

Image Calculations

Under the Image menu you'll find two useful commands – Apply Image and Calculations. Before the introduction of layers with Photoshop 3.0 image compositing and controlling effects relied heavily on channel masking. The most advanced method to create fine-edged masks was to use the Image Calculation commands to combine and refine images and channels. Today with the use of layers and blending modes many of their results can be achieved with more easily but, these commands still offer useful methods for creating image composites and building masks that maintain fine tonal and edge detail. Since Image Calculations use interchannel math that compares channel values to create the results they are often called *chops* (channel operations).

The Apply Image and the Calculate commands have similarities and differences that make them more daunting to understand than they really need to be.

The two commands share the following requirements:

- Images you want to calculate need to be open. You can't navigate to a closed file on your hard drive to use it during a calculate session.
- Images you want to calculate together need to be the exact same (to the very pixel) width and height. With the booming popularity of digital cameras, this requirement is becoming easier and easier to meet.
- You can mix and match RGB, LAB, CMYK, and grayscale images with the Calculate command.
- Both commands can be used to move selections between files.
- In addition to the standard blending modes, both Apply Image and Calculate include the Add and Subtract blending modes (see the sidebar "The Math behind Blending Modes" for more information).

The primary differences are:

- The Apply Image command uses the composite color image or single channel as its source to create color images or channels. It cannot create a new document, channel, or layer.
- The Calculate command lets you choose a source from any open image with the same image resolution, but it only uses a single grayscale channel. Calculate creates a new channel, black-and-white document, or an active selection but never a color file.

To be completely accurate, the Duplicate command is also a calculate function, and it is the fastest way to duplicate a file – especially one with many layers and channels. Holding down the (Option) [Alt] key while selecting Image > Duplicate bypasses the duplicate window. (You also have to keep your mouse button down during this maneuver, if you release the mouse when the menu drops down, while holding the Alt key, the menu disappears.) Since the Apply

Image command overwrites the active source, I recommend you either duplicate the file before using Apply Image or make 100 percent sure you're working on a copy of your original file.

Blending Mode Guide

The Calculate commands apply the math of the blend to the layer, channel, or composite to create the desired effect. It is essential to remember that 0 is the equivalent of black, 128 is the equivalent of gray, and 255 is the equivalent of white, and that all blends compare pixel values to calculate the result.

- Normal: Combines the two sources based on opacity.

Darkening Group: Neutral to white; will have no effect on light areas; the effect will be progressively stronger as the tones become darker.

- Darken: Dark pixel values replace light values.
- Multiply: Multiplies values less than 50% gray times each other, resulting in darker values while light areas are not affected.
- Color Burn: Results in a darker channel with increased contrast.
- Linear Burn: Is a strong combination of Multiply and Color Burn and forces dark values to pure black.

Lightening Group: Neutral to black; will have no effect on dark areas; the effect will be progressively stronger as the tones become lighter.

- Lighten: The opposite of darken, it compares the two sources and replaces the darker pixels with lighter pixels.
- Screen: The opposite of multiply, results in a lighter channel while dark areas are not affected. Also reduces contrast.
- Color Dodge: Increases contrast of areas lighter than 50% grey while preserving black values.
- Linear Dodge: Is a combination of Screen and Color Dodge and forces light areas to pure white.

Contrast Group: Neutral to 50% gray; will have no effect on 50% gray areas; and are all good to add contrast i.e. make the dark values darker and the light values lighter.

- Overlay: Multiplies dark values and screens light values, which increases contrast but without clipping to pure white or black.
- Soft Light: Is a combination of dodge, which lightens the light values, and burn, which darkens the dark values. Adds less contrast than Overlay or Hard Light.

- **Hard Light:** Multiplies the darks and screens the light values and increases contrast dramatically.
- **Vivid Light:** Lightens the values above 50% gray by decreasing the contrast and darkens the values below 50% gray by increasing contrast.
- **Linear Light:** Combining linear burn and linear dodge, this blend mode lightens the values above 50% gray by increasing the brightness and darkens the values below 50% gray by decreasing brightness.
- **Pin Light:** Combines darken and lighten to replace pixel values. Always very contrasty and used for special effects and less often to create masks.
- **Hard Mix:** Lighter values lighten and darker values darken to the point of threshold and posterization.

Combination Group: Found only in the Apply Image and Calculate commands.

- **Add:** Adding light values results in lighter to bright white values. Black values areas remain black ($0+0=0$). The Scale factor is any number between 1.000 and 2.000. The Offset value lets you lighten or darken the pixels in the destination channel by any brightness value between -255 and +255. Negative values darken the image; positive values lighten the image.
- **Subtract:** Subtracts the pixel values from the corresponding pixel values and uses scale and offset as in Add.

Comparative Group: Neutral to black.

- **Difference:** Reveals identical pixel values as black, similar values as dark and opposite values as light to white values.
- **Exclusion:** Similar to difference but with less contrast. Blending with black produces no change and white inverts the compared values.

Have I memorized all of these blending modes? No. But I do know which general group to start with to darken, lighten, enhance contrast, etc. Often getting into the tonal ballpark is a start and then I can choose a related blend to see if the effect is creating the desired effect.

The Apply Image Settings

The Apply Image is the smaller of the two commands, as it always uses the active image as its target, meaning the image that is active when you select Image > Apply Image will always be at the receiving end of the Apply Image command. Before we use Apply Image to make masks, an overview of the terms used.

- **Source:** Pull-down menu used to select from the other open images to be processed with the active image.

- **Layer:** Determines which individual layer or merged layers of the source will be used. Merged is only available if both files are in the same color mode.
- **Channel:** Determines if the results will go into the merged color file or into one individual channel. If the layer you choose has transparency (such as a text layer) transparency will also be a choice.
- **Target:** Is always the document that was active when you invoked the Apply Image command. When making masks (as we will do later in this section) the name of the active channel will appear here.
- **Blending:** The mathematical formulas used to combine the layers or channels. See the sidebar “The Math Behind Blending Modes” for more information.
- **Scale and Offset:** Only active when Add or Subtract are chosen in the Blending option. The Scale factor is any number between 1.000 and 2.000 – a higher Scale value darkens the image. The Offset value lets you lighten or darken the pixels in the destination channel by any brightness value between +255 and -255. Negative values darken the image; positive values lighten the image.
- **Opacity:** Controls the percentage of the source used in the calculation process. The lower the percentage the more the target is used.
- **Preserve Transparency:** If the target layer has transparency, use this checkbox to protect it from being effected.
- **Mask:** Lets you control where the calculation takes place, with a mask from any open image that has the same pixel resolution.
- **Invert:** Switches tonal values from within the Apply Image command.
- **Preview:** Lets you monitor the effect of all the above settings. Thank goodness!

In a nutshell, before using the Apply Image command, make sure the image, layer, or channel you want to composite or make a mask for is active. Use the pull down menus to create the desired results as explored in the following examples.