

EquaLight™

Version 3.1

Operating Manual

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EXTREMELY IMPORTANT NOTE

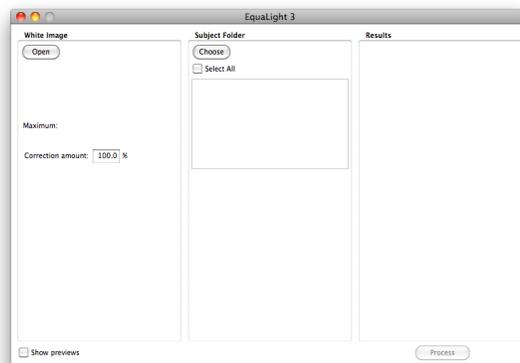
Do not skip reading this upon penalty of losing one-half of all your sock pairs!

Only TIFF images are opened, processed and produced by EquaLight. This allows for cross-platform transfer of images. The **TIFF images must be RGB only, single layer, with RGB interleaved data.** Either 8 or 16-bit data is accepted.

Introduction

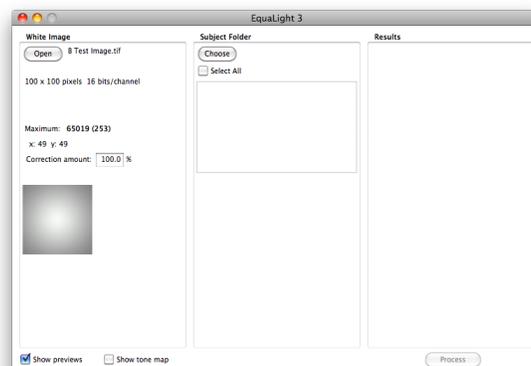
EquaLight™ is a program that will take an image with an intensity falloff and convert it to an image with a more even intensity distribution. It opens TIFF RGB images and produces TIFF RGB images.

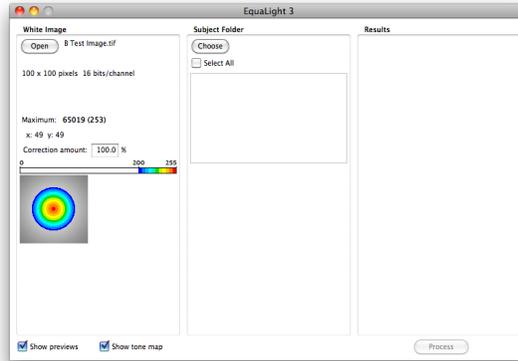
The image intensity falloff is described to EquaLight by taking an image of a flat, white surface in the same lighting used for taking the picture image. A compensation function is calculated from the white image and applied to the subject image pixel by pixel. For this reason, the white image must be the exact size as the subject image.



Operation

Begin by opening a white image using the *Open* button in the *White Image* area. A file open dialog window will appear to allow you to select the white TIFF image. The white image will be opened, analyzed, and the maximum value encountered in the file is displayed in the window. For 16-bit per channel images, the 8-bit equivalent value is displayed in parentheses.



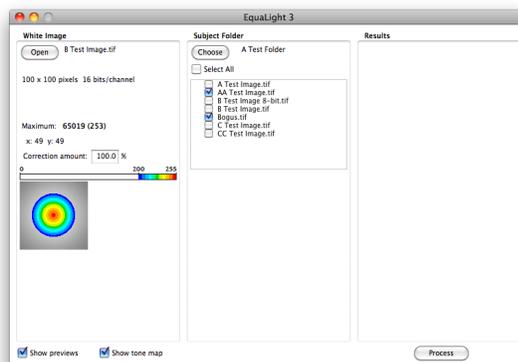


Once the Show previews option is checked, another checkbox appears to show a tone map of the white card image. When the Show tonemap option is checked, the white card image is overlaid with bright colors to indicate the lightness levels. The levels from RGB value 200 to 255, inclusive, are displayed in various colors according to the following plan.

250-255	
245-249	
240-244	
235-239	
230-234	
225-229	
220-224	
215-219	
210-214	
205-209	
200-204	
000-199	white image pixel

A scale appears immediately above the white image display area to indicate the tone mapping.

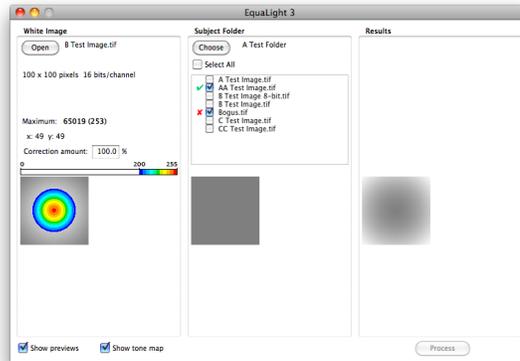
The subject images are selected by first clicking the *Choose* button in the *Subject Folder* area to select the folder containing the images to process. All the TIFF images within the folder are then listed. **Images to process must be selected by checking the box next to their names.** If all the images are to be processed, check the *Select All* checkbox.



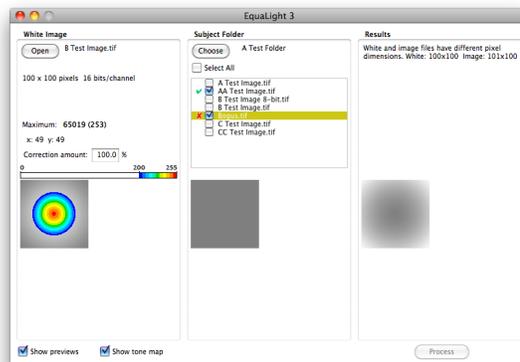
Once the white image is open and the subject images are checked, clicking the *Process* button will start the intensity compensation. A File Save dialog window will open to allow you to specify the folder for the resulting processed images. By default, the resulting image will be given the same name as the picture image with a “_eq” appended. The name of the resulting image file cannot be changed at this point.

Note: While EquaLight does not use a color management profile for its calculations, any profile present in the picture image will be copied to the processed image when it is saved. Any additional information in the subject file header, such as GPS location or EXIF data, will also be copied to the processed image file.

As each image is processed, a preview image of the subject and the result image will be displayed at the bottom of their respective areas if the *Show previews* box is checked. The subject image is shown as the process begins to work on the file but the result image is not displayed until after the processing has been completed on the file. As each image file is processed, the respective images will be replaced in their display areas.



After each image is processed, a green check mark will appear next to the file’s name in the subject list to indicate successful processing of the file. A red cross will appear if a problem was encountered in processing the file. To discover the cause of the problem, click on the problem file’s name in the subject list. The reason for not processing the subject file will be listed in the *Results* area.



Correction amount

When an image's exposure is determined by the lightness of a chart's white patch, **the white patch should be placed at the brightest point in the imaged area**. Often this is not possible because the brightest area may be difficult to determine or the color chart used does not allow for placing the white patch at the brightest point. When this happens the white patch exposure will be a lower value than the brightest point value. Since EquaLight uses the brightest pixel as the reference, increasing lower brightness areas toward that of the brightest, then some areas may be increased enough to cause them to be raised beyond the maximum lightness level. EquaLight will clip these over-brightened areas to 255 for 8-bit/channel values and 65535 for 16-bit/channel values.

To reduce the amount of clipping, the *Correction amount* value may be used to cause EquaLight to apply less than the full amount of lightness correction. The value entered in this field is the amount of falloff correction to apply to the subject image. A value of 100% will apply full correction to the image. A value of 0% will result in a copy of the subject image without any correction applied.

A small correction of just a few units will normally be all that is needed. The percentage amount can be specified to a tenth of a percent for fine tuning the correction. This critical adjustment will be most helpful in creating optimum profiles. The reason for the correction is that a number of circumstances (stray dust, objects on edge of white card, etc.) can create one or more bright pixels, which then increases the overall correction.

Falloff

Normally, every camera produces a type of intensity falloff in the image due to the physics of bending light through the lens and aperture. This is called *cosine fourth falloff* due to the mathematical function defining the rate of intensity change.

In addition to lens falloff, an image can also exhibit lighting falloff. Light intensity diminishes by the square of the distance from the light source. If a light produced a given intensity at a distance of 1 foot from the source, at a distance of 2 feet the light falling on a point would be one-fourth of the initial intensity.

If the light source was a point source, light would fall off evenly in a spherical manner as the distance from the source increases. However, photographic lights usually have reflectors, diffusers or other light intensity affecting devices. Lights are rarely a point source but are three dimensional in shape, thus producing irregularly shaped light distribution patterns.

Lighting falloff in combination with the lens falloff can produce very irregular light falloff distributions that cannot be easily compensated using a simple cosine fourth model. This can be especially true where the illumination is positioned to enhance the subject's texture.

EquaLight uses a method that will compensate for any intensity falloff pattern. To accomplish this the falloff must be described to the program. This is accomplished by providing an image of a uniform white subject taken with the same lighting and lens used for the subject images.

Important Notes

1. The white image must be free of dust, dirt, reflections or anything else that is not due to the lighting distribution. Dark spots in the white image may produce bright spots in the equalized image. Conversely, bright spots may produce dark spots in the final image.

In addition to making certain the white subject is clean and free from dirt, dust or bright reflections, it is a good idea to open the white image in an image processing program and carefully remove any irregular spots. Be certain that if you are removing a spot that you replace it with the same intensity values surrounding the spot. The healing brush or the clone tools in Photoshop can be very helpful with this process.

2. One way to hide small dust spots is to defocus the camera slightly when taking the white image. Be very careful not to overly defocus the image and thereby change the light falloff distribution. Defocusing the image will also help to hide small amounts of dust on the white. Remember to refocus the camera before continuing to other subjects.

3. Another way to hide dust spots is to blur the white image before processing in EquaLight. A Gaussian blur in Photoshop is one way to blur the image. The amount of blurring can be adjusted with the radius parameter. For images of 20 MB or larger, a 20 pixel radius works well.

4. Matte surfaces are also preferred over glossy ones for the white material. A matte surface will provide a more evenly distributed falloff pattern and helps prevent equalization errors due to surface reflections.

Improving Performance

Here are some tips for getting maximum performance from EquaLight. Most of these tips apply to any program, not just EquaLight. The reason these may be more important for EquaLight is that many EquaLight users are working with images of 100 MB in size, and larger! These users tend to shoot many images for each project, are always under a deadline. Any ideas that improve the equalization processing time can mean a huge time and cost savings. So here are some ideas for both Mac and PC users.

1. **Both:** Process the images on the same type of processor that created them. This is extremely important for speed. Intel and Motorola processors use different ways to store image data. If an image is created on a PC but processed on a PowerPC Mac, then the data must be converted by the Mac before it can be processed. This slows down the equalization process. This problem also occurs if the image is created on a PowerPC Mac then processed on a PC. The newest Macs use the same processors as PCs, so this does not present a problem. Mixing older PowerPC based Macs with new Intel Macs or PCs will have this encoding mismatch.

2. **Mac:** Turn off “Show icon preview” in the Finder’s View/Show View Options menu command. When an image file is created, the operating system will start a process running in the background to create an icon preview image. This process will take time away from EquaLight.

3. **Mac:** Turn off “Calculate all sizes” in the View/Show View Options menu command when using List Views. This option starts a background process that will display the sizes of each list item. For folders this means adding up the size of each option within the folder. This process can take time away from other running programs, such as EquaLight.

4. **Both:** Turn off all file sharing. If you are sharing your disks or folders with others on a network, your computer will not be giving full time to its operating programs, like EquaLight.

5. **Both:** Do not operate any other programs while EquaLight is processing. The fewer programs running will mean more computer time should be available to EquaLight.

6. **Both:** Uncheck the *Show previews* option in EquaLight for large images. Preview image generation can add significantly to the processing for each image. When batch processing many images, not showing the previews will greatly reduce the total processing time.

Changes in version 3.1.0

1. Tone map feature added for white card image analysis.
2. Subject image dimensions added to the error message.
3. Result image cleared before starting the next image.
4. Image previews are now off by default.

Changes in Version 3.0.0

1. Redesigned interface.
2. Batch processing.
3. Preview images may now be displayed.
4. The Correction amount is now user controlled.
5. The white image may now be changed without needing to quit the program.

Minimum System Requirements

Macintosh or PC

MacOS 10.4 or later, Windows 2000 or later

32 MB memory, or more

Color monitor with an 800 x 600 pixel resolution, or larger