Mastering Flash Photography

LESSON 1 UNDERSTANDING FLASH

In a perfect world for photography, every photograph we take would have perfect light, the perfect subject, perfect exposure, resulting in the perfect photograph. However, as you know there is nothing perfect in our world including the conditions, in which we photograph. Fortunately, there are tools available that allow us to capture pictures that may appear close to perfect and flash is one of them.

Flash has so many useful applications in photography. It can be the dominant light source or a secondary light source. In this photo it is secondary as the flash is set to fill in the shadows to lower the contrast created by the sun. We will cover flash fill coming up.

In this course, we will closely examine how flash works in conjunction with your camera and explore techniques that will improve your photographs, and even open up creative options you may not have been aware of. Once you understand the fundamentals behind flash, you will find that using one is really quite simple. You can then take these fundamentals, and apply them to your particular flash and camera system.

There are many makes and models available today and they change literally on a daily basis. We cannot possibly cover how each and every flash unit works, but

with the basic understanding of flash theory and technique, you should easily be able to revisit your owner's manual and gain a thorough understanding of how your flash and camera system work together. Most of today's state-of-the-art flashes have similar functions and we will examine many of them in this lesson.

Understanding Light

Light is all around us! It comes from other locations and it defines the world by creating highlight, shadow, and shape. When photographing, we are often presented with light that is too bright, too dark, too soft, or too harsh. In some cases, these light sources are adjustable; such as turning an indoor light on or off, but in many others circumstances we have no control. We cannot control the sun or a street light and so we must find a way to make the light work in our photographs.

These light sources are called Ambient Light, also known as available light. The sun is ambient light; the street light is ambient light; the light in the grocery store, office, or living room is ambient light. Strobe or flash light is supplementary light and unlike some ambient, is completely controllable from the camera. Your ability to use ambient and supplementary light together will often make or break a great photo.

Flash Metering

One of the most important aspects in understanding flash is its metering ability. Today's flash units are very sophisticated electronic devices. They have the ability to read the scene with the camera and output the necessary amount of light to properly expose the picture. These camera meters the ambient light and flash output to determine correct flash output by using a pre-flash. The purpose of the pre-flash is to send a weak initial flash to determine the distance from the unit to the subject. From this test, the camera can determine the best exposure and flash output for the subject.

Flash units use E-TTL, which stands for 'Evaluative through the lens'. Canon refers to it as ETTL, while Nikon uses iTTL (intelligent TTL) or to simplify: just TTL. The pre-flash only fires when you have depressed the shutter enough to start taking the actual picture. Most importantly, it only measures flash output, and does not fire when the camera is also metering the ambient light. The pre-flash usually evaluates the exposure through the lens just like the camera metering ambient light. This system makes it harder to fool the camera into an incorrect measurement of light.

E-TTL/iTTL also has the ability to make subtle changes in output for flash fill techniques. To add even more ability to flash evolution, Canon added a great feature called AIM (Advanced Integrated Multi Point Control System,) which allows the camera to favor flash exposure where the focus point is set for more

accurate exposure with off-center subjects. This type of technology is also seen in the Nikon equipment. (Please read your manual for specifics). What this means is that whichever auto focus point you have set in the cameras viewfinder in where the flash will measure for proper flash output.

Today we have a newer version of Through the Lens technology: ETTL-II. This newer system is based largely on mathematical algorithms and measures the light before the pre-flash and after it. This allows it to evaluate all the light reflectance values with and without flash and provides a superior evaluation and more accurate flash exposure. This now means that metering of proper flash exposure is no longer dependent on just the auto focus point.

In cameras using older ETTL, flash metering was based on the assumption that autofocus points were on the subject and when it was not, flash exposures were off. ETTL-II moves beyond that. Now ambient light is measured first when the shutter is pressed, then a pre-flash is fired allowing measurement from many central metering zones. Next, the ambient metering and flash metering are compared and the areas with small differences are chosen as the flash metering zones. Following this analysis between ambient and flash reflectance values, the results are stored in memory. Research your camera system to determine how your make and model is setup for accurate metering of the light sources. But understand based on your camera model and flash that if you have ETTL your system meters from the auto focus point and if you have ETTL-II your metering is done in the central metering zone.

Types of Flash

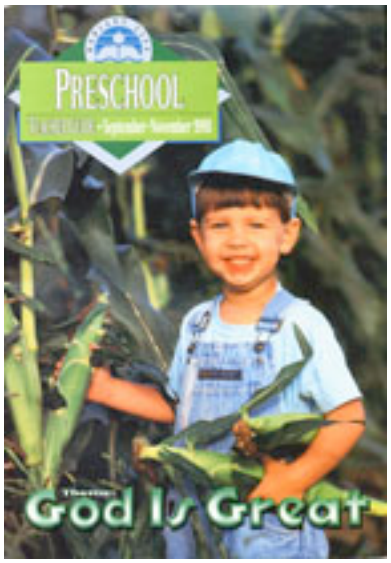
Today, many cameras come with flash units built in, but not all. These built in pop-up flashes are convenient and easy to use, but are also low in power and only work well for subjects that are close to the camera. These flash units are for recording subjects in conditions in which ambient light is not sufficient. They produce a harsh, flat, and contrasty light.

External flashes have more power and capabilities. They can be removed from the camera for other lighting options. Most of today's film cameras support these different types of technologies, while many digital cameras will only support the newer versions of flashes. For Canon digital users this means only EX flash units. Nikon users will be successful with flashes such as the SB900, SB800, SB700, SB600, or DX flashes. It is very important that you do your homework and make sure that your system is integrated in a manner you

wish so that the camera and flash, when working together, are totally compatible.

On the right is an older Vivitar 285. This is an old workhorse and is not TTL compatible with newer cameras. It does have the ability to measure flash output but is not TTL nor nearly as accurate as current state-of-the-art flashes. This flash is a great addition to my flash arsenal as an off-camera unit that I might place somewhere in my scene and fire it remotely.

Caution: If you have an older flash like this one make sure that you research the model number and its voltage output when the flash is fired on a newer digital camera. Reports are that they might 'fry' the digital camera. If your flash is new, no worries, but be sure and check!



This photo of my son was taken in a local cornfield. I purposely dressed him to look like a kid who lives on a farm. I also used flash with a warming filter to make it look like sunset lighting. Filters are covered later.

Understanding Flash Theory

The flash unit is a complex system of electronics containing a capacitor that is charged full of energy and then discharges in an instant when you press the shutter. It provides a burst of energy into a tube full of gases. The speed in which a flash discharges light is measured in milliseconds.

This brings us to our first important concept that must be understood. There is a distinct relationship between f/stops and shutter speeds, and how they affect flash exposures. To understand this fully, disregard for the moment the settings on your camera and shooting modes such as Program, Aperture Priority, and Shutter Priority and also forget about TTL for the moment.

Consider the following information with the camera set on manual exposure and the flash output is set manually at full power.

The rule is:

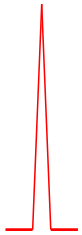
- Shutter Speed controls the ***amount of time*** that light is allowed to expose the picture.

- Aperture controls the ***amount*** of light (or rate) allowed to expose the picture.

What is important is how you apply this concept. Because a flash's output duration is instant (milliseconds), the shutter speed does not control the flashes exposure. Think about that! If your shutter speed is 1/60th of a second and the flash is one millisecond, then does it matter where within the 1/60th that the flash fires? No it doesn't.

If you are using 1 second or 1/125th, the flashes output duration is relatively the same, an instant burst of light. Below is what I call a "timeline" of three different shutter speeds and the relationship with the flashes duration. The following diagram is meant to illustrate this point: no matter whether the shutter speed is at 1/30th or 1/125th, it cannot control the flash exposure.

---------- 1/30th second
---------- 1/60th second
---------- 1/125 second



Here you can see that 1/30th second is twice as long as 1/60th meaning the shutter is open twice as long. 1/60th is open twice as long as 1/125th. The flash spikes when the shutter is opened and its length of time (flash duration) remains the same no matter the shutter speed. At 1/30 the shutter remains open long after the flash burst while 1/125 the shutter is open a shorter time after that burst. This example is only meant to illustrate a point and is not proportional.

Important Point: To emphasize this point again; the shutter opens and the flash fires. Because the flash duration is so fast, the shutter remains open after the flash has fired to capture the ambient light. This also means that the shutter speed is ONLY for changing the exposure of the ambient or background light. It does not change the flash exposure.

Here are two examples: the image on the left is your typical indoor flash picture and had a shutter speed of 1/60th (P Mode). On the right is the same picture at ¼ second (A Mode). The right side shows more ambient light in the room and the window light is putting highlights on her cheeks. Flash exposure remains the same in both examples if you look at the face, just the ambient room light has changed on her face making the exposure appear slightly darker, but the flash exposure is the same.

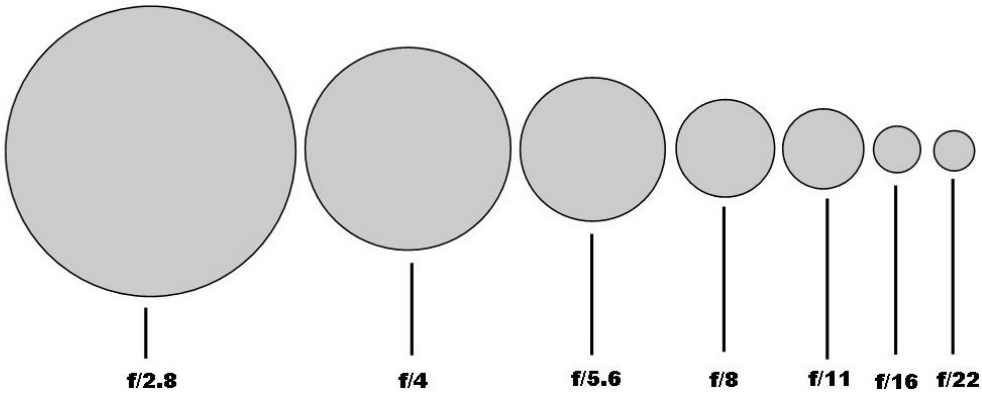
In addition, the image on the left is P mode, which has a limit on shutter speed of 1/60th meaning it cannot pick a longer s.s. than 1/60, which in this case provides a dark background. The right image is in A mode and selects the shutter speed for proper ambient room exposure no matter how long (usually up to 30 seconds). More on camera shooting modes coming up.

Here are two more examples using different shutter speeds. The left is 1/30th and the right is 1/250 and both at f11. The flash exposure is the same but the background is much darker at 1/250th.

Shutter speed only controls ambient exposure!

F/stop or aperture on the other hand DOES controls the ***amount*** (or rate) of light allowed to expose the picture. This means that by changing your f/stop, you control the brightness of your flash exposure, just like an ambient outdoor exposure! Remember, we are in manual flash in this discussion, not TTL.

Here is an example: take a picture with the flash set on manual (not ETTL) and at full power let's say that f/stop is f/11. The picture is too dark, so you open up your f/stop to f/8 to let in more light, hopefully creating the correct flash exposure. On the other hand, if the picture at f/11 is too light, you close the f/stop down to f/16 to let in less light from the flash. These concepts are vital: shutter speed does NOT control flash exposure while f/stop DOES.



More Theory:
Consider the above chart of f-stop aperture sizes. If you start with an f/stop of f8 and change it to f11, you have reduced the size of your aperture opening in half, meaning you also cut the amount of light moving through the lens in half as well. Now if you were using the flash for a correct exposure at f8, and then changed to f11, the flash picture will be dark because you made the aperture half the size of the previous aperture so half the light is coming in to expose the picture. If you go the other way, to f5.6, you have doubled the amount of light coming through the lens and the picture will be overexposed. This proves that aperture or f-stop controls flash exposure while shutter speed does not.

The Reality
Now before moving on I should clarify the previous paragraphs as correct flash *theory*, because it is theory and it's based on manual flash. The reality is when you are in TTL automatic flash; the flash will adjust its light output automatically to any changes in f-stop you have made. So if you move the f-stop from f8 to f11, the flash will automatically double flash output for a correct exposure at f11. If you adjust from f8 to f5.6, the flash will reduce by half the amount of output for a proper exposure. It's this function that makes flash so easy to use: TTL does all the work.

The Exposure Triangle
You may have heard about the exposure triangle and how it is the foundation for a proper exposure. There are 3 factors that contribute to the exposure: shutter speed, aperture, and ISO. It is a combination of these three 'ingredients' that contribute to exposure and they all impact each other.

You know that S.S, is how long the shutter is open and the f/stop is how much light enters the lens when the shutter is open. ISO is how sensitive the camera sensor is to the light level. If one of these ingredients changes, it impacts the others. As an example, if you are in low light and you want to use f/11 for depth of field and you need a fast shutter speed like 1/125th to hand hold the camera, you may not get either because the light is too low. The solution is to increase ISO until you get the shutter speed you desire.

For example, the low light only gave you 1/30th at f/11 when you were using ISO 100, but when you double the ISO 200 the new shutter is 1/60th. When you go to ISO 400 the new shutter is 1/125th, and so on.

This theory works with flash as well. When you increase ISO the light from the flash goes further because the camera sensor is more sensitive and this is the most effective use of ISO when using flash: extend the range of the flash. My recommendation is always the same: Use the lowest possible ISO ALWAYS unless you cannot get the desired exposure combination and/or the flash does not go far enough.

Here is an exercise for you to try*:*
Go outside after the sun has set and with your flash on camera, set the camera to Manual shooting mode and set your shutter speed to 1/60th, the f/stop to f/8 and the flash on TTL. Set ISO to 100 or 200 if 100 is not an option. Compose a scene so you see sky where the sun set and your backyard or similar. Focus on a subject like a person or object and then turn off auto focus on your lens so the camera is not looking for something to focus on in the low light. Now take the picture. Next adjust your shutter speed to whatever the in-camera meter suggests for proper ambient exposure and it might be something like 1 second at

the f8 aperture. Take a second picture. Comparing the two photos, there should be no difference between the two as far as the flash exposure is concerned but the ambient light should be dark in the first picture while the second exposure, set to the cameras meter reading for ambient light, should have detail or proper exposure similar to the two pictures above.

This picture is not relevant to the current topic, but was a fun use of flash. My wife and I decided to have some fun with an upcoming birthday party we were having. I used a 20mm lens and had my wife hold the birthday cake out towards the camera and me. I bounced my flash off the ceiling and took picture 1. She set the cake down and then held out her hands as if holding a giant cake and I took picture 2. I then went into PS and cut the cake out of picture 1, enlarged it until it fit her outstretched hands in Image 2. We will cover bounce flash in the next lesson.

Sync Speed

Synchronization speed is the fastest shutter speed you can use with your camera and a flash. This is an important fact when using dSLR cameras with focal plane shutters. I believe most 35mm dSLR use a focal plane shutter and the sync speed varies depending on make and model. I have owned cameras with sync speeds from 1/60th second, to 1/90th, 1/125th, 1/200th, and even 1/250th. The Canon 6D which is new as I revise this course, has a 1/180th sync speed. That is much slower than previous models that are now outdated. At the same time, other brands have 1/320th. On average, most digital cameras have a sync speed of 1/250th. (PLEASE READ YOUR CAMERA MANUAL TO DETERMINE YOUR CAMERA'S SYNC SPEED.)

This is a different concept than mentioned previously where the point was made that the shutter speed had no effect on flash exposure. Here, we are talking timing and the synchronization of the shutter and flash occurring together. If you use a sync speed faster than the designated shutter speed you get a picture that is part picture and part black. The reason for this is that the flash sync speed is the fastest speed where the first shutter of the camera finishes opening before the second shutter starts closing.

This is what the wrong sync speed can look like. The flash fired when the shutter was not completely open. The flash output builds, fires, and falls off quickly. If your shutter is just about to open or close, the entire picture will not be evenly lit. The result is often a dark border.

Cameras are equipped with curtains and the shutters move vertically, exposing the picture as they move. When using fast shutter speeds, these curtains literally become narrow slits exposing as they go. If the flash fires when the narrow slit is at the top or bottom, this results in an incomplete flash exposure. The top sync speed for each camera varies, but at the designated shutter speed the curtain is open completely when the flash fires exposing the entire image.

Many new cameras won't let you take a photo if the sync shutter speed is incorrect and flash turned on. The camera might give you a warning or more often, reverts to the proper sync speed when the camera knows a flash is attached.

Things are changing in this fast-paced digital revolution. The word is that it wont be long before some digital cameras have sync speeds up to $1/500^{th}$ second. In addition, some newer digital rangefinder cameras now have leaf shutters allowing flash sync at any speed. It is important that you understand your cameras sync speed capabilities and you will see examples later in the course.

To use your flash at its maximum capability and get the most power from it you want to use it at a shutter speed no higher than its designated sync speed. That allows you to use all the power the flash can provide for perfect exposures. However, there is a feature that allows you to use a shutter speed higher than the designated sync speed and it is called Auto High Speed Sync and its advantages are covered in a later lesson.

I need to mention this now: if you have a newer camera, you might have an option in your menu that is called Auto FP with FP meaning Focal Plane. It should be called, Auto High Speed Sync because that is what it is about. If you turn this on you can shoot flash pictures at any speed like 1/1000 or 1/8000 and at anytime. You can go your merry way never thinking about sync speed ever again. (Gee that sounds good!) There is a problem with this however (covered more in a later lesson.)

When you use High Speed sync to get faster shutter speeds, then the shutter is open for a shorter time. When this happens, the flash must cut output so that it can output the flash burst within the time the shutter is open. Less output means less distance the flash can be from the subject and less distance means closer subjects and so on.

At different output levels, the light from the flash has different durations. On the Nikon SB900 as a random example, the flash duration from the beginning of the flash burst to the end of the burst is 1/880 of a second at full power. The same flashes duration changes dramatically when the power output level is dropped to its lowest output level of 1/128. Here the duration of the flash 'spike' is 1/38,500

of a second. This means that when the flash fires the entire duration of the burst of light is mind boggling fast. You can use a flash in HSS to stop a speeding bullet although I don't recommend you try that.

You can use high speed flash to stop a skier in midair and in HSS you can use any speed like 1/8000 of a second. But here is the catch: using the flash to stop that skier at 1/8000th second means that skier can be no further than 3' from the camera. Now it is useless. When you use HSS and simply double the shutter speed from your designated sync speed, the flash cuts output by half. So if your designated speed is 1/250 and you move it to 1/500, the flashes total output ability is not cut in half. Go to 1/1000 and output is cut in half again and so it goes. While HSS sounds great it has huge tradeoffs.

If Auto FP (HSS) is on and you photograph and discover later that your sync speed was 1/400 and you learned in this course that there should be a black border and there aint, it is probably because Auto FP was engaged. Check your manual and settings!

I photographed a friend with his dog and used the very simple flash fill technique with an on-camera flash. Fill flash is coming up!

Summary:

Key points to remember:

1.) Aperture controls the amount of light allowed to expose the picture.
2.) Shutter speed controls the amount of time the picture is exposing, but not the actual flash exposure.
3.) You can control the flash exposure by moving the flash closer or farther from the subject.
4.) The camera has a maximum sync speed for use with flash
5.) Shooting Program mode weighs towards flash exposure more
6.) Aperture Priority and Shutter Priority modes weigh towards background exposures