

Remember that the f-stop and shutter speed have a reciprocal relationship. If you change either setting, you must change the other in the opposite direction for an equivalent exposure. Thus settings of $f/8$ at $1/125$ and $f/11$ at $1/60$ produce the exact same exposure, because the smaller lens aperture ($f/11$) reduces the light by half and the slower shutter speed ($1/60$) doubles the time during which light exposes the film.

At very fast and very slow shutter speeds, this reciprocal relationship becomes less predictable and begins to break down. This is called **reciprocity failure**. The exact speed at which failure happens varies with the type of film you are using. In general, with black-and-white films, shutter speeds of about 1 second or longer and $1/2000$ or faster are subject to reciprocity failure.

You rarely have to worry about this, since such speeds aren't used that often. However, if you are making time exposures with the "B" or "T" setting of your shutter or if you are using a very fast shutter speed ($1/4000$ or faster), you may have to adjust for reciprocity failure. The same goes when using a flash, many models of which have extremely short durations of $1/4000$ or faster.

To compensate for reciprocity failure, you will have to give film more exposure than the meter indicates, either by setting a larger lens aperture or exposing for a longer time. You also may have to alter film development to improve image contrast. Since film has its own reciprocity characteristics, check the manufacturer's Web site for specific details.

Whenever possible, change your lens aperture rather than your shutter speed. This way, you can minimize or even avoid the ill effects of reciprocity failure. For example, if your exposure settings are $f/4$ at 1 second, open up your lens to $f/2.8$ and use $1/2$ instead, and reciprocity failure will probably not kick in. Because shutter speed times get exponentially longer as the film exposure "fails," there are times when working in very low light might require a shutter speed of several minutes, or even longer.