

Kodachrome™ profiles

On most scanners, Kodachrome® transparencies produce a strong blue or blue-magenta cast, because the yellow dye used in Kodachrome film emulsions appears weaker through typical scanner filters than it does to the human eye.

This yellow deficiency can be solved by darkening yellow and lightening cyan and magenta (CMYK workflow) or by lightening red and green and darkening blue (RGB workflow), but this is tedious and inefficient if you scan a lot of Kodachromes.

This paper describes how to make a “pseudo” Kodachrome scanner profile from a Fujichrome or Ektachrome HCT profile. It relies on visual judgment and is somewhat un-scientific, but works remarkably well if done carefully. The same procedure can be used for any film type for which there is no available target.

REQUIREMENTS

This process is based on visual corrections (in Photoshop 6 or later) of actual originals, for which you will need a selection of 35mm or 120 Kodachrome slides exhibiting fairly large areas of near-neutral grays, reds, yellows, greens, cyans, blues and magentas. Note that there are at least three generations of Kodachrome, dating from the 1930s (Kodachrome I), 1960s (Kodachrome II and X) and 1970s and 80s (Kodachrome 25, 64, 200). Fortunately, a profile made for the latest generation seems to work well for earlier generations.

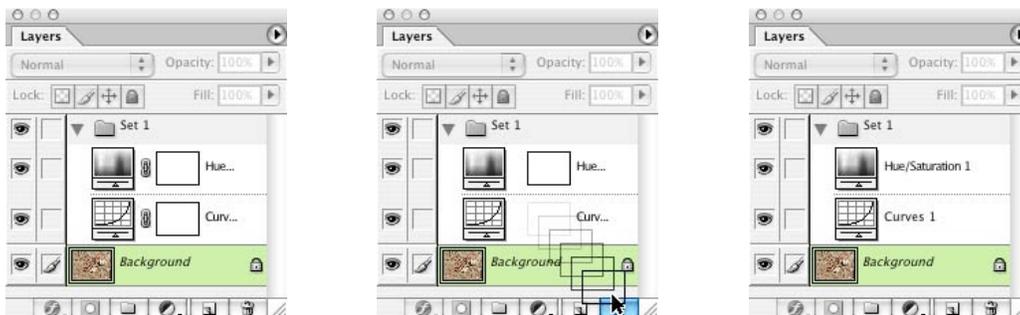
The most efficient way of making a Kodachrome profile involves subjective visual corrections on a computer monitor, for which you will need an accurately-calibrated monitor with a top-quality ICC profile.

You should also have an intensity-variable D50 viewing box alongside the monitor, with which to compare the screen to the sample transparencies. The best viewer is the GTI SOFV-1e (or 2e), which should be dimmed so the empty transparency viewer is only about 10% brighter than a blank white screen (255 red, 255 green, 255 blue) in Photoshop.

If you do not have a profiled monitor and intensity-variable viewer, corrections will have to be tested with prints made on an accurately-profiled printer, and compared to the originals in a standard D50 viewing booth with transparency and reflection illumination.

PREPARATION

1. Scan an HCT target (Fujichrome or Ektachrome) and make a **normal ICC scanner profile** from it. Save the raw scan of the HCT target.
2. Select several Kodachrome originals, including at least one with large areas of neutral or near-neutral grays, and others with a range of saturated colors in each of the main color families; reds, yellows, greens, cyans, blues, magentas, and tape the originals together to form one large collage at least 4 inches by 5 inches in size.
3. Scan the collage using the same setup as the HCT target. In Photoshop 6 or later, open both the HCT scan and the Kodachrome collage scan, then assign the **normal ICC scanner profile** to both.
4. On the Kodachrome scan, open the Layers menu and create an **Adjustment Layer Set**. Make a **Curves** adjustment layer and above it, create a **Hue/Saturation** adjustment layer, but do not apply any edits to either layer. Delete the masks that were automatically made for each adjustment layer.



Removing the layer masks from the Adjustment Layer Set

5. Remove the collage of original Kodachromes from the scanner and place it, and the original HCT target in a dimmable D-50 transparency viewing booth alongside the monitor. Adjust the booth's intensity till the HCT original matches the overall brightness of the displayed HCT scan.

At this stage, on a properly profiled monitor, the displayed HCT scan should look very similar to the actual HCT target. If not, either adjust the intensity of the viewing booth, or adjust the color balance of the monitor, or re-create the scanner and/or monitor profiles until the displayed HCT scan matches the actual target as closely as possible.

CORRECTING GRAY BALANCE

6. Analyze the Kodachrome originals and evaluate the apparent gray balance error in the screen display. Typically the displayed image will be too blue, or lacking in yellow density, compared to the original Kodachromes.

7. Edit the Red, Green and/or Blue curves of the **Curves 1** layer with simple mid-tone moves until the screen grays match the originals. Typically a single mid-point move should eliminate most of the error, but more than one adjustment point may be necessary.
8. Continue until all near-neutral areas in the displayed scans match as closely as possible the same areas in the physical Kodachromes.

IMPORTANT: At this stage, IGNORE any errors in saturated colors. For example if reds are too "cool" or yellows are too "green", do NOT attempt to correct them with Curves.

CORRECTING SPECIFIC COLOR HUES

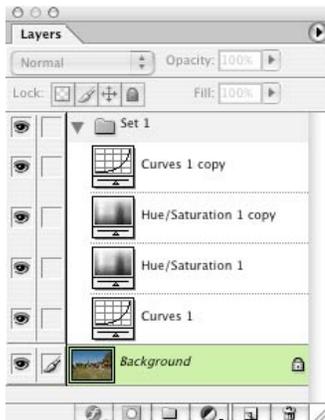
9. Once the grays match, evaluate the apparent error on screen in terms of specific color families. Ask yourself; "Is the screen image too red, too yellow, too green, too cyan, too blue or too magenta (or any combination thereof)?"
10. If there are no color errors, go straight to "MODIFYING THE HCT SCAN".
11. If one or more color families are obviously inaccurate, even though grays are now correct, open the **Hue/Saturation** adjustment layer and alter the appropriate color channel(s), using the **Hue** or **Saturation** sliders. Continue until the screen image matches the physical transparencies as closely as possible.

WORKING WITHOUT AN ACCURATE MONITOR

12. If you are NOT working with an accurately profiled monitor, make some estimated **Curve** and **Hue/Saturation** changes then reproduce the collage on a profiled printer with the adjustment layers active. Compare the print to the transparency collage in a viewing booth and repeat until the print is as close as possible to the original.

MODIFYING THE HCT SCAN

13. Once you are satisfied that the correction layers are working optimally, drag the whole **Adjustment Layer Set** from the Kodachrome collage image to the original HCT scan from which you made the scanner profile.
14. In the layer set on the HCT scan, duplicate both the **Curves 1** layer and the **Hue/Saturation 1** layer.
Note that this will temporarily double the effect of each control. Ignore any visible change for the time being.
15. Move the **Curves 1** copy layer to the top of the stack, as shown below.

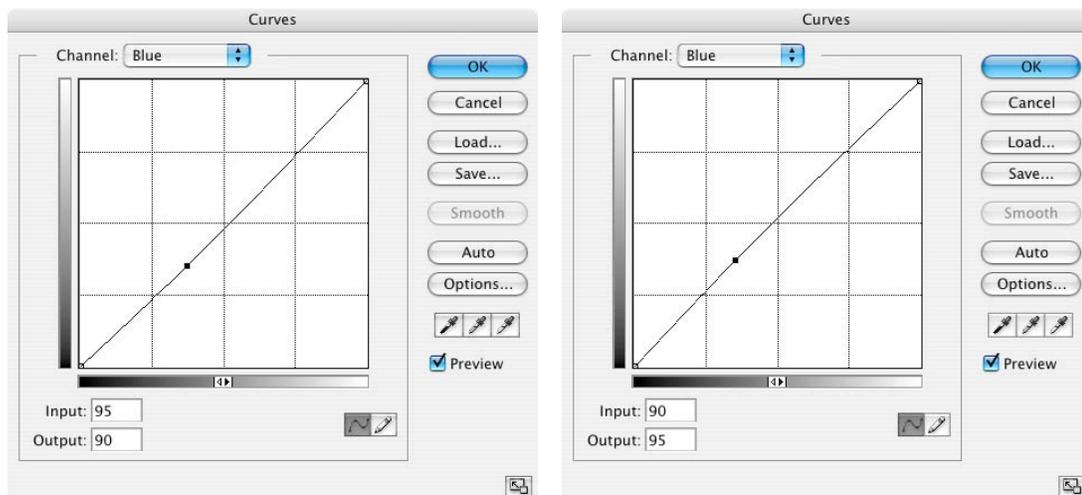


The adjustment layers set on the HCT scan

16. Temporarily switch off the two **Hue/Saturation** layers by clicking their respective eyeball icons.

CURVES INVERSION

17. In the **Curves 1 copy** layer, swap the **Input** and **Output** values for all control points on the red, green and blue channels. For example, if the Blue curve in the **Curves 1** layer goes from **Input 95** to **Output 90**, change the **Curves 1 copy** layer to **Input 90** to **Output 95**, as shown below.



Typical Blue correction in the “Curves 1” layer (left) and its inversion in the “Curves 1 copy” layer (right)

18. Repeat for all points on all three RGB curves.

HUE/SATURATION INVERSION

19. Restore activity of the two *Hue/Saturation* layers by making their respective eyeball icons visible. (There is no need to disable the two *Curves* layers.)
20. On the *Hue/Saturation 1 copy* layer, change the polarity (sign) of any number you applied in any channel. For example, if you decreased the Yellow *Hue* by -3 degrees in the *Hue/Saturation 1* layer, increase it to +3 degrees in the *Hue/Saturation 1 copy* layer, as shown below.

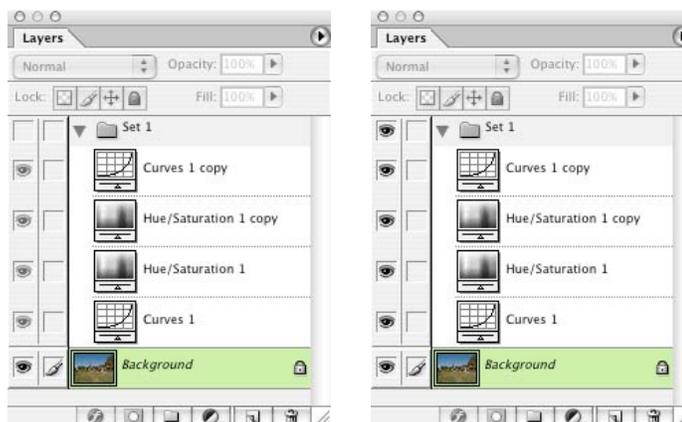


Typical Yellow move in the “Hue/Saturation 1” layer (left) and its inversion in the “Hue/Saturation 1 copy” layer (right)

Hint: Press Command + 1 through Command + 6 to select Reds, Yellows, Greens, Cyans, Blues, or Magentas. Press Tab to cycle between the Hue, Saturation and Lightness sliders.

TESTING THE INVERSIONS

21. The whole point of the inversion process is to make the two *Curves* layers cancel each other, and the two *Hue/Saturation* layers cancel each other. You can test this by toggling the *Set 1* eyeball on and off.



Switching the whole Layers Set off (left) and on (right) by clicking the Set 1 eyeball

22. If there is no visible difference on screen between “set on” and “set off”, then the two *Curves* layers and the two *Hue/Saturation* layers must cancel each other.

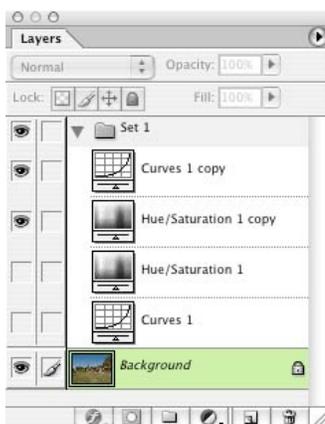
23. If you DO see a difference, check that the copy layers are exact opposites of their respective correction layers, and if necessary, adjust the **copy layers only** till there is no difference between “set on” and “set off”.

*Note that the Hue/Saturation controls may not cancel each other completely, simply by inverting the sign of each adjustment. This is normal. Modify the **Hue/Saturation 1 copy** layer as needed to get the best cancellation of the **Hue/Saturation 1** layer.*

24. Save a copy of the edited HCT image in PSD format with **Preserve Layers** checked to simplify any later fine-tuning of your new profile. Name the HCT scan differently (e.g. with the suffix “_ed1”) to distinguish it from the original HCT scan.

MAKING A “PSEUDO-CHROME” PROFILE

25. Disable the **Curves 1** and **Hue/Saturation 1** layers by clicking their eyeballs off, to leave only the **inverted** layers active.



Switching off the correction layers leaves only the inverted layers active

NOTE: The image of the HCT target should now look as if it was made on Kodachrome film. Typically this means it will look bluer than the actual HCT transparency target.

26. Flatten the HCT image (**Layer – Flatten Image**) and accept the option to **Discard hidden layers**.
27. Save a copy of the flattened HCT image in **TIFF** format. Name the flattened image something different from the original scan, for example “**Pseudo-Kodachrome HCT**”.
28. Make a new ICC profile from the modified HCT scan using the same reference file supplied for the original HCT target. Include the name of the film type you are imitating (e.g. “Kodachrome”) in the profile title.

TESTING THE NEW PROFILE

29. Disable, or delete, the adjustment layer set from the Kodachrome scan.
30. Assign the new profile to the Kodachrome scan and compare the displayed image to the actual Kodachrome transparencies in the viewer. They should now be very close in matching quality.
31. Confirm the accuracy of the new profile by making a printed reproduction of the Kodachrome collage and comparing it in a D-50 viewing booth to the original transparency collage. Ideally the result should be as accurate as a reproduction of the raw HCT image with the *normal ICC scanner profile* assigned to it.
32. If the results look good, this is your Kodachrome profile. If you need to make more corrections, go back to the layered HCT PSD file, alter the adjustment layers as necessary, and make a new profile.