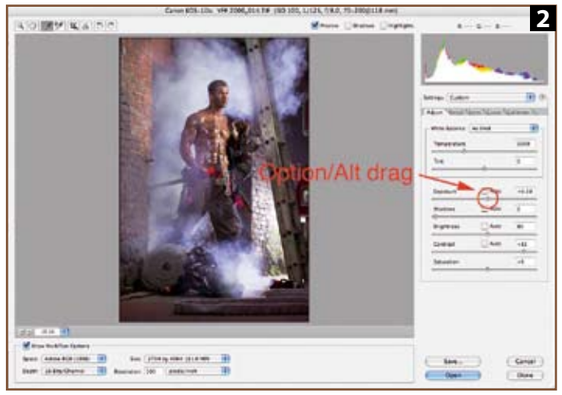
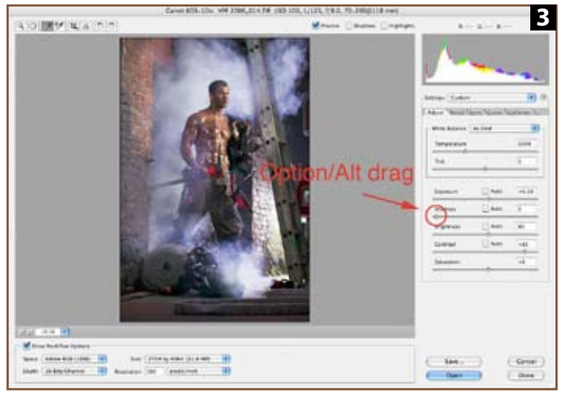
Capture to Output Fidelity

by Dave Montizambert

FOR THE PAST FIVE YEARS BACK OVER HERE IN THE COLONIES (British Columbia Canada), I have been doing an annual two-day shoot for the Vancouver Firefighters' Association producing thirteen plus images for their "Hall of Flame" calendar. The calendar raises money for Vancouver's under-funded burn treatment centre. Some thirty firefighters try out for the calendar. Thirty are chosen, by a panel of female celebrities at a media party, a month or so prior to the shoot date. One lucky firefighter gets to put his fidelity to the test on the front cover while the other twelve almost-as-lucky contestants get to test their fidelity inside the calendar, one for each month. My job is to deliver digitally captured images with impact that will reproduce well in several different output media and do all of this with only 45 minutes per firefighter, on location, with full lighting, generators, fire trucks, fire equipment props, and changing weather/ambient light conditions.

During postproduction in Photoshop CS2, I converted the images into RGB black and whites, introduced a digital sepia effect, and then shifted the firefighters' soot stained yellow pants to fire-engine red. The look for the calendar is always the heroic, stoic male, set against harsh surroundings, ready to save the day. For me this technically translates into high contrast moody images where lighting, exposure, and digital densitometer values are key. Since I can create more range than can be printed, I always invest time up front reading the brightest and darkest critical tones in the image to make sure that they will print well. This can be done in Adobe Photoshop's Camera Raw or in your camera's proprietary software or in Photoshop once the image has been processed. If the scene contrast is too much or too little I adjust the lighting to get it right - it is generally faster to fix it at time of capture than it is after the fact in Photoshop. After the lighting has been roughed in and metered, I shoot directly, via firewire into my laptop, which is mounted on a tripod and placed right next to the camera. Several test shots are made, and then I open the raw files in Camera Raw, setting the Adjust sliders and curve points relative to readings from the densitometer eyedropper tool. To find the brightest, most significant point in the image, I depress the Option (Mac) or Alt (PC) key while dragging the Exposure slider (see image [2]). This throws the image into Threshold mode. Sliding the Exposure slider all the way to the left makes the image drop out to black. Slowly dragging the Exposure slider towards the right will cause posterised forms to appear. The first points that appear are the very brightest points in the image. In Threshold mode it is sometimes hard to see what these areas actually are. To bring back the normal image for a quick peek, let go of the Option/Alt key - you can easily toggle back and forth this way to bounce in and out of Threshold mode. At this point I make the decision whether the area showing is a significant point that needs to retain detail in the final printed piece or not. If so I set this point to the brightest tone that will hold detail in final reproduction. This is done by dragging the Exposure slider left or right while reading the densitometer RGB values under the eyedropper tool. The same procedure is repeated only this time Option/Alt dragging the Shadow slider from the left to the right (see image [3]). At the far left, everything goes to white, the first tones that show up as you drag to the right are the darkest tones. The same procedure for finding brightest and darkest significant points can be done in Photoshop using Levels - Option/Alt drag the right (highlight) input slider to the left and Option/Alt drag the left (shadow) input slider to the right.





Keep in mind that not all images contain a significant highlight or shadow point that you can set to the brightest or darkest tone that will still print with detail. That is to say that their natural range of contrast may be low. You may run across this with copy work of watercolor paintings, or images taken in foggy conditions, or a wedding invitation on a white linen tablecloth. In cases such as these, pick the brightest or darkest points and set them to a value that seems appropriate. That "appropriate" value may be well within the brightest or darkest printable tonal range - an image of a wedding invitation on a white linen tablecloth may not contain any tones darker than a quarter-tone (64 levels). To force this point down to the darkest printable brightness would totally change the reality of that image making it very contrasty. Within limits, If your monitor is profiled, you can judge these values on screen. If time permits, it is a really good idea to soft proof your adjustments by printing the image on a decent ink-jet that has been profiled. If you have a series of images, print them as a contact sheet to save time and materials. Of course wedding photographers who print proofs are, essentially, already doing this.

In RGB we express brightness values as levels (0 – 255 levels for 8 bit per channel color). The higher the number, the greater the brightness – 255 equals pure white and 0 equals pure black. The important question you need to ask is, how does the output device that I am printing from or displaying my image from fit within this 0 to 255 range? In other words what are the brightest and darkest values that that device can reproduce and still hold detail?

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Assuming that you are setting the range of contrast of your image in RGB rather than in a CMYK printing space, the following should give you a guide line to safe output. Generally speaking most output devices will hold a slight bit of detail in light areas at 245 levels and in dark areas at 15 levels - at these RGB values, these tones should transfer safely to CMYK. However if you had a dark tone such as Firefighter Harp's dark skin in shadow on his left shoulder under the belt-strap, you would probably want it to be in the 20+ level ranges so that more than slight detail is seen. In fact this area reads Red: 25 Green: 22 Blue: 21 in one spot, and Red: 44 Green: 40 Blue: 37 near by. Now, most UK wedding photographers photograph men with all their cloths on, as we do in Canada. In this case a more common dark area to watch is the groom's dark tuxedo. An area of a black tuxedo that is in full light I would probably want in the 30 to 50 levels range. To avoid solid black occurring in areas of a dark tux that are in shadow, I generally try to achieve a brightness of 15 to 20 levels. If your image is to be reproduced in newsprint you may well find that 15 levels is too low. Since newsprint is printed on a very rough porous paper, the ink dots tend to spread, called dot or press gain. Light toned areas are made up of smaller printing dots, and darker are made up of larger printing dots. Larger means more ink. More ink means more ink to bleed outwards into other ink dots. The more the ink spreads the more fine shadow detail gets lost. So for newsprint I like to set the significant shadow point higher than 15, more like 20 to 25.

On firefighter Harp's right chest muscle, the specular highlight reads Red: 247 Green: 246 Blue: 245 in one spot, and Red: 213 Green: 208 Blue: 206 near by. So parts of this specular highlight will probably print with no detail, but I had little concern because the burned out areas are only two to four pixels in size and are surrounded by a scattering of darker pixels. In general it is natural to have bright specular highlights burn out, however large areas of no detail does not look very good. The same is true (in most cases) with large areas of no detail in the dark portions of an image. One other point you need to be aware of is, if you let an area burn out, this area will have no printing dot when it prints. This means that you will be viewing the bare printing paper in this area. If you are using off white paper this can look a little odd, so pull the values of these burned out areas down so that they will print with dot. This won't create detail in these areas if none existed, but it will stop the brightest highlights from looking off. To bring these values down try dragging the highlight Output slider to the left in Levels in Photoshop or by dragging the highlight endpoint of a curve in Curves straight down the right side of the Curves grid. Either way move these points until the burned out areas of the image read in the 240 to 245 level safe zone.

Newsprint: shadow with detail - 20 levels however don't drop below 30 levels in areas where detail is really critical. For Highlight or white with detail you can go with 245 levels however I usually play it safe and go with 240.

Coated stock on sheet-fed offset print press: shadow with detail very slight detail is 15. Critical dark detail set to 20 – 25. For Highlight with detail don't go above 245. If the quality of the printing is at question then play it safe and go with 240.

Ink-jet: shadow with very slight detail is 15. Critical dark detail set to 20 – 25. For highlight with detail don't go above 249 levels, however if you can't run some test prints first to see how far you can go then I would suggest sticking to 245.

Chemical based lab prints: shadow with very slight detail is 15. Critical dark detail set to 20 – 25. For highlight with detail don't go above 250 levels, however if you can't run some test prints first to see how far you can go then I would suggest sticking to 245.

The above figures are for neutral highlight and shadow points, which are also referred to as white and black points. Neutral means all three channels must read close to the same value, e.g. white with detail may equal Red: 245 Blue: 245 Green: 245. You will run into images that don't have a neutral highlight or shadow. The brightest or darkest significant points may have a colour associated with them meaning that 1 or 2 of the channels will read less than the other(s). If this is the case you will at the very least still have 1/3rd of a highlight or shadow, or if the gods are only mildly annoyed with you that day, 2/3rd's. So make sure that the brightest/darkest value of the 3 channels doesn't exceed the output figures I listed earlier. The image of Harp is a good example of this - since it has had its entire colour removed it should read neutral wherever you place the cursor. However this is not the case because of the colour caste introduced by the sepia toning effect, which makes the Green and Blue Channels, read less than the Red. In a case like this, I set the Red Channel at the maximum safe value, and let the other two falls into place proportionally. Wedding photographers will run into a similar case with cream coloured wedding gowns, which are typically low in the blue channel giving a yellow caste.

So one last tid-bit to finish off with: Earlier I mentioned that neutral means all three channels must read close to the same value - they have to be close but do not have to be exact. Our eyes are more sensitive to colour changes in highlights than in shadows, so a greater variance can go undetected in shadows than in the highlights. How much variance you can get away with will also depend on what other colours or neutrals are in the image - your eyes will automatically make comparisons. And finally, a minute or two with the densitometer in Photoshop or Camera Raw will help to guarantee better printing with fewer disappointments, more repeat business, and less stress so you can concentrate your energies on more important things like testing your fidelity. However, checking the range of each image shot may not be realistic for a high volume image-maker like a wedding photographer. However setting up an automated drag-and-drop-go-get-a-coffee Raw processing workflow that takes output range of contrast into account is realistic and is the topic of my presentation in January 2006 at the SWPP convention in Birmingham.

See Dave Montizambert's lecture "Controlling the Burn" at SWPP January 2006 in Coventry. This session looks at burned out wedding dresses, blocked up tuxes, and not one but 400 of them to deal with at a time. Through four simple tests, and a bit of Photoshop automation you can setup a better workflow that will help you consistently create stronger images that will look better, print more easily, and allow you to sleep better at night.

Also, see Dave's Photoshop CD tutorial lessons at www.software-cinema.com.

General aim-points for neutrals in RGB values (0 – 255)

Darkest tone without detail	0 – 10
Darkest tone with slight detail	5
Darkest tone with some detail	20 - 25
Dark tone with lots of detail	30 – 50
The 1/4 tone is around	64
The mid-tone is around	128
The 3/4 tone is around	191
Highlight/white with detail but not a reflection	240 - 245
Pure white	255

Between these ranges are the transition areas. For example, a densitometer reading of 105 indicates that this area is neither 1/4 tone nor mid-tone, it is in the transition area between. The above ranges are of course rough figures and will vary depending on the output situation. For instance, most output situations such as fairly recent digital printers can hold detail in the highlight up to 249 levels. However, if you captured a digital image that was destined to be printed on uncoated paper on a web printing press, you would probably want to set the highlight in RGB (assuming that you are correcting in RGB instead of CMYK) no higher than 245 (240 if you really want to play it safe). The 3/4 and 1/4 range are the most subjective brightness ranges of an image since they are generally set relative to the type of image. For instance, an image made up of mostly dark tones may look best and reproduce better with lighter 1/4 tones and an image made up of mostly light tones will look snappier with darker 1/4 tones.

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