

CAMERA CONTROLS

THE SHUTTER

The shutter controls light and motion

The shutter of a camera starts and stops the exposure. The time that the shutter is open can be set to stop motion or, by allowing blur, to show motion. The shutter can allow us to record phenomena in manners not visible to the eye.

The control for the shutter time uses whole numbers to indicate fractions of a second. Thus 1000 actually stands for $1/1000^{\text{th}}$ of a second. Although some modern electronic shutters can adjust in $1/3x$ increments, standard shutter speed scales give $1/2$ the exposure as you change to the next higher number and twice the amount of exposure when you change toward the lower number. An exposure at $1/60$ is twice as much light as at $1/125$ and is $1/2$ the exposure of $1/30$. $1/500^{\text{th}}$ is $1/4$ the exposure of $1/125^{\text{th}}$. We generally refer to changes in exposure by the number of times the exposure doubles or halves. A change in exposure by a factor of two is called a 1-stop change. We would say that an exposure of $1/500^{\text{th}}$ is 2-stops less than $1/125^{\text{th}}$ (a factor of 4). An exposure of $1/30^{\text{th}}$ is 4-stops more than $1/500^{\text{th}}$.

Normal human motion can be stopped at $1/250^{\text{th}}$ second speed. Most football, basketball and soccer shots can be done at $1/250^{\text{th}}$. These sports usually call for a telephoto lens to get tightly framed action shots. When handholding a longer lens, a shutter speed equal to the full frame focal length of the lens should prevent shake-induced blur, e.g. a 200mm telephoto or zoom lens would need a speed of $1/250$ to eliminate blur from camera shake. For small sensors you must apply the crop factor to get the minimum speed. Newer lens that have a shake-canceling system in them allow holding at slower speeds, but you still need enough shutter speed to stop the subject action.

If the shutter speed used allows the subject time to move during the exposure, a streak or blur in the image will show motion. Artfully used, this can give the viewer a sense of the subject in motion. Panning with the subject allows the background to blur even more and can be helpful when the background is especially busy or distracting. Panning involves moving the camera at the same rate of speed as the subject moves. This keeps more of the subject sharp and blurs mostly the background.

Even longer exposures can record a subject not visible to the eye. Star trails are an example of this. A letter "B" is used for the setting that allows longer exposures. When using "B" you have to time the exposure by counting or using a watch. Cameras with electronic shutters often allow times longer than 1 second to be directly set, indicating long exposure times with a letter "s" or a quotation mark following the number. An exposure of 4 seconds would be shown as "4s" (or 4").

Most digital single-lens reflex (DSLR) cameras use a focal plane shutter that is made with two curtains that open and close to expose. Fast shutter speeds are obtained by releasing the second curtain immediately after the first one, forming a slit moving across the gate. This effects the way flash must be used. More about this will be covered in the flash class.

Standard Shutter Speed Progression

B 1 2 4 8 15 30 60 125 250 500 1000 2000 4000 8000