

Day 4: Mastering ISO

- **Measurement:** ISO is a rating of the sensitivity of your camera to light. It is measured in increments that start at 100 and go up from there.
- **Range:** As just mentioned, nearly all cameras have a baseline ISO of 100. Some digital cameras topped out at ISO 6400 (a range of 6 stops) but most modern cameras allow you to raise the ISO to at least 25,600 (a range of 8 stops).
- **The Trade-Off:** Historically, you have had to be very careful with ISO, because a high ISO would lead to grain (in film) or digital noise (in digital cameras).
- **Current Situation:** The trade-off between ISO and noise still applies, but improvements in cameras and noise reduction software now allow you to raise your ISO much more than you could just a few years ago without fear of digital noise ruining your picture.

Don't be Afraid of Raising the ISO

The downside of using *too high* of an ISO is that you get digital noise in your picture. You can fix digital noise in post processing. We will cover that later in the course (Day 30).

On the other hand, the downside of using *too low* of an ISO is that you'll be forced to use a slower shutter speed (risking camera shake and blur) and/or a wider aperture (with less of the frame in focus). Neither of these can be fixed. When in doubt, raise the ISO!

Default ISO values

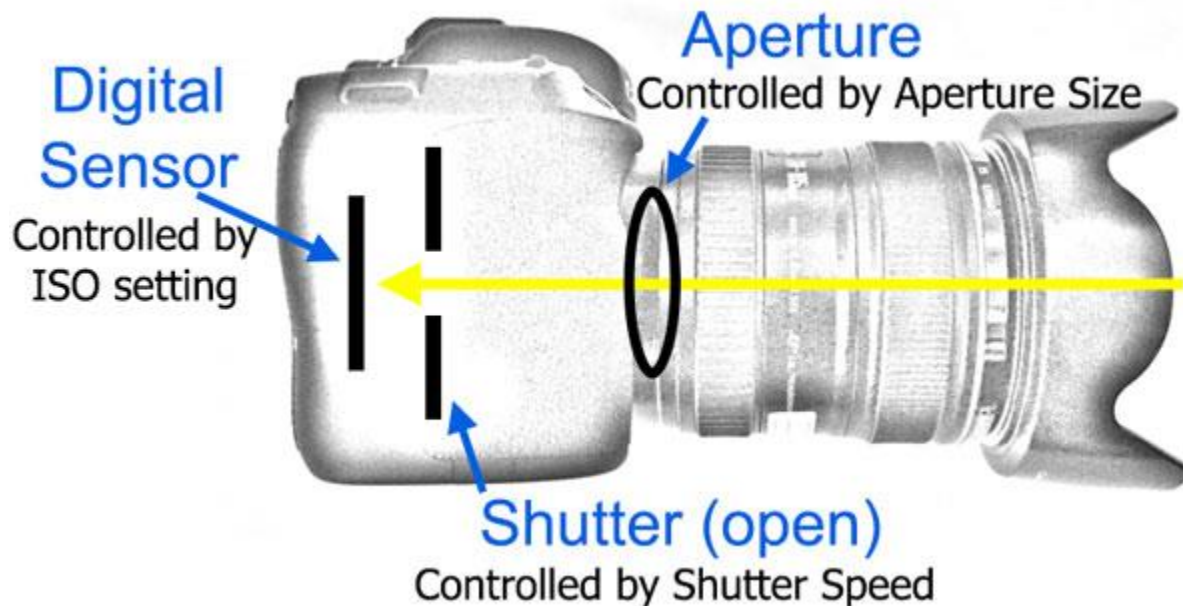
Here are some default values to start with when setting your ISO:

ISO Value	When to Use It
100	Use only in very bright settings or if you want a slow shutter speed/small aperture
200	Use as a default setting for outdoor shots in good light
400	Good starting point for cloudy days
800	Use in fading outdoor light or in a relatively well-lit interior
1600	Good default setting for many interior shots
3200	Use as a default in darker interior shots
6400	Use in dark places where you need a fast shutter speed

Keep in mind that these get more and more conservative as cameras and noise reduction software gets better and better. Don't hesitate to go a little higher.

Additional Commentary

The first exposure control I want you to be familiar with is called ISO. This control is the sensitivity of your digital sensor to light.



ISO has always been important – and as mentioned earlier is a part of the exposure triangle – but it has become much more important in recent years. Digital photography made this aspect of exposure much more important, and recent advances in cameras and post-processing software have made ISO even more important. In this lesson you will learn how to control it and use it to maximum advantage.

How the ISO Measurement Was Developed

But first, what is ISO and how was it developed?

Let's start at the beginning. ISO stands for International Organization for Standardization, which is an international organization that sets standardized measurements for all sorts of things. In the context of photography, this group created a scale for measuring sensitivity to light. The scale was developed many years ago and was established to measure the sensitivity of film to light (there was no digital photography at that time).

If you remember the film days, you will recall that you used to buy film that had numbers on it. Some of the film would say "100," some would say "200", there would be some that said "400" and the top end was usually "800." That was the film's ISO rating.



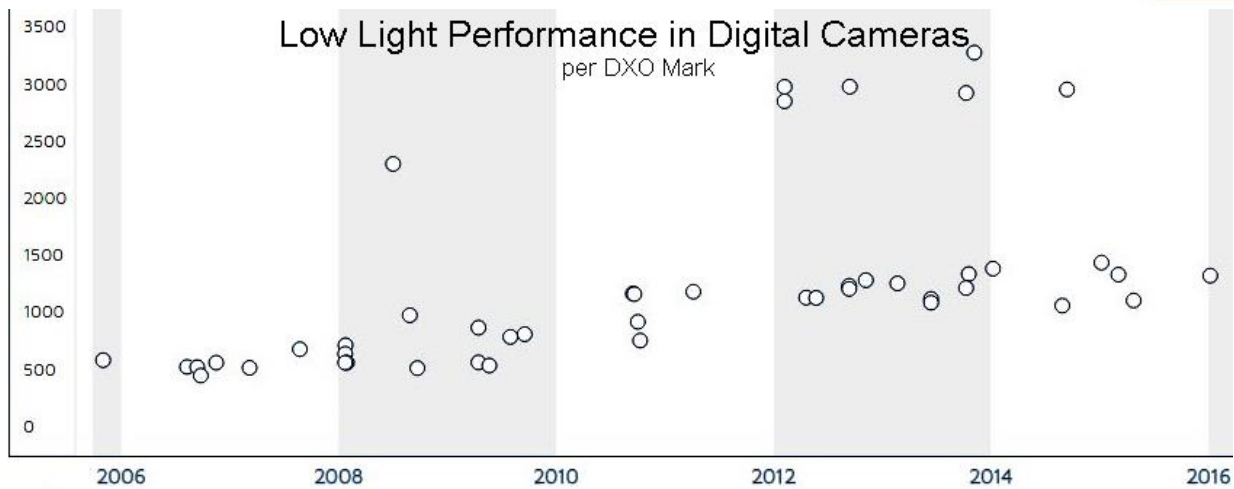
In the case of 100-speed film, the lower number meant that the film was “slower” film that required more light to expose. At the same time, that slower film created really nice pictures that were not grainy. On the other hand, the film that was 800-speed was “faster” film that took less light to expose. That was great, but it had a downside, which is that it made your pictures look grainy. The higher the ISO rating of the film, the less light it took to create a proper exposure but the more it made your pictures look “grainy.” You were dealing with a trade-off.

ISO in the Digital Age

When digital cameras were developed, the manufacturers found they could make the digital sensors more or less sensitive to light. They needed a scale to measure that sensitivity. They decided to use the exact same scale they had been already been using with film. Therefore, digital cameras use ISO in exactly the same way as the film days. You will see ISO values on your digital camera of 100, 200, 400, 800, etc. exactly as was used in the film days.

The only difference is that rather than being stuck with a given ISO for a whole roll of film, you can change it for each shot. As a result, ISO immediately assumed much greater importance in digital cameras than it had in the film days.

In addition, as digital cameras have advanced, ISO has become even more important. With each generation, digital cameras become capable of higher and higher ISO values. Now you aren’t limited to ISO ranges of 800 – 3200. If you have a modern digital camera – even an entry-level camera – it is likely that your camera supports ISO ranges up to 25,600 or higher. Not only that, but newer digital cameras produce less digital noise in pictures taken at all levels.



A company called DXO Mark tests cameras and determines what they believe to be the maximum useable ISO level for all new cameras. They record that data and it is set forth in the graph above. Don't worry about the specific data - just note the general upward trend of the graph. This shows general improvements in ISO levels in cameras. In addition, if you look closely at the data (available at <http://www.dxomark.com>) you'll see that even entry-level cameras released recently perform better than professional cameras from just a few years ago.

ISO has always been part of the exposure triangle. Although, in truth, it was sort of the red-headed stepchild of the exposure triangle. It had a very limited range and it a big chunk of that range was unusable because of digital noise. The other two exposure controls (shutter speed and aperture) were much more important. Now, however, with improvements in cameras ISO truly deserves a seat at the grown-up table of the exposure triangle.

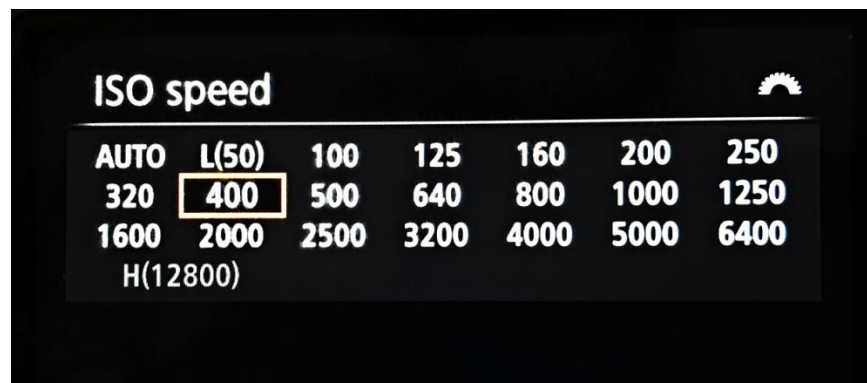
Setting Your ISO

Now that you understand a bit about ISO let's talk a bit about how to set it.

Most cameras work in roughly the same way. First, you press a button labeled ISO on your camera body.



When you do that, the camera will list possible ISO values on your LCD or in the viewfinder. You scroll up and down with a dial on your camera until you reach the value you want to use.



Select the value you want and you are all set.

We'll talk more about specific ISO values in a second, but first let me introduce you to the measurement. The lowest native ISO value in most cameras is 100. Photography measures all exposure in "stops" which is a doubling of light. So, a 1-stop increase from your base ISO level of 100 is 200. The next stop up is 400, then 800, and so on. Your camera might change in smaller increments (likely 1/3 stop increments).

There are cameras with a dedicated dial for ISO values, but it is still uncommon. It seems that camera manufacturers still haven't come to grips with the increased importance of ISO.



Example of how the ISO setting might appear on an LCD display

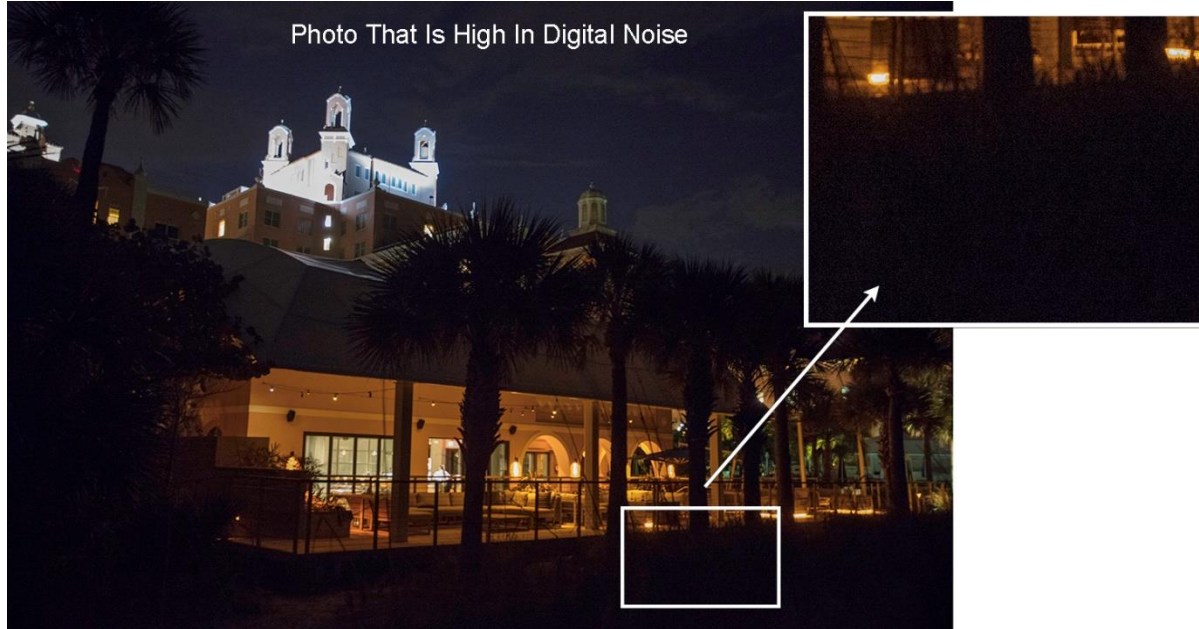
Believe me – you are going to change this setting all the time. Get used to this control. Practice it. You’ll be glad you did.

The Trade-Off with ISO

Now you know how to set ISO. And you know how it works. You understand that you can set lower values that make your digital sensor less sensitive to light and higher values that make the digital sensor more sensitive to light. Making the digital sensor more sensitive to light means you don’t need as much light to create a proper exposure.

Why wouldn’t you just always use a high ISO with your digital camera? After all, if you do that, you could use a fast shutter speed and avoid any problems with camera shake, and you could always use a smaller aperture and maximize your depth of field (if what I said doesn’t make sense to you, don’t worry and you’ll learn more about in the next few lessons). You don’t want to do that, however, because using a high ISO in a digital camera means your pictures will have more *digital noise*.

Digital noise is random artifacts that come into your picture and generally make it look terrible. It is the equivalent of grain in film, except that sometimes grain actually looked good, whereas noise always looks bad. Therefore, you want to keep your ISO as low as possible to keep digital noise from creeping into your picture.



While it is difficult to see in a greatly reduced photo, the dark areas of this photo show unacceptable levels of digital noise.

So there is the trade-off you face with ISO: Choose too high an ISO and you risk digital noise ruining your picture; choose too low an ISO and you cannot use the shutter speed or apertures you want. What to do?

Choosing the Best ISO

Setting the right ISO value will depend on the particular circumstances you face for your shot. But that isn't very helpful, is it? So let's try to come up with some default values you can start with in deciding which ISO to use on your shots.

Before we do that, let's talk a little bit more about the factors in play here. You already know that there is a trade-off between exposure value and digital noise. And we've already talked about the improvements in cameras that allow you to use higher ISO values. But there are a few other things I want to address as well.

The first is that digital noise – within certain limits – can be fixed. We'll cover that in detail in the post-processing part of this course, but for now I just want to make sure you are aware of that fact. The software for eliminating digital noise has gotten really good in recent years as well. So you don't need to be as afraid of digital noise as you did in the past.

The second is that I believe many more pictures are ruined by using ISO values that are too low rather than too high. Many of us have this tendency to worry about digital noise and try to use

a low ISO value. That reduced sensitivity to light means that you have to let more light into your camera to make a proper exposure. You'll learn more about this in the next few lessons, but means you have to use a slower shutter speed or a wider aperture (or both). These have consequences. The slower shutter speed can and will lead to camera shake and blurry pictures. The wider aperture can and will result in a shallow depth of field so portions of your picture are out of focus.

Where does that leave us? It means there are a lot of factors indicating you should use a higher ISO value than you might think. The camera can handle it. You can fix the noise anyway. And the lower ISO value has consequences that you cannot fix.

With those additional factors in mind, here are some specific ISO values to use as starting points:

<u>ISO Value</u>	<u>When to Use It</u>
100	Use only in very bright settings or if you want a slow shutter speed/small aperture
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400	Good starting point for cloudy days
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3200	Use as a default in darker interior shots
6400	Use in dark places where you need a fast shutter speed

Of course, I need to offer some caveats. The first one is that every situation is different. Just think of these values as defaults to get you started.

The second is that if you are in a position to use a tripod, you don't need to worry about ISO as much. When you are using a tripod, you can use a slow shutter speed. Doing so lets a lot of light into the camera, so you don't need to worry about your ISO. In addition, once your camera is stabilized on the tripod, you can pretty much make the shutter speed as slow as you want, so you use that to lower the ISO further.

Finally, this is somewhat camera dependent. If you bought your camera in the last 3 years or so, this scale should work fine for you. If you paid a lot for your camera, it might even be a little conservative. But if your camera is older, you may need to knock it down one stop.

Day 4 Assignment

The Night Photo

Description:

Wait until after dark, then go out and take some photos. Find a well-lit building, monument, or bridge to shoot. The low-light nighttime environment will make you work with your ISO control quite a bit.

Keys to Success:

Shoot in different lighting situations and note the ISO values you use.

Get comfortable changing the ISO without looking at the controls.

Hand hold some shots and note how high you need to raise the ISO to get a useable shutter speed.

If you are already familiar with ISO, note how its use has changed in recent years. Does it give you more flexibility?

After you're done, review the photos:

- At what level does digital noise start becoming a factor?
- At what point does the noise ruin the photo?
- How does the noise affect light and dark areas differently?

Upon Completion of this Assignment:

You should now have a solid understanding of how to use the first exposure control - ISO. Remember: we have ways of fixing digital noise later, so don't give up on these pictures if they are noisy.