

The Mysterious F-Stop

What are f-stops?

An f-stop is a numerical expression of the relative aperture of a lens at its different openings. The f-stop or f-number is equal to the focal length of the lens divided by the effective diameter of the lens opening.

They are numbers which refer to a specific lens opening (or lens aperture) and are written like this: $f/2$, $f/22$, or $f/5.6$. It may seem strange to a beginner that the smaller the number, the larger the lens opening, and the larger the number, the smaller the lens opening.

That's because the f-numbers represent a ratio and fraction. Replace the "f" with "1" and $f/2$ becomes $1/2$; $f/22$ becomes $1/22$. Now you see why $1/2$ of the focal length of the lens (instead of $f/2$) has a larger lens opening than $1/22$ ($f/22$) of that focal length.

And saying it the usual way, the lens at $f/4$ - $1/4$ -is much larger than at $f/16$ - $1/16$ -so the expressions are "close down to $f/16$ " or "open up to $f/4$ ".

The system of f-numbers was calculated so that theoretically all lenses transmit the same amount of light to the negative at the same f-stop if they faced the same subject from the same distance and the exposure was made at the same speed. Slight differences in each camera's shutter operation or number of lens-reflecting surfaces may make the differences which show up in actual performance however.

The top f-number of a lens is a quick rating of its "speed". The "fastest" lenses are those with the smallest numbers because they have the largest openings and let in the most light. In this class are the $f/1.4$, $f/1.9$, $f/2$, and $f/2.8$ lenses.

The speed rating of each good lens is engraved on the lens mount along with its particular design, focal length, manufacturer and individual number. The lens opening is written as a ratio: Nikkor 1:2 f-50mm (Nikkor lens, $f/2$ 50 millimeter lens)

The f-stops which are marked on cameras have a precise relationship with each other. Each one transmits twice as much light as the next larger number or half as much light as the next smaller number.

A list of f-stops found on current cameras may include these: $f/1.4$, $f/2$, $f/2.8$, $f/4$, $f/5.6$, $f/8$, $f/11$, $f/16$, $f/22$, $f/32$, $f/45$, $f/64$. There are slight variations in some models which may have: $f/3.2$, $f/4.5$, $f/6.3$, etc, but each f-stop's ability to let in light is double that of its right-hand neighbor and half that of its left-hand neighbor.

The expression, therefore, “open one stop” or “close down a stop” is a suggestion to let in twice as much light or reduce the light by half.