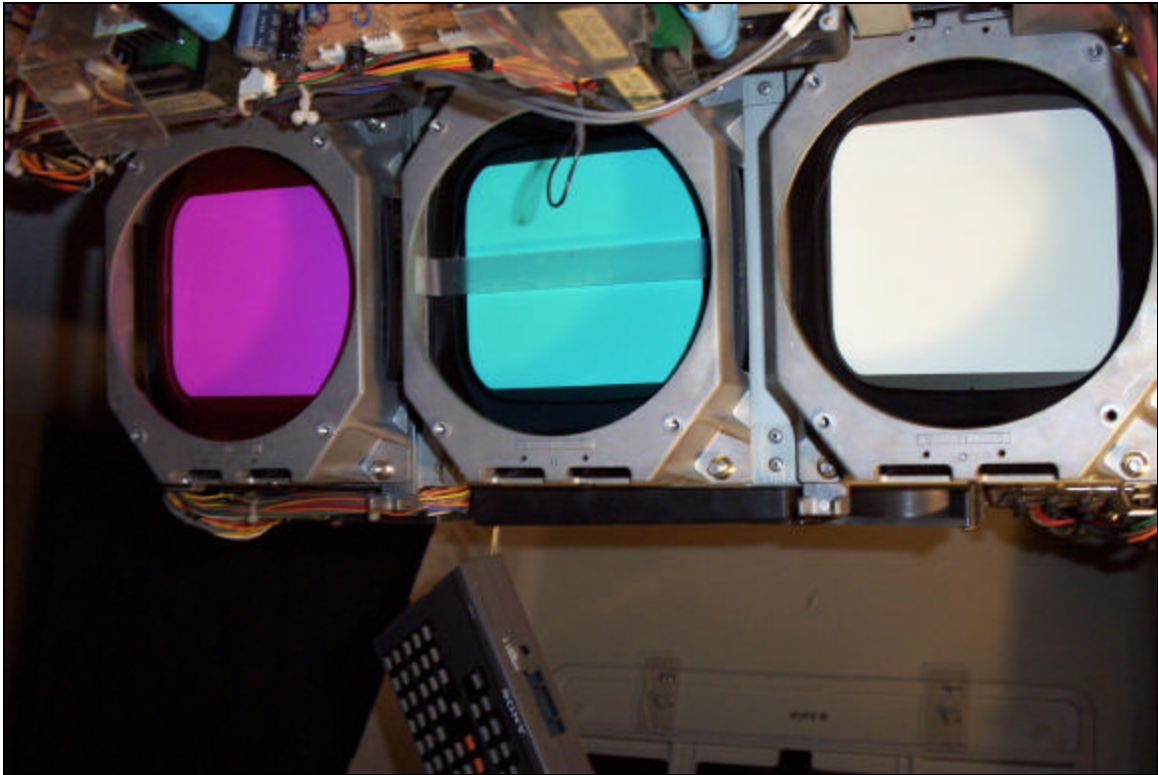
Now project the cross hair pattern and center it to these marks (you may have to use the zone control as it gives a greater range of adjustment). Turn the brightness and contrast down so you don't go blind in the process. Save this as data for all inputs (hold the MEMORY key down for about 10 seconds). Remove the tape from the CRT faces, clean the faces and re-install the lenses. Now, bring the brightness and contrast back up (50 contrast, 80 brightness) and project the cross hairs onto the screen. You'll

likely see that the tubes do not line up at all. The green tube is your point of reference and should not be moved at any time.

The red and blue tubes need to be pointed so that the centers of the cross hairs line up as closely as possible. This is where things start to get difficult. Skip ahead to the focus section for more info on this.

2.2   Electrical Adjustments

### 2.2.1   2/4 Pole Adjustment

The magnet adjustments are done by moving the plastic tabs on the following picture. If they've never been adjusted before, there will be white paint holding them from moving. Grab a razor blade and cut the paint.

Very Important Note: there is lethal voltage in here, be very careful.
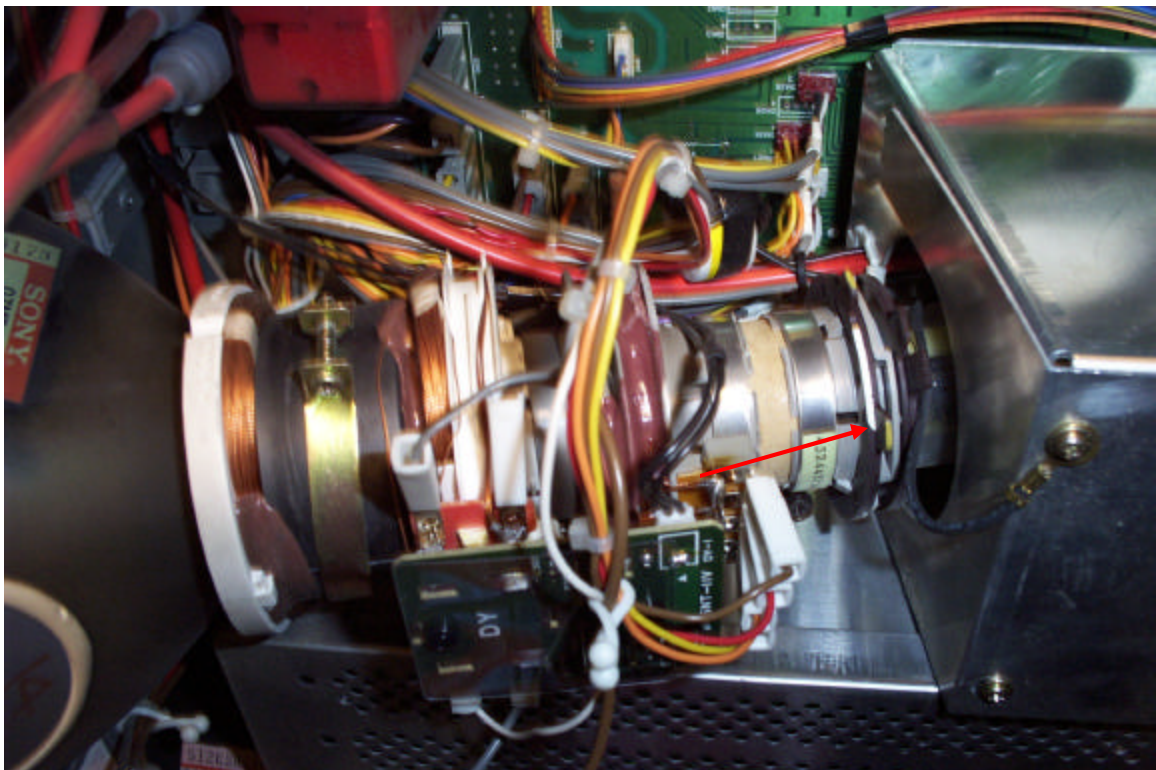
The 2 – Pole Magnet Adjustment

- select an input with nothing attached
- get in service man mode
- press RESET and set contrast to max and brightness to 50
- press test and get to the crosshair pattern
- cut off the CRT's that you aren't adjusting
- rotate the focus slightly counter clock wise from perfect focus
- adjust the 2 – pole magnet (rear) so that the luminance point lies in the center of the flare
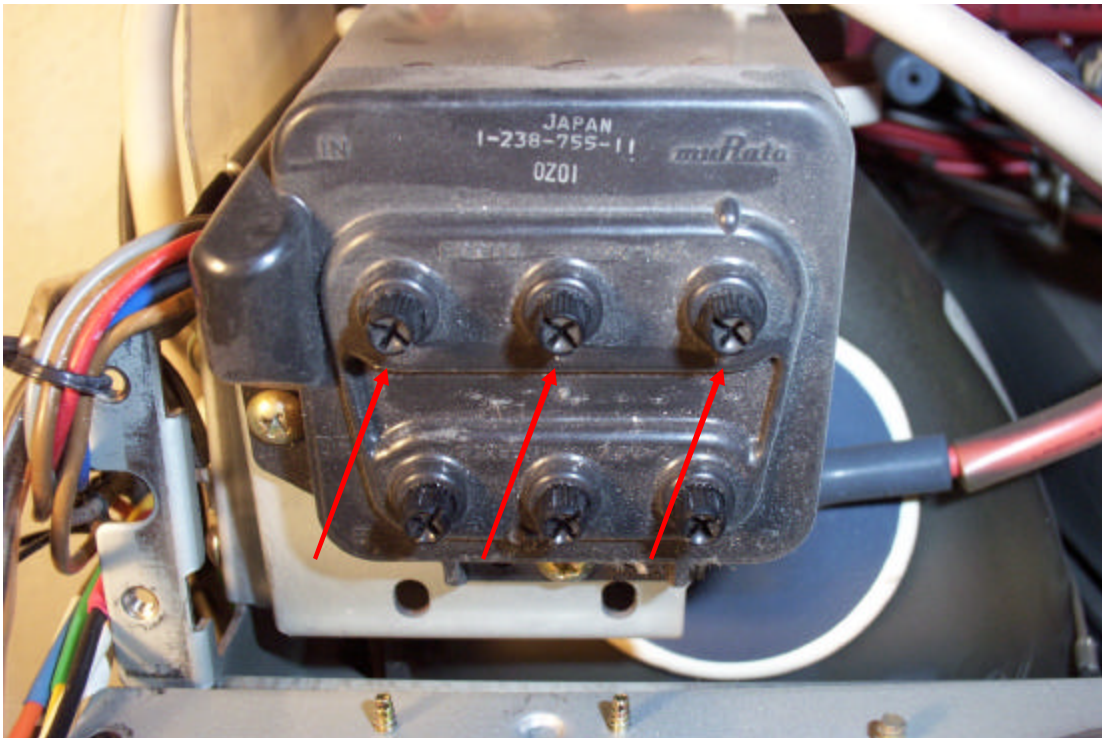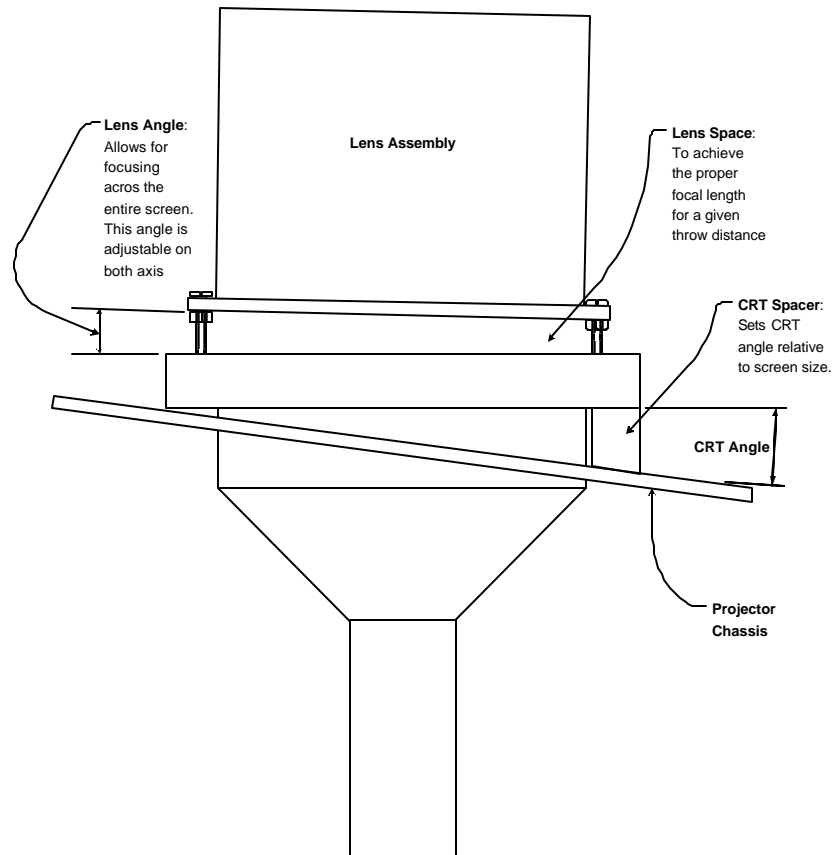

The 4 – Pole Magnet adjustment

- Output the dot pattern
- Rotate the focus to just clockwise of perfect focus
- Adjust the 4 – pole magnet (front magnet) so the dot becomes round

2.3   **CRT PJ Focus** by Me, Wes Hill

I've focused my PJ as best as I can…well for a while anyway. I've gotten it so that I can distinguish the individual dots of the internal focus test pattern (little H's) on all tubes and in all corners. This has translated into seeing scan lines at 1184 x 666, even in the corners. I'm very impressed with the picture this PJ puts out now. I'm going to give what I believe to be a simple description of my focus technique. Keep in mind that any terminology I use isn't any kind of standard, it's just what I use for myself.

Lens Angle: Allows for focusing acros the entire screen. This angle is adjustable on both axis

Lens Assembly

Lens Space: To achieve the proper focal length for a given throw distance

CRT Spacer: Sets CRT angle relative to screen size.

5

CRT Angle

Projector Chassis

To get the mechanical focus perfect there are a few things that need to be adjusted accurately. *First*, the actual CRTs must be pointed at the correct spot. This correct spot is a point at which all 3 tubes, with the crosshairs centered on the phosphor, come together. The Red and Blue CRTs come equipped with grey cast metal spacers which come in 3 sizes, S, M and L.

The idea is to more accurately point the Red and Blue CRT's (CRT Angle) so that these crosshairs line up without any electrical adjustments.

Second, the optical assembly must be placed at such an angle (Lens Angle) that the light travels equidistant to the screen from left to right. Top to bottom adjustment is handled within the optical assembly but we can improve on that too.

So, essentially, we must adjust the Lens Angle (by adjusting the Lens Space) and the CRT Angle (by adjusting the CRT Spacer). These are not adjustments for the timid so please be prepared to open a very large can of worms if you start this. I really can't stress this enough.

The problem with the factory system is that it is designed for a range of screen sizes. If you want perfect focus, as most of us do, this is unacceptable. The thin plastic spacers (blue arrow) are designed put the CRT face at certain distance from the lens to provide the proper focal length for the optical system for the screen size/throw distance.

I've come up with a simple fix that will allow for very fine adjustment of lens flapping, but will take significant amount of time to set up as installation will be difficult and adjustment much more difficult. A second person is definitely a good idea.
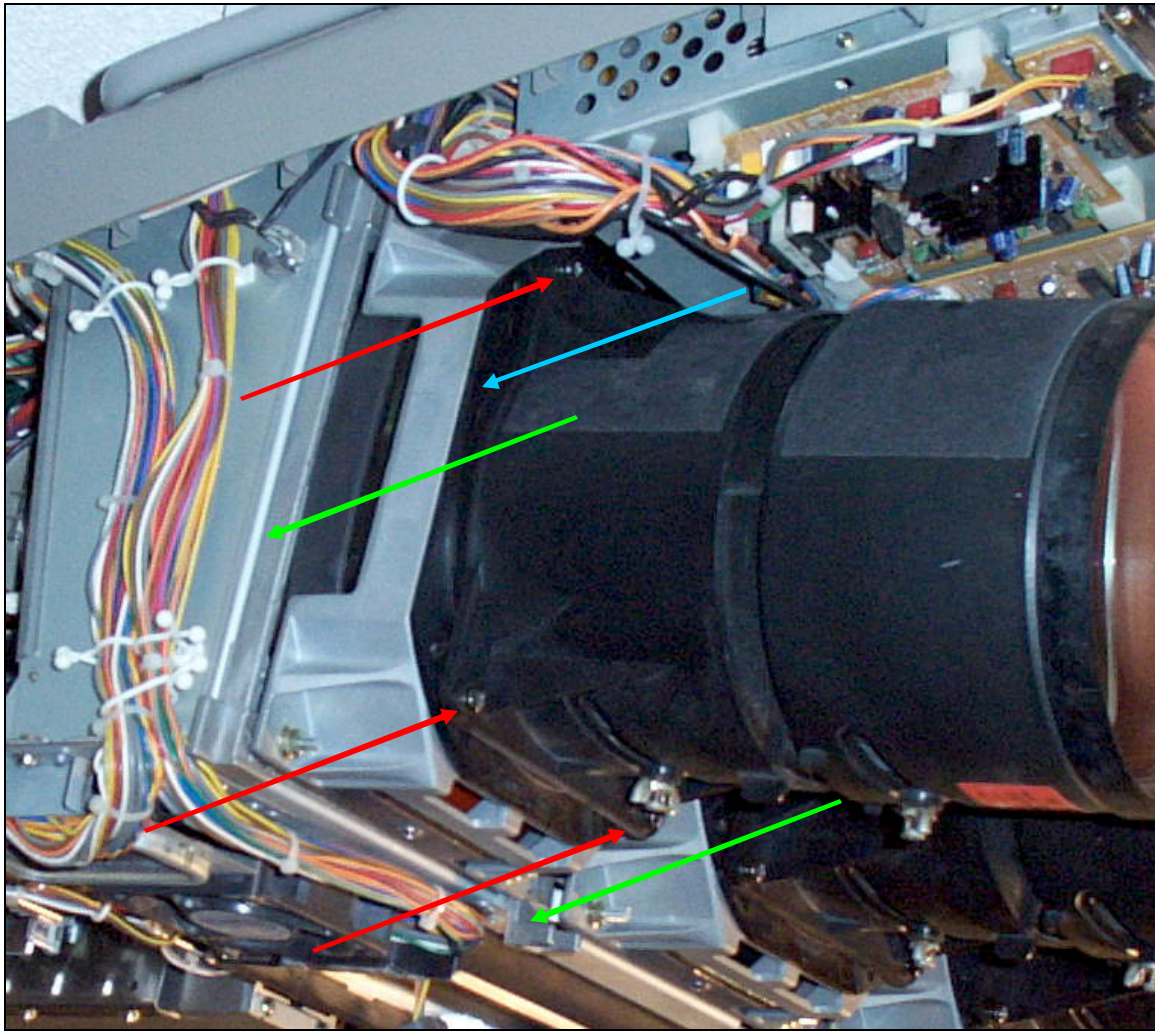
What I have done is replace the spacer with bolts and nuts at each corner. The drawing above should give a good graphical description of this. Essentially, by turning these bolts in and out you can adjust each corner of the lens individually. There are inherent problems to this design though: you must make sure you don't adjust 1 corner too much or the lens case tabs can be strained or even broken. Also, the spacers must be removed as they are now useless. Further more, you must adjust the large spacers (green arrows) in concert with the goggle flappers in order to keep the image centered. This is no easy task and will take many hours. It has for me but as time goes by I'm getting better.

The following is a drawing of the "Goggle Flappers".

Sony 1270Q Lens Flapping Adjusters (Scheimpflug) "Goggle Flappers"

25.00

5mm.

Lock Nut (Teflon insert)
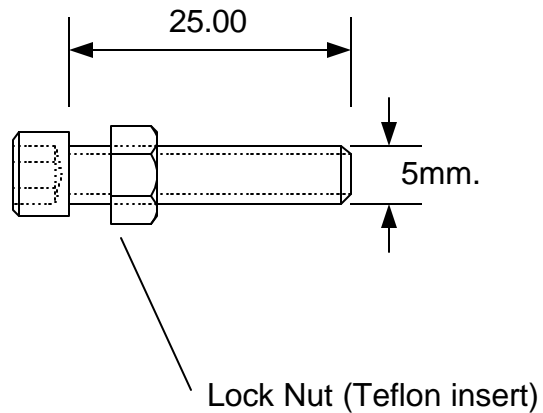
The thickness of the nut must be somewhat less than the spacer you removed. This will ensure that the proper amount of adjustment is possible.

Material List:

    12 – M5 x 25 mm allen head bolts

    12 – 5 mm Lock Nuts nuts

    1 – Very long 5 mm allen key, some ingenuity will be needed here, you likely wont find a 11″ long allen key at Home Depot.

Installation:

    1. Measure the spacer between the lens base and the lens case tab (red arrow below, Lens Space in drawing above).
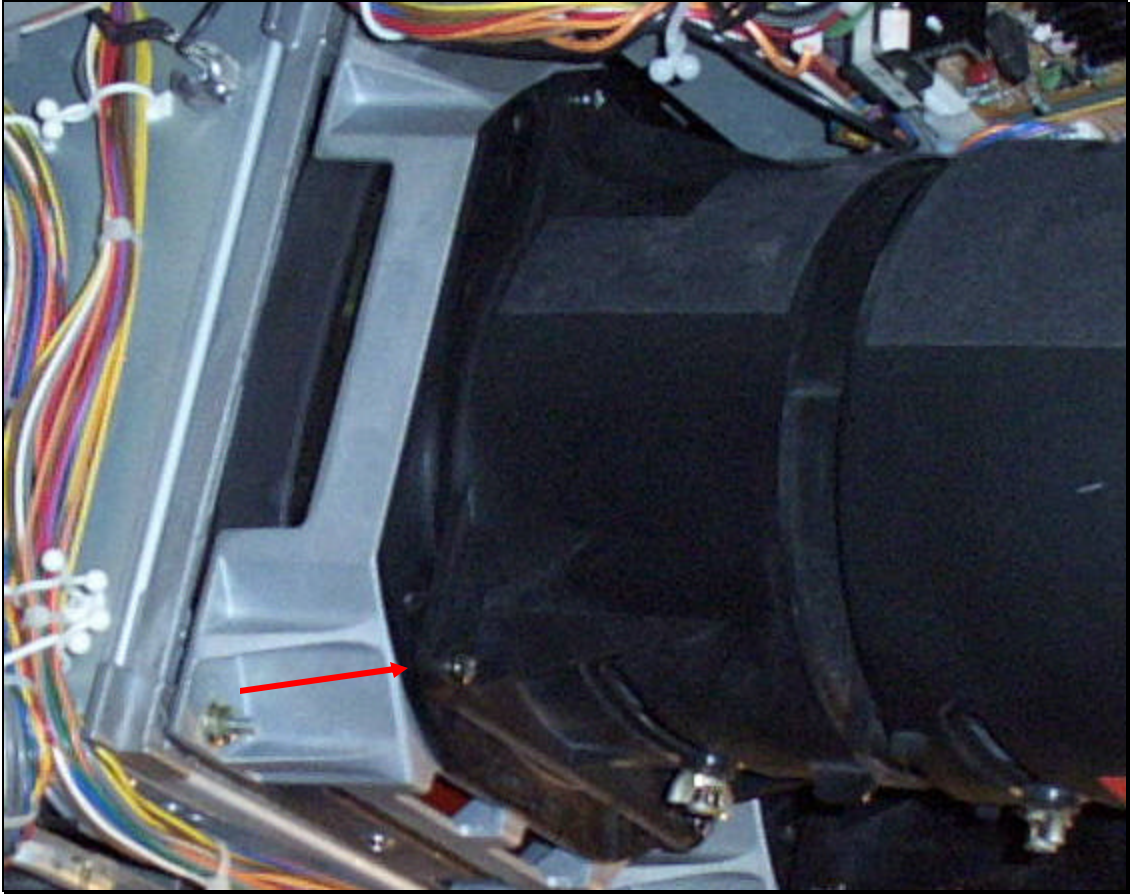
2. With all of the lenses removed, install the nuts and bolts. Install them on the lens, leaving the tiniest bit of play so that the lens case tabs can move slightly without having to flex.

3. Start with the installation of the green tube. Have someone help you install these as you'll only be able to thread each bolt in a few turns at a time. Thread each in until you are approximately the distance you measured before (spacer thickness). It's likely easiest to go ahead and fire up the PJ and focus the green tube now.

Prior to adjusting the lens flapping, I place the front most lens adjustment in the neutral position and focus the center of the screen. Then I begin moving the lens slightly in one direction and refocus, noting how the focus has reacted. After a few tries you'll get a feeling of which way you need to move it relative to your focus problem. It took me about an hour to get the focus

equal across the entire screen. Once you get it equal across the entire screen, you can continue with electrical focus refinements as well as further astig adjustments. Follow this with astig and electrical focus and you will be able to see every dot of each H on the focus pattern across the entire screen. The resulting picture will amaze you!

Here's a picture of the completed install:

2.4   Convergence

There are at least 2 convergences you must do when setting up your PJ. The first applies to all inputs and must be done when there is no input attached to the PJ. The second is for a particular input/bandwidth. The memory structure of the Sony PJ's is such that it automatically saves the convergence for a range of bandwidths, for example 21 – 31 kHz. Any image refresh /

resolution combination that results in a bandwidth in this range will have that convergence information applied to it.

It is very important to get as good of an initial convergence as possible without using the zone controls. This will lead to a more stable convergence in the long run. With a bit of practice and after getting used to your PJ's particular idiosyncrasies, convergence becomes a relatively easy process. Trust me; you'll do it so many times that it'll become second nature. For instance, my PJ has a problem with the blue in the lower left and red is poor in the upper and lower right. I have to use the zone controls fairly extensively to get these areas acceptable. Anytime you mess with electronic focus or astig, you'll need a total re-convergence. Don't worry, it gets easier. Even though sometimes it feels like you've taken 1 step forward and 2 steps back, sooner or later you'll see the light at the end of the tunnel. Really, you will ;-)

2.4.1   Initial Convergence

Make sure you have no input attached to the PJ.
- Press and hold the test key until the PJ asks if you want to enter MAN mode.
- Press the up arrow to agree.
- Press the test key until you get the crosshairs

There is a particular order you must adhere to when converging. The first adjustments you must do apply to only the center axis (the horizontal and vertical lines on the crosshairs). These adjustments are SIZE, LIN (linearity), BOW and SKEW.

The first thing you have to do is get some of that low tack blue masking tape. What I do is mask 5 lines vertically and 3 horizontally as in the figure below.
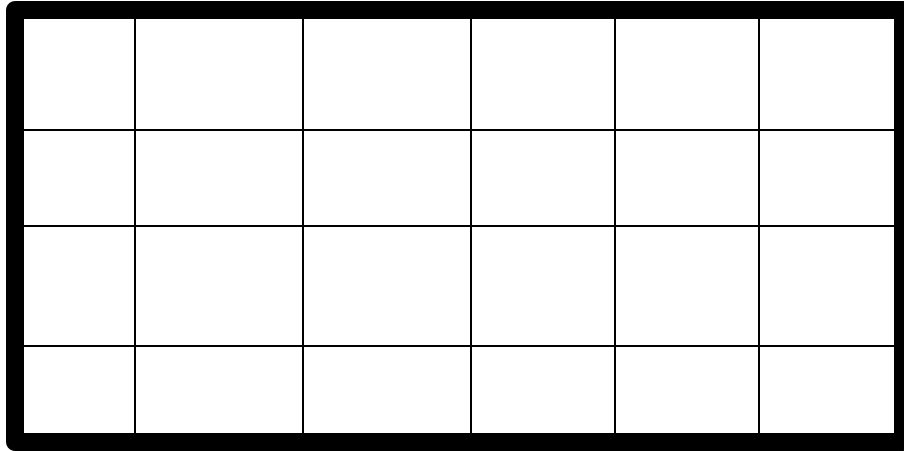
Make about 6 or 8 marks with a sharpy on each of the lines, measured a constant distance from the edge of the screen. It's really hard to see your blue test pattern on blue tape, hence the marks ;-)

Since you have the crosshairs test pattern up, hit the cut off for red and blue. Make sure you hit the ADJ key for the green. This will allow you to see the green only; the red and blue will be referenced to this later. Center the green, although this should be done already. Now go to work on the SIZE and LIN adjustments, you'll find you'll adjust them both at the same time. You'll likely want to bump the BOW and SKEW adjustments, feel free, all of these adjustments can be done in any order. Keep in mind that these settings are for the horizontal and vertical lines of the crosshairs only so only display this test pattern.

Hit the TEST key and display the cross hatch pattern. Now you can move onto the PIN and KEY adjustments. Have fun, by now your eyes are probably getting pretty buggy. The key is trying to get geometry as good as possible. Keep in mind that you should do any ZONE adjustments which are needed now for the green in order to get the best geometry possible.

Once you've got the green to a point where you're happy, move onto the red. To do this hit the ADJ key for the red tube. Now ensure that the green and

red tube are on, cutoff the blue. Now adjust the red in the same order you did the green. You want to have a yellow grid. If you find that you can't get a corner, try to balance that with another corner, you know, try to split up the problem over two areas, this way you require less ZONE convergence. Finish up with zone convergence.

Do the blue and you're done, for now…

Press and hold the MEMORY key until the PJ asks if you want to save this data for all memories, hit the up arrow to agree.

2.4.2   Individual Input Convergence.

Now, with the proper input selected and being displayed, go into the MAN mode and repeat the above adjustments until the convergence is perfect. I seem to find that I have about 3 areas on the screen that are a problem. As I get used to my PJ's problems they seem to get better.

2.5   Setting the G2 Adjustments

I've taken these notes from 2 threads b/w Eric van Ballegoie and Chuck Williams. With this set up properly my picture got a lot better. It' amazing how black the blacks can be with the screen still being bright. Sure makes DLP's look funny ;-)

Keep in mind that your grey scale will be messed up after you do this so continue knowing that it'll have to be reset. This is impossible to do accurately yourself and expensive to get done professionally.

NOTE: This is slightly different on other 12xx series PJ's

1. Set brightness and contrast
    - Brightness: 50
    - Contrast: 80
2. Disable the AKB (Auto Cathode Bias)
    - On the CF2 board there is a connector with only 2 pins
    - Short these pins
3. Call up the pluge pattern (-5 IRE, 0 IRE and +5 IRE)
4. Set the Bias and Gain to factory defaults if possible
    - Press the right and left arrow at the same time
    - Else, set Bias to 140 and Gain to 180
    - Adjust the bias to make the +5 IRE barely visible in each color
5. Enable AKB
6. Reset Gain and Bias controls for proper grey scale. (such a short sentence to describe such a major procedure ☺)

Note: be sure to turn the status display off while making these adjustments.