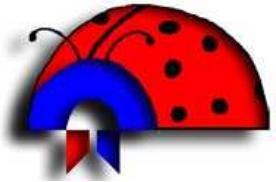


# BUG Data



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## What is Dynamic Range?

by Mike Clarke

Some months ago, I wrote about a photographic concept called High Dynamic Range Imaging or HDRI without actually defining what Dynamic Range really is. I had put the proverbial cart before the horse to demonstrate a very useful tool available to all photographers, but that story is already written.

Dynamic Range (Wikipedia) "is the ratio between the smallest and largest possible values of a changeable quantity such as in sound and light". We, of course, are discussing light, so let's move on.

In photographic terms, Dynamic Range represents the range between the brightest and darkest detail that a camera can capture where detail can still be recognized. Beyond the limits of this range one encounters complete black at the low end and all white (blowout) at the upper end. Each location within the range (brightness) is also referred to as luminance.

Each and every camera has its own range of dynamic ranges depending on the settings used including aperture, shutter speed, sensitivity (ISO) and any other adjustment available. More critical, however, would be the bit depth and size of the sensors. A

higher bit depth (14 over 12) usually means a greater dynamic range, and the larger each photosite, the better the dynamic range as well. Noise also is a very large factor seriously limiting dynamic range in the lower end of the range.

Briefly, the following table describes the capability of different devices in terms of the range of f-stops for each device. The source this is "borrowed" from is more detailed but I think the following relative comparisons get the idea across.

sc=scene, dv=device, ds=display

	<u>Description</u>	<u>f-Stops</u>	<u>Ratio</u>
sc	High Contrast Scene (including light source eg sun)	16 - 17	100,000:1
dv	Human Eye, full working range (moving)	15	30,000:1
dv	SLR High End (HDR)	14	16,384:1
dv	Other SLR	12	4,096:1
sc	Sunlight to Shadow (contrasty scene)	10 - 11	100-2500:1
ds	Active matrix monitor	8+	350:1
ds	8 bit per channel JPEG, TIFF: potential range	8	255:1
ds	CRT monitor	7-8	200:1
ds	Glossy paper	7-8	128-256:1
dv	Human Eye (fixed, unmoving)	6+	100:1
ds	Matte Paper	5	32:1

Notice the difference it makes (from 6 to 15 stops) simply by keeping the eye moving, thanks to the rapid change in the eye's lens as light intensity changes. We usually don't notice this change because the brain perceives the image as a whole. A camera, however, is like the unmoving eye, where it gets only one shot to take the whole picture in.

It can be useful to know the dynamic range of each individual camera, especially if you are attempting to create High Dynamic Range Images. In my next article, I'll describe a method where you can determine the dynamic range of any specific camera, using a grey card.