

IMAGE PROCESSING GUIDELINES

When you capture an image digitally — whether using a digital camera, a film scanner or a flatbed scanner — it is imperative that you always capture the image in color. This is true regardless of whether or not you are capturing a latent lift card (with a black powder lift) or a ninhydrin print on a check.

Once the image has been captured successfully, there are a number of variables that affect how you process your images for better clarity. For example, perhaps you photographed a latent print that was on a plastic baggie that had been processed with cyanoacrylate (superglue fuming). This image simply needs to be inverted to convert the white ridge detail to black ridges. Similarly, you may have photographed a gray or white power lift that also needs to be inverted to convert the white ridge detail to black ridges.

Or perhaps you acquired a latent print processed with ninhydrin that appeared on a check with a blue security background or a pink security background or a multi-colored gradient security background. Or conceivably the ninhydrin print was on a brown rough textured paper bag or a brown smooth paper bag.

All of these scenarios are very possible. The bottom line is that you can acquire images from an unlimited number of surfaces, including skin, as well as acquire images that have been processed using any number of powders, chemical processes, dyes, fluorescents, etc.

You also have an arsenal of light sources to aid in the visualization and capture of latent prints, body fluids, gunshot residue, etc. Simply stated, all images – even images processed using the same development process (such as ninhydrin) on the same type of surface (such as paper) with the same type of light source – cannot be processed using the exact same technique. Therefore it is impossible to provide a scenario in which you will always use the same technique.

There is, however, a “typical” order that you will can follow when you are processing images, whether it be a fingerprint, palm print, shoe print, tire tread, etc. Please be aware that the following steps are offered only is a recommended order and in no way is this intended or implied to be the required order for image processing techniques.

Recommended order of processing techniques

Once you have captured the image, the following steps will help guide you through the proper order of the steps that you should follow to properly develop (enhance) your image.

1. Calibrate (scale) the image for life-size output, including printing as well as exporting to an AFIS.
 - a. Manually calibrate the image using Adobe Photoshop
 - b. Calibrate the image using Foray Technologies' Image Calibration Utility plugin for Adobe Photoshop (Filter menu > Foray > Image Calibration Utility)
2. Evaluate color channels and modes; it may be necessary to adjust color values within the image.
 - a. Review the following color modes (color channels) to remove one color value:
 - i. Image > Mode > RGB
 - ii. Filter > Foray > Chromatic FFT
 - iii. Image > Mode > CMYK
 - iv. Image > Mode > Lab Color (Lightness channel, Channel a (green + red) or Channel b (green + blue))

NOTE: When using LAB color, it is necessary to adjust the levels in Channel A and Channel B to properly evaluate the information contained within those two channels.
 - b. If none of the color modes provide the desired results, then you may need to adjust individual color values to isolate the background. In other words, using one color channel not be sufficient to eliminate all of the background color values that interfere with the visualization of the image. Therefore it may be necessary to adjust the color values so that a single color channel *can* remove the background. The following tools can be used to remove two or more color values as well as adjust the color values so that a color channel may be used too eliminate the background:
 - i. Image > Adjustments > Hue & Saturation (eliminates two or more color values; used in conjunction with Calculations to eliminate background noise)
 - ii. Image > Adjustments > Color Balance
 - iii. Image > Adjustments > Black & White (Adobe Photoshop CS3 only)
 - iv. Image > Adjustments > Variations
 - v. Image > Adjustments Photo Filter

- c. In some instances, you may not be able to necessary Image > Calculations (creates multi-channel image ... and used to eliminate backgrounds, such as ninhydrin prints)
3. Convert active color channel to grayscale – after selecting the appropriate color channel (and removing the background noise, if required).

a. Image > Mode > Grayscale (all versions of Adobe Photoshop)

NOTE: If a continuous, consistent, and repetitive pattern can be identified within the image, you should use the pattern removal filter (Filter > Foray > Pattern Removal Filter) immediately after the image is converted to grayscale. [This must be done before adjusting tonal range and contrast to avoid raising the tonal range of the fingerprint, etc. to the same frequency as the obstructing pattern.]

4. Adjust tonal range and contrast: There are a variety of options for adjusting tonal range and contrast, and you may use one or more of the following options together to achieve the desired result.

a. Image > Adjustments > Levels (balance tonal range)

b. Image > Adjustments > Curves (extraordinary contrast)

c. Image > Apply Image (multiply, overlay, screen, etc.)

d. Image > Adjustments > Shadow/Highlight (balance tonal range and contrast)

e. Image > Adjustments > Exposure (balance tonal range)

f. Burn and Dodge

g. Image > Adjustments > Brightness/Contrast

5. Once you have achieved the desired tonal range and contrast, you may want to perform a series of “filter” functions to eliminate “hotspots” that may occur as a result of using an alternate light source with florescent/dye stained latent prints. Or, you may need to “fine tune” the image to eliminate blurring caused by the digital photographic process.

NOTE: If the image is a bit blurry, you may want to use one of the sharpen filters, such as sharpen (creates a higher level of contrast between two contrasting pixels positioned side by side), sharpen edges (creates the appearance of more contrast by sharpening only edges while preserving the overall smoothness of the image), and Unsharp mask (adjusts the contrast of edge detail and produces a lighter and darker contrast on each side of the edge, emphasizing the edge and creating the illusion of a sharper image.)

a. Filter > Noise > Dust & Scratches (Remove artifacts – using dissimilar pixel values – introduced through instrumentation, etc.)

b. Filter > Noise > Reduce Noise (Removes random artifacts – based on edges –introduced through instrumentation, etc.)

- c. Filter > Sharpen > Unsharp Mask (Sharpens an image by increasing contrast –locates neighboring pixels that differ in value, and the lighter pixels get lighter and the darker pixels get darker.)
 - d. Filter > Sharpen > Smart Sharpen (Similar to Unsharp Mask, but provides significantly more control)
 - e. Filter > Sharpen > Sharpen Edges (Like Unsharp Mask, sharpens areas where significant color changes occur , but significantly less control than Unsharp Mask or Smart Sharpen)
6. Save the image (CAUTION: Do ***NOT*** overwrite the original image!!! For legal purposes, you must maintain the original image and be able to provide the original image, if requested, for discovery and/or court.)
- a. Save the processed image as a copy – it is important to maintain the same naming convention to help identify the relationship between the original image and the processed copy of that original.
 - b. Save as TIF (no compression)

Required Guidelines for Brush Tools (Burn and Dodge)

1. When using brush tools, such as burn and dodge, you must use the following guidelines:

- a. **Rule Number 1:** Always choose a soft (feathered) round brush.
- b. **Rule Number 2:** Always choose a brush size that is at least four to five ridges in diameter.

NOTE: Generally, you should choose *Shadows* for the *Range* when using the **Burn** tool, and *Highlights* for the *Range* when using the **Dodge** tool.

- c. **Rule Number 3:** Always drag the brush across the ridges — go across the ridge flow; do not go **with** the ridge flow. Alternatively, place the cursor at a single location and click the mouse button one or more times to achieved the desired results.

Feathering Guidelines for Area of Interest Tools (Marquee and Lasso Tools)

It is permissible (and legally acceptable) to use area of interest tools to isolate specific areas within an image. These tools include the rectangular and elliptical marquee, the lasso and polygonal lasso, and the magic wand. However, you must “feather” your selection to blend the adjusted area into the rest of the image. When you use the Magnetic Lasso or the Magic Wand, it is not required to feather that selection because those tools are used to select an area based on a difference in edge contrast.

1. From the Image menu, choose Image Size, and then note the image resolution.
2. From the tool bar, choose the appropriate area of interest tool.
3. Use the mouse to select the area to be processed.
4. Photoshop CS2: From the Select menu, choose Feather¹.

Photoshop CS3: From the Select menu, choose Modify, and then choose Feather².

- If the Resolution is *less* than 1500 PPI, multiply the number of hundreds by three (3). That value will be the “Feather Radius” that you enter in the Feather Selection dialog box.
- If the Resolution is *greater* than 1500 PPI, multiply the number of hundreds by four (4). That value will be the “Feather Radius” that you enter in the Feather Selection dialog box.

NOTE: You may need to adjust the feather radius based upon the size of the selection within the image. For example, you may need to reduce the Feather Radius if you are selecting an area that is so small that the feather radius overlaps; or you may need to increase the Feather Radius if you are selecting a significant portion of the image.

¹ Alternatively, you can enter the feather radius for each area of interest tool on the tool options bar located directly beneath the main menu bar. (NOTE: This must be done *before* selecting the area to be processed. If you select the area first, then try to enter the feather radius in the Feather field on the tool options bar, it will have no effect on the current selection; it will only affect *future* selections. If the area has already been selected, then you must either deselect the area or you must use the Feather option from the Select menu.

² Please refer to Footnote 1 above.