

## FixBadPixels

Version 1.0

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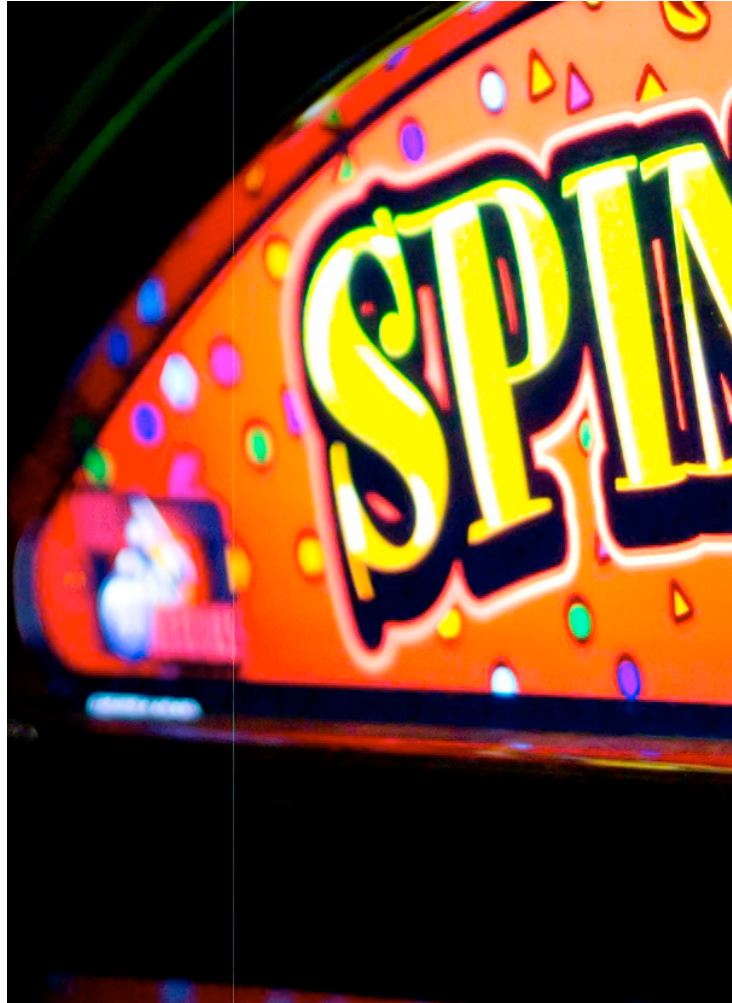
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### Overview

Camera sensors may develop defective pixels over time. In some sensors, defective pixels are isolated and can be mapped out automatically by the camera. In CCD sensors, however, a defective pixel may result in a bad column or partial column of pixels, due to the way CCD readout works. This shows up in the image as a vertical line, as shown in the example below:



Example image (overview).



*Closeup (100% pixel view) with noticeable vertical line artifact.*

The usual fix is to send your camera or a sample image to the camera vendor; and the vendor will patch your camera's firmware to map out the defective area. This solves the problem for future images, but doesn't fix the images you've already shot!

FixBadPixels is a free software utility to fix defective pixels in your existing raw images.

Note that FixBadPixels does **not** support non-raw (e.g., JPEG, TIFF) images; this type of correction is best performed on raw mosaic image data.

#### **What's included?**

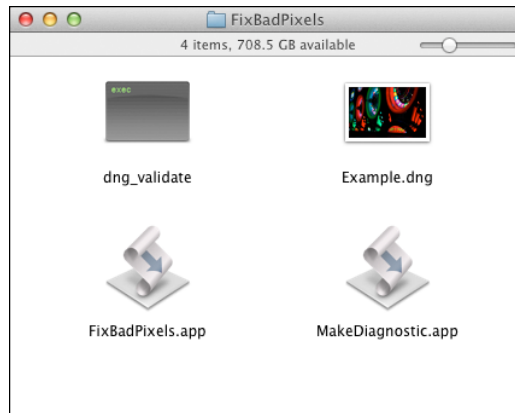
- Two AppleScript applications, named FixBadPixels and MakeDiagnostic.
- A helper program named dng\_validate.
- An example DNG raw image with a defective partial column.
- This README document.

#### **What do I need?**

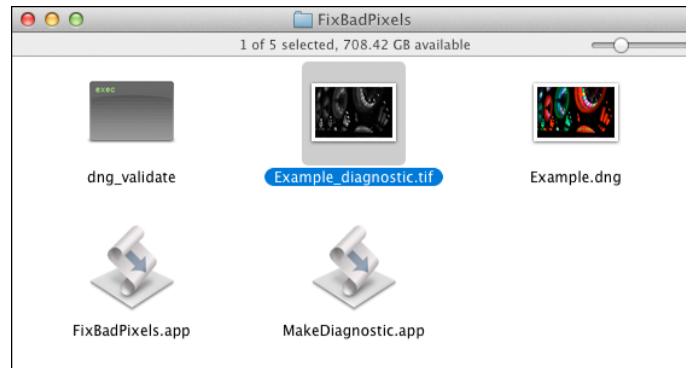
- A Macintosh computer with Intel 64-bit processor.
- Mac OS X Snow Leopard or Lion operating system. I have tested FixBadPixels on 10.6.8 and 10.7.3 operating systems. Older Mac OS X versions like Leopard (10.5.x) may also work (not tested).
- DNG raw files. If your raw files are not in DNG format, you can use Adobe's free DNG Converter software.
- Raw processing software that supports DNG 1.3 or later. Examples include Camera Raw (5.4 and later) and Lightroom (2.4 and later).

**Step-By-Step Instructions:**

1. The unzipped folder should look something like this:



2. Drag an affected DNG raw image (e.g., Example.dng) to **MakeDiagnostic**. This will write out a diagnostic TIFF image (e.g., Example\_diagnostic.tif) to the same folder as the original DNG, like this:

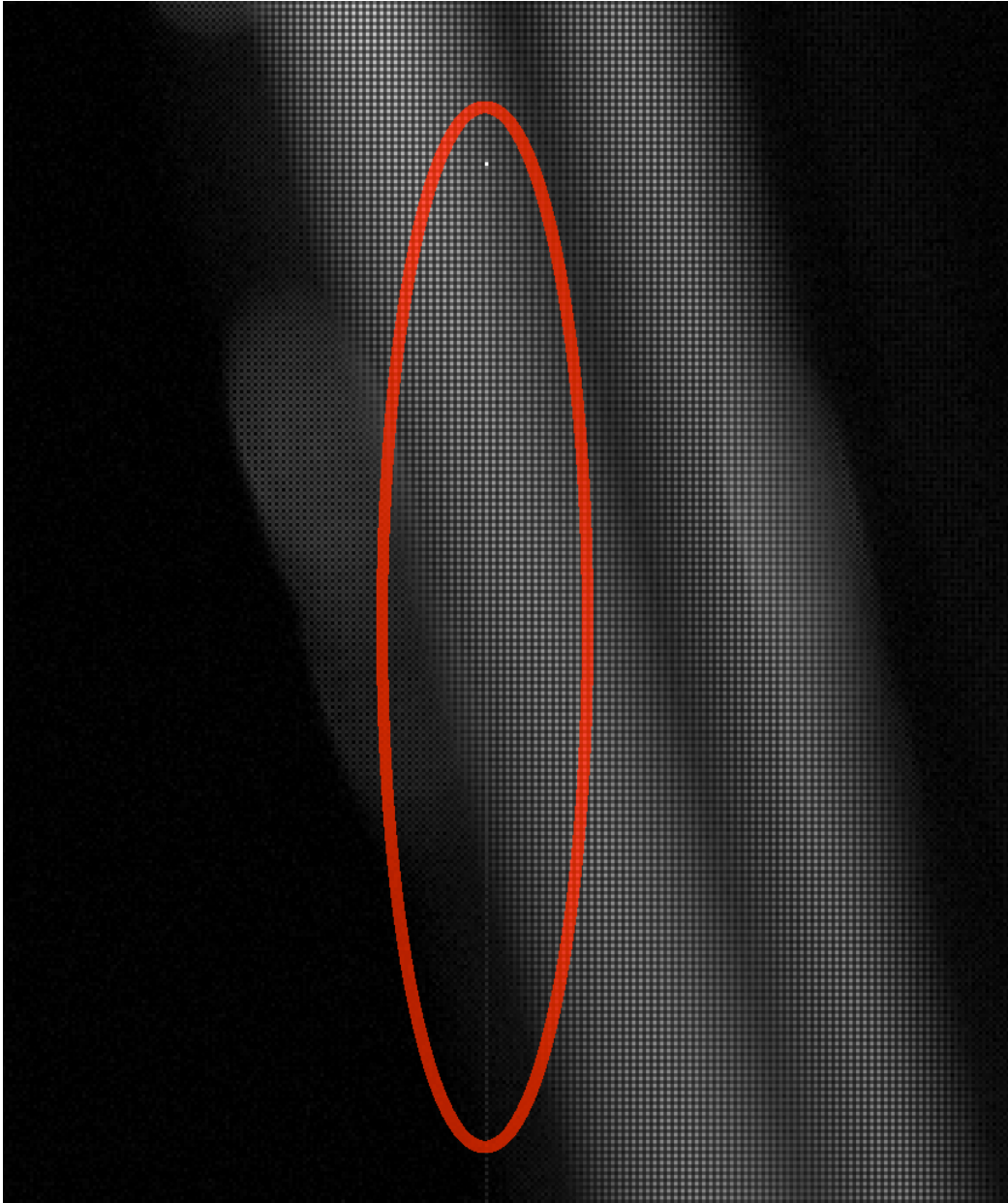


3. Open the diagnostic TIFF image in Photoshop or an image editor that supports pixel coordinate readouts. It will look something like this:

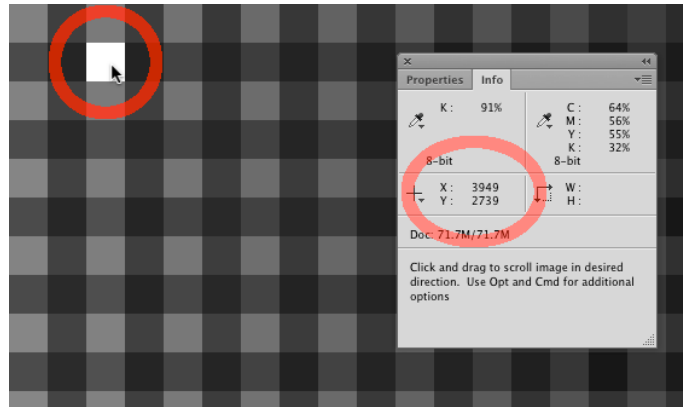


This is a grayscale raw mosaic image. It is probably dark, so it may be a good idea to brighten it (e.g., with Levels). This will make the bad pixel column(s) easier to see.

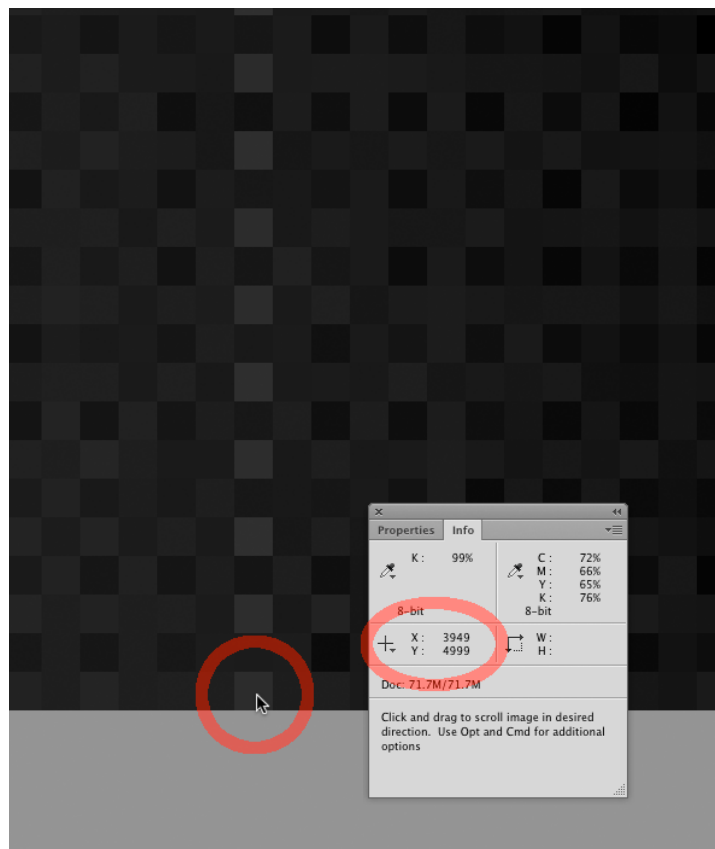
4. Zoom in to 100% or higher pixel view to find the defective pixel area. In this example, the defective area is a single partial column (see outlined red area, below). The top pixel is "hot" and is causing the other pixels below it in the same column to be bright as well.



5. Move your cursor over the **top-left** bad pixel in the defective area. Check the Info readouts and write down the X and Y pixel coordinates. (Make sure your Ruler units are in pixels!) In this example, the top-left bad pixel is at  $X = 3949, Y = 2739$ :

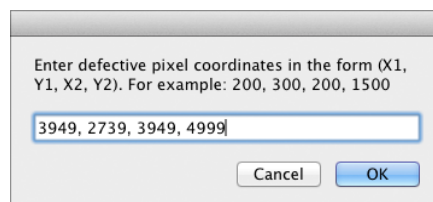


6. Similarly, move your cursor over the **bottom-right** bad pixel. Again, check the Info readouts and write down the X and Y pixel coordinates. If only a single column of pixels is bad (as in this example), the X coordinate from this step will match the X coordinate from the previous step.

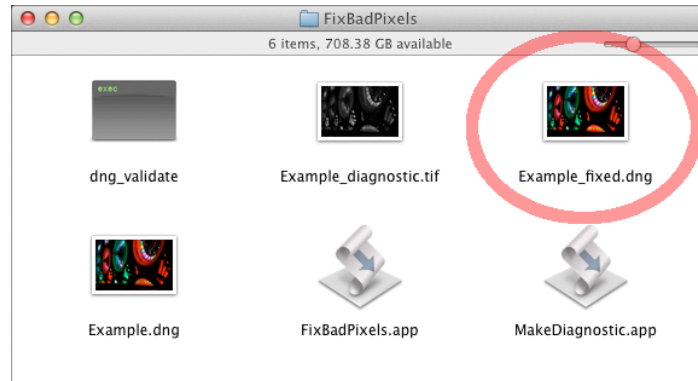


7. Drag your affected DNG raw image (not the diagnostic TIFF) to **FixBadPixels**.

8. A dialog box will appear, asking you to enter the defective pixel coordinates. Enter the values determined above, starting with (X,Y) from the top-left bad pixel, followed by (X,Y) from the bottom-right bad pixel. In this example, the coordinates are: 3949, 2739, 3949, 4999.



Click OK. This will result in a separate "fixed" DNG raw file being written to the same folder as the original image, with the "\_fixed" suffix (e.g., Example\_fixed.dng). For safety, the original image is not modified whatsoever.



9. Open the patched DNG raw file in a supported DNG 1.3 reader (e.g., Camera Raw 5.4 and later, Lightroom 2.4 and later) and check that the affected area is fixed. Here is the same closeup as shown earlier, but with the defective area now fixed:



*No vertical line artifacts.*

10. Once you are satisfied that the fix is effective, you can repeat the previous three steps with your remaining affected images. The defective pixel area should be the same for all the images, so there is no need to run MakeDiagnostic on the remaining images. Instead,

simply select all your affected DNG images and drag them to FixBadPixels. The FixBadPixels script will batch-process all the images.

### **How does it work?**

FixBadPixels adds an opcode named FixBadPixelsList to your affected DNG images. An opcode is a processing instruction. In this case, the opcode instructs the raw processing software to interpolate over the defective pixel area when reading the image. The raw mosaic values stored in the image data are unchanged.

Opcodes were introduced in version 1.3 of the DNG specification. Therefore, only DNG readers that support version 1.3 or later will be able to process the FixBadPixelsList opcode. Example DNG 1.3 readers include Camera Raw (5.4 and later) and Lightroom (2.4 and later).