

**SENCORE**<sup>®</sup>*Means Success In Electronic Servicing***tech**  
**tips**

## Calibrating White Balance in CRT-type Displays Using The CP291 Color Analyzer

Correct white balance or color temperature is critical to reproducing a good picture on CRT-type video displays. White balance directly effects other picture characteristics and setup adjustments, including black level, white level, color tint, and color saturation. Each of these picture parameters and setups depends on proper white balance.

A properly white balanced CRT display reproduces low luminance level gray patterns at the same color temperature as higher luminance level white patterns. Because the color temperature is calibrated to track from black to white and at all shades of gray in between, a white balance adjustment is sometimes called gray scale tracking. If a video display has incorrect white balance, the shades of gray will have visible color tint.

Calibrating white balance involves adjusting the CRT bias or cutoff controls while displaying and

measuring a low luminance level (20 or 30 IRE) window pattern, and adjusting the drive or gain controls while displaying and measuring a high luminance level (90 or 100 IRE) window pattern.

### What is Needed to Set White Balance

To correctly adjust white balance you will need:

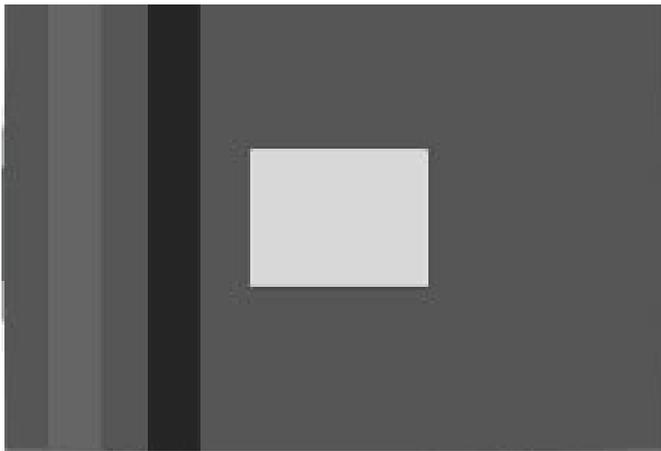
- Access to the video display's service menu (to adjust the bias/cutoff and drive/gain controls)
- A video pattern generator that outputs selectable IRE window patterns,
- A color analyzer to read the x, y, Y or color temperature of the displayed image

This Tech Tip provides a simplified procedure for calibrating white balance in CRT-type video displays using the Sencore VP300 VideoPro multimedia generator and the CP291 ColorPro color analyzer.

The VP300 provides special Window patterns that include two pluge bars on the left side of the screen, as shown in Figure 2. These pluge bars allow you to maintain proper black level as you make the white



**Fig. 1:** Use the CP291 to quickly and accurately measure color temperature and use the VP300 to provide adjustable IRE level Window patterns.



**Fig. 2: The VP300 Window patterns contain 2 pluge bars. Set the display's Brightness so only the left bar is visible.**

balance adjustments. Adjust the Brightness (black level) control on the video display so that only the lighter of the two bars (the left bar) is visible. The second bar is "blacker than black" and should be lost in the background when the display is properly calibrated. Note: Figure 2 shows the Window pattern with the black level adjusted to high, so both black bars can be viewed.

## White Balance Calibration Procedure

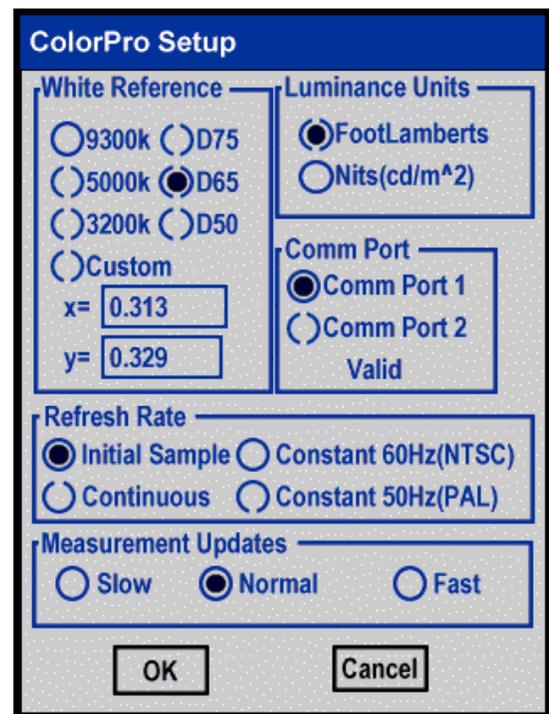
*Note: The following procedure assumes that you have a basic understanding of the operation of the VP300 and CP291. If you require more information on how to use these units refer to their operation manuals.*

1. Connect the VP300 to the video display using the appropriate connection and select a format that matches the video display.



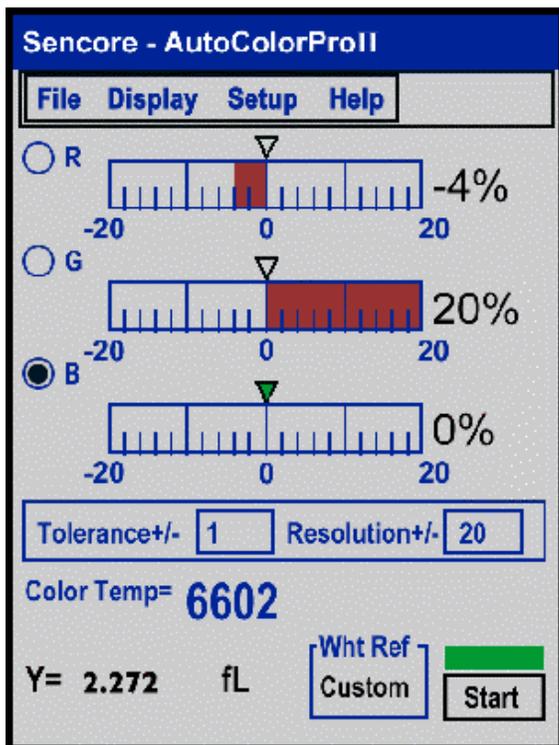
**Fig. 3: Select the 30 IRE Window pattern and attach the color pod over the center of the window. Adjust the CRT bias/cutoff controls for proper balance.**

2. Select the VP300 Window1 pattern and adjust the pattern for a 30 IRE window
3. Attach the ColorPro pod to the CRT, centering it over the window pattern as shown in Fig. 3.
4. Open the CP291 ColorPro Setup window and choose D65 as the White Reference, as shown in Fig. 4. D65 is the most common white reference and is also the NTSC standard.
5. Tap on "OK" at the bottom of the ColorPro Setup when the D65 selection has been made.



**Fig. 4: The CP291 ColorPro Setup window. Select D65 for most White Balance adjustments.**

6. Closing the Setup display automatically opens the measurement display. Select the Delta RGB display by tapping on "Display" in the menu bar, then tap the "Delta RGB" menu item. This will open the Delta RGB display, shown in Figure 6. (As you become more familiar with White Balance, you may choose to use either of the other two measurement displays options)
7. To start the CP291 measurements, tap the "Start" button in the lower right corner of the display window (see Figure 5). Notice that the box above the Start button is flashing green, indicating that the CP291 is making measurements.



**Fig. 5: The CP291 Delta RGB display shows the comparative levels of each CRT gun needed to obtain the selected color temperature.**

8. The Delta RGB display shows how much each CRT gun must be adjusted to achieve the selected color temperature. Adjust the red, green, and blue **cutoff/bias** controls in the video display until all three bar graphs read at or as close to zero as possible.

The display in Figure 5 shows that the red cutoff control needs to be increased 4% and the green cutoff control needs to be decreased 20%. The blue bar graph is at zero reference, as indicated by the highlighted circle to the left of it.

*Note: If one of the adjustments in the video display is at the end of its limit, or if the video display only has adjustments for 2 guns, tap the circle next to the desired gun to select it as the reference. The display then shows how much the other two guns need to be adjusted relative to this reference.*

9. Select the VP300 Window2 pattern, and adjust the pattern to 90 IRE. The display should now appear as seen in Figure 6.
10. Adjust the video display's **drive/gain** controls until all the graphs read at or as close as possible to zero.

11. Adjust the VP300 Window pattern from 100 IRE to 10 IRE and check that the color temperature varies only slightly at all IRE levels. Some fine-tuning may be required to get the color temperature to track at all IRE levels.
12. All of the display's user controls should be adjusted after the white balance has been calibrated. These controls include contrast, brightness, sharpness, hue, and color. For more information on these adjustments see Tech Tip #242 "Using the VP300 to Adjust A Display's User Controls".



**Fig. 6: Select the 90 IRE Window pattern and adjust the CRT drive/gain controls for proper balance.**

**For more information,  
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