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tech tips

Using the VP300 to Adjust Video Display User Controls

Today's technology has produced extraordinary improvements in video picture quality, making it possible to have Cinema-like quality video right in the home. However even a small misadjustment of the video display's "user controls" can have a significant visible impact the picture image quality, and can void other service calibrations and negate the benefits of high-end circuits. This Tech Tip explains how to properly adjust each of the five common user controls found on most video displays using the Sencore VP300 Multimedia Video Generator. The user controls are: (common name listed followed by the more accurate technical term in parentheses):

- Brightness (Black Level)
- Contrast/Picture (White Level)
- Sharpness
- Tint (Chroma Hue)
- Color (Chroma Saturation)

These controls should be the final adjustments that are made to the display, and should be re-checked after calibrating white balance. Most of the User control adjustments interact, so perform them in the order listed. Also keep in mind that the viewing environment surrounding a video display greatly affects the user controls. Before adjusting the User controls always set the room lighting to match how it will be during normal viewing conditions.

Brightness Control

The brightness control adjusts the luminance or light level of the darker portions of a picture (which is why this control is more accurately called black level). When the black level is set too dark subtle dark gray details of a scene are lost to black. When the black level is set too bright the darkest grays and deep blacks become lighter grays, effectively lowering the contrast ratio and reducing picture quality.

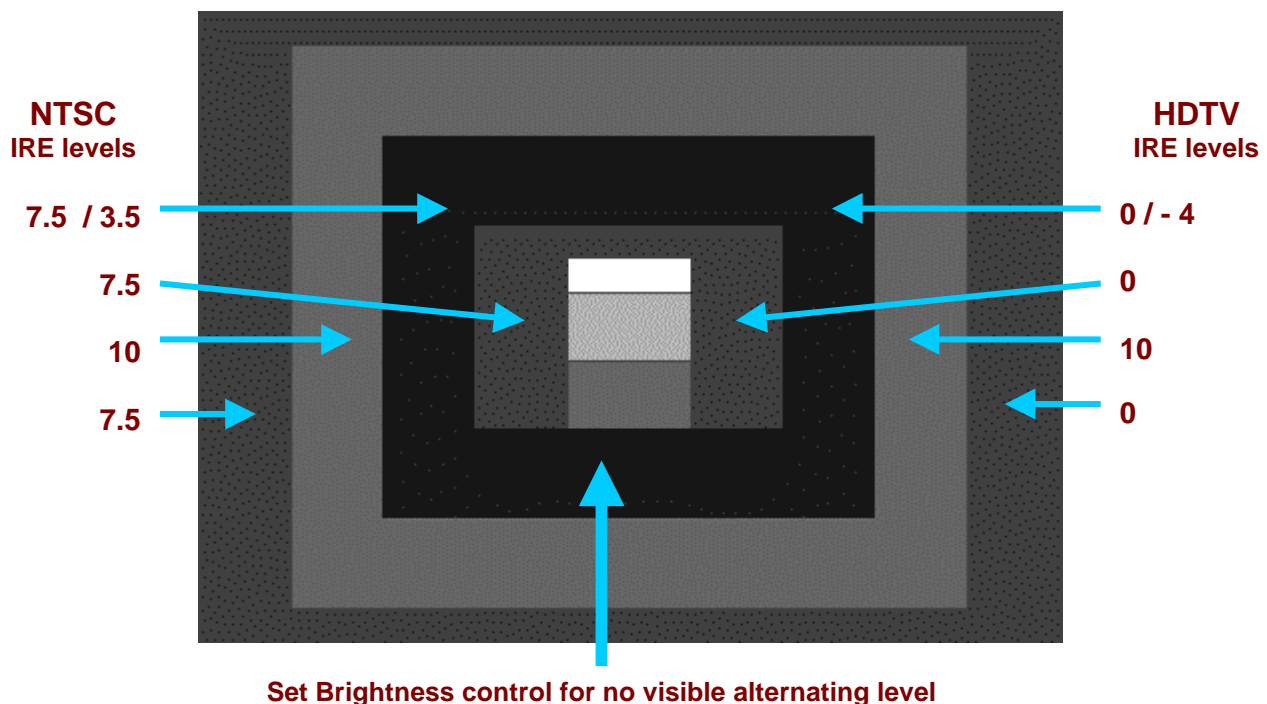


Fig 1: Use the Pluge pattern to adjust the user Brightness control for proper black level.

The VP300 Pluge pattern, shown in Figure 1, provides a unique black level alignment signal that is designed for quickly adjusting the brightness control for proper black level. The Pluge pattern contains several fixed IRE luminance levels and an area of alternating IRE levels. The alternating pluge allows you to accurately set the black level.

To adjust the brightness control with the Pluge pattern watch the second box from the inside (the one that is alternating luminance levels). Adjust the brightness control until the two luminance levels appear the same and the flashing just becomes invisible. At this level the outer 10 IRE box should still be slightly visible. Use the same method for both NTSC and HDTV formats.

If the brightness level of the outer two rectangular areas does not remain constant as the alternating pluge changes luminance level, the display has poor DC restoration. (You can see this problem better by adjusting the brightness/black level control slightly higher than normal). If the chassis has poor DC restoration you may want to adjust the black level using a pattern that has an average picture level (APL) that matches the typical viewing conditions. If the display is usually viewed in a darkened room, adjust the brightness control using the low APL Pluge pattern, as described above. However, if the display is usually viewed in a bright room, adjust the brightness control using the pluge levels in one of the

VP300's medium or high APL patterns, such as the SMPTE Bar pattern or one of the Window patterns set to a high IRE level.

The two pluge bars in the other VP300 patterns, as shown in Figure 2, are fixed and do not alternate level. If you are using one of these patterns simply adjust the Brightness control until only the left pluge bar is visible. (The pattern in Figure 2 is adjusted too bright so that both pluge bars are visible).

Sharpness Control

The sharpness control is designed to enhance the fine detail in a picture, independent of picture content. But, an improperly adjusted sharpness control will either add picture distortion or reduce picture resolution. Sharpness controls were originally introduced in older NTSC color televisions that used notch filters to separate the luminance and chroma information. Because these filters also removed the high frequency black and white detail, a sharpness control was added to put some of that detail back in. Today's NTSC video displays however, separate the Y/C signals using a comb filter, which doesn't remove the high frequency luminance detail. Although there is no longer a need for the sharpness control, it is difficult for many manufacturers to take away a feature that consumers have become accustomed to. Proper Sharpness adjustment is critical to preventing picture artifacts.

The VP300 Needle pattern is commonly used to properly adjust the sharpness control since it contains narrow lines that correspond to high frequency detail. This Needle pattern, shown in Figure 3, contains white lines running through a black background and black lines running through a white background. These vertical lines are commonly referred to as needle pulses.

To calibrate the sharpness control, turn the contrast control to about mid-scale to make the white portions of the pattern appear gray. (This luminance level best shows sharpness-related picture defects).

Watch the left and right edges of the needle pulse lines as you adjust the sharpness control. The vertical lines should be crisp, without ghosting. If the

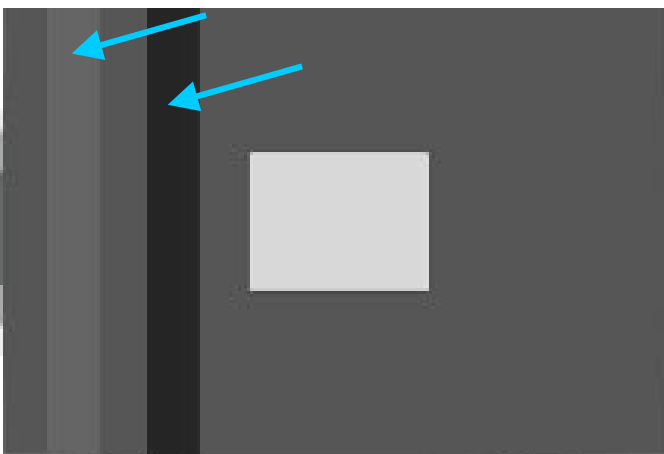


Fig. 2: Several other VP300 patterns contain fixed-level pluge bars to use when a higher APL pattern is needed. Set the display's Brightness so that only the left bar is visible.

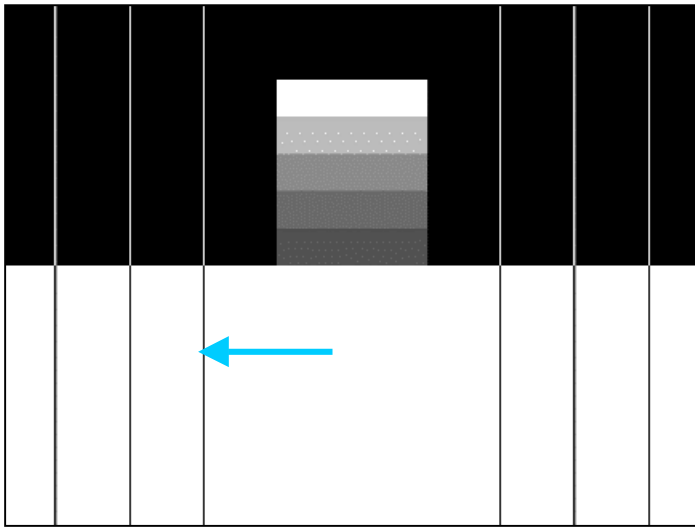


Fig. 3: The Needle pattern is used to properly set sharpness. Adjust the Sharpness control so that the vertical lines have crisp resolution without ghosting.

sharpness is set too high a faint duplicate line (ghost) will be seen beside the original line. This ghosting affect is unwanted picture distortion caused by too much high frequency response. If the sharpness control is set too low the needle pulses will appear out of focus and the image will lose resolution. Adjust the sharpness control for the best balance between ghosting and poor focus/ resolution.

The multiburst pattern can also be used as a reference to adjust the sharpness control. Starting with the sharpness control at its minimum setting, increase the control until all five bursts are at equal brightness levels. Do not adjust the control too high as to cause ghost lines adjacent to the widest stripes.

Contrast Control

The Contrast control is sometimes labeled "Picture" control. But a more accurate term is "White Level" as the contrast control really adjusts the light level of the white or high luminance portions of a picture. If the contrast is set too low the image will look dim, the whites become dull and the image loses its luster. (This is why many displays shipped from the factory with the contrast control set to maximum). If the contrast is set too high the raster may become distorted and pixel blooming occurs. Pixel blooming occurs when the screen phosphors are driven so hard that light spreads to the adjacent pixels, causing white images to appear to be out of focus.

The VP300 Needle Pulse pattern works very well for adjusting the contrast control for maximum light level while minimizing raster distortion or blooming.

Adjust the contrast control until the top white bar is the same width as the four gray bars beneath it. This ensures that there is no pixel blooming. Also observe the vertical needle pulses. These lines should be straight without any bowing. If the contrast is set too high the display's power supply may cause raster distortion, visible as bending in the needle pulses. This line bending creates unwanted picture distortion.

For the least picture distortion adjust the Contrast control to a setting just below where either blooming or raster distortion becomes visible. This setting however, may result in an unacceptably low white picture level and you may want to make a compromise between an accurate picture and a bright picture.

Recheck the setting of the Brightness control after adjusting Contrast, as the two controls may interact.

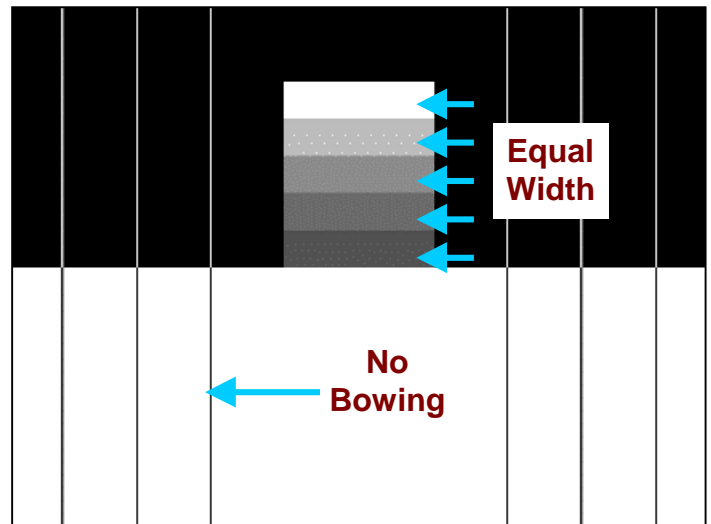


Fig 4: The Needle Pulse pattern is also used to adjust contrast. Adjust the Contrast control so that all five bars are the same width and that the vertical lines are straight.

Color and Tint Controls

The Color and Tint User controls should be adjusted last. The easiest and most accurate way of adjusting these controls is to view the SMPTE color bar pattern through a blue filter. You will need a blue filter for the following procedures. Contact your Sencore Sales Engineer if you do not have one.

Color Control

The Color control sets the saturation or amount of color in the video image. If the color control is set incorrect, the displayed image will either look washed out or bloom with excess color.

Adjust the color control by comparing the intensity of the large, top outside blue and white bars to the intensity of the small bars below them, as indicated in Figure 5. Set the Color

control to make these bars appear at the same luminance or brightness level when viewed through a blue filter.

To double-check the color control adjustment, look at the yellow and red bars without the blue filter. These bars should appear very colorful without any signs of blooming into the adjacent bars.



Fig 5: View the SMPTE bar pattern blue through a blue filter. Adjust the Color control to make the top and bottom outside bars the same intensity.

Tint Control

The user color Tint or Hue controls determines the actual color of the picture images. When misadjusted, images have the incorrect color, and familiar objects, especially flesh tones, look incorrect.

Adjust the tint control by comparing the intensity of the upper and lower cyan and magenta color bars through a blue filter, as indicated in Figure 6. Compare the light level of the large cyan and magenta bars with the small bars directly below

them. Adjust the tint control to make these bars appear at the same luminance or brightness level when viewed through a blue filter.

To double-check the adjustment, remove the blue filter and observe the yellow and cyan bars. If the tint is set too red, the cyan bar will look green and the yellow bar will look orange. If the tint is set too green, the cyan bar will look blue and the yellow bar will look green.

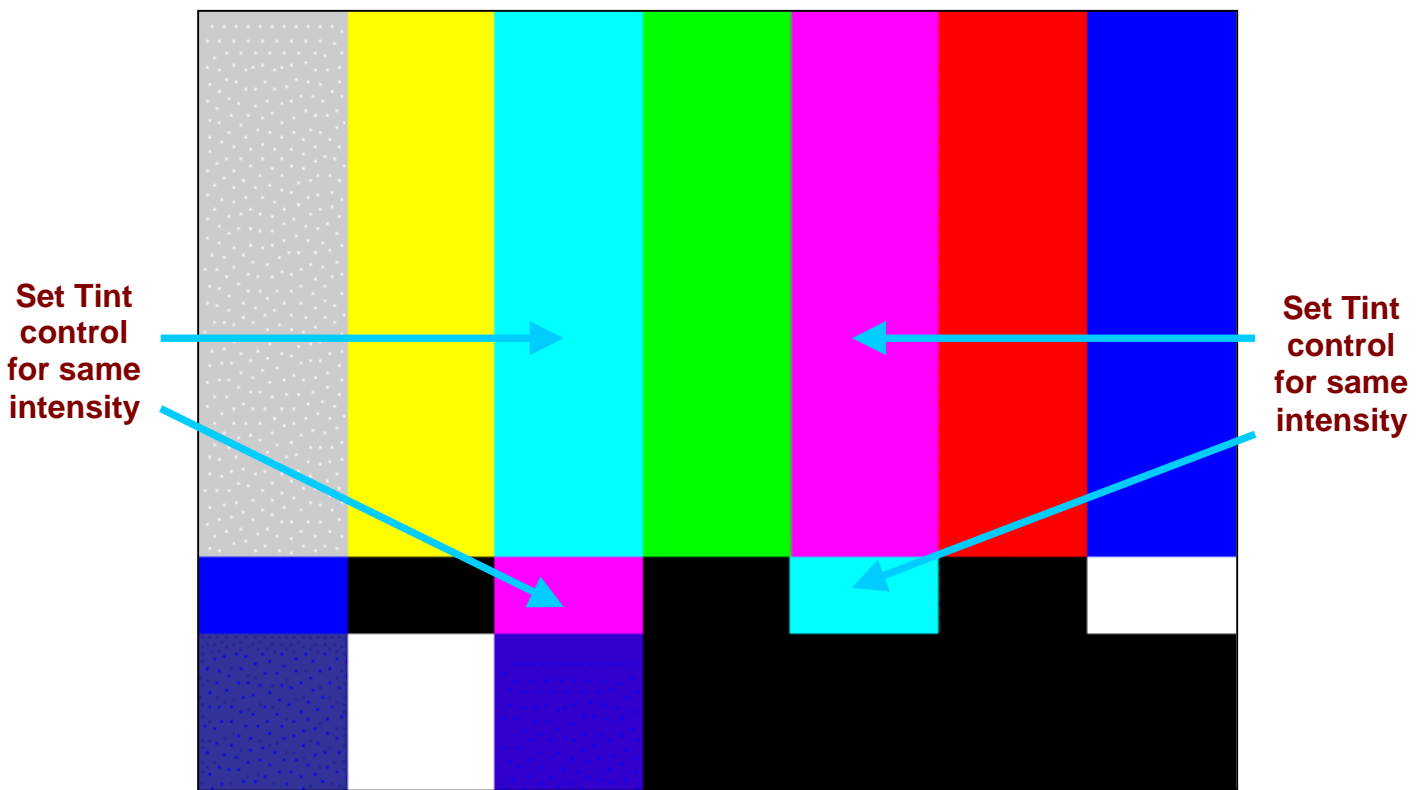


Fig 6: View the SMPTE bar pattern blue through a blue filter. Adjust the Tint control to make the magenta and cyan bars the same intensity.

**For more information,
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