

Calibrating Your Images

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When you acquire images either from a digital camera or from a film scanner, the images are not calibrated for one-to-one (1:1), life-size output. In contrast, if you are scanning images using a flatbed scanner, there is no depth of field involved and you specify the size of the area to be scanned, so images acquired using this particular digital device are acquired as true, life-size images.

Unless, of course, you are scanning an image that has been enlarged, such as a latent fingerprint that was photographed and then printed as an 8 by 10 inch photograph, which may or may not be to a particular scale. Upon scanning this photograph, it would be necessary to rescale the image to print a life-size image or to send the image to an automated fingerprint identification system (AFIS).

But returning to our original scenario, let's say you are using a Kodak DCS 330 digital camera. The CCD chip has a resolution of 2008 pixels by 1504 pixels. You can photograph a one-inch by one-inch area or you can photograph a three-by-five-inch area; it makes absolutely no difference to the camera. But the camera, not being the brightest crayon in the box, has no idea how large the area is that it just captured. All it knows is that you captured an area that consists of 2008 pixels by 1504 pixels.

Using Adobe® Photoshop®, you can accurately calibrate any image as long as the image has a scale in it. As an alternative to this method, you can also use an image calibration utility, such as the *ADAMS* Image Calibration Utility. Both techniques use the same theory — counting the number of pixels from one known point on the scale to another known point on the scale, thus determining the number of pixels per inch for resolution.

NOTE: There are three elements that make up image size of any digital image. First there are the “measurable” physical attributes: width and height. Then there is a more obscure dimension known as resolution (AKA pixels per inch). By knowing one of the measurable attributes, you can determine the other two attributes of image size.

So how do you calibrate your images? Using Adobe® Photoshop®, it is a simple, two-step process. First you crop the image, then you tell the computer what this distance is, and the computer does the rest. Here are the actual steps to perform this process.

Step-by-step Instructions

1. Using the Crop tool, crop the image ensuring that the “marching ants” of the crop box go through the middle of the bar on the scale. (It is also extremely important to ensure that the marching ants are parallel to the edge of the scale when cropping the image. If they are not parallel, rotate the crop box to make it parallel.)



Figure 1. Image window showing placement of the marching ants

NOTE: For accurate scaling, ensure that the marching ants go directly through the center of the scale bar because the width of the scale bar can vary depending upon the resolution of the CCD, the size of the area captured, and so forth. For example, an individual scale bar can be 13 pixels wide or it can be 23 pixels wide. Therefore, by counting the exact number of pixels from the center of one scale bar to the center of another scale bar gives you a more accurate pixel count.

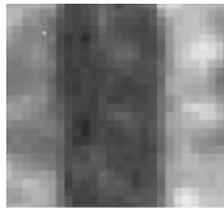


Figure 2. Enlargement of a single scale marker; the width of this scale bar is 13 pixels.

2. From the Image menu, choose Image Size.



Figure 3. Image Menu

- When the Image Size Dialog Box appears, ensure that the Resample Image option is disabled. (There should not be a checkmark in the box to the left of this option and a bracket with a chain should be displayed on the right side of the Width, Height, and Resolution fields indicating that these three fields are linked. As a result, as one option is changed, the other options change, thus keeping the appropriate size aspect ratio.)



Figure 4. Image Size dialog box shows the link of width, height, and resolution fields

- The image shown in Figure 1 includes a metric scale. Therefore, click on the drop down option for the unit of measure for the Width field, and change inches to centimeters. (See figure 5 below.)

NOTE: We recommend that you use a metric scale to make it easier for determining the numeric value to be entered into the width or height field. For example, $\frac{1}{4}$ inch, is easy, you simply enter 0.25 for the known distance. If you have $\frac{1}{8}$ th of an inch, the size is 0.125; $\frac{1}{16}$ th of an inch is 0.0625, and so forth. If you have $\frac{3}{16}$ th of an inch, it is 0.1875. (OK, in Ski's world you have officially entered "math hell!" With a metric scale, all you have to do is count the number of scale markers and divide by 10. Hence 24 mm equals 2.4 cm; 13 mm equals 1.3 cm, and so forth. It is much easier! Even Ski can get it right!)

- Highlight the width measurement, and type the appropriate distance. (In Figure 1, the width of the cropped portion of the image is 14 mm wide or 1.4 centimeters). As soon as you enter the appropriate width, the other two fields are changed automatically.

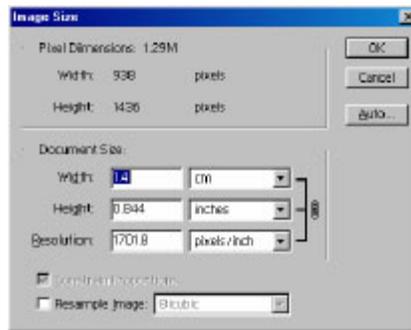


Figure 5. Image Size dialog box showing the unit of measurement changed for width, and the correct distance entered in the width field

6. Click OK and your image is now calibrated. You can print an accurate, life-size image, or you can send your image to the AFIS for accurate matching. You can use a variation of this process for calibrating images that have either a partial ruler in the image, such as a shoeprint that has only a six-inch ruler or a palm print that has only a one- or two-inch ruler in the image. Simply follow the processes described in steps 1 through 5 above. In this case when you crop, you will simply crop the image to the part of the scale that is visible in your image.

7. Then make a note of the number of pixels in the resolution field. Instead of clicking OK, click the Cancel button in the image size dialog box. Then revert back to the original (uncropped) image. Choose Image Size from the Image menu. Once again, verify that the Resample option is off and the Width, Height, and Resolution fields are linked. In the Resolution field, type in the correct number of pixels noted above, and click OK. Your image will then be calibrated.