UNDERSTANDING ELECTRONIC FLASH

By Bryan F Peterson/Charlie Borland

LESSON#1

Dissuaded, discouraged, frustrated, deterred, put-off—these are but a few of the G-rated words used to describe many photographers' experiences with electronic flash. Unfortunately, failure with flash—at least in the beginning—is the norm rather than the exception. Ask anyone who has tried flash long enough about their early experiences, and they are no different than those experiences you are having today. There have been numerous photographers who "get it" when taking pictures in available light as soon as the camera comes out of the box. Unfortunately, I know of no photographer who "got it" when using electronic flash for the first time—or the second or third or fourth. Flash can be frustrating, for certain, and your patience will be tested, especially in the early stages.

Most of us instinctively pop up the flash on our camera or mount our portable electronic flash when we find ourselves shooting indoors. Not surprisingly, we expect that flash to simply fill the area we are shooting with perfect light, and we are frustrated when that doesn't always happen. Why do most flash pictures taken at birthday parties and holiday gatherings tend to look so darn harsh? Why do most of our flash pictures look over-exposed, under-exposed—even scary—with colors never seen when taking pictures outdoors?

All three images above owe their success to the use of ONE electronic portable flash You too will enjoy taking pictures like this, well before this six-week flash classs ends!

Most electronic flashes now come equipped with a great deal of sophistication—sophistication that is intended to make our lives easier. Ha! If you know me, I hold the same disregard for flash automation as I do toward the sophisticated automation offered by just about every DSLR on the market. The only thing all of this flash automation has done is increase most people's anxiety. The manual that comes with most electronic flashes is upwards of 90 pages! Yet, there are usually just three pages written about using your flash in manual exposure mode, and these three pages may be the most useful in the entire manual! Sure, you want to learn how to tilt and rotate the flash head, put on colored gels, and attach a diffuser, but at the end of the day, the most important thing you want to learn is how to use your flash in manual exposure mode.

If you have read my book Understanding Exposure, which deals almost exclusively with available light, you may recall the emphasis I place on the photographic triangle: ISO, aperture, and shutter speed—with a further emphasis on the heart of the photographic triangle, light. In this book, you will discover that the photographic triangle is still alive and well when using flash. At the heart of the triangle you will still find light, but with the addition of a portable, incredibly powerful "miniature sun": the electronic flash. This book builds on the manual exposure foundation that I detail in Understanding Exposure. Electronic flash does not require a new way of shooting. It does not require a new photographic mindset. Flash is simply a supplementary tool that we add to our other fundamentals to augment the light in certain situations. When you operate with that understanding, and once you've mastered the manual exposure operation of your flash, you'll be able to get a perfect flash exposure every time.

By applying the principles of the photographic triangle and the techniques of manual exposure, I discovered that flash is a necessary and immensely creative tool that will increase your creative opportunities a hundred fold. And you will too over these next six weeks! Once you fully understand electronic flash and how it works, your eyes will be opened to a new level of photographic versatility. No more tossing images where the light was too contrasty, too dark, or too weak and flat. Rather, you will discover how flash can be used to reduce high-contrast sunlight, or even simulate sunlight when the sun is not out. You will understand how to use that pop-up, built-in flash for better photographs while also learning its limitations when compared with a larger, external flash. You'll also find out how to freeze a moving subject with flash and prevent blurring, how to photograph a traditional studio portrait, and how to create light in ways you could only imagine previously. And when you make it a point to combine what you know about available light with what you are about to learn about artificial light, you, too, will be unstoppable!
If you stick with flash, your patience will be amply rewarded. When you do "get it," and you will before these six weeks are over, venture forth with the confidence that the journey ahead is filled with unlimited discoveries! You will reach that level of enthusiasm where you feel that your capabilities with your flash, your miniature sun, are unlimited. Flash photography can add light to what you want, when you want

and where you want it. Considering the size of our planet, that provides a lot of opportunities, and your flash journey will indeed be long and exciting.

LIGHT AND ARTISTIC LICENSE

Perhaps you are familiar with those ocean scenes painted by artists where a very bright, colorful sun is setting in the background, yet the details of the sand, surf, and nearby rocks in the extreme foreground are still vivid and bright? Ever tried to take a picture of an ocean scene like that? If so, you were probably disappointed. The human eye is an amazing machine that can see light and dark simultaneously. Compared to what your digital sensor (or film) can actually see and record, our eyes can see much, much more. A typical digital sensor records an estimated 7-stop range of light and dark. Our eyes see an estimated 16-stop range. A painter who sees this scene before him in the entire 16-stop range paints a landscape where all 16 stops are represented, from light to dark. Your camera only records a fraction of that.
The solution? Your portable miniature sun. By adding supplemental light in the right parts of the foreground, your camera's sensor can "see" those other portions of the scene that were previously too dark. With your electronic flash you, too, can achieve an image on par with a fine painting.

At a workshop in Cape Cod, my students and I rose in time for this sunrise over Nausset Beach. We were greeted by a vivid yet narrow opening of magenta color between the clouds and the horizon below. Twenty minutes later, the sun slipped up

into this narrow opening, and as the photograph on top shows, the common sunrise/sunset at the beach image was the result complete with the familiar dark foreground). In the photograph below and in name of artistic license, a second sunrise took place 'behind' me, which added some welcome front light. Of course, this "second sunrise" is nothing more than the light from a single electronic flash whose flash head is covered with an amber colored gel and when fired, it illuminated that dark incoming ocean wave.

Photographers and painters have been manipulating light for centuries and when done well, a flash can be perhaps the best manipulator of all. Depending on how you shape it or color it, flash can add drama, mystery, and surprise to an otherwise mundane scene, even turning an ordinary day into night.

Image above-Nikon D300S, f/11 for 1/8 second, Nikkor 12-24mm lens at 16mm
Image below-Nikon D300S, f/11 for 1/8 second, with manual flash exposure from Nikon SB-900 Speedlight, Nikkor 12-24mm lens at 16mm.

A SIMPLE LESSON ON MANUAL FLASH EXPOSURE

Light is all around us and comes from many sources, visually sculpting our world by creating highlight, shadow, and shape. Some light we can control, and some we can't. For example, if light is too bright, too harsh, too dark, or too soft, we may be able to simply turn a lamp off or on. In other cases, we have no control. Existing light sources, whether artificial or natural, are called available light or, more commonly, ambient light. These are, unlike flash, constant light sources and are usually always on. The sun is ambient light and is "always on" during daylight hours. A streetlight is ambient light and is always on during evening hours. Lights in a grocery store or office are ambient light and are almost always on.

Light from an electronic flash, on the other hand, is supplementary light. Unlike most ambient light sources, electronic-flash light is 100 percent under your control. You have the choice of illuminating a large area or a small one—and from just about any angle you can imagine. What's truly exciting about using flash is that you get to control its contrast, brightness, and volume—all while maintaining complete control over the ambient light and its resulting exposure. With one or more electronic flashes in your camera bag, you'll begin to feel that you've discovered your own planet where numerous suns are rising and setting at the same time, under your command, casting light in places of your choosing!

But before you can master flash, you have to understand how the camera "sees" light.

PHOTO#1- 

Posing in front of the Chicago landmark Wolfy's on Peterson Avenue, my friend Jon Demopolous helped me demonstrate how to combine electronic flash with a storytelling aperture, e.g. f/22 (one that renders great depth of field from front to back and contains distinct foreground, middle-ground, and background elements as different parts of the story).

Similar to a sunset seascape, the range of light in this scene was greater than what the camera was able to capture. With my camera and lens mounted on tripod, I set an aperture of f/22, because I wanted maximum depth of field. I then adjusted my shutter speed until my camera's light meter indicated that 1/4 sec. was the correct exposure for the sky and neon sign. The resulting available-light exposure above is spot-on for that area as the background shows, but Jon, on the other hand, is much too dark.

PHOTO#2- 

What's the solution? Electronic flash and so with my flash in manual flash exposure mode, I dialed in f/22 on the back of my flash, and the flash distance scale then indicated a flash- to-subject distance of 4.4 feet for a correct flash exposure.

With my flash tethered to a remote flash trigger (see page XXX) so that it was ready to fire remotely, I held the flash up high with my left hand, just to the left of Jon, and pointed down at about a 30-degree angle. I then tripped the camera's shutter release with my right hand while Jon began to bite down on his hotdog. Voilà! The background is properly exposed, while the foreground is also illuminated. The satisfaction of eating a Wolfy's Dog has been recorded.

Both photos: 12–24mm lens. Top: f/22 for 1/4 sec. without flash. bottom: f/22 for 1/4 sec. with Nikon Speedlight SB-900

*Now of course I do ***not*** expect most of you, at least at this moment, to truly understand this "Simple lesson on Manual Flash Exposure", but if any of you caught a glimmer of a 'little light coming on' inside your brain, after reading the above, I wouldn't be at all surprised. As you are about to learn, manual flash photography is ***not*** the "rocket science" you were led to believe! But first let's wade through the 'science' because it is just important enough to know.

The Inverse Square Law and Light Falloff

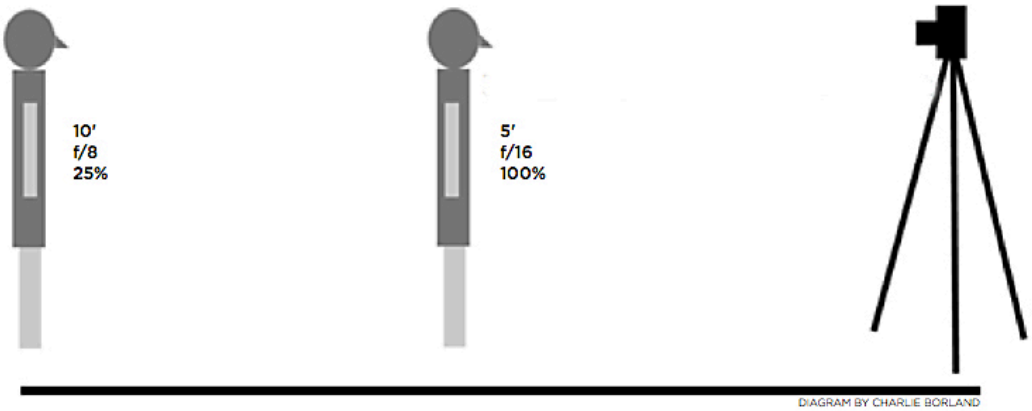
All light is mysterious, but flash is especially mysterious, and I'm convinced it's partly because the flash burst is so fast that if you so much as blink, you can't say for sure that the flash even fired. Even if you did see it fire, you can't say where the light went or how far it traveled.

If you've tried to understand how your flash works at all, you have perhaps come across a number of articles both in books and on the Web that talk about the Inverse Square Law. What is this law? Well, the light output from your flash is a physical quantity, and the Inverse Square Law relates to the falloff of light in relation to the distance from flash to subject. And it's a good concept to get a handle on before we move on to the specifics of making flash exposures.

Think about it this way: You're at an indoor concert, and you hold your camera up to photograph the musicians onstage. When you check the shot, you see that the people 3 feet in front of you have "skin burn" from the flash because they were too close to it. The people ten rows ahead are perfectly illuminated, and the musicians onstage are dark because the flash never reached them. Despite the flash's best attempt to illuminate the subject (in this case, the musicians), the light fell off dramatically before reaching it.

Simply put, the Inverse Square Law states that as the flash-to-subject distance doubles, the light reaching the subject is only 25 percent of the original light that left the flash. So for example, what this means for photographers is that if you move your subject from 4 feet to 8 feet away from the light source, you'll need four times the amount of light to get the same exposure at 8 feet that you got at 4. It's also good to be aware that the closer something is to the light source, the faster the light falls off; the farther it is from the light source, the slower the light falls off. So falloff will be more pronounced up close.

The falloff explained by the Inverse Square Law accounts for much of the disappointment many of us have felt when shooting flash exposures. But this fundamental principle is logical when you think about it. When you're out in your front yard setting off firecrackers, you don't expect every- one within six blocks to hear the same exact loud bang, do you? Of course not, because you know all sounds eventually fade to silence. The light output of your flash works the same way. Just like the bang of a firecracker, it falls off quickly.



THIS DIAGRAM ILLUSTRATES *the Inverse Square Law. Let's say your subject is 5 feet from the camera and your perfect exposure is f/16. When the subject is moved to 10 feet away, or double the distance from the flash, only 25 percent of the light from your flash will still reach the subject. Because of this, the new f/stop would be f/8, or 2 stops more than at 5 feet, to let in more light.*

Chloë and i headed out the door for some "festive city" photos, and as these shots clearly show, there's a definite difference in each of the flash exposures—and that's courtesy of the Inverse Square Law.

This first example combines a perfect flash exposure with a perfect ambient-light exposure. The ambient-light exposure was f/8 for 1/15 sec., and based on f/8, the correct flash-to-subject distance was 15 feet, which was where Chloë stood (15 feet from me).

But note how she becomes progressively darker in these next two shots. This happens for one reason—and one reason only: The distance between the flash and Chloë has increased.

In this second photograph, the flash distance between Chloë and the flash was 21 feet;

and in this third example, the flash to subject distance increased to 26 feet.

The exposure used was the same in all three shots, but the flash-to-subject distance increased, and therefore, light falloff accounts for Chloë being too dark.
All photos: f/8 for 1/15 sec., Nikon Speedlight SB-900. Top: Chloe at 15 feet. Center: Chloe at 21 feet. Bottom: Chloe at 26 feet

Shutter Speed a.k.a. Flash Sync Speed

The flash sync speed is the fastest shutter speed you can set on your camera while using flash without fear of losing part of your composition to darkness. (This shutter speed will vary depending on the particular situation and lighting conditions.)
To understand this, let's review the science of flash photography. Whether you have a portable flash or several powerful studio flashes, something called the thyristor stores up energy inside the flash head. When you press the shutter release, the flash head emits the flash burst. Depending on the make and model of your flash, the rate of speed at which ***the light from the flash*** is expelled might be as high as 1/40000 sec. or as low as 1/800 sec.

Given these speeds, it might seem logical to then assume that the camera's shutter will be open both before and after the flash has fired. This is true, but only when you're using shutter speeds that are "in sync" with the flash. By in sync, what's meant is that the shutters are fully open at the same time the flash goes off.

Let's break this down a little. The shutter of every camera has two curtains. Think of your shutter opening and closing in much the same way as two stagehands opening and closing the stage curtains in a dark theater. The first curtain begins in a closed position, and the second curtain begins in an opened position. At a designated signal, the first stagehand begins to open the first curtain, moving left to right. Once that curtain has gotten to the end of the stage, fully exposing the dark stage, a spotlight from the back of the theater quickly flashes on and off, briefly illuminating everything on stage. The shutter speed in use will then determine just how quickly the second stagehand begins closing the second curtain, also moving left to right so that it covers the stage that was exposed by the open- ing of the first curtain.
In this analogy, the signal to open and close the curtains is the pressing of the shutter release button on your camera. The speed at which the second stagehand begins to close that second curtain is determined by the choice in shutter speed. It might be 1/60 sec. or 15 seconds or any other shutter speed that's in sync with the flash when it fires. When you use a shutter speed that's not in sync with the flash (faster than the maximum sync speed of your camera), then the second stagehand has already begun closing the second curtain before the first stagehand was able to fully open the first curtain and reveal everything on the stage. And since the second stagehand has already

started closing the second curtain when the spotlight briefly turns on and off, a portion of the stage will never be illuminated. In your picture, this unilluminated area will record as black, because it never saw the flash go off. In other words, the shutter was already closing on that part of the frame when the flash burst occurred. By now you may be understandably concerned over your ability to remember to set the correct sync speed on your camera, but this fear may be unwarranted. Many newer cameras won't let you take a photo at an incorrect sync speed when your portable electronic flash is attached to your camera. These cameras automatically reset the shutter speed dial to the maximum sync speed when the flash is in the camera's hot shoe or tethered to the hot shoe via a flash cord. (The problem of not being in sync is more likely to happen when you use the flash off camera, via remote triggers. I'll get to some techniques for working with off-camera flash via remote later on in this course. For now, just remember that when using the flash off camera, you should add Charlie's one-liner to your checklist: "Before I shoot the mink in the rink, make sure I'm in sync!"-Charlie Borland)

For an example of this auto sync-speed resetting, assume for a moment that you're shooting your son's soccer game at the blazingly fast shutter speed of 1/2000 sec. Then the game ends, and you want to shoot a team photo. It's midday, with the sun directly overhead, so your subjects have the raccoon eyes that we discussed earlier. You reach for your flash to provide some fill light to illuminate those under-eye shadows, and as soon as you attach the flash to your camera, it may automatically reset from 1/2000 sec. to its maximum sync speed for flash. Your cutting-edge camera just saved you from making an out- of-sync exposure.

To check your camera's automatic max sync speed set- tings, set the shutter speed to 1/1000 sec., attach the flash, and turn it on. See if the shutter speed resets and to what speed. If it did reset, that's your max sync speed. To return to the higher shutter speed, just turn off the flash, and the shutter speed should reset to the previous speed. Older camera models may act differently and not reset to the max sync speed when you turn on the flash. If this is the case, when you take a picture at the faster, out-of-sync speed, you'll have a black border along the long edge of your picture showing the shutter closing before the flash duration was complete.
There are an abundance of sync speeds—presently, often as fast as 1/200 sec. or 1/250 sec. Most modern DSLRs also include a high-speed sync feature that allows you to use you flash at any shutter speed and still be in sync. There's more on high-speed sync later in this course but basically, when engaged, high-speed sync lets you use

flash at any shutter speed—yep, at 1/500 sec., 1/8000 sec., and anywhere in between. You could turn on high-speed sync, leave it on, and, low and behold, you'd never have to worry about your sync speed again. Now, you may be thinking that you're liberated, free from the confines of having to even think about your designated sync speed, but there's a catch: When high-speed sync is on, you will lose at least half of the flash's power—even more as you increase the shutter speed. That's because, as mentioned prior, the only way to shorten the flash duration is to

reduce the flash power. That's a big trade-off. Since I often need all my Nikon Speedlight SB-900's output ability, I leave high-speed sync turned off and only use it when needed. High-speed sync is a useful feature, but in all likelihood, you'll do 95 percent of your flash work within the range of the normal sync speeds.

On locatIon in the new Zealand forest outside of Christchurch, this young man named William was kind enough to make repeated leaps while, one by one, my students and I made flash exposures from a low angle. Because I wanted to combine the correct exposure for freezing action with the correct exposure for the surrounding natural light in the forest, I first set my shutter speed to 1/250 sec., the fastest normal sync speed, which is fast enough to freeze most subjects when using flash.

Before William started his leaps, and with my shutter speed already set, I adjusted my aperture until f/16 indicated a correct exposure for the light of the surrounding forest. That aperture dictated that I also set the flash to f/16 so that the light output of the flash and the ambient light of the forest would record the same exposure. All that was left to do was note the suggested flash-to-subject distance on the distance scale—7 feet in this case— and place the flash at that distance from William. So I placed the flash 7 feet from the spot at which I expected William to be in peak form and made the exposure.

Nikon D300, Nikkor 14mm fish-eye lens, ISO 400, f/16 for 1/250 sec., Nikon Speedlight SB-900

Recycle Time and Flash Duration

RECYCLE TIME

Another consideration is the speed of your flash; it's 'recycle time' and 'flash duration' are the two things to consider here. Recycle time refers to how long it takes for the flash to return to full power between flashes. Most flashes, on a fresh pair of batteries, will return to full power easily within several seconds. However, if you're planning to shoot in rapid succession over the course of an hour or longer, don't expect your flash to keep up with you beyond the first 15 or 20 minutes. Think of a portable electronic flash's recycle time as a person with healthy lungs about to blow out fifty birthday candles on a cake. The person sits back in their chair, takes a really deep breath, and then blows across the cake. Sure enough, that person has extinguished all fifty candles with a single, powerful breath. But wait! No sooner are the candles blown out when another cake is brought out, and those candles have to be blown out quickly because another cake is in on the way—and then another and another and still another. You can imagine that even someone with the healthiest of lungs will soon be feeling faint and need to stop to rest a bit just to regroup to full power. Unlike our lungs which will make a full recovery if given a few moments rest, the batteries in the flash have expelled quite a bit of power here and as such their initial 'full power' has now been diminished and as a result of this diminished power, the recycle time has lengthened.

You can dramatically shorten or even eliminate a flash's recycle time by hooking it up to a separate battery pack. Using a powerful battery pack, such as those made by Quantum Instruments, would be like hooking up our candle blower to a pure-oxygen pump that constantly refreshed the blower's air supply. These battery packs can be expensive, though, and they probably only make sense if you're planning to do a lot of rapid shooting for long periods of time, such as shoots done by wedding photographers, sports photojournalists, and Event photographers.

For the most part, when I talk about portable electronic flash in this book, I'm referring to flashes that use four AA batteries. You'll quickly discover—and often at the wrong time—that these portable flashes love to feast on AA batteries. Some photographers buy only alkaline batteries, and lots of them, while others use AA rechargeable nickel- cadmium (NiCd) batteries, with a backup set or two of alkaline AAs. Regardless of how you power your flash, you should always have an extra set of AA batteries in your bag. (And note: Just because the recycle time slows down significantly in between each flash, that doesn't mean the AA batteries are spent. There's still plenty of juice left in them to operate your TV remote control or other small battery-operated devices, so don't be so quick to throw the batteries in the recycle bin just because they no longer fire the flash.)

FLASH DURATION

Flash duration describes the actual speed of that burst of light, the flash "bang," released by the strobe when you press the shutter release on your camera. On average, when a flash is set to full power, the duration lasts for around 1/4000 sec. That's blazingly fast, at least when compared to the blink of an eye, which is around 1/100 sec. Some of you may own a flash whose duration at full power is 1/8000 sec., while others have a flash with a flash duration of 1/2000 sec. Again, this duration is based on the flash being set to full power (1/1). When you reduce the flash's power, you're able to work closer to a subject and still maintain a correct exposure. As we will learn, proper flash exposure relates to flash-to-subject distance, so the logic here is that a less powerful flash burst from a closer distance will achieve the same illumination results as a more powerful flash burst from farther away. However, something else that's noteworthy also occurs when you reduce power on your flash: The flash duration shortens. A shorter flash duration opens up a whole new world of freezing-action opportunities. Why? The bang of the flash is shorter in its duration and the recycle time is also much faster, since the powered down flash expends less energy! So, a shorter flash duration combined with a much faster recycle time means you can fire off more frames more quickly without waiting for the flash to recycle every 2, 4, or 8 seconds. This makes a significant difference when you're trying to shoot a sequence of a fast-moving subject.

Note that the only way to shorten the flash duration is to decrease the power. You can assume that with every power decrease—from 1/1 (full power) to 1/2 to 1/4 to 1/8 power and so on—the flash duration gets shorter and shorter. Using an average flash duration time of 1/2000 sec. (for most flashes at full power), you can assume the duration increases by two for each halving of the power setting. So if the duration is 1/2000 sec. at 1/1, then it's 1/4000 sec. at 1/2, 1/8000 sec. at 1/4 power, and so on. (We will learn all there is to know about "powering down" the flash next week!)

Catching the splash of a simple drop of water from the kitchen faucet as it falls into a glass bowl of water is a snap when you power down your flash!

To set up this shot in my kitchen sink, I covered a small cardboard box with one of my bright Hawaiian shirts to make a colorful backdrop. I placed a glass bowl filled with water on top of the shirt and box and adjusted the faucet so that it produced a steady drip of water.

Although this is a two-light setup (opposite), rest assured that I've also been successful with a single electronic flash. With both flashes powered down to 1/16 power and loaded with fresh batteries, the recycle time was remarkably fast—almost as fast as the motor drive on my camera, which I fired at 4 frames per second. Based on the distance from the flash units to the water drop, and based on the reduced-power settings on the flashes, the distance scales on the back of the flashes indicated a correct exposure of the subject at an aperture of f/11. With my shutter speed set to 1/250 sec., I was able to fire off three quick frames as the water drop hit the surface of the water in the bowl. The exposure of the resulting upward splash right is one of my favorites.

(Do NOT expect to understand this fully-but rest assured that after next week you will!)
Nikon D300S, 105mm lens, ISO 200, f/11 for 1/250 sec., two Nikon Speedlight SB-900s

Guide Numbers and Flash Power

We would be remiss if we did not discuss some of the mechanics behind your flash so that you can better understand how your portable electronic flash works (or what considerations you should make when purchasing a new flash).

An important element is flash power, which relates to the total distance the light from your flash can travel. The guide number describes your flash's total power output. The higher the guide number, the more power the flash possesses. A flash's power is analogous to the horsepower of a car; The bigger the engine, the greater the horsepower and the more powerful the vehicle. A more powerful flash gives you more shooting options because it provides the requisite flash output for more situations without forcing you to adjust other exposure settings. It's my feeling that a guide number of 110 or higher will give your flash "engine" plenty of muscle.
The flash range refers to the closest and the farthest points a subject can be from the flash to obtain an accept- able exposure. Each flash unit has a certain range of flash ability based on the total power it can produce. As just noted, the higher the guide number, the higher the flash output. Following up on that, the higher the flash output, the greater the distance the flash can travel (the greater the flash range). On the other hand, the lower the guide number, the lower the flash output. The lower the flash output, the shorter the distance the flash can send light.

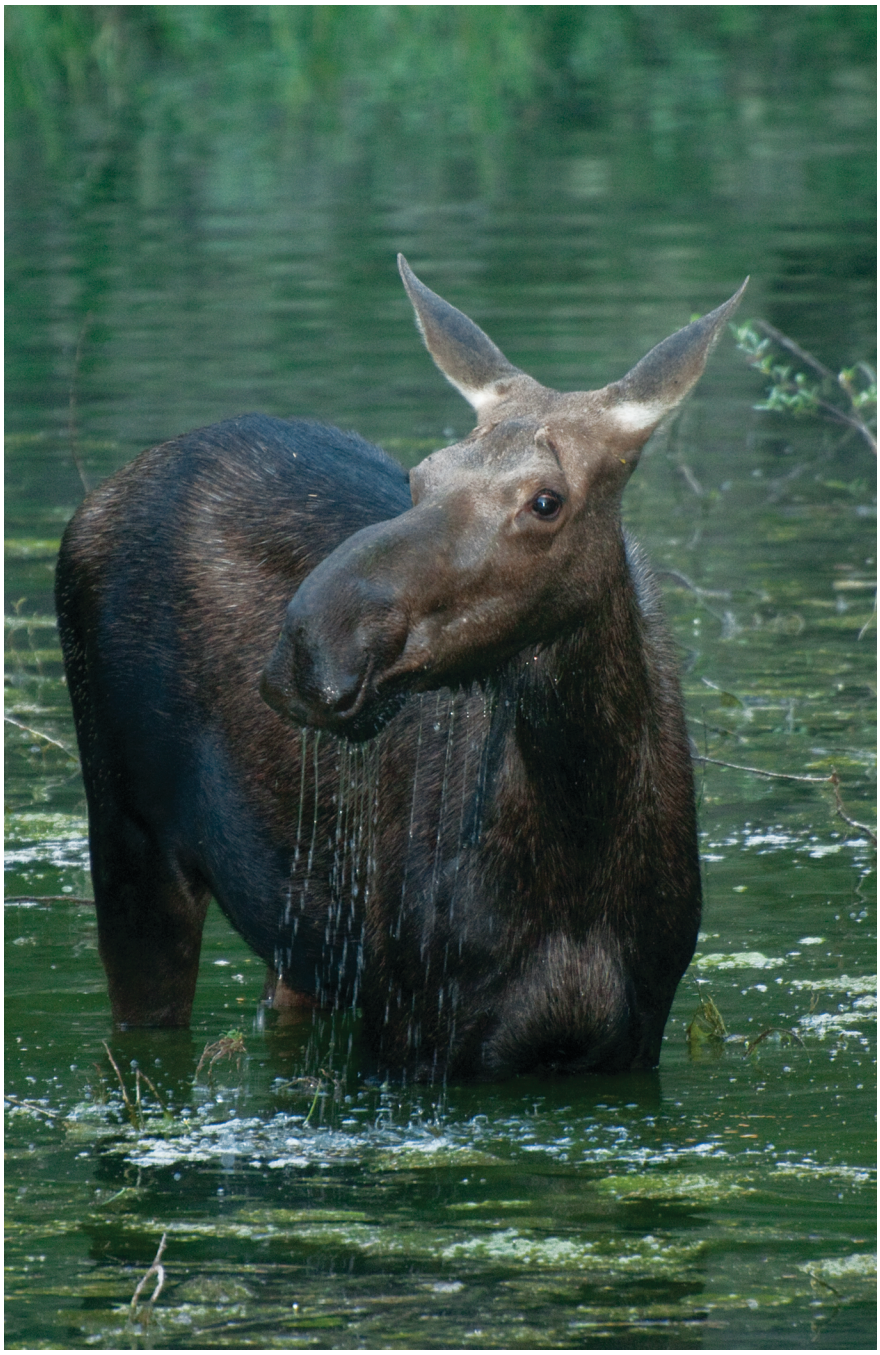
The guide number for my Nikon Speedlight SB-900 is 157, and it has a range roughly of 2 to 65 feet based on an ISO of 100. So for the SB-900, 2 feet is the closest a subject can be; anything closer will be over-flashed (unless I power down the flash and by the way, 'powering down the flash' is covered in week#3). And 65 feet is the farthest the subject can be (unless I increase my ISO). Beyond 65 feet, the light falloff (based on the Inverse Square Law) will make an acceptable flash exposure impossible.

The camera settings that affect your flash range for a specific exposure are aperture and ISO. Adjusting aperture affects the range because you are widening or constricting the hole through which light travels to reach your image sensor, thus allowing more or less light to reach your sensor. For example, changing your aperture from f/4 to f/11 shortens the flash range because f/11 allows in less of the flash light while the shutter is open, so it requires a greater amount of your flash's total light output because that light has to squeeze through the tiny f/11 opening for a proper exposure. Go the other way, from f/11 to f/4, and you extend the flash range substantially because it takes less of the flash's light to slide through the wider f/4 opening, allowing the light to reach much farther.

ISO impacts flash range because a higher ISO makes your image sensor more sensitive to light, so less flash out- put is required to properly expose an image. As a result, a higher ISO increases the flash range.

To determine your flash range for a given exposure set- ting, you could go through a series of calculations before every click of the shutter. Or if you're like me and don't want to crunch numbers before every flash picture, you could just use the automated distance scale on the back of your electronic flash. The flash manufacturers have already done the math for you, and all the information you need is right there.

If you determine your flash can't reach a particular subject, the easiest thing to do is change the flash-to-subject distance by moving closer and bringing your subject within range. If moving closer isn't an option—say you're photographing wildlife and you can't just walk up to the animal—you can increase your flash range by widening your aperture or increasing your ISO. Just be careful of depth-of-field concerns if you're opening up your aperture and shooting a subject that requires a bit more depth of field. Most modern DLSRs let you go up to ISO 1600 with very little noise, opening up a wealth of long-distance shooting options by combining flash and high ISO.



I came upon this moose feeding in a small pond just off the Going- to-the-Sun Highway in Glacier National Park. It was near dusk, so the available light was minimal at best. Plus, the moose was about 90 feet away from the road. With my camera and lens on tripod and ISO 200, I set the lens wide open at f/5.6 and adjusted my shutter speed until 1/15 sec. indicated a correct exposure. Motion blur wasn't a risk; the moose was moving through the water at a speed that would make a snail look like it was breaking the sound barrier.

Unfortunately, the somewhat flat light was far from flattering. I could use my flash, giving the moose a bit of a "pop" that would also include catchlights in

the eyes, but with ISO 200, my flash would never reach the moose. However, once I increased my ISO to 800 on both the camera and the flash, the flash distance scale offered up a new setting that indicated a correct flash exposure was now possible far beyond 66 feet. As this image shows, my flash exposure of f/5.6 for 1/30 sec. not only gave the moose a bit of a pop; it also provided that catchlight in the eye.

Nikon D300S, 70–300mm lens, ISO 200, f/5.6 for 1/30 sec., Nikon Speedlight SB-900

Aperture: The 'STAR' in recording Correct Flash Exposures

It's important that you too think of your flash as a "miniature sun" since it ***is!*** The sole purpose of calling upon your miniature sun is to add light to those areas of your composition where the light (or lack thereof) doesn't meet your preference or suit your tastes.

Assume for a moment that you're a magician. You wave your magic wand over a scene and after a few abracadabras, sunlight appears in areas that were once in open shade. Or light (whether outdoors or indoors) begins to illuminate the front of a backlit subject. Or you create low-angled sunlight, like the glow from early morning sunlight, to create frontlight even though it's an overcast day. To perform these tricks, you must first understand the workings of your magic wand—i.e., your electronic flash.

If your flash is going to work its magic time and time again, it can only do so if the following three conditions are met: (1) the right aperture is set on your camera, and (2) correspondingly, this same aperture is set on the flash and (3) the flash to subject distance is at the distance being indicated on the back of the flash by the distance scale.

Your portable electronic flash should have a distance scale on the back that tells what the flash to subject distance needs to be. I'll cover the distance scale in more detail in a little bit, but this is the one and only tool that will tell you the correct flash to subject distance based on your aperture choice.

I can't stress enough that a correct flash exposure is 100 percent determined by the aperture. Your flash doesn't care what shutter speed you use. This news may come as a surprise. Many of you have been led to believe that a correct shutter speed, the 'flash-sync' speed, is vitally important when using flash, but that's a myth, as we'll see as we progress. Still, although your flash is indifferent to it, you won't want to discount shutter speed's vitally important role, which we explore more later on.

Shutter speed allows you to manipulate the ambient light in your overall composition, and manipulating this ambient light is what often creates much of the drama in exposures that include both flash and natural light.

When shooting in natural light and without any flash, the principles of the photographic triangle tell us, both aperture and shutter speed work in combination to create a perfect exposure. If you have read my book or taken my course, Understanding Exposure, here at PPSOP you are hopefully, in the habit of asking yourself what kind of picture you wish to take (storytelling, isolation, or "Who cares?"). Your answer to that question will determine which aperture to use. Now, this may come as a surprise, but when you add flash, I do not want you to change a thing in your approach to image making. Why? Because it's the flash-to-subject distance that determines which aperture you can use. And you can always move your portable electronic flash closer or farther away (or you can "power it down"). And because your flash is, indeed, portable, you can almost always move it to the distance required by a particular aperture, so you can still use story-telling, isolation, or "Who cares?" apertures to make your ideal composition. We will discuss in much greater detail the value of the Photographic Triangle and it's role in Flash Photography next week.

Let there be light! Let me say it again: ***The amount of the light output from your flash that reaches your digital sensor is 100 percent dependent on combining the right aperture with the right flash-to-subject distance.*** A bit of grass against a rusty 55-gallon drum illustrates the importance of this simple fact.

As you can see in this first example, there really is no sunlight. I captured the rusty barrel and tall grass on this overcast day with f/11 for 1/30 sec. and only ambient light.

This next image shows the addition of some “sunlight” with flash. As you just learned a few pages back, when you want to kill the ambient light, you should strive for no less than a 3-stop under- exposure of the ambient light, so with my aperture still set to f/11 but my shutter speed now set to 1/250 sec., all that remained was to fire up the flash and dial in the aperture on the flash unit to f/11. When I did this, the flash distance scale stated that the flash- to-subject distance must be 9 feet to record a correct flash exposure.

Turned out I was about 9 feet away from the subject, so I fired off the shot and I recorded what looks like low-angled, natural sidelight, complete with the telltale signs of sun and shadow. I held the flash in my hand, off to the left a bit, and fired it wirelessly with Nikon's Commander mode feature. (More about Nikon's Commander Mode later.)

And just to prove how integral the proper aperture is with flash, note how much darker the exposures became, (above photo) as a result of my changing the aperture from f/11 to f/16 and than made darker still going from f/16 to f/22. (photo below)

The smaller apertures greatly reduce the amount of flash light that hits the camera sensor. A clear the wrong aperture directly influences a correct flash exposure. In this case when we stop down the lens, the hole is made smaller and subsequently it is not large enough for the light of the flash to travel through and record a correct exposure.

All photos: 70–300mm lens at 135mm. First photo, no flash, was shot at f/11 for 1/30 sec. Second photo: f/11 for 1/250 sec. with flash. Third photo: f/16 for 1/250 sec. with flash Fourth photo: f/22 for 1/250 sec with flash.

Manual Mode and the Distance Scale

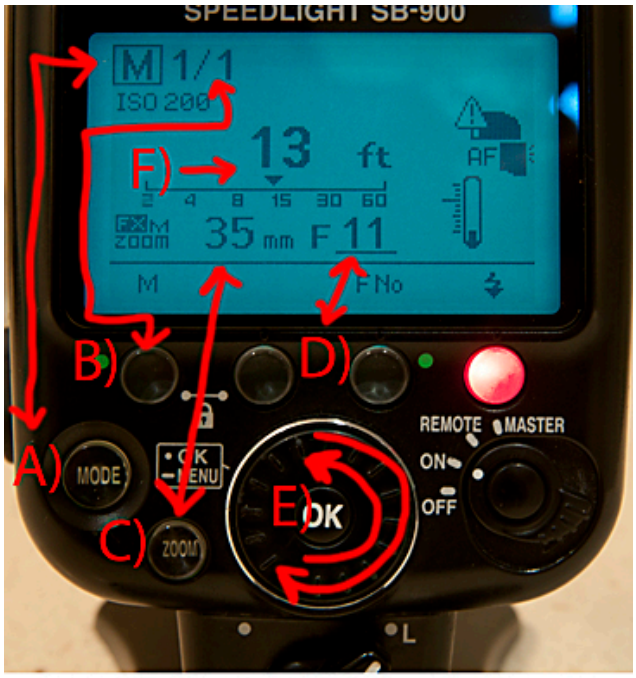
There was a time, back in the late 1950s and early 1960s, when flash photography was a completely manual operation. A correct flash exposure was 100 percent dependent on the use of the right aperture for the corresponding flash-to-subject distance. Electronic flashes came with handy charts listing the best aperture based on the flash-to-subject distance. You simply matched up your ISO in use with the flash-to-subject distance on the chart, and there was the recommended aperture! As we've just seen in this first lesson, a correct flash exposure is still 100 percent dependent on the use of the right aperture for the corresponding flash-to-subject distance. Now you might think the electronic-flash industry is still living in the dark ages, but the fact is that the electronic flash has come a long way, delivering far more sophistication and much more power than were available back in the '60s. One exciting example of this is that most of today's flashes have an ***automated*** distance scale. You tell the flash what aperture you want to use, and based on your ISO, the automated distance scale tells you the exact distance your flash needs to be from the subject to record a correct exposure. Conversely, you can plug in your ISO, determine your desired distance from flash to subject, and the automated distance scale will tell you the correct aperture. Set that aperture on your lens, and you're good to shoot! If this isn't the aperture you wish to use, either increase or decrease your flash-to-subject distance until the scale indicates the aperture you want.
If you know my book Understanding Exposure, then you're already familiar with my insistence on learning how to shoot a daylight exposure in manual exposure mode. Many of you have reported to me just how liberating that was and how it opened up an entirely new and far more creative world of photography. You also reported—with tremendous enthusiasm—just how darn easy it was. Well, learning to shoot a manual flash exposure is just as easy.

If you're not sure how to set your flash to manual exposure mode, get out your flash manual, and look it up. (I've also put together a series of short video clips describing how to set many of the more popular flashes to manual mode. You can view that video link here:) You will also want to set your camera to Manual Exposure mode. If your camera remains in A or S Mode or heaven forbid, Program Mode, your camera will likely default to a much slower or faster shutter speeds to account for low-light levels or bright light levels in your scene and as you may have already learned, you want to be the 'master' over your ambient/natural light!


13'

Let's see how easy it was to make a manual flash exposure of my daughter above. (Nikon D300S, 24–85mm lens, ISO 200, f/11 for 1/100 sec., Nikon Speedlight SB-900)

Pressing the mode button (marked A in the image below), I set the flash mode to 'M', Manual. I've now assumed full control of the flash. I am going to shoot a classic "who cares" composition, so I select f/11 by pressing (D) the aperture selector. Once I do this, I look above to the distance scale (F) and see that when using f/11 my flash to subject distance needs to be 13 feet.



A) Push this button and you change the MODE; TTL, GN, A, RPT and the all important MANUAL setting

B) Push this button and you can change the power setting with each single push

C) Push this button to 'zoom' the flash, thereby changing the angle of the flash output; from wide to narrow

D) Push this button and you will change the f/stop with each single push

E)Push any button, then change 'that' setting e.g. aperture, power, zoom, by turning the wheel-(just another option for you)

F)The all important distance scale: in this example the flash is telling you a 13 foot flash to subject distance is needed for a correct flash exposure.

So just like that, the amazing computing power of my flash just told me that when I use f/11, the flash needs to be 13 feet from the subject to record a perfect flash exposure and sure enough, I fired away fro 13 feet and a perfect flash exposure was the result! Manual flash exposure does NOT get any easier than this! Are we having fun or what? (Note that the flash was mounted on the camera's hot shoe for this shot AND that the flash example above is for the Nikon SB-900 I have also included a 'generic' flash below and NOT surprising, the controls are quite similar.)

TTL VERSUS MANUAL FLASH EXPOSURE

No doubt some of you in this class are shaking your heads and wondering, why bother with all of this "manual stuff", when all you really have to do is use the TTL settings on the flash and bingo, bango, bongo, you get perfect flash exposures!? Good question and I am about to tell you why.

In the late 1960s, Honeywell came up with automatic flash, thus eliminating, in theory, the need to readjust the aperture every time someone moved from the distance for which the flash was set. Eventually this automatic flash concept was further developed into what is today known as TTL (through-the-lens) flash, initially introduced with great fanfare by Olympus back in the '70s. Today's flashes are even more sophisticated, most using E-TTL(evaluative through-the-lens), while Nikon now has i-TTL(intelligent through-the-lens). And to be clear, TTL isn't limited to portable flash. It's the "norm" for all of those built-in or pop-up flashes found on digital point- and-shoots and many DSLRs. Just as you can change the setting for TTL on a portable flash to Manual flash exposure mode, you can also change the standard TTL default setting to Manual flash mode on most pop-up and some built-in flashes. *Also note that TTL is a function of your flash, not your camera!*

TTL works on a simple premise of first sending out a "pre-flash"—an infrared beam or white light—that strikes your intended subject, travels back to the camera, and tells your flash's onboard computer how much flash power is needed to create a correct flash exposure based on the subject's distance from the flash. The pre-flash beam is able to determine the subject-to-flash distance, and the onboard computer adjusts the flash power for this distance, based on your chosen aperture setting. This pre-flash journeys out from the flash head and returns so darn fast that you don't even know it happened. What pre-flash? Exactly.

Let's say you want to take a picture of your son, who's standing 12 feet away, and you're using an aperture of f/8. As you press the shutter button, the pre-flash zips out of your electronic flash, bounces off your son, and flies back to the flash unit to tell the onboard computer, "Okay, Boss, here's the deal: We need to light a subject 12 feet away, and the photographer is using an aperture of f/8!" The onboard

computer makes a calculation based on these variables and tells the flash to put out exactly the right amount of power for that 12 foot distance and for that aperture of f/8. To ensure even more accuracy, this pre-flash takes its information from whatever you focus on. (And there-in lies the problem-more about the problem in a minute!)

Technology can be good, and for some, TTL flash technology is the greatest of all. If you're a professional wedding photographer, Event photographer, photojournalist, or member of the paparazzi, operating in TTL mode makes perfect sense. You don't have to think about anything— just point and shoot. I'm all for TTL in some instances, but even the latest and greatest flash out there will become a useless tool if you don't know where to aim it and understand where the light is going—even when using TTL.

Let's examine further the Manual Flash vs. TTL Flash question a little deeper.

The thought process usually goes something like this: Just use TTL flash, and it will take a perfect flash exposure every time. It does so without asking anything of you. No matter where you are, no matter what your subject might be, no matter what time of day, just call on TTL! If you've spent any time in photo chat rooms, at camera clubs, or jawin' with other photographers at your local Starbucks, you are no doubt familiar with this argument. Well, guess what? This assertion just isn't always true. You can get perfect exposures in TTL, sure, but it requires some degree of input from you. The day of simply aiming, focusing, and shooting has yet to arrive. With TTL we're really, really close, but manual flash exposure still provides the most control over your flash exposure in the widest variety of shooting situations. Outside of the aforementioned wedding photographers, photojournalists, and paparazzi, there are but a handful of photographers who honestly understand flash so well that when they operate in TTL mode they can actually predict the outcome 99% of the time. (Our own Charlie Borland is one of those guys!) But as for me, I want to know what's going on with the camera and flash before I shoot. I want full control, from start to finish, of both my exposure and composition. (I am such a strong believer in Manual Exposure that I ***had*** to write a book about it; Understanding Exposure!)

My deliberate manual mentality carries over to my use of flash too. I have deliberately set my flash to Manual mode, and for the most part, it never leaves this parking spot. I know, just about every time, what the flash is going to do, where it's going to go, what it's going to light, and how the light will be shaped before I press the shutter release.

Since I'm a fair guy, I must be fair to most TTL users and describe where I think it's most useful. While it does take some time—albeit just seconds—to establish a proper manual flash exposure, it takes even less time to use TTL. If you have a moving subject, for example a speed walker heading straight for you on the sidewalk

or the airborne boy on a skateboard, the distance from subject to flash is constantly changing.

the distance from subject to flash is constantly changing. Unless you can function at warp speed, it will be a challenge, if not impossible, to keep up with evaluating the flash-to-subject distance and then spinning the aperture dial quickly in an attempt to provide an accurate manual flash exposure. By the time you calculate the distances and settings, they will have changed. In this case, TTL allows you to just pay attention to the moving subject and concentrate on framing and composition. You have to make the choice that works best for you, which may be manual flash for some subjects and TTL for others.

The reason I usually choose manual is that, while today's flash units are highly advanced, the TTL metering can still be fooled. Alternatively, when you work in manual flash and adjust your settings correctly, your exposures are perfect every time. Here's an example: let's say your neighbor's cousin asks you to photograph his summer wedding. After doing some group portraits, you switch your camera to TTl so that you can circulate through the reception, capturing candid moments of moving subjects. A few moments later, however, the bride returns and grabs you for one more portrait. As she poses in front of the white wall with her flowing white gown and her three nieces, also in white dresses, you click away. But when you check the results, you flinch at what you see. Each of those frames is dark and gray, indicating an "under-flashed" exposure.

What happened? TTL metering was fooled by all the white in the scene (the white wall and white dresses). With TTL, all faith is placed in the flash's ability to meter the light reflected back off the subject. Because white is highly reflective, when the pre-flash bounced back to the camera, it indicated a higher-than-actual amount of light, causing the flash meter to say "enough flash" and prematurely stop the flash, resulting in an under-flashed picture.

The opposite problem can occur with dark subjects. Take the groom and all the groomsmen and position them in front of some dark burgundy curtains, and the TTL flash metering may very well be fooled again. Those black, light-absorbing tuxedos may not bounce back enough light to the flash metering system, so the flash thinks it needs to send out extra light to brighten up the dark subjects. This results in "over-flashing" the groom and groomsmen, which renders those black tuxedos gray instead of their true shade.

As simple and easy as TTL is to use, you now understand my preference for manual. Manual flash mode takes a little more thinking and some simple math (estimating the distance between the flash and the subject), while TTL is quick and easy but a little less reliable. The choice is now yours!

To assure you that i'm not too set in my ways, I'll admit that I have used TTL flash both indoors and outdoors. And this shot is one example of the latter. While at a skate park in New Zealand, I found kids everywhere, zooming past me at varying distances and speeds and making repeated jumps with their scooters and skateboards. With my aperture set to f/11, TTL told me, "Don't you worry about a thing Bryan! I know you're at f/11, and as you can see on the distance indicator on the back of your flash, as long as you shoot subjects that are within 2 and 10 feet, we've got you covered!

I took around fifty shots over the course of the next 10 minutes, but none was more satisfying than this.

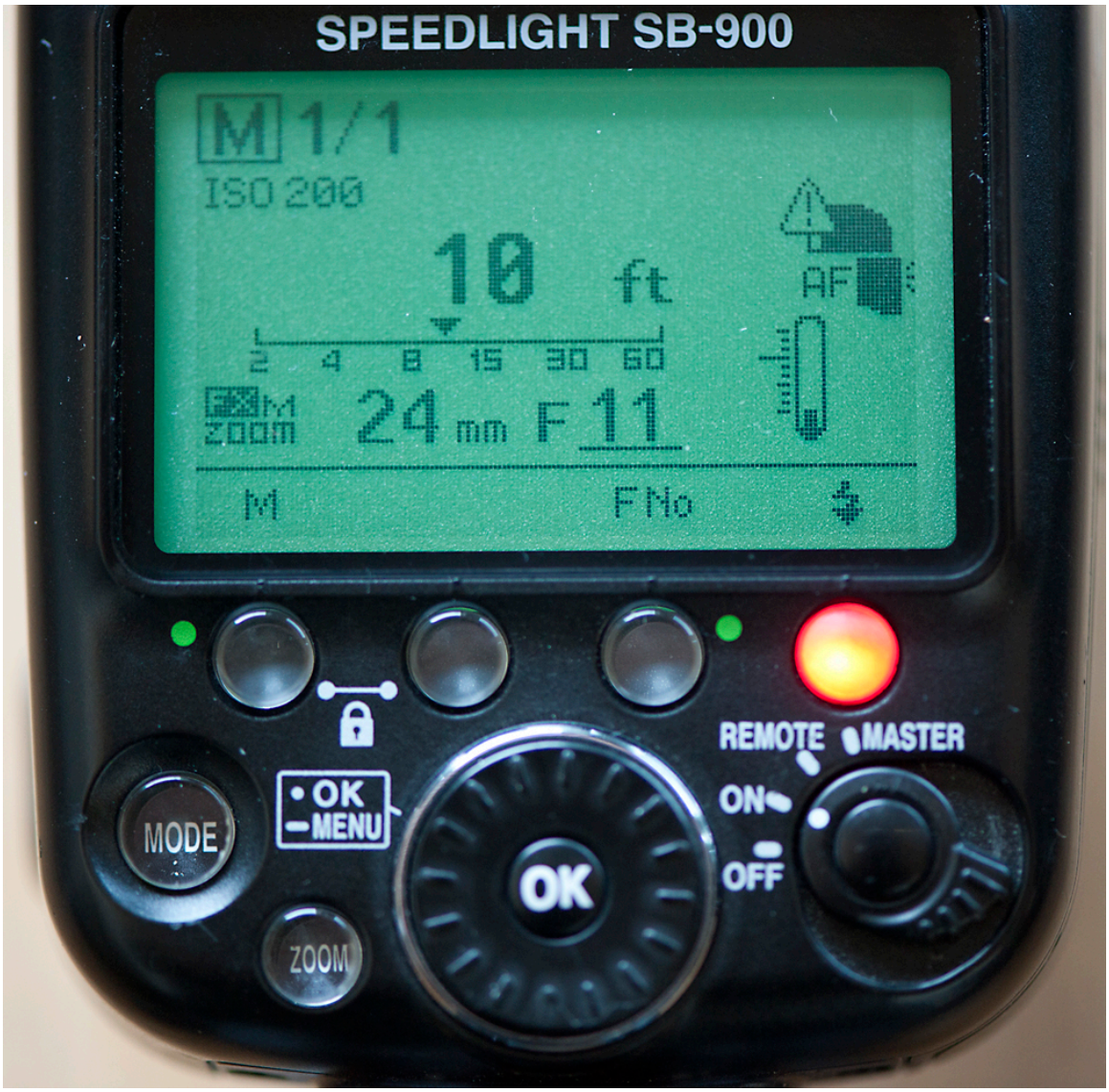
Nikon D300, 12-24mm lens at 24mm, ISO 200, f/11 for 1/80 sec., TTL mode

As you now know, I do on occasion shoot in TTL mode. On one crisp fall afternoon in Chicago as my daughter Sophie played outside with her friend Orion, I noticed the strong backlight around Orion's hair. With my lens at a focal length of 200mm and the flash head zoomed also to 200mm I fired up the flash and set it for TTL. Since I wanted to render the background trees as out-of-focus tones, I chose an aperture of f/5.6 for shallow depth of field and adjusted my shutter speed until 1/200 sec. indicated about a 2-stop underexposure for the natural light reflecting off Orion's

face. Without benefit of any flash, and as you can see in the image on the right, her face was still a bit too dark.

I could have simply changed my shutter speed from 1/200 sec. to 1/50 sec. and rendered her face as a brighter exposure, but in doing so, her naturally backlit hair would have been recorded as another full stop overexposed (it was already about 3 stops overexposed). Also, the bright background of out-of-focus leaves would have been too bright. So what was my option? Flash, of course. In one of my rare moments, I mounted the flash atop my camera and covered the head with Nikon's small diffuser. According to my flash's distance scale, while in TTL mode, I could take my picture at f/5.6 as long as I wasn't closer than 3 feet to the subject or farther away than 45 feet. Since I was about 15 feet away, I was well within the TTL range, and as the image on the right shows, a perfect flash exposure resulted.
Both photos: 70–300mm lens at 200mm, f/5.6 for 1/200 sec.

NOTE: Here are two images that show the distance scale on the back of my Nikon SB-900-the first one shows that when in Full Manual Flash Exposure Mode there is just one specific distance indicated, 10 feet. I must be at or very near that ten foot distance in order to record a correct flash exposure and of course set at the aperture that is called for that specific distance. The second image shows that when in TTL Mode, I am offered a range of distances, from a bit under 2 feet to as far away as 10 feet and the promise of TTL is that as long as my subjects are within this flash to subject range, just under two feet to ten feet, a perfect exposure will result. (Remember in TTL MODE an infra-red beam rushes out ahead of the firing of the strobe and reports back to the strobe what the exact power needs to be for that specific distance so IF you are truly *horrible* at judging distances, then TTL may just be your Messiah). I would counter that concern with the following: carry a tape measure in your bag!


SPEEDLIGHT SB-900
M 1/1
ISO 200
10 ft
AF
2 4 8 15 30 60
M
ZOOM
24 mm F 11
M
F No
REMOTE
MASTER
ON
OFF
MODE
OK
MENU
OK
ZOOM

Why do I dislike TTL? Because it has a heck of time dealing with white or black subjects. Consider this example of Kate below, standing in an alleyway against a black wall while wearing a white blouse. As you can see in the image on the right, taken in TTL flash mode, an underexposed image was the result. In TTL mode, the flash powers down a bit automatically, limiting its light output, because it gets fooled by the white blouse, making it gray, but since Kate's blouse is white, I want it to look white.

When I switch to Manual flash exposure, I know, without question, that I'll record a perfect flash exposure, simply because the aperture I'm using corresponds to the flash-to-subject distance. Unlike TTL mode, in Manual mode there's no infrared beam that measures the reflected value and distance to the subject—and thus, no opportunity to record a bad exposure. The full power of the flash is realized, since I set the exposure, and unlike the TTL metering, the flash isn't being fooled by the

white blouse. As the second example clearly shows, the correct flash exposure reveals a much better exposure!

Both photos: Above: Nikon D300S, 24–85mm lens, f/8 for 1/200 sec., Nikon Speedlight SB-900. DIREX/157: TTL mode. Opposite: Manual flash mode

ASSIGNMENT:

Take 3 flash exposures in MANUAL FLASH EXPOSURE MODE; all of them at the "who cares" apertures of f/8, /9 f/10 or f/11 and each one of a different subject. All we care about in these shots is that whatever you are flashing is seen as a correct flash exposure. We will NOT judge you harshly for poor compositions or poor exposures of the surrounding ambient/natural light-(we will DO

THAT next week however!) Just get out there and make 3 manual flash exposures that are not too bright, not too dark, but "just right" and that "just right"! Subject matter is wide-open.

(ADVANCE TIP FROM NEXT WEEK'S LESSON#2: It's up to you if you want to include a correct exposure of the ambient/natural light or "kill" the ambient/natural light exposure. But you will want to use Manual Mode on your camera too! Then, adjust your shutter speed for the ambient/natural light exposure that surrounds your subject and you just might be pleasantly surprised by what you see!)