

Tips for Digital Photographers

Choosing Shutter Speed and Aperture



by Norm Whyte

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Introduction to Shutter Speed and Aperture (f-Stop)

Two basic controls change how much light hits the sensor in your camera:

- shutter speed and
- f-stop.

Shutter speed affects how long light is allowed into the camera and thus create an image on the sensor.

Shutter speed is often displayed as just the bottom number — for example,

1/60 second appears as 60.

F-stop determines how much light is allowed through the lens. A bit like a blind on a window.

It is controlled by changing the aperture, or the size of the opening in the lens.

A larger lens opening, such as f/2.0 (a fully open lens has a small f-stop number), uses most of the maximum diameter of the inside of the lens and allows maximum amount of light to enter the lens.

You can imagine using this fully open lens setting in lowlight areas such as rainforests and inside buildings.

A smaller opening, such as f/11 (a large f-stop number), uses an aperture that is less than the diameter of the inside of the lens and allows a smaller amount of light to enter the lens.

You would use this setting in very bright sunlight and for landscape photos

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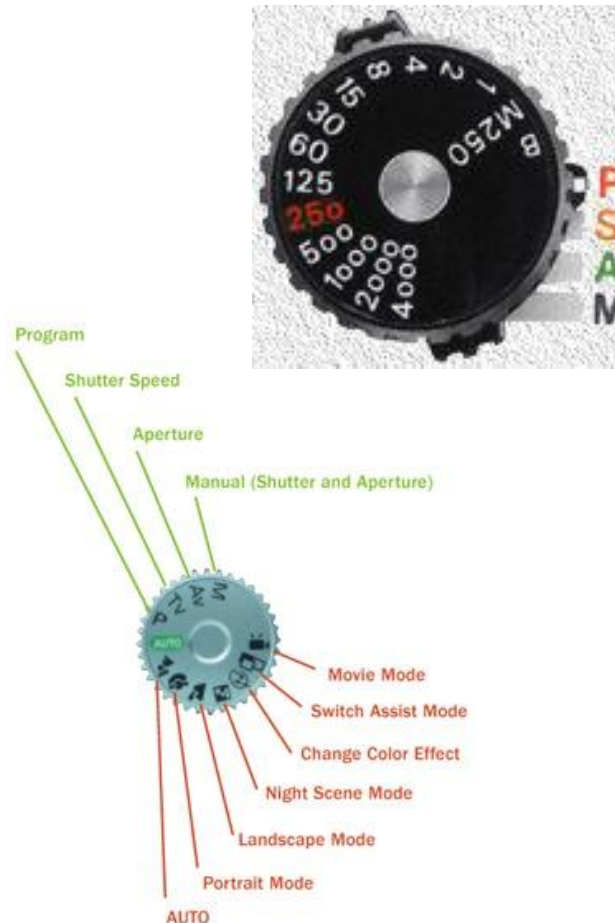
Control Exposure with Shutter Speed

Shutter speed and f-stop work together to create an exposure for your subject. You have many options in these combinations.

You can potentially use each shutter speed with every f-stop, and vice versa, to match a huge range of brightness conditions.

The camera will help you with specific choices, depending on the exposure mode you choose.

Most cameras have program, shutter priority, aperture priority and manual modes.



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Control Exposure with Shutter Speed 2

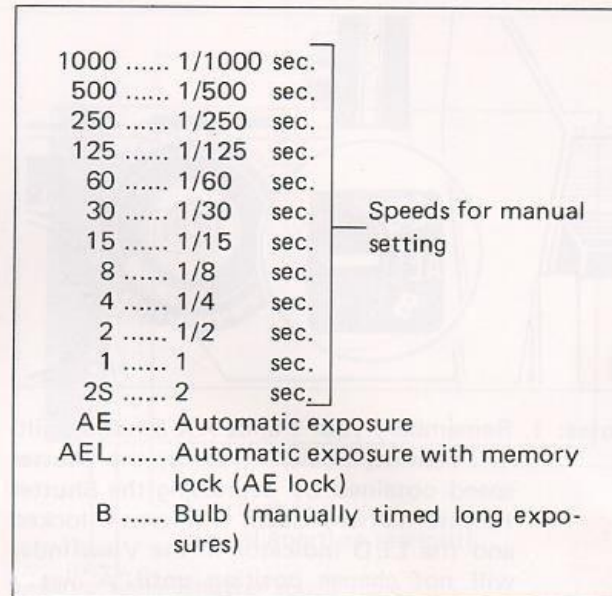
Shutter Speed and F-Stop Have a Direct Relationship

As shutter speed is changed, a corresponding amount of f-stop must change in order to keep the exposure the same.

The camera typically does this for you as you change shutter speed or f-stop with auto-exposure. However, with this knowledge in mind, you can influence exposure by using different shutter speeds and f-stops.

Shutter speed for general use is a factor of your lens length. For example 1/250 sec for 200mm lens will generally avoid camera shake.

If that 1/250 sec used f11 for correct exposure, settings of 1/1000 at f5.6 and 1/60 at f22 would also give same exposure



1000	.....	1/1000	sec.
500	.....	1/500	sec.
250	.....	1/250	sec.
125	.....	1/125	sec.
60	.....	1/60	sec.
30	.....	1/30	sec.
15	.....	1/15	sec.
8	.....	1/8	sec.
4	.....	1/4	sec.
2	.....	1/2	sec.
1	.....	1	sec.
2S	.....	2	sec.
AE	.....	Automatic exposure	
AEL	Automatic exposure with memory lock (AE lock)	
B	Bulb (manually timed long exposures)	

Speeds for manual setting

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Control Exposure with Aperture (f-Stop)

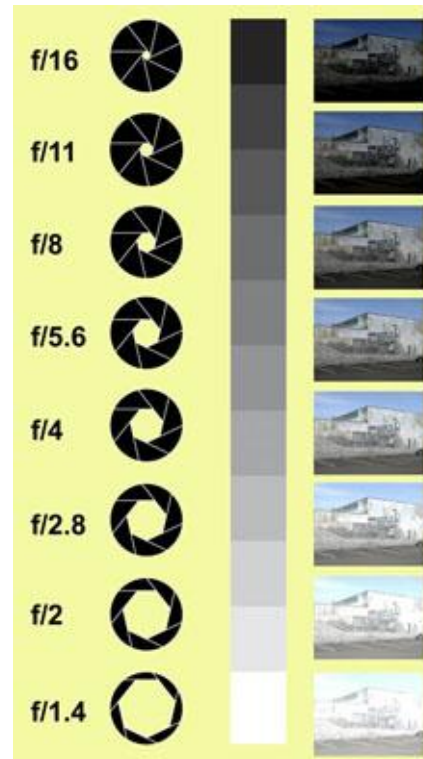
F-Stops Change in a Regular Way

The most common f-stops are f/2, f/2.8, f/4, f/5.6, f/8, f/11, f/16, and f/22. (lens opening opening largest to smallest)

These are full f-stops, and each gives an exposure that allows twice the light through the lens when you go from smaller lens opening to larger (f-stop f8 to f5.6)

Each change in f-stop halves the amount of light when shutting down the lens from larger to smaller. f-Stop changes (f8 to f11).

The chart indicates a correct exposure using f5.6 while f16 is under exposed by 3 stops and f2.8 is over exposed by 2 stops.



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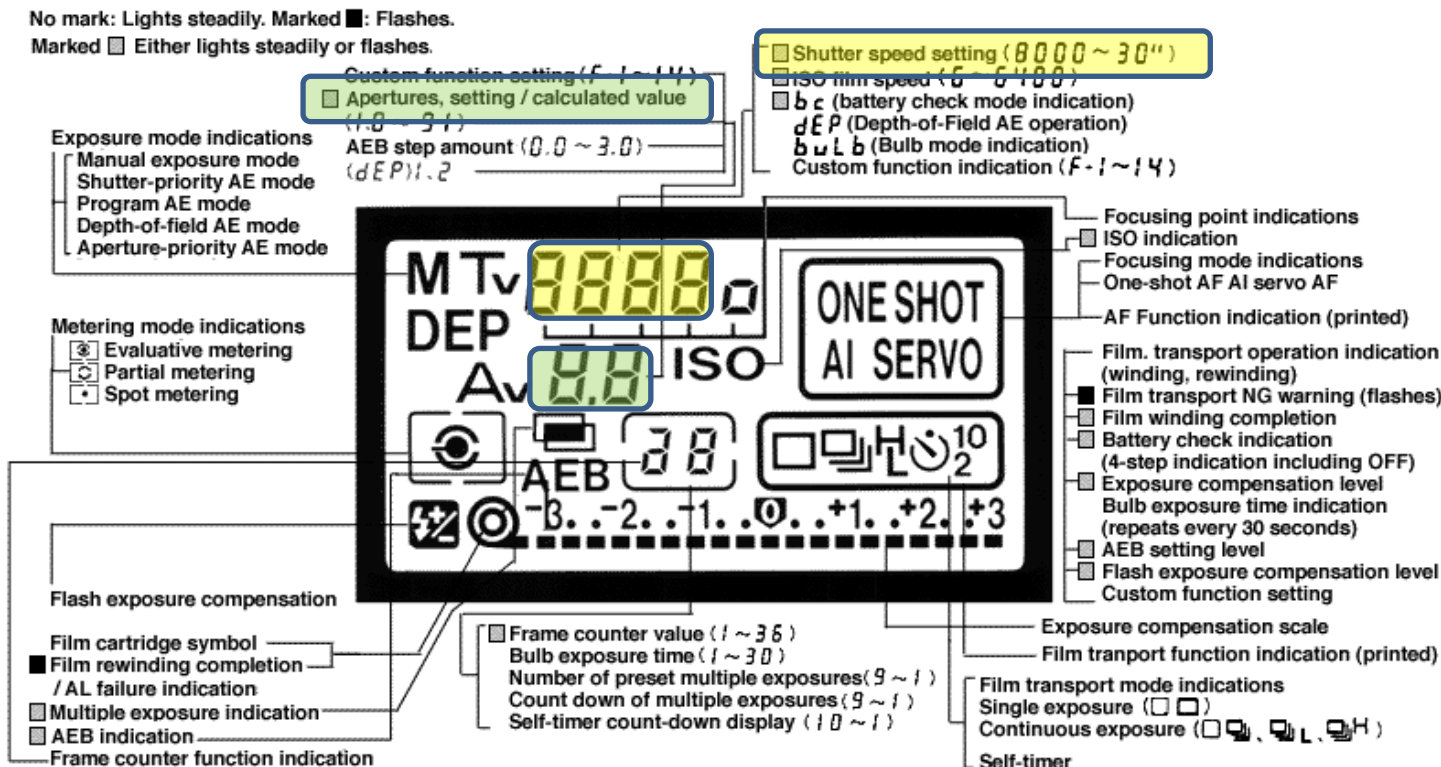


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The Relationship between Aperture and Shutter Speed

Digital cameras give you this relationship of shutter speed and f-Stop in the LED, but what does it all mean?



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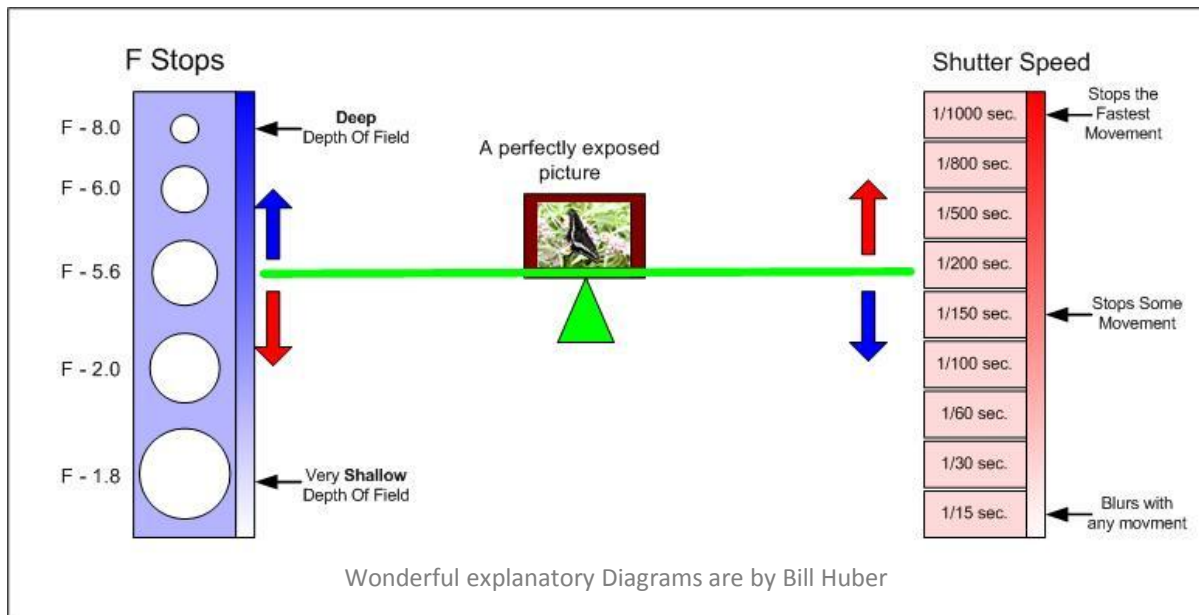


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The Relationship between Aperture and Shutter Speed 2

Let's look for a moment at the relationship between aperture and shutter speed. In this diagram, various apertures are listed on the left and shutter speeds on the right. Correct exposure is the 'balance' of the two.



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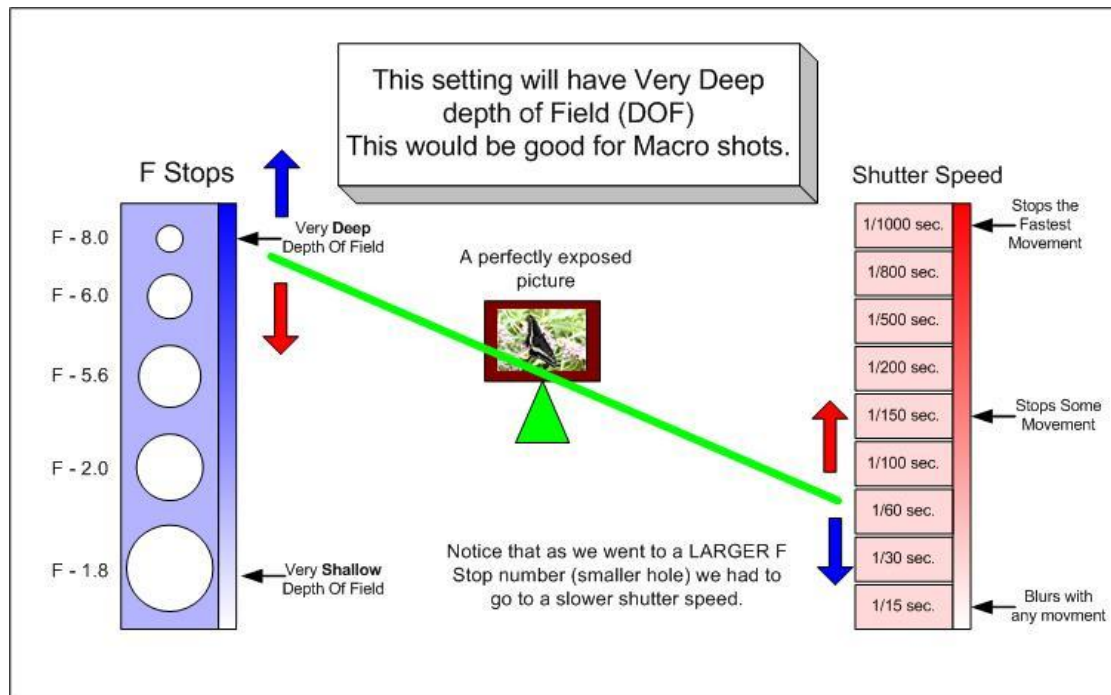


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The Relationship between Aperture and Shutter Speed 3

For each unique photo opportunity, there is an exact amount of light required for a proper exposure. Let's call it the exposure 'balance'. In this example, a larger f-stop number lets in very little light, so the shutter must remain open longer to allow the proper amount of light for a good exposure.



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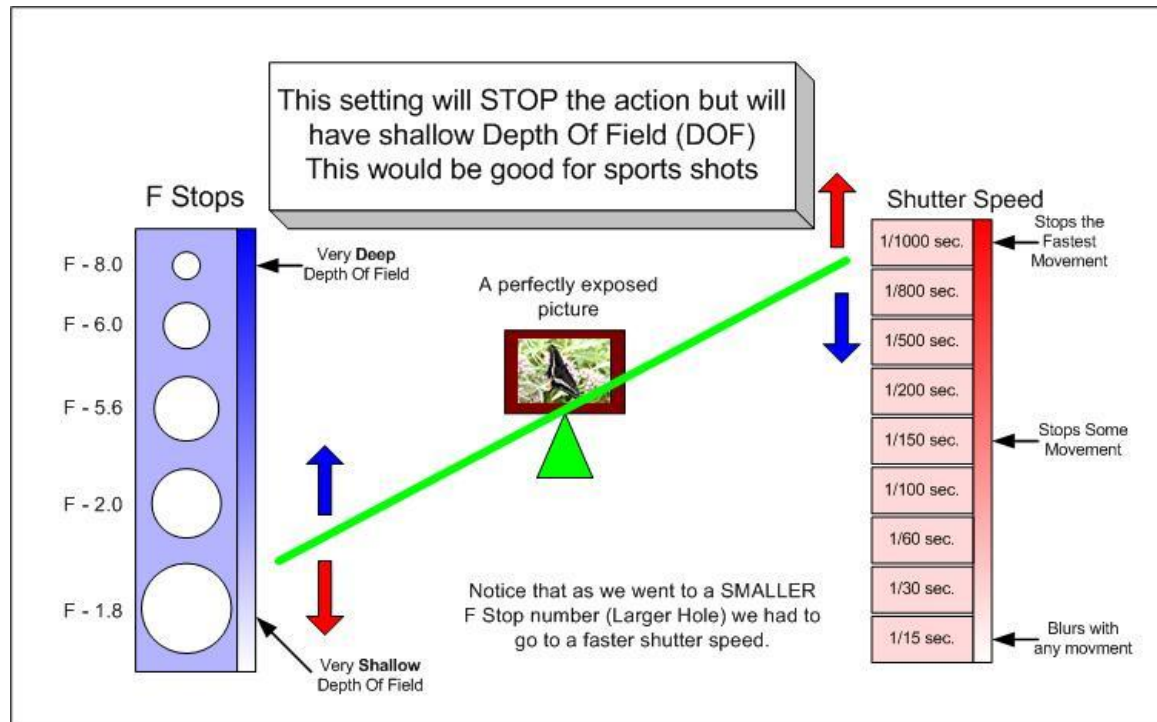


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The Relationship between Aperture and Shutter Speed 4

Shooting the exact same scene as before, we can set the shutter speed to its highest setting. This will permit very little time for light to enter the camera. So, in order to get a proper exposure, the aperture must be much larger than before to allow additional light to enter the camera. For a given exposure, shutter speed and aperture work in relation.



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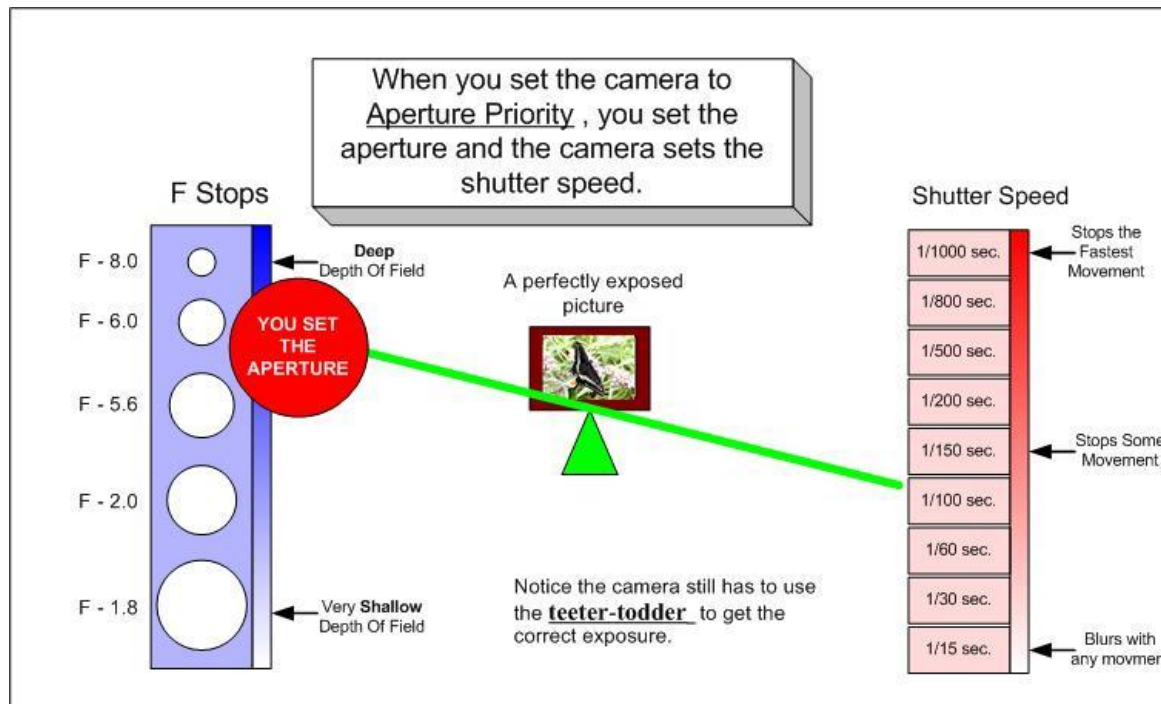


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The Relationship between Aperture and Shutter Speed 5

One of your camera operating modes is called Aperture Priority. With aperture priority YOU set the APERTURE and the camera will automatically select a shutter speed to get the correct exposure. Note that the camera still uses the 'balance' or 'see-saw' concept to do this.



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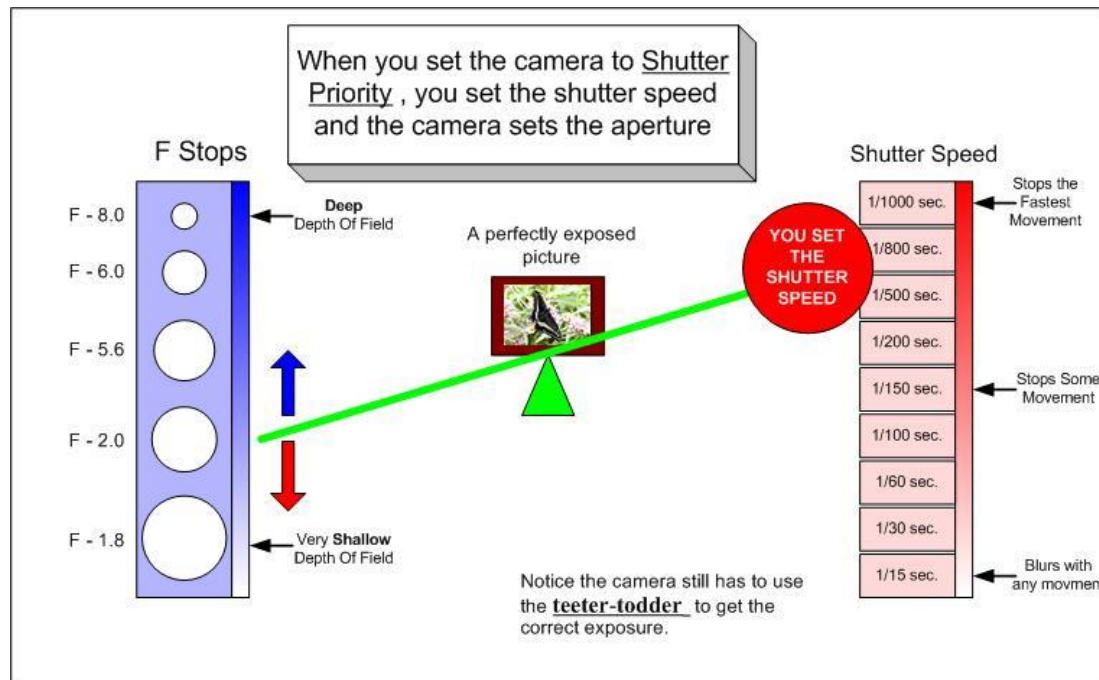


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The Relationship between Aperture and Shutter Speed 6

Another mode you will find on your camera is the Shutter Priority setting. This works very much like the aperture priority in the last example. With Shutter Priority YOU set the SHUTTER SPEED and the camera automatically selects the proper aperture. Again the 'balance' concept comes into play; the camera has to adjust the aperture to get the correct amount of light for a correct exposure.



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The Relationship between Aperture and Shutter Speed – Water-Taps

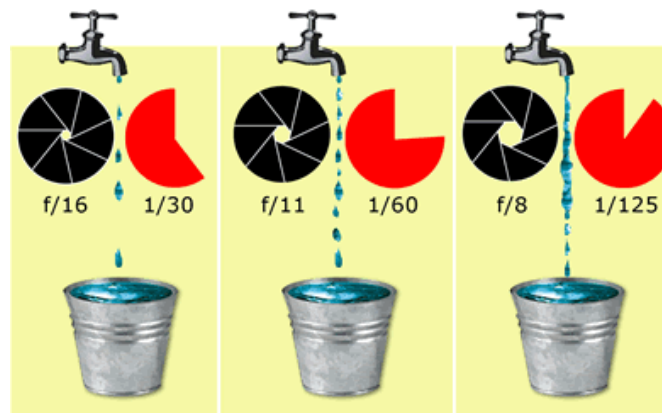
One way to think of apertures and shutter speeds is to use the analogy of a water-tap for the aperture and a timer for the shutter speed.

When you open a tap all the way, water gushes out so you fill a bucket in a very short time. This is the same as pairing a large aperture and fast shutter speed to let in bright light for a short time.

When you open a tap just a little, water trickles out and so it takes a much longer time to fill a bucket. This is the same as pairing a small aperture and slow shutter speed to let in dim light for a longer time.

No matter which combination you choose, the bucket is filled the same amount.

Likewise, an image in a camera can be exposed the same amount by various aperture and shutter speed combinations while also controlling motion and depth of field.



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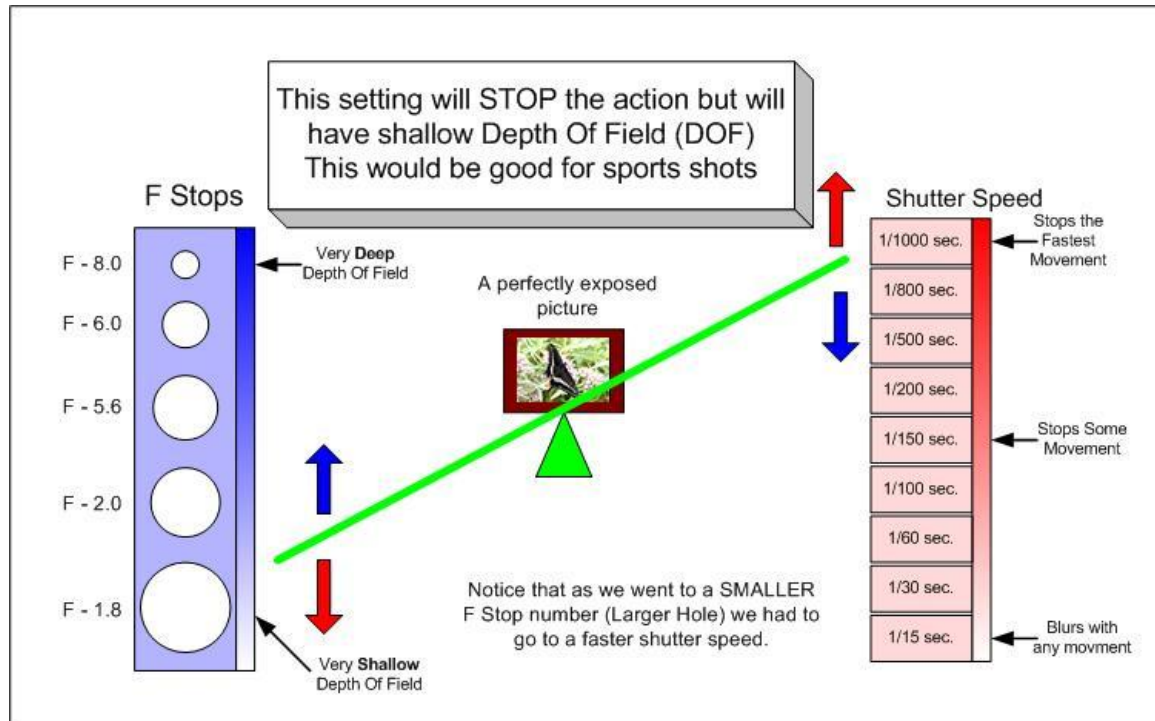


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Stop Action with Fast Shutter Speeds

Exactly what shutter speed to use varies depending on the situation. You may have to use a larger ISO to accommodate low light situations. (see later). Be aware higher ISO settings will give more 'noise' or 'grain' to your image



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Stop Action with Fast Shutter Speeds 2

Fast shutter speeds stop action. If action is an important part of your photography, then shutter speed must be your main consideration.

Aperture, or f-stop, is usually far less important. If action is supposed to look sharp — and it usually is — then you need a shutter speed fast enough to stop that action for the photograph.



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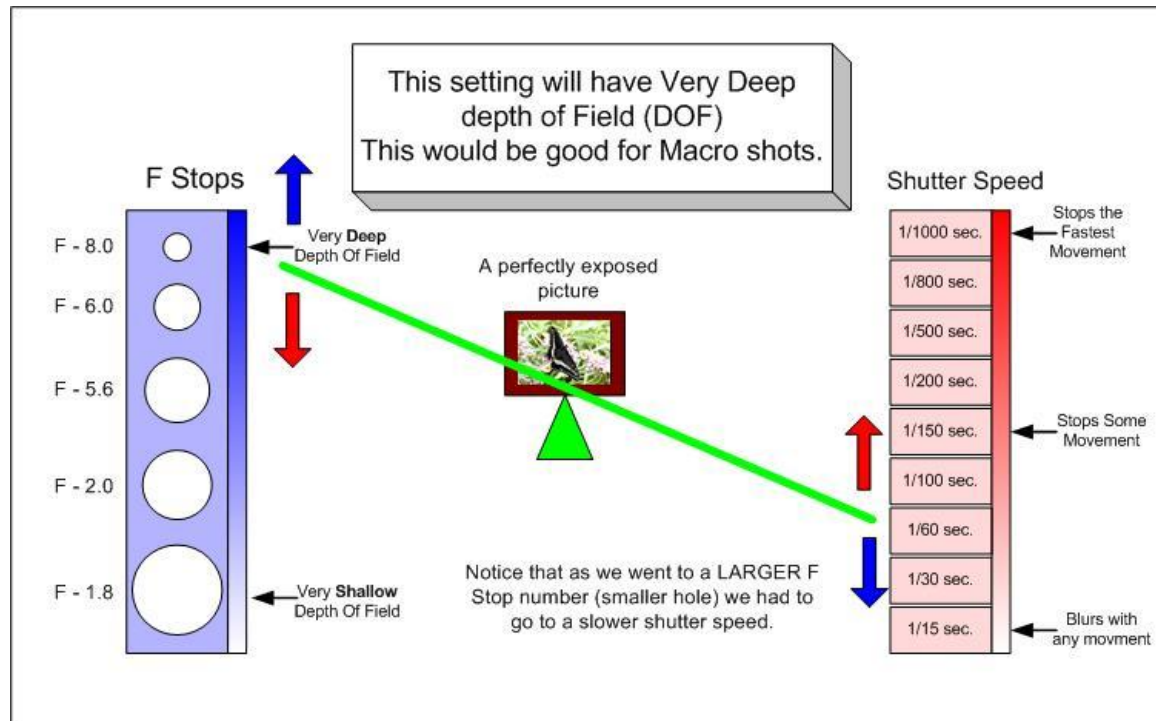


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Blur Action with Slow Shutter Speeds

Shutter speed is not simply about stopping action. A speed can be too slow for a particular action, causing the movement to be blurred.



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Blur Action with Slow Shutter Speeds 2



This is obviously a problem if you want to stop the action of an athlete but only get a blurry image. However, blurs can be used creatively and can show more of the world than we can even see. If you want to experiment with blurs, then be sure to choose a shutter speed that really blurs the subject. Slight blurs look like a poorly photographed subject.

Light becomes critical for slow shutter speeds and you may need to use a tripod in very low light situations.

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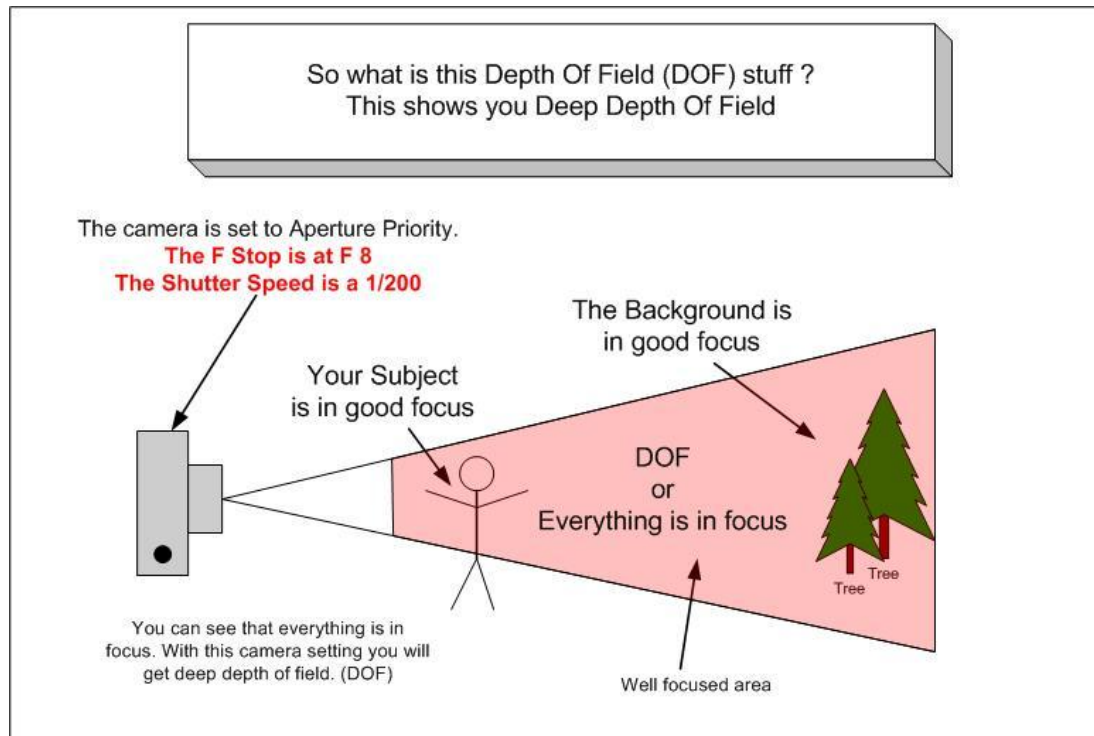


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Increase Depth-Of-Field with Small lens Apertures (large f-stops) *

The choice of f-stop has a very big effect on sharpness in depth in a photograph, or depth-of-field. As you choose smaller lens openings or larger f-stops, depth-of-field increases.



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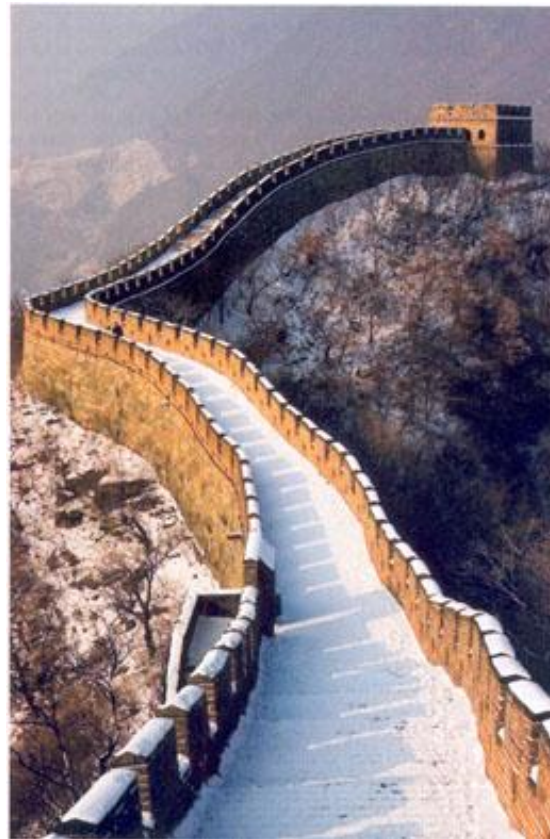
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Increase Depth-Of-Field with Small lens Apertures (large f-stops) * 2

As the lens opening gets smaller and the f-stop gets larger, less light comes through the lens. This means that shutter speeds get slower, increasing the chance of blur and may also require you to use a tripod.

** F-stops are a little confusing because as they get smaller, the numbers get bigger. This is because the numbers actually represent a fraction, so while 8 is a larger number than 4, 1/8 is smaller than 1/4. This is exactly what happens with f-stops; f/8 is a smaller opening or aperture than f/4.*



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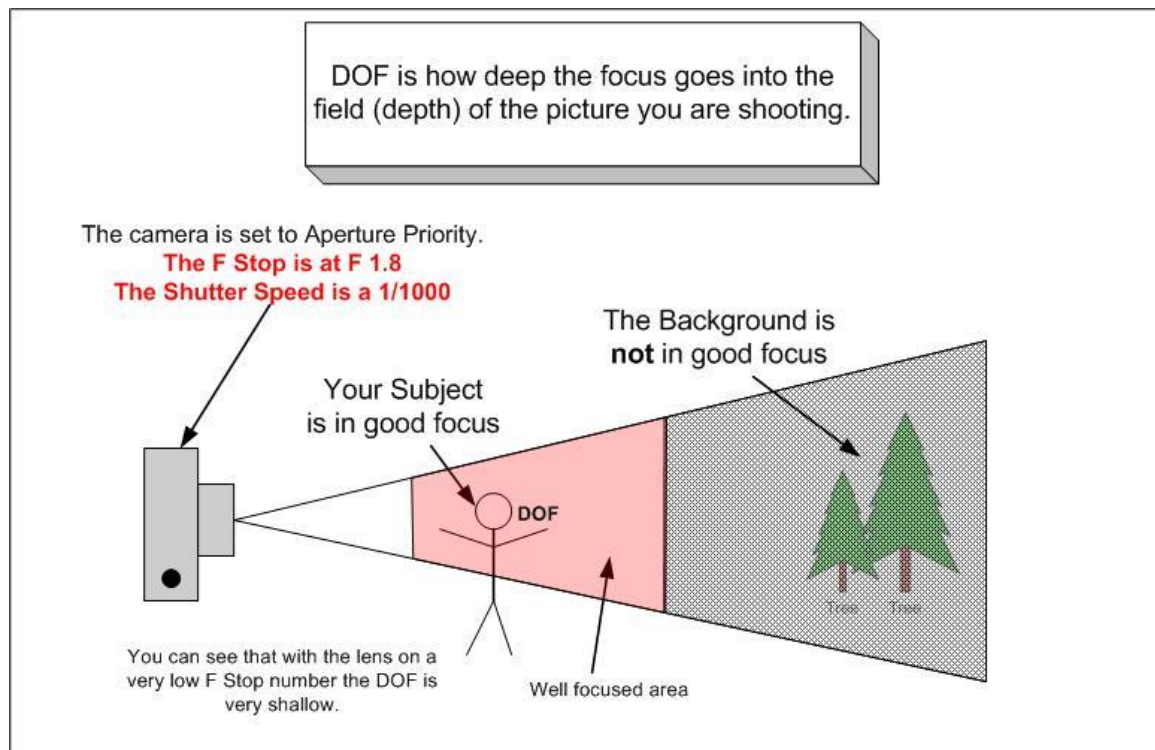


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Create Shallow Depth-of-Field with large lens Apertures (small f-Stops)

While deep depth-of-field can be nice for a landscape or a travel scene in some distant city, it can be a problem with some photos.



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Create Shallow Depth-of-Field with large lens Apertures (small f-Stops) 2



Your subject can blend into a background at times if both are equally sharp. For example, you may not necessarily want the background to be sharp and competing with your nice portrait of your son or daughter.

Or, you may want to be sure your photograph of a flower actually makes the flower stand out for a viewer — it will not if the background is too sharp.



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ISO Settings Affect Exposure Settings

Light never remains constant. It changes in so many ways, but especially in brightness.

Your camera gives you some control in how the camera responds to that brightness, in the form of ISO settings.

Film had ISO numbers that relate to each film's sensitivity. In a similar way, ISO settings reflect how sensitive the camera sensor is to light and at what 'speed' the sensor captures the light.

The numbers change sensitivity in direct relation to their mathematical change; for example, going from 100 to 200 doubles the sensitivity of the camera and increases exposure by one stop.

ISO Settings Boost the Sensitivity of Your Digital Camera

ISO settings on a digital camera are not exactly the same as for film. Film ISOs were locked into a specific film. You can change digital ISO settings at any time. Low light to bright light.



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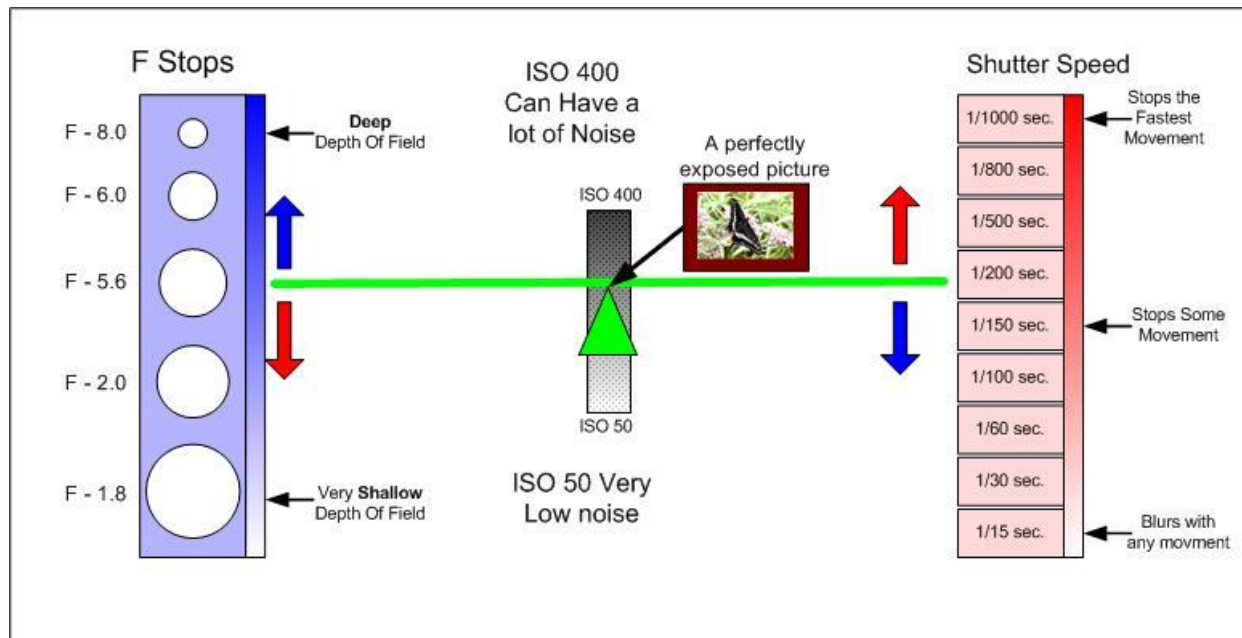
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ISO Settings Affect Exposure Settings 2

With film cameras, remember the decision as to which film to use? Films are rated in ISO numbers, where ISO 100 is for bright outdoors, ISO 400 for indoor and outdoor use, and ISO 800 and 1600 for low-light conditions.

The higher settings of ISO may introduce 'noise' to your images.



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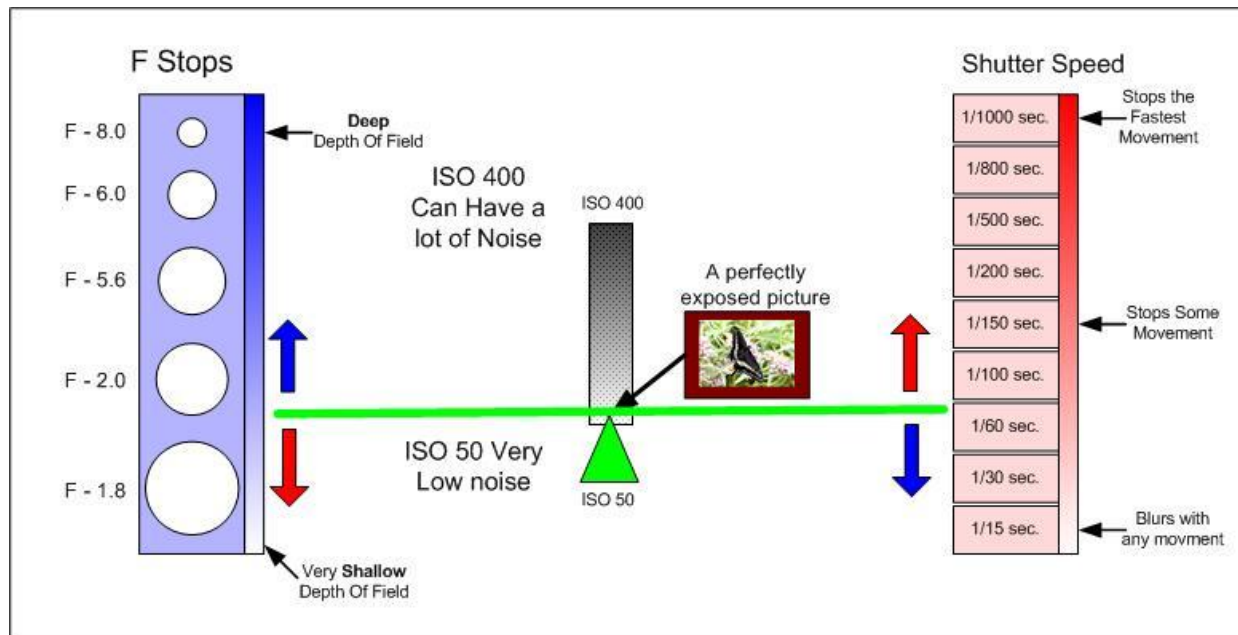
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ISO Settings Affect Exposure Settings 3

Most digital cameras have the ability to adjust the ISO setting in the same way. With digital, ISO is the sensitivity of the CCD to light, the higher the ISO setting the more sensitive to light the CCD is. The lower the ISO the less sensitive to light the CCD is.

The 'balance' relationship still stays the same, it is just the range that changes.



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Shutter and Aperture Challenges

Challenge 1: Slow shutter speed

Cascading water over rocks or the water fall in city fountain

- *Hint: use a large f-stop (f11 or f16 – small lens opening) which will force a slow shutter speed to get enough light to the sensor.*

Eliminate people from your image in a shopping centre

- *Hint: use a tripod and set your exposure to several minutes using available light) You will be surprised at the effect. People will walk in and out of your image as though they are not there*

- **Get maximum depth-of-field** by using f16 and shooting at 'balance' shutter speed. *You will not need a tripod in good daylight.*

Challenge 2: Fast shutter speed

- **Birds or Kids in flight** (stop movement of wings or legs 😊)

- *Hint: use a very fast shutter speed and watch your light – you may find the camera shooting on small f-stops (f2)*

- **Kids on the swing, track racing cars or other sports.**

- *Hint: Try for 'panning'* effects shooting at right angles moving camera with the direction of the kids, cars etc (* blurred striated background caused by moving camera)*

NOTE: Consider showing your images at a Seminar and sharing your experiences with others.

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- reading up to date issues in my monthly **Newsletter**
- asking questions in our **Lifetime Photographer's email network**.
- my regular free '**Tips for Digital Photographers**' which will help you improve your skills.
- '**Challenges**' in Tips for Digital Photographers which accompany each issue to expand your creativity.

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