



## Film Speed or the ISO

*Stephen Sagers*, Tooele County 4-H Agent  
*Ron Patterson*, Carbon County Ag/4-H Agent

Light is energy. Brighter light is more energy than dimmer light. This concept is central to understanding film speed, or ISO. (ISO stands for **International Organization for Standardization**, a network of the national standards institutes of 161 countries with a Central Secretariat in Geneva, Switzerland, that coordinates the system. The mix-up of the letters has to do with language variations.) This organization sets standards for various photo settings.

There are four common ways to deal with low light situations:

1. Decrease shutter speed
2. Increase aperture setting
3. Add artificial light
4. Adjust your film speed setting

This fact sheet will deal with film speed. In this sheet we will refer to it as film speed, but it is often referred to as ISO on cameras and in other literature.

In certain circumstances, lighting cannot be adjusted by a flash and the objects move too fast for a slower shutter speed to be effective. While an aperture adjustment may help, it is often not enough or provides the wrong effect. In these situations adjusting the film speed is the best practical solution. Film speed affects the recording speed of a camera while it is taking a picture. (For more information on aperture, shutter speed, and lighting see the fact sheets related to those topics.)

### How Film Speed Functions

Different film speeds allow pictures to be taken in different lighting scenarios without artificially adjusting the light. Film cameras use film that is rated by an index number. The index number indicates how sensitive the film is to light. A lower number is less sensitive to light but the image resolution is higher.

Speeds such as 100, 200, and 400 are widely used depending on the circumstance, and 100 would provide the highest resolution. In low-light situations film speeds such as 800 or 1600 are frequently used; but the image will be grainier (see Figure 1). In digital photography a grainy picture is often said to be “noisy.”

Digital cameras that allow the film speed to be adjusted use the same scale and principles as film cameras. The difference is that instead of film sensitivity, the numbers refer to the image sensor sensitivity. So, selecting a faster film speed has two effects—increasing exposure (lighter pictures in darker environments) and decreasing the resolution (more noise).

Another way to understand resolution is to think about making a picture with a bunch of dots. If you make a picture with a lot of dots it is much easier to see the shading and lighting but it takes a lot more energy and/or time to put all those dots in place. If you make the same sized picture with fewer dots it will take a lot less time or energy and you can probably still see the picture but there is a lot more

space between the dots. The close-up photos in figure 1 show a comparison between high and low resolution as determined by the film speed setting.



Figure 1 In this series of photos the film speed was changed and the camera was allowed to adjust other factors to obtain proper exposure.

	Aperture setting	Shutter speed	Film Speed
#1	f/4.5	1/125 sec.	ISO 100
#2	f/8	1/500 sec.	ISO 1600

Note how the photos get noisy as the film speed increases, but also note how the shutter speed also increased significantly. The aperture setting also changed, but that was mostly so the camera could achieve a good balance. (For help in understanding the effects of aperture setting see the fact sheet on that topic.)

Overall picture resolution (density of light points) is better with a slower film speed number, provided there is enough light for a good image.

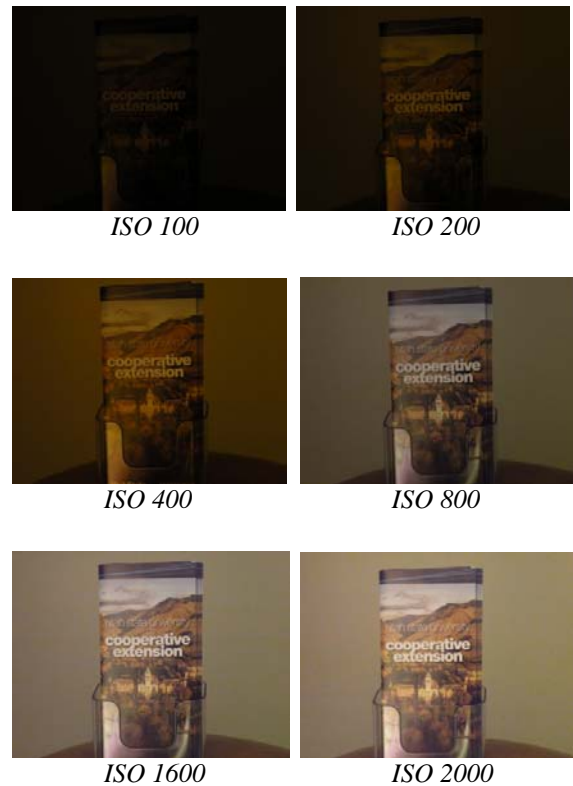


Figure 2 Through the series of photos the picture of the USU Extension pamphlets become brighter, but they have a noisier appearance. These pictures were all taken at the same shutter speed.

## Adjusting Film Speed on a Digital Camera

Adjusting the film speed on digital cameras is much easier than on film cameras. A roll of film was manufactured to operate at a certain speed, but the entire roll either had to be used or wasted if a change was necessary. For example, shooting pictures in a darker area required a roll of 800 or 1600 speed film. If the camera was taken outside in the sun for more photographs, the film had to be changed to 100 or 200 speed film. So either the photographer had to shoot all 24-36 pictures, waste the rest of the roll, or have a separate camera.

Most digital cameras today have sensors that are capable of a film speed adjustment. Instead of worrying about switching films for a different environment, a photographer can simply push a few buttons and the sensor recording speed will change (Figure 3).

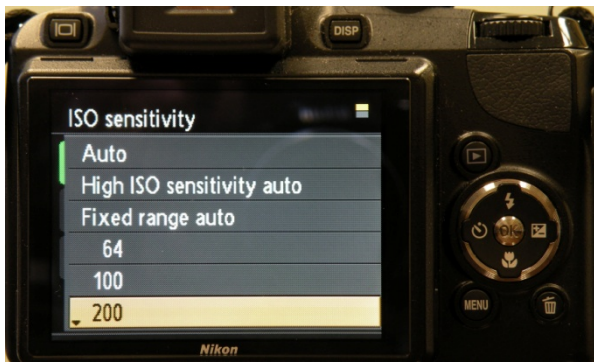


Figure 3 This menu on the LCD screen demonstrates the ISO levels on a digital camera.



Figure 4 This roll of 400 speed film had 24 pictures that needed to be shot before changing it.

## Film Speed Uses

In the dark there are circumstances when a flash is not effective or appropriate. When a subject is in motion and is more than 25 feet away, a regular flash will not illuminate the area enough. In this circumstance it is necessary to change the film speed.

Another common case for adjusting the film speed is at an event like a wedding. A flash will interrupt the event so adjusting the film speed is critical. In this case adjusting the film speed helps to maintain the atmosphere without sacrificing the mood associated with a wedding reception (Figure 5).



Figure 5 A flash may be distracting or inappropriate in certain settings, so photographers adjust the film speed. The film speed was set at 800 for this photo.

This is also true for nighttime shots at stadiums, theatres, or other places where a flash would not be appropriate or effective.

The following film speed settings are common for the indicated environments when shooting a picture at 1/30<sup>th</sup> of a second or faster.

- 100 ISO During bright days outside.
- 200 ISO Inside a lit studio, or lower outside light conditions.
- 400 ISO Inside a well lit room, or lower outside light conditions.
- 800 ISO At a wedding or with average indoor lighting.
- 800+ISO At an event where flash is not appropriate or is ineffective, and the subjects are in motion.

## Special Effects with Film Speed

In addition to simply adjusting for the lighting, film speed can be adjusted to enhance the mood. The grainy look of a faster film speed often provides a desired effect when taking a picture. It often gives an antique effect, or provides a calm environment for a still shot.

The photo of the rider on a bull in Figure 6 demonstrates a time when a higher film speed was both desired and necessary. The picture was shot from several hundred feet away in the stands, and it was also at night under spotlights. However, the grainier texture enhances the rustic appeal of a bull and the rider.



Figure 6 This motion shot in a dark setting would not be clear if not for the higher ISO adjustment.

## Summary

Film speed may be adjusted so a camera can capture moving objects in a darker setting. Though the resolution on the images are not as clear on faster speeds, they can capture a moving object in a dark setting when a flash or other external source of light is not available or appropriate.

The 100 or 200 speeds are the most commonly used settings. It is used when lighting is good. However, inside dark rooms or at night other speeds may be necessary. It is much easier to adjust the film speed on a digital camera than it is to replace a roll of film on a film camera. It is also sometimes desirable to have a picture with a grainy texture which a higher film speed setting provides.

## References

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Peterson, B. 2004. *Understanding Exposure Revised Edition*. Amphoto Books. New York, NY.

2008. *Coolpix P80 User's Manual*, Nikon Corporation. Tokyo, Japan.

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This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Noelle E. Cockett, Vice President for Extension and Agriculture, Utah State University.