

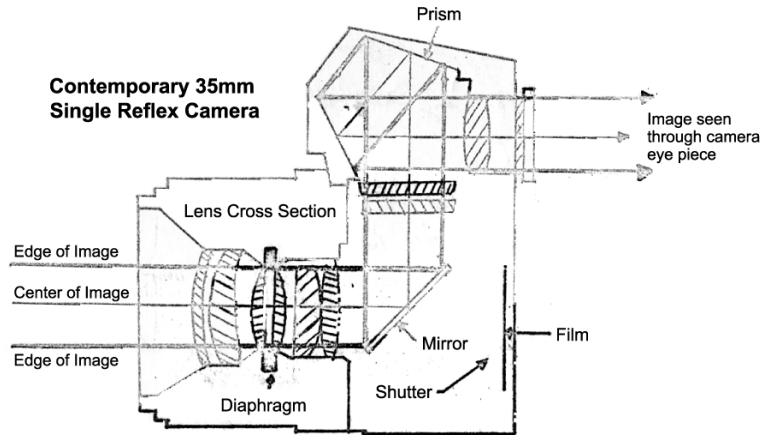
Camera Basics

Understanding how the camera's components work together is key to mastering proper film exposure and developing creative control over your photographs.

Determining Correct Exposure

Every photographic exposure is based on four considerations:

1. The amount of light available
2. The sensitivity of the film/sensor to this light (ISO rating)
3. The amount of light passed through the lens (aperture)
4. The length of time light passes through the shutter

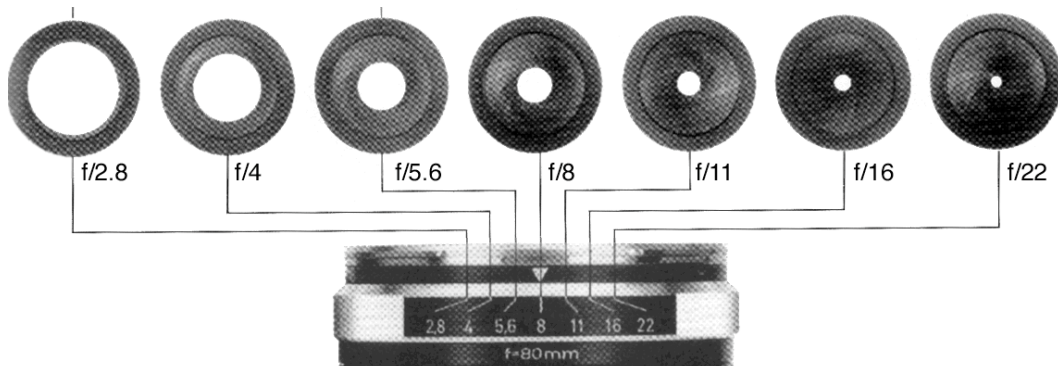


Light Meters

Today, most cameras have built-in light meters to help you determine your exposure. This equipment "averages" the lighting conditions so personal judgment is still important. If you have an irregular lighting situation you may need to "think" for your camera and make adjustments. Understanding aperture and shutter speeds is key to understanding your camera.

Aperture

The aperture is an adjustable diaphragm that controls the amount of light that reaches the film/sensor through your lens. It functions similarly to the pupil of an eye. The size of the aperture is indicated by its **F-Stop**. Standard F-stops are: f1.4, f2, f2.8, f4, f5.6, f8, f11, f16, f22. Each whole f-stop allows half the amount of light of the adjacent f-stops. (The Rule of Halves)



A small F-number stands for a large opening in the diaphragm. When you are told to "open up" you need to move to a smaller number

A large F-number stands for a smaller opening in the diaphragm. When asked to "close down" you need to go to a larger number.

A change of one full stop, up or down, doubles or halves the amount of light reaching the film/sensor. Example: F8 will allow half the light as F5.6, and twice as much as F11.

Shutter:

The shutter controls the length of time the film/sensor is exposed to light. Shutter speeds are fractions of a second (i.e., 1/4 second, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, etc.). On your camera these fractions are shortened to only the denominator: 1 (1 full second), 2 (1/2 second), 4 (1/4 second), 8, 15, 30, 60, 125, 250, 500, 1000. Each shutter speed is half or double the next one, the same relationship as the aperture sizes.

Combining Aperture and Shutter Speed

The combination of aperture and shutter speed determines how much light actually reaches the film. When film is exposed properly images will have bright delicate highlights and dark but detailed shadows.

If an image is **underexposed** it receives too little light, shadows and mid-tones lack detail. For negative films negatives will be thin.

If an image is **overexposed** it receives too much light. Details are lost in bright areas and mid-tones. For negative films negatives will be too dark.

Some adjustments can be made during printing, but generally an under/over-exposed image does not yield as high a quality of print as a properly exposed image.

Equivalent Exposures

The relationship of halves between adjacent apertures and shutter speeds allows you to use different combinations and achieve **equivalent exposures**, with different visual results.

For example, if the determined exposure is F8 at 1/125 of a second but you want the motion in the image to be blurred. You could use F11 at 1/60 of a second and maintain the correct exposure. Below is an example of equivalent exposures to this scenario.

Aperture	F4	F5.6	F8	F11	F16
Shutter Speed	1/500	1/250	1/125	1/60	1/30
	"Stop motion", shallow depth of field				Motion visible, deep depth of field

WHEN USING FILM In very low light situations the equivalent exposures rule breaks down. This is known as **reciprocity failure**. When you are doing very long shutter speeds (over 1 second) you get a decrease in effective film speed and consequently underexposure. To make up for this you must increase exposure even longer. These longer exposures can affect contrast and can cause color shifts in color films.

Holding the Camera with a Slow Shutter Speed

When using slower shutter speeds it is very easy to move the camera while taking the picture. This camera movement will be visible in your images, the image will be blurred. I generally try to shoot at 1/60th or faster.

General rule: If you are hand holding the camera, use a shutter speed faster than the focal length of the lens, i.e., 1/60 of a second or faster if you are using a 50mm lens, 1/250 of a second or faster with a 200mm lens. More on lens sizes later.

Camera Modes

Most newer cameras have modes that allow you to control either aperture or shutter speed and it will automatically control the other. You may also have other auto modes that are designed with specific characteristics in mind.

- Shutter priority: you select the shutter speed, the camera sets the aperture
- Aperture priority: you select the aperture, the camera sets the shutter speed
- Program: camera calculates both while letting you adjust them
- Manual: you control both.

White Balance:

The color of light is measured using the Kelvin Temperature scale. With film cameras we have to purchase specific film types for the different colors of light or filter the light to correct it.

With digital cameras we are able to tailor our white balance specifically to our situation shot by shot. Your camera will have an Auto White Balance setting. This will generally switch as lighting conditions dictate, although it is important to evaluate your camera's response in various conditions. Understanding these settings will also allow you to use them to creatively color the light in your images for visual and emotional effect.

- Daylight is for the bluish light of midday
- Tungsten/Incandescent is for the reddish light of standard light bulbs. It can also be used at sunset.
- Fluorescent is for the green cast of fluorescent bulbs
- You may also have other settings or be able to set the white balance to a specific temperature rating.

ISO

ISO is a numerical rating that indicates the sensitivity of the film/sensor to light. As the rating of the ISO doubles, the sensitivity doubles. Therefore, an ISO of 200 is twice as sensitive or "fast" as ISO 100. The faster the ISO, the less light required to produce an image; therefore you can shoot in dimmer light or with faster shutter speeds or smaller apertures. However, faster ISOs are grainier/noisier, so you will get the best results from the slowest ISO usable in your lighting conditions. You should pick the ISO to match the lighting conditions as closely as possible.

- Slow speeds: ISOs under ISO 100 render very fine detail but take longer to expose. Appear sharper and have more saturated colors and a fuller range of tones.
- Medium speeds: ISO 100-200, have larger grain/more noise but maintain sharpness and allow shorter exposures, good color and tone.
- Fast speeds: ISO 400 or faster are beneficial in dim light or if you want to "stop motion". Appear less sharp, have less color saturation and significantly more grain/noise.

The Lens

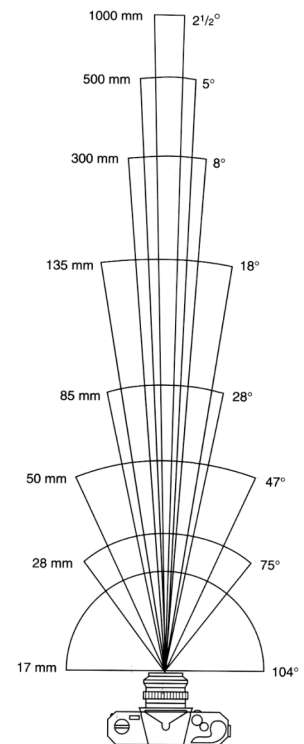
The lens of your camera collects light rays coming from a scene in front of the camera and focuses them on the film at the back of the camera. The type of lens you use controls scene magnification and what is sharpest in your image.

Focal Length

The most important way that lenses vary is focal length, the distance between the lens and the focal plane (your film). Focal length controls the magnification of a scene and *angle of view*. A longer focal length will create a larger image of the subject. It will therefore, also include less of the scene around the subject. A small focal length will magnify the subject less and therefore show more of the surrounding scene.

Lens Attributes for 35mm Cameras:

- **Normal:** 50mm lens
Approximates human vision, faster, less expensive, compact
- **Wide-angle:** 24-35mm
Wide angle of view, deep depth of field, distortion of perspective
- **Telephoto:** 70mm or longer
Narrow angle of view, magnifies, less depth of field, heavy, expensive, slow
- **Zoom:** one lens that offers a variety of focal lengths
- **Special Lenses:**
16mm or shorter are super wide,
7.5 is fisheye, which gives 180° view creating a circular image



NOTE: These characteristics are for 35mm film. Because the size of your sensor is probably smaller than a 35mm negative your lens will function differently. Look in your manual to find the lens conversion number for your camera. For example, for a Nikon D40X the approximate focal length can be calculated by multiplying the focal length of the lens by 1.5 times. So, a zoom lens with a focal length of 55mm-200mm will have behave like a 82mm-300mm lens. Different cameras will have different conversion numbers because of the size of the image sensor. Learn what yours is.

Artfully Combining Aperture and Shutter Speed

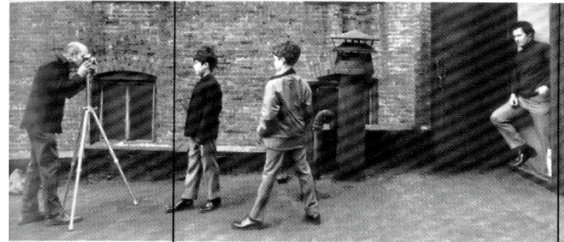
The combination of aperture and shutter speed not only determines how much light reaches the film/sensor, it also determines what your image will look like.

Depth of Field

Your aperture or f-stop controls the **depth of field**. Depth of field is the area in front of and behind the focused subject that is in focus, the sharpness from near to far. As the aperture is stopped down and gets smaller, more of the background and foreground become focused. So, a larger aperture (i.e., F2) will have less depth of field than a smaller aperture (i.e. F 16)

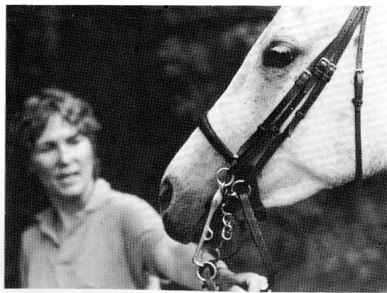


f/2 - shallow depth of field

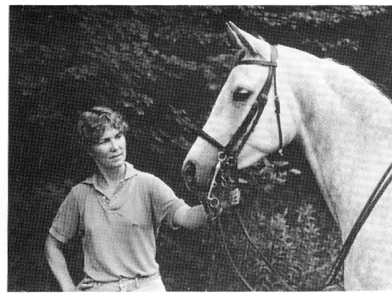


f/16 deep - depth of field

Also affecting depth of field is your distance from your subject. The further you are from your subject the greater the depth of field at any aperture. Conversely, the closer you are the “shallower” the depth of field at any aperture.



closer to subject



farther from subject

Stopped or Blurred Motion

The shutter speed controls how motion appears in your picture. With a fast shutter speed (1/250 or faster) motion can be “stopped” in the photograph. With a slow shutter speed (1/60 sec or slower) the motion translates onto the photograph in different ways, depending on the speed of the shutter and the subject photographed. At slow shutter speeds accidental camera movement is often a problem. When using a shutter speed slower than 1/60 it is best to use a tripod.

