G2 Adjustment Procedure

Concept What you are doing here is setting the bias levels for the CRTs' grid no. 2, hence the name "G2."

Control Locations The G2 adjustment pots are located on the "G2 + Diagnostics" module; it's the one with the row of LEDs.
The end stages have an Automatic Black Level (ABL) circuit, which will need to be defeated for this adjustment. The end stages are the driver amplifiers attached to each CRT neck.

Procedure

- Feed the projector a composite video signal (NTSC or PAL) with a black image (aka "raster.")
- Using the IR remote, set BRIGHTNESS, COLOR, and TINT to 50 on the bar graph.
- On the Adjust menus, go to Random Access > Selected Source > Color Balance > User Black Balance. Set the red and blue cutoffs to 50 on the bar graph. Back completely out of Adjust mode. Set CONTRAST to 0 on the bar graph.
- Defeat the ABL on the end stages. Next to where the small co-ax goes into the end stage, you will notice a pair of pins sticking through the metal housing. Short these pins together using a 0.100-inch header plug of the type commonly found in computer equipment. It's OK to do this with the projector running.
- Look directly into the red lens. Adjust the red G2 adjustment pot until you can just barely see the raster above the background blackness. Repeat with blue and green. The goal is to get the same (negligible) apparent light output from each of the CRTs. The exact level isn't all that important, but it is critical that they be the same.
- Don't forget to remove the ABL jumpers when you're done!

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Global Magnetic Focus Alignment Procedure

Concept What we are doing here is focusing the electron beam on the face of the CRT. There are no optics involved. Having said that, it is convenient to do this after a quick optical focus adjustment. (Just to be able to make the adjustment and see the results at the same time.)

Control Locations There aren't really any controls as such, but the focus is adjusted by sliding the focus yoke fore and aft along the CRT neck. *The focus yoke is the yoke located farther away from the face of* the CRT. At the moment, it is made of brown plastic and has small wires to it. It is clamped to the CRT with a hand-turnable screw. Do **not** confuse it with the deflection yoke!
The optical center-focus adjustment is the thumbscrew on the lens closer to the CRT face (but you knew that).

Procedure

- Feed the projector any composite video signal (NTSC or PAL).
- In your darkened shop, get the best optical center focus you can on your screen (or wall).
- Go to Adjust mode and select Random Access > Genlocked Pattern. Find any adjustment that will let you see an unobstructed raster of all the colors. Not necessarily all at once, but you will need to see all the colors one at a time.
- While displaying a red grid (if other color(s) are present, put the caps on the other lens(es)), loosen the screw on the red CRT's focus yoke and slide it fore and aft (don't rotate) to obtain the best *focus at the center of the image. Tighten the clamp, only enough to prevent the yoke from moving.*
- Repeat for green and blue.
- Exit completely out of the Adjust mode.

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Digital Dynamic Astigmatism (DDA) adjustment procedure

Concept Dynamic Astigmatism is a way of adjusting the shape of a spot over various areas of the screen. This will help to assure that vertical and horizontal lines will be the same width, and that spots will be round rather than elliptical.

Control Locations Happily, this can all be done from the IR remote. The procedure is similar to convergence, in that you Select an area of the screen and then Adjust it.

Procedure

- Feed the projector a composite video signal (NTSC or PAL). Content does not matter.
- Go to the Adjust mode. Under the Service menu, select Dynamic Astigmatism (last item). Pick your first color under Genlocked Pattern.
- Set the CONTRAST and SHARPNESS controls on the remote to maximum. The SHARPNESS control is actually adjusting midpoint magnetic focus for this adjustment only, but it will revert to where it was once you exit.
- On the first area (center right), adjust the diagonal astigmatism using the left-right arrows or joystick. You are looking for the spot to be straight up and down, not "leaning" to one side. Adjust the axial astigmatism using the up-down arrows or joystick. You are looking for the spot to be round (as opposed to elliptical).
- Repeat for all areas of all colors.

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Setting the raster width coils

Concept The overall widths of the red, green and blue rasters are set with variable inductors, one per color. The Barco 1208 has two sets of raster width coils, one for low band and one for high band, for a total of six coils that need to be set. Low and high bands refer to horizontal scan rates. The changeover point is approximately 72 kHz -- signals with horizontal scan rates below that fall in the low band and those above are considered high band.

Control Locations There are two sets of controls we will be using for this: the width coils themselves and the sub-horizontal-shift pots. The coils are on a circuit board attached to the inside of the hinged metal cover over the CRTs. Of the two covers, it is the one closer to the lenses. It is secured with three clamping screws (7mm socket) on each side, and three quarter-turn screw fasteners across the projector. The six coils are labeled on the circuit board as "R," "G" and "B" and as "high" and "low." The horizontal shift pots are on the Mag Focus/Horizontal Shift module under the other hinged cover. This is the module with the tan fibre-board cover, with two trimmer pots peeking through a notch. If the projector is on a table with the lenses pointing away from you, it will be the leftmost module. The access cover is secured with three clamping screws (7mm socket) on each side, and three more across the back of the projector.

Procedure

- Feed the projector a signal that is unmistakably low-band -- say, a 640 x 480 computer signal, or even composite video. *If possible, generate a white field, or at least something that has all three* colors edge to edge.
- From the IR remote, set the horizontal size (in the Geometry menu under Random Access) to 50 on the bar graph scale. Then go to the Installation menu and step through until you get to the "raster centering" step. Set each color's horizontal position to 50 on the bar graph scale. Exit completely out of the adjustment mode.
- Using a plastic "tweaker" tool (NOT a metal screwdriver), turn the slugs in each low-band coil fully clockwise until they bottom out. **Don't** use too much muscle, because it's possible to break things. You'll find that one of the coils is already bottomed out. And please, make sure you've got the right set of coils (high or low -- they are labeled on the circuit board).
- Using the horizontal shift pots, move the red and blue rasters until one edge is aligned with that of the green raster. Note which color has the smallest width, and adjust the other two to be the same width by turning their coils' slugs counterclockwise. You'll have to juggle the shift pots at the same time, because once you adjust the widths the edges will move.
- Repeat the above steps with a high-band signal, i.e. something with 80kHz or more scan rate. *You'll most likely have to use a test generator, as very few computers put out anything this high* and it's unlikely you'll find one at a job site. If your customer will **never** have anything above 72kHz, you may consider skipping this part; it's a judgement call, but it would be The Right Thing to do it anyway.

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Just a few notes on terminology...

When I say an adjustment is **global**, that means it affects the projector for all sources and circumstances. This would include things like the optical focus of the lenses. Once you focus a lens, it doesn't change until you go back and readjust it.

The converse of **global** would be **by source**. Most of the parameters you can adjust on a Barco projector are stored separately for each video format. This includes things like convergence settings, image size, etc. This is a nice feature to have because you can set the parameter individually for each source. On the other hand, you **have to** set the parameter individually for each source.

Some adjustments come in **static** and **dynamic** varieties. Chief among these are magnetic focus and convergence. **Static** adjustments affect the entire screen at once, although they still may be **by source** or not.

Dynamic adjustments can be made to individual regions of the screen. Convergence is a good example of an adjustment which is both **dynamic** and **static**, as well as being **by source**. Static convergence simply shifts the entire red (or blue) raster up/down/left/right. This is the adjustment you are making when the box is in the center of the screen under the Convergence menu. On the other hand, dynamic convergence actually alters the shape of the red (or blue) raster. When you do a Convergence adjustment, you are doing a dynamic adjustment when the box is in any of the 24 other screen regions (other than the center). Convergence settings are stored separately for each source, as discussed above.

Most dynamic adjustments are by source, such as convergence. Sometimes, however, an adjustment is both **dynamic** and **global**. A good example is Dynamic Digital Astigmatism.

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The Barco projector's block memory: How does it all work?

Like any modern CRT projector, the Barco 1208 is digitally controlled to the maximum extent possible. The 1208 stores picture settings - the ones that are by source - in nonvolatile memory and recalls them based on the input signal. Settings that are global are also stored, but do not change from one source to another. Unlike some other brands - Sony comes to mind - you do not need to "save" your changes. Any adjustments you've made are saved automatically once you Exit completely from the Adjust mode. This is a mixed blessing; you don't have to remember to save, but on the other hand if you get it all cocked up you can't say "no, forget it."

Parameters that are stored by source include:

- Scan configuration - floor/ceiling/front/rear;
- Horizontal and vertical scan rates for this source;
- Dynamic focus;
- Geometry - bow, keystone, linearity, etc.;
- Convergence settings;
- Color balance;
- Size, position and blanking;
- Picture controls - brightness, contrast, etc.;
- Input number.

There are probably more, but that's all I can think of right now.

Each set of values is stored in a group of locations within the projector's memory, and is called a "block." The Barco 1208 can store up to 32 blocks.

The last item on the list above bears closer examination. The term "input number" can mean one of two things. For a stand-alone projector, it refers to the "port" as shown on the back panel: port 1 is encoded composite video, port 2 is SVHS, port 3 is TTL, port 4 is RGB (sync on green), and port 5 is RGB (separate sync). Simple enough. However, if you're using a Barco video switcher, such as an RCVDS or a VS-05, with the projector, the "input number" stored in the block refers to the **switcher's** input number.

This may seem like a minor distinction, but consider the situation of one customer I had a couple of years ago. He had a software demonstration lab with a Barco projector and an RCVDS with all slots filled. This lab contained a Sun, a unix laptop, two different resolutions each of Macintosh and PC, composite video and a line doubler. The user wanted to be able to display any of these on the screen at any time. But the way the original installer had set up the system, each RCVDS input was brought out to a connector plate under the floor. Apparently the idea was that the customer would be able to move computers around easily, plugging them into different inputs as the occasion demanded.

A good idea, but here's the problem: With the 10 different types of video signal and 10 possible places to connect them, that makes 100 combinations. Because the Barco projector stores the **input number** as part of the block, it's obvious that we will run out of memory very soon. We need 100 blocks, but we only have memory for 32.

What I do to get around this is to use a third party (non-Barco) video switch. In a situation like the above, one approach would have been to use a 10-input RGB switch connected to the projector's RGB input (port 4 or 5), with perhaps a second switch to route one of 10 composite video inputs to the

projector's composite input (port 1 or 2). The advantage to this approach is that now the projector considers any RGB signal to be on the same input (4 or 5), and any composite source to be on "input" 1 or 2. In the example above, we now only need 20 blocks instead of 100.

Just something to think about when planning your installation.

The 1208 offers a couple of options for moving and deleting blocks via the IR remote. If you press Adjust and select the Service menu, you'll see that two of the options are Delete A Block and Copy A Block. Here is how they work.

- **Delete A Block** - First of all, be careful with this! You can blow away all your hard work with the press of a button! Having said that... When you select the Delete A Block menu item, you are presented with a listing of the main parameters of the current block. That would be the scan rates, the block number, and the scan configuration. By the "current block," I mean the block whose settings are now in force for the source currently being displayed. By using the arrow key or joystick, you can select other blocks. When you get to the block you want to delete, press Enter. The projector asks you to confirm by pressing Enter again, and then deletes the block. **You have now destroyed a group of settings.** The main thing I use this function for is to free up memory, or to delete things that are obviously spurious, such as the factory-preset PAL blocks when I'm in an NTSC country.

- **Copy A Block** - Again, be very careful using this function. From the menu display, it's not clear how the Copy function works - but here's the deal. As with Delete (above), when you select the Copy A Block menu item you are presented with a listing of the main parameters of the current block. Also as with Delete, you can scroll up and down to look at other blocks. But with Copy, when you press Enter the block being displayed on the menu screen is **copied** to the current block. This has the effect, of course, of destroying whatever settings were in the current block.

  The Copy function is mainly useful for situations where you're using a Barco input switcher, and you have the same signal format on more than one input. For example, you may have a camera on input 1 of your RCVDS, and a VCR on input 2. The low-effort setup procedure would be as follows:
  - select input 1 (the camera);
  - tweak the projector for the camera;
  - switch to input 2 (the VCR);
  - use the Copy function to copy the camera's block to the current block;
  - make any fine adjustments needed for the VCR.

  This saves you from having to do the whole thing over again for the same signal on a different input. If you're using a non-Barco switcher, e.g. to route several of the same type of computer to Port 4, the projector considers them all to be on the same "input," so it uses the same block for all of them and the above is not necessary.

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Some notes on color balancing

Like so many other projector adjustments, color balancing can really only be done "by eye." If you have just one projector in a room, it's not terribly critical. As long as the colors are reasonably plausible, people will accept it. However, once you have more than one projector in the same room, any customer will be quick to say, "Hey! The colors don't match!" Evidently the human eye is extremely sensitive to **differences** in color, but is fairly tolerant to errors in absolute color. It's sort of like how most people wouldn't notice if a tape player's speed were slightly off - causing an error in absolute pitch - but would notice in a New York second if one musician were out of tune with the others.

Another thing, which is especially obvious with rear projection, is that the apparent color will change depending on where you're standing. This seems to be inherent with any CRT projector, and as far as I know is unavoidable. (If I'm wrong about this, and you know of a fix, **please** let me know and I'll put it up on these pages.) My best explanation for this phenomenon is that with every CRT projector I've ever seen, the three CRTs each have their own lenses. These CRTs, and their lenses, are arranged in a row from left to right. If you stand off-center to one side, you are closer to the blue CRT so the light intensity from it is greater and the picture seems blue. If you walk across the room to the other side, you're now closer to the red lens and the picture looks red. The shorter the throw distance is, the worse this problem becomes. I don't know any way around it but to explain it - diplomatically - to the customer, and let them decide to live with it. For some reason, this phenomenon is almost unnoticeable with front projection. Go figure.

A Simple procedure for Color Balancing Barco Projectors

With Barco projectors you get gain and cutoff adjustments on the red and blue amplifiers. These are accessible from the menus under Color Balance, and are set by source.

- While displaying a black field in a dark room, turn the contrast all the way down and the brightness so you can just barely see some light on the screen. What I do is look at the boundary between the "bargraph box" and the underlying raster. With the brightness fairly high, the raster appears gray against the box. As you turn the brightness down, the raster gets darker until it disappears. Just before it disappears - when you have a dark but still visible raster - you have the right Brightness setting for this adjustment.

  Adjust the red and blue cutoffs so the picture looks like a colorless charcoal gray. Note - this is more difficult than it sounds; be prepared for frustration! Your eye needs a certain amount of light to be able to perceive color, and it's often hard to tell if you've got it right or not.

- Restore normal room illumination and turn the contrast to some "normal" level like 75 - 90%. Adjust the brightness down until the raster is on the verge of disappearing. Now display a white field. If you have more than one projector in the same room, make sure that they all seem to be producing about the same amount of light; adjust Contrast as needed to achieve this. Go into the Adjust>Random Access>Selected Source>Color Balance menu and select White Balance. (Depending on your unit's date of manufacture, this might be called "Custom" or "User White Balance.") Adjust the red and blue video gains until the screen looks like a colorless white. If you can't do that, adjust your (several) projectors until they all show the same shade of off-white.

- If your display device has gamma adjustments, you may want to use the Chip Chart to adjust for the in-between gray levels. Even if you don't have gamma controls, which you won't on a Barco, the chip chart is useful for spotting any obvious errors. Use the cutoff adjustments for touching up

the black and dark gray areas, and the gain adjustments for the white and light gray.

The goal is to get the image completely colorless when displaying these monochrome images. If you can attain that, then your device is color balanced and colors should look good. But bear in mind that with Barcos, this adjustment is by source, and therefore needs to be repeated for each different signal you have in the system. That is, once you've set this up for a Macintosh you have to repeat it for your SGI Extremes, and again for your Sun Ultras, etc.

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