

# Color Correction for Video - Scene Matching

Application Note

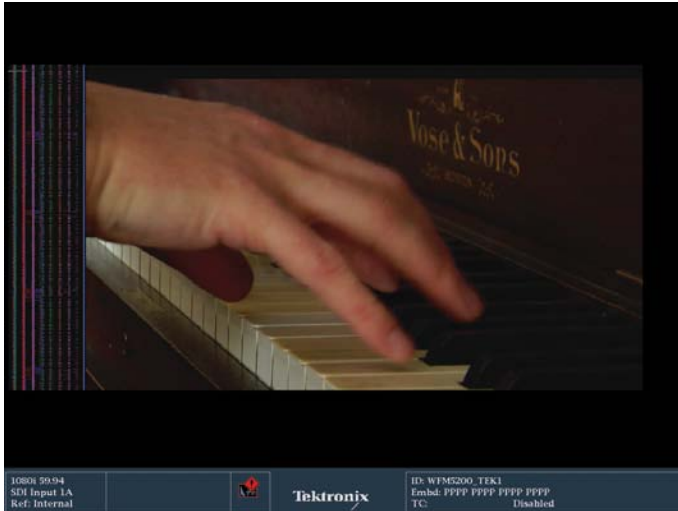


Figure 1. This shot will be corrected slightly and matched to the cooler shot in Figure 2.

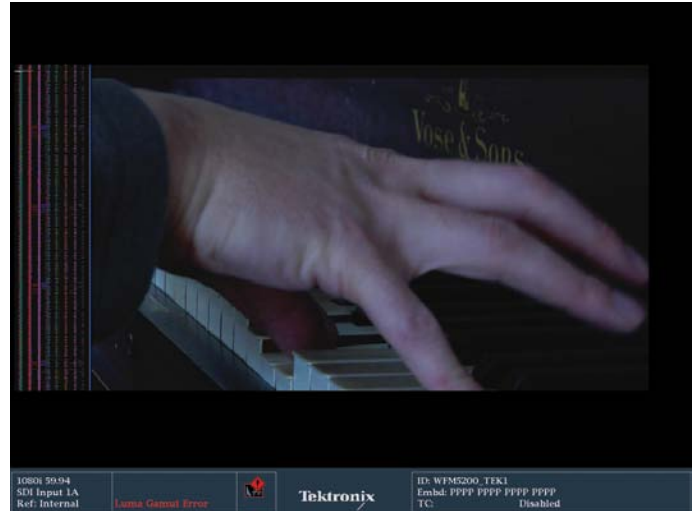


Figure 2. This shot was mis-white-balanced. Using Tektronix's Capture function, this shot will be corrected to match the image in Figure 1.

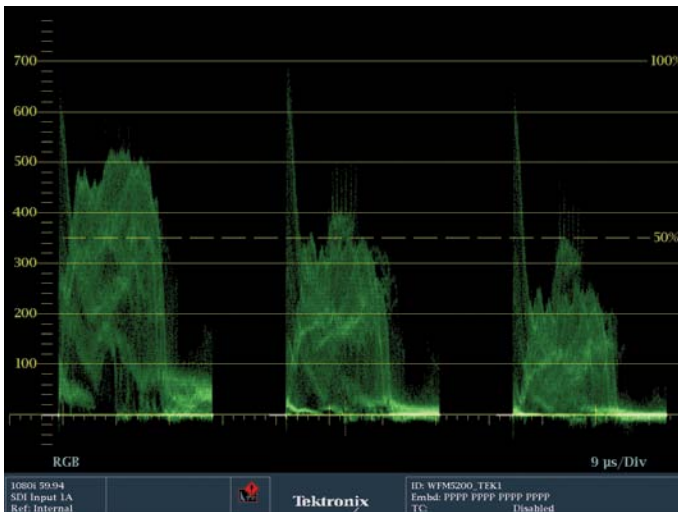


Figure 3. This is the RGB Parade Waveform image for the shot in Figure 1. Notice the prominent Red channel, compared to the green channel (the middle waveform) and the blue channel (to the far right).

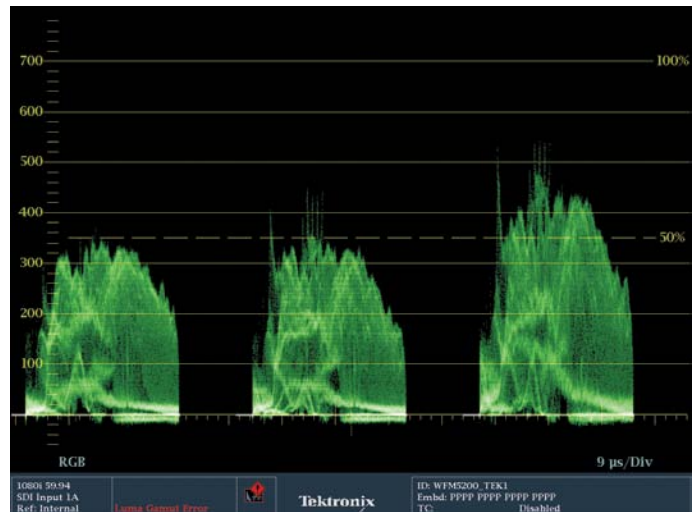


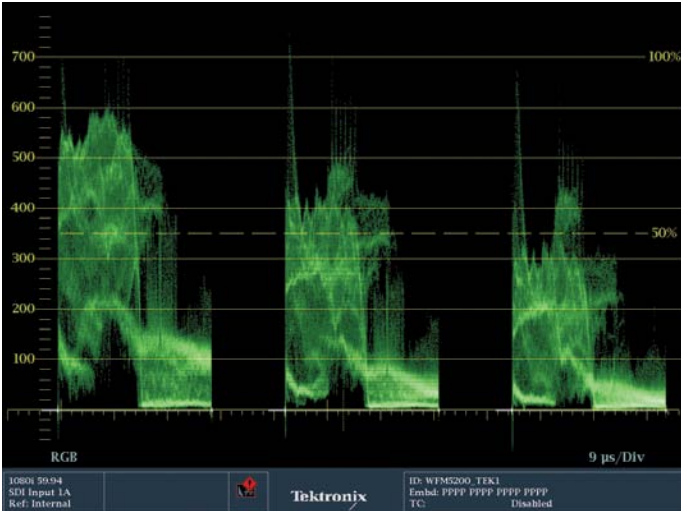
Figure 4. This is the RGB Parade image for the cooler image in Figure 2. Note that the blue channel is the strongest of the three color channels, but in Figure 3, the red channel is the strongest.

One of the color grading tasks that takes some real experience and skill to deal with is matching scenes. Lots of footage from dramatic TV shows, indie features and even corporate and marketing projects require making two shots in a scene look like they belong together even if they were shot by different cameras or at different times of day. Tektronix Waveform Monitors have a fantastic feature that makes this common - but difficult - task much easier.

Normally, colorists save a still of one image that they're trying to match and will then cut rapidly back and forth between the reference scene and the scene they're correcting. This is the time-tested method for matching used by most of the colorists.

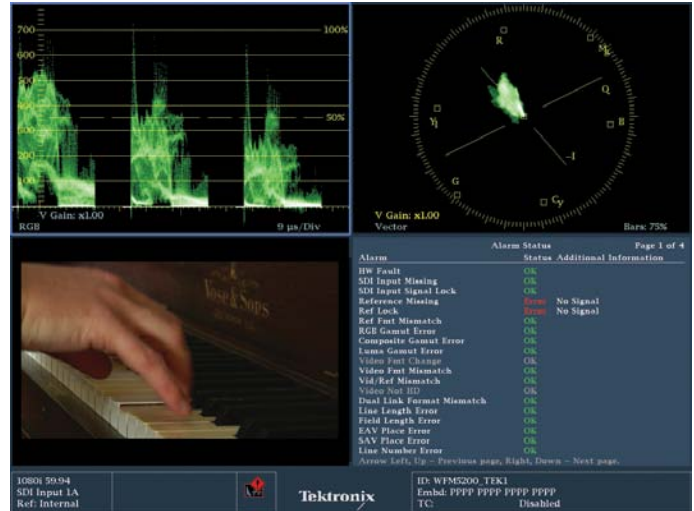
But, with a Tektronix waveform monitor, there is an amazing little trick that will save time and will get your footage to match very quickly with much less effort.

To demonstrate, we'll match these two shots (Figures 1 and 2). One is color corrected fairly faithfully - maybe a little warm - and the other is mis-white-balanced towards blue. Note the colors of the images and the way they're represented on the Tektronix RGB Parade Waveform monitors (Figures 3 and 4). Specifically, not the different levels of red, green and blue in each shot as seen in the waveform monitors.



**Figure 5.** This is the RGB Parade waveform for the shot in Figure 1 after spreading the tonal range. Note the higher levels between Figure 3 and 5.

The first step will be to pick the shot closest to the final image and manipulate it in primary color correction to a satisfactory result. There's no sense taking the bluish shot too warm, for example. In this example, the warm piano image was chosen as the "hero" shot. The tonal range was spread at both ends using the shadow and highlight controls (Figures 5 and 6). This increased the contrast. Always take corrections a bit PAST



**Figure 6.** Tektronix WFM5200 showing an RGB Parade waveform with a vectorscope. This is a very common pairing of waveform displays for most colorists.

where you believe they should go and then come back to the "sweet spot." It's a little like focusing a camera. You don't really know if it's in focus until you've focused a little too close and a little too far, first. With the outer limits of my tonal range set, manipulate the gamma or mid-tones of the image to create a nice rich, well-exposed look.



Figure 7. Vectorscope of the warmer piano shot. Notice that the trace leans towards the red vector.

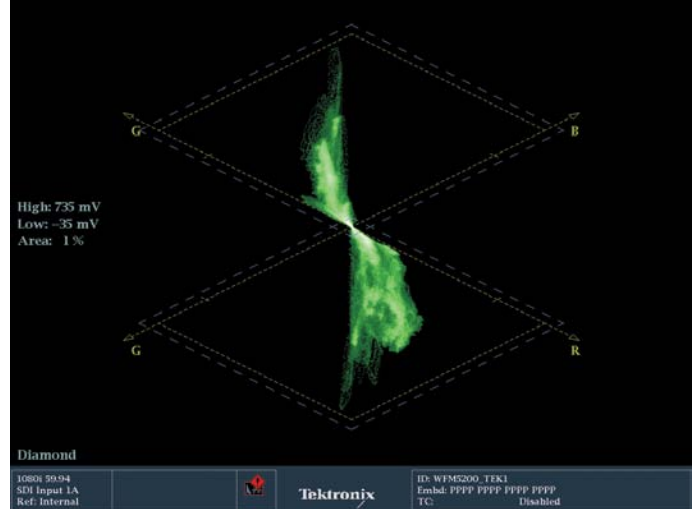


Figure 8. Diamond trace display. Notice that the trace leans towards the red quadrant which is to the lower right. There is also some green (the upper left quadrant), which along with the red indicates yellow.

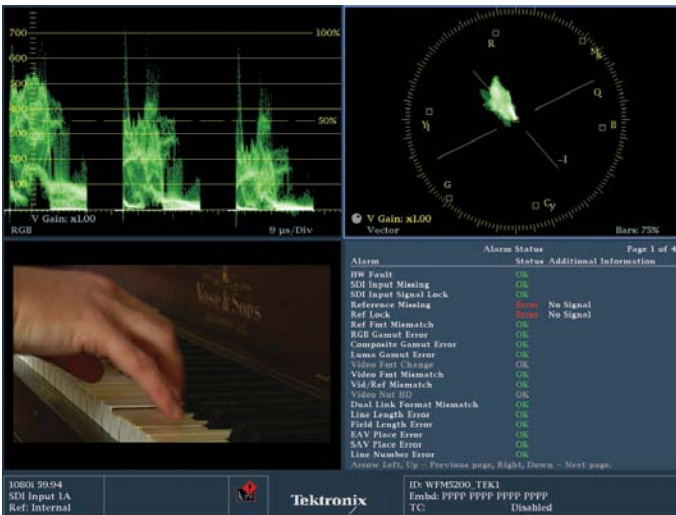


Figure 9. The RGB Parade waveform in the top left corner shows that the image has quite a bit of red in it. The red channel is stronger, but that is to be expected with the prominence of the flesh tones in the hand and the warmth of the wood in the piano.

Now that the tonal range is set the image should be balanced. It's a little warm. The warmth is indicated by the elevated levels in the red channel compared to the others (Figure 9). You can also see the warmth in the vectorscope, as the trace leans toward the red vector towards the top left of the vectorscope

(Figure 7). You can even see this warm balance in the diamond display (Figure 8). If the trace in the bottom diamond leans toward the right – with this RED indicator here – then the image is warm. This warmth is not a bad thing. Since there is a lot of wood and there are flesh tones, the image should be fairly warm.

To the right in the top diamond indicates a blue balance. Balance out some of that warmth using the trackballs or color wheels by pulling the center of the color wheel down towards the blue vector. To eliminate a cast, move the color wheel in the opposite direction of that cast. The diamond display shows black levels and balance at the intersection of the diamonds. White levels or highlights are indicated at the top of the top diamond and the bottom of the bottom diamond. Midtones are indicated across the center of both diamonds at their widest point.

Use the RGB parade waveform to set the balance. Though you can and should look at more than one display as you work. This is very easy to do on the WFM5200, which can show two trace displays side by side. The 7000 and 8000 series Tektronix scopes are capable of showing four trace displays at the same time. Having multiple views of different waveform displays is critical to the way most colorists work.

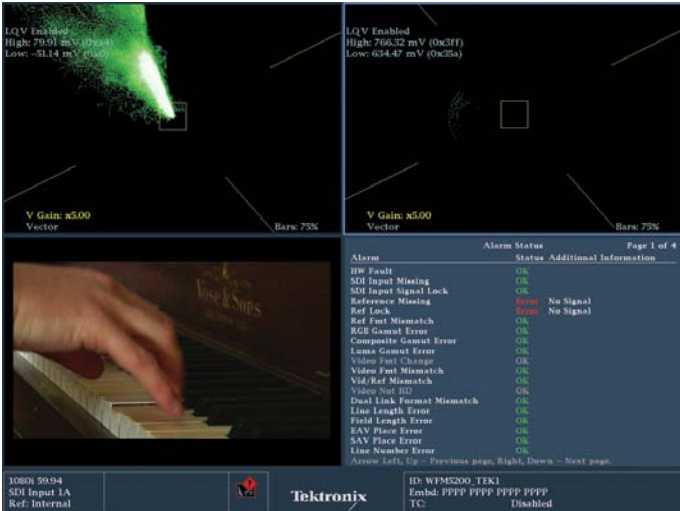


Figure 10. Using the LQV display.

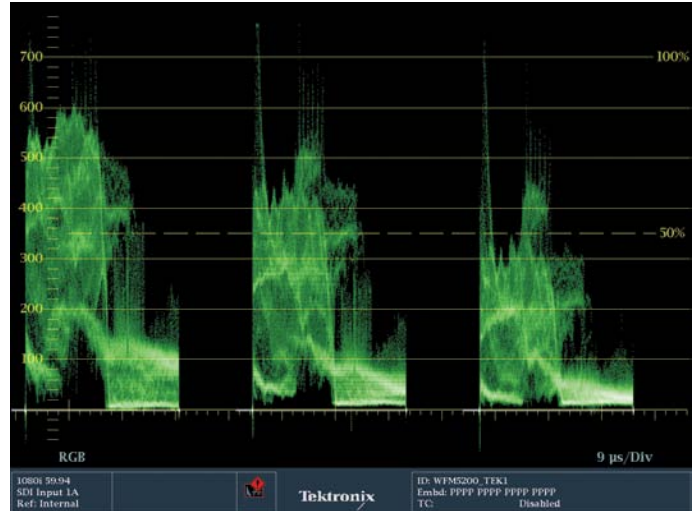


Figure 11. This RGB Parade shows a well-balanced flesh tone, with slightly more red than green and slightly more green than blue.

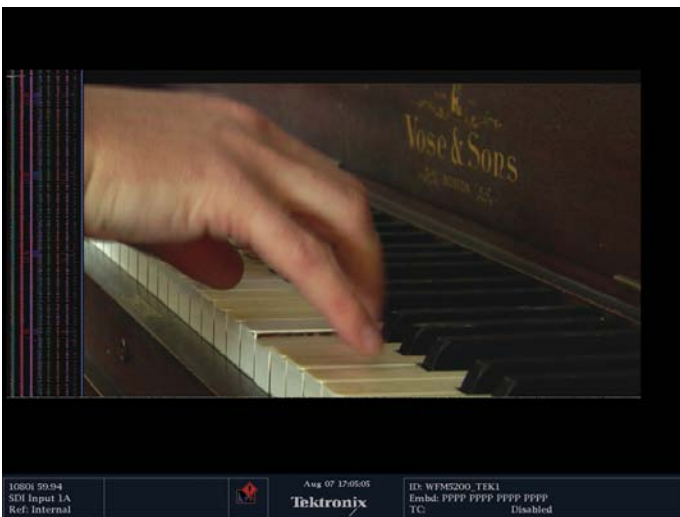


Figure 12. This is the final corrected image with a wider spread in the tonal range, finessed midtones for a nice exposure and "feel," and a color balance that is not as saturated and red.

To find a white and black point use Tektronix's exclusive Luma Qualified Vectorscopes (LQV) (Figure 10). The LQV displays are like regular vectorscopes, except for one important distinction. LQV displays allow you – through menus or presets – to restrict the display of the trace so that it only shows you a specific portion of the tonal range. For example, you can set the LQV display to only show you the shadows, or only the highlights. Create a preset with side by side LQV displays (or download the presets from the Tektronix website) with one displaying just the shadows and one displaying just the highlights. Then use your color wheels to dial the trace right into the center of the display for an easy color balance.

In the RGB Parade, look at the bottom of the three cells – R, G and B (Figure 11) – in the waveform and adjust the individual R, G and B shadow levels in your color correction software. The trace in each color channel should barely touching the 0 line. No higher, no lower. This means the blacks are balanced. In most images, if the shot was balanced, the tops of each channel in red, green and blue would also basically match, but there is so much skin tone and matching warm wood tone, that the red channel should be elevated, and there's a lot of yellow in wood and skin, so the red and green should both be higher than blue, which is the opposite of yellow, so this angle between red, green and blue is actually perfect and indicates a good skin tone and warmth (Figure 11).





Figure 13. This is the mis-balanced image we will match to Figure 12.

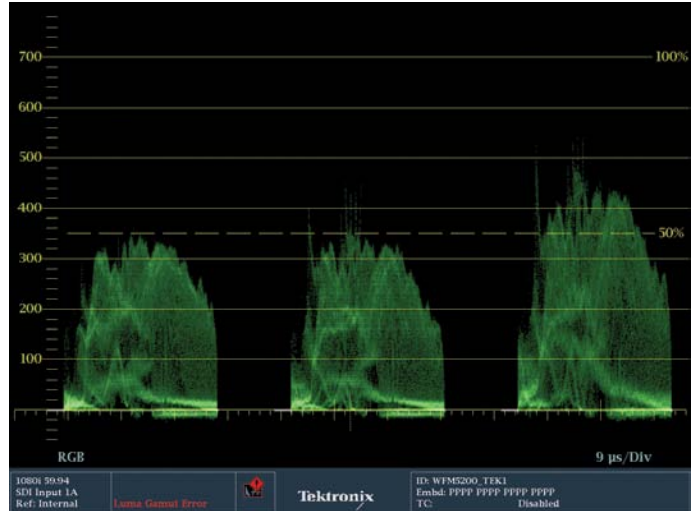


Figure 14. This is the RGB Parade Waveform for the shot in Figure 13. Note the relative positions of the red, green and blue channels compared to the levels in Figure 11.



Figure 15. The Capture button is at the bottom, on the right side.

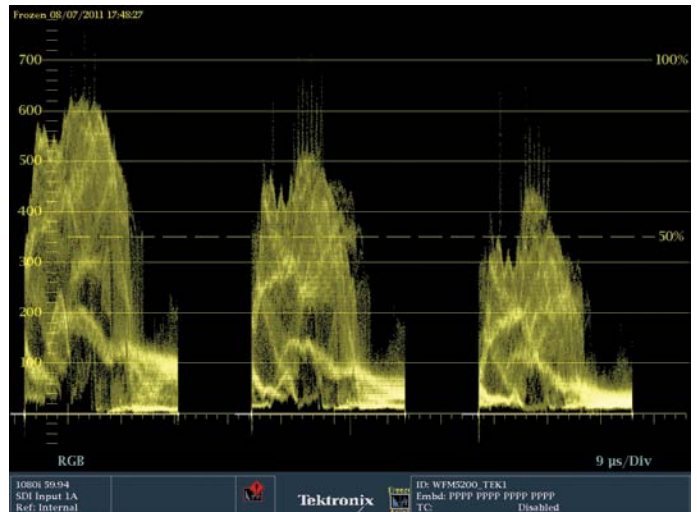


Figure 16. When you capture an image, the default color for the trace is gold.

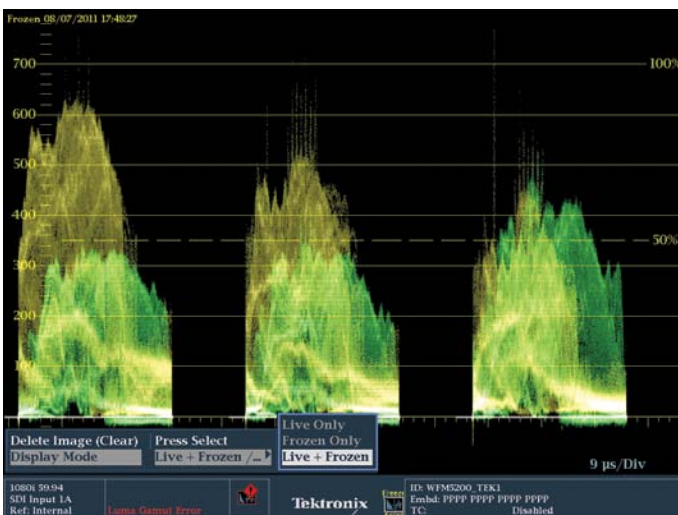
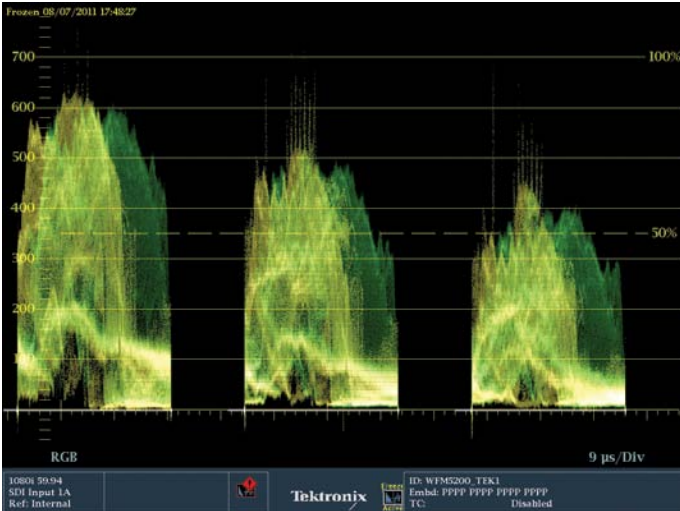


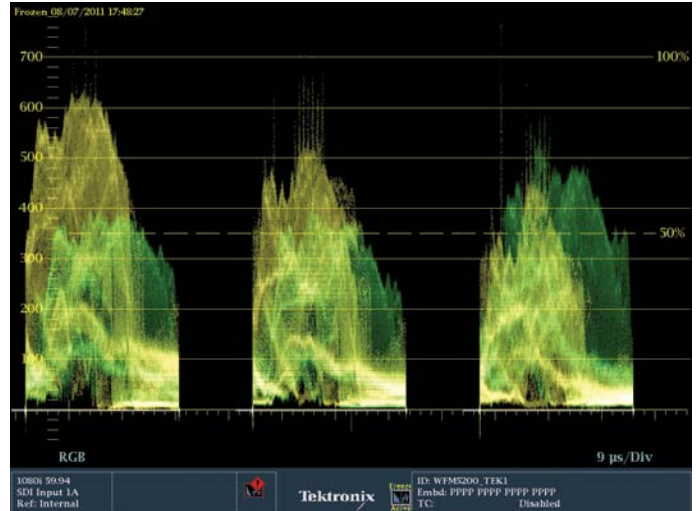
Figure 17. When you switch your software to display the live image to be matched, the default color of the trace of the live image is green. In this image you can see the green trace of the cool image overlaid on the golden trace of the warm, captured image.

Compare the corrected “hero” shot (Figure 12) to the “cool” shot (Figures 13 and 14). The discrepancies are pretty obvious.

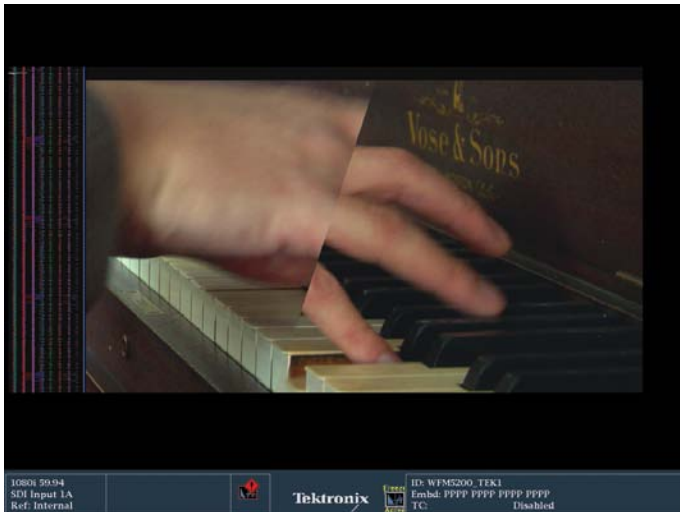
Before starting the matching correction, capture the corrected “hero” image as a reference on your Tektronix waveform monitor. On the WFM5200 – and on MOST Tektronix Waveform Monitors - there is a Capture button on the face of the instrument (Figure 15). Pressing that button will cache or store that image in the waveform monitor (Figure 16). This is better than a still frame in your color correction software because the WFM 5200 can now overlay the LIVE feed from your system on TOP of the captured still. No need for a switcher or special software or rapidly punching back and forth. You can simply see the captured image as a GOLD trace on the waveform display while the LIVE display is layered on top of it as a green trace (Figure 17).



**Figure 18.** Note that the levels between the red, green and blue channels of the gold trace and the green trace match quite closely.



**Figure 19.** Match the green live trace to the gold captured trace.



**Figure 20.** This is a split screen between the two original shots, Figure 1 and 2, after using the Capture button to compare the RGB Waveforms of the two images and correct them.

When you combine the gold trace with the green trace, the combined brightness can be a little high, so you might want to create a preset for this where you lower the trace brightness (Figure 18). Then save that setup as a preset, name it, and you can call it up very quickly next time you want to use this technique. Pretty cool.

The captured reference image is saved and the live image is layered on top. With the images superimposed, matching them is pretty simple. Use the RGB lift, gamma and gain controls in your color correction software, or use Curves, to adjust the levels of each color channel so that the green and gold trace in each color channel basically lines up. Find some shapes in the trace that you can match in each color channel (Figure 19). At the end of the balance, look at the split between the two (Figure 20).

Contact a local Tektronix representative or distributor and give this a try. This can transform your color correction process. Be sure to check out the on-line demo of the Tektronix WFM5200 and the rest of the videos on Color Correction on the Tektronix web site at [www.tektronix.com/5200learn](http://www.tektronix.com/5200learn).

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Contact List Updated 10 February 2011

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Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com)



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09/11 EA/FCA-POD

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