

Digital Photography School

Moving Toward Manual Settings: Understanding Aperture (a beginner's guide)



In this tutorial [Natalie Norton](#) explores the topic of *Aperture*.

A few months back I wrote an article here at DPS that created a bit of a stir:

[4 Reasons Not to Write Off Shooting in Automatic.](#)

I expected to get a lot of naysayers scolding me up and down and all around. I did get a few of those, but what I didn't expect were the literally dozens of emails (not to mention comments on the post itself) from people sincerely thanking me for taking the pressure off, for helping them see that great photography is great no matter how it's captured.

I stand by everything that I wrote in that post. I particularly maintain that photography should be FUN and rewarding and that focusing too much energy on the technical aspects of it shouldn't detract from that.

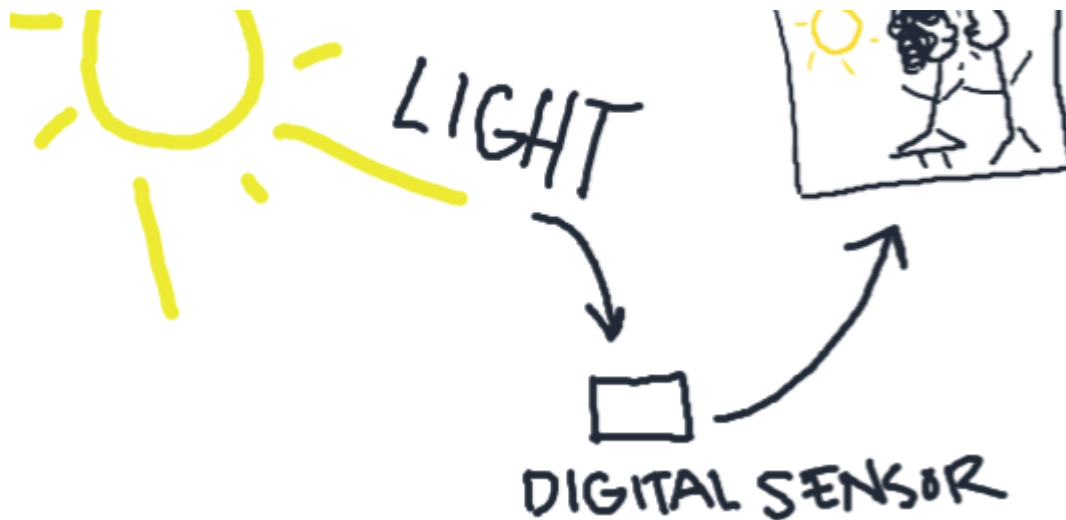
HOWEVER one can't argue with the fact that shooting in Manual does give you more control and greater creative freedom. Period. End of story.

So on we go to Manual settings: I know this topic has been discussed a ZILLION times over, and that it's as boring as dry toast, but we're going to go at it again. . . in layman's terms.

1. What is Exposure?

Exposure is basically the AMOUNT OF LIGHT (controlled by the aperture) that is captured over a SPECIFIC AMOUNT OF TIME (controlled by the shutter speed). Is that clear?





So your exposure is the process of recording light onto your digital sensor (or film). Don't make it more complicated than that: light recorded somewhere (digital sensor or film). THE

END. Easy Cheesy.

2. What is Aperture?

Your aperture, or your F-stop, controls (along with the shutter speed which we'll discuss in the next post so just throw that out of your brain for now before you get confused) how much light hits your sensor.

A lens's aperture (fstop) is basically a hole (and we're getting as basic here as is humanly possible) that opens to let in more light and closes to let in less light. Similarly to the iris in your eye, but if that analogy doesn't work for you feel free to throw it on out. The larger the "HOLE" or aperture (fstop), the more light will hit your sensor, the smaller the "HOLE" or aperture (fstop) the less light will hit your sensor, capiche?

Seriously, try not to over complicate it.

NOW: I'm going to sucker punch you here and I'll just apologize in advance. A HIGH aperture number (fstop) = LESS light being recorded on your digital sensor (or film) while a LOW aperture number = MORE light being recorded on your digital sensor (or film). Yay to the genius who decided upon that little gem of a system! Seriously, I'd be game for toilet papering his house . . . you just let me know the time and place and I'm there.

****QUIZ:** Which aperture (fstop) is going to let in more light? f2.8 or f4

ANSWER: f2.8 Remember the smaller the number the larger the "hole" and thus more light entering the camera to be recorded by your digital sensor.

The TRUE apertures are as follows (called fstops):

1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45, 64, 90

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There are third “stops” in between (just think of it as where the “hole”, aperture, STOPS to let in a set amount of light), your camera may or may not have these.

The best way to find out will be to crack your manual or flip through the aperture dial on your camera and see which apertures show up. If you get numbers like: 2.8, 3.2, 3.5, 4.0, 4.5, 5.0, 5.6 then you’ve got third stops to work with. If on the other hand you’ve got 4.0, 5.6, 8, 11, 16. . . then you’ve got the true apertures and no option for 3rd stops.

NOTE: your lens may not have numbers as low as 2.8 or it may have an aperture number as low as 1.2. Your lens isn’t broken, it’s just got more or less capacity to let in more or less light. . . The general range of most lenses are highlighted in blue above.

Last word about aperture: it is your aperture (fstop) that controls the depth of field in a photo (don’t hyperventilate. . . see below).

3. What is Depth of Field?

Depth of field is basically the amount of an image that is in focus. An image with a very deep depth of field would be an image where everything is in focus, while an image with a very shallow depth of field would have a lot of “fall off” or BLUR with only one segment of the image in focus.



****QUIZ:** Does the image above have a deep or a shallow depth of field??

ANSWER: Shallow, because only the boy is in focus and everything else is thrown out of focus.

STOP! Before we go any further, I want you to have a steady grasp of the way your aperture (fstop) functions. So I have a couple of assignments below for those who are desperate to learn about manual settings. . . or simply want a refresher.

FIRST: Memorize the full fstops. Just commit them to memory. The end. You can do it! Here they are again.

1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45, 64, 90

└

SECOND: For this assignment you will need 2 objects placed on a flat surface 1-3 feet apart outside or in a well lit room. Pop your camera over to Aperture Priority and experiment.

Aperture Priority (AP or AV) will allow you to play around with Aperture and how it affects depth of field without having to worry about shutter speed, because in AP/AV the camera automatically selects your shutter speed for you depending on the amount of light available.

Once you're in AP/AV, set your lens on the LOWEST POSSIBLE APERTURE (fstop) probably somewhere between 2.8-4.0. Focus on the object closest to you and take a picture. NOW, "stop up" to the next FULL fstop. . . you just memorized them, so it should be easy. Skip over the third stops. . . or don't. It's up to you. So let's pretend that I have a lens that has a maximum aperture of 4.0. I'd start by taking an image at 4.0. Then I'd take the same shot at 5.6, then at 8.0 then at 11 then at 16. . . see how this goes? You'll notice a difference in the depth of field. That's the goal of the assignment: to learn how aperture affects depth of field.

Don't be dismayed if your images are slightly dark. I've noticed that for the most part when you shoot in AP/AV images tend to be slightly underexposed. . . . surely to protect from the digital photographer's nemesis of over exposure! Muhahahaha! Watch out for him. He's a real beast.

In the next post in the series, we'll be moving into [shutter speed and capturing/freezing motion](#), so do your homework and check back soon!! To get notified of the next post in this series [subscribe to Digital Photography School here](#).

Happy Shooting!

Natalie Norton lives and shoots on the North Shore of Oahu, HI with her husband Richie and her 3 crazy boys. Check her out at natalienortonphoto.com.

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66 Responses to “Moving Toward Manual Settings: Understanding Aperture (a beginner’s guide)”

- [Mathieu Says:](#)

Great post for the beginners, you explained very well what was Aperture, the stops. I’ve got to say, beautiful drawing! =P

- [Bart Says:](#)

I will gladly join you on a TP’ing venture of the genius who came up with the f-stop measurement system. I mean, I’m sure they had some logical reason, but does that really completely trump having an intuitive measuring system?

- [Chattanooga Photographer Says:](#)

Great beginners guide. I’ll be sure to point some folks to this. Cheers!

- [Everett Says:](#)

The difference in depths of field between f/8 and f/11 is amazing. I never realized such a difference. Granted, I mostly use f/8, but not I’m strongly considering f/11 for shots I want crystal clear.

- Ann [Says:](#)

Thanks for the oversimplification of this :) Loved the drawings.

- [taryn Says:](#)

thanks for explaining that for us in layman’s terms. it makes perfect sense.

- [Beau Says:](#)

If you go from 2.8 to 4 isn’t that considered ’stopping down’ (instead of ’stopping up’? Confusing because of the numbers being opposite of the size of the hole, because down could refer to Fstop or the size of the whole.

My understanding is that going from 2.8 to 4 would be ’stopping down’.

- [Gini Says:](#)

I have had my troubles understanding the manual modes. Thanks for this simple yet effective tutorial.

- Eddie [Says:](#)

Didn’t really know about the 1/3 stops until now. Really good article!

- karlee [Says:](#)

we need more simple posts like these. I read, read and read until I think I have it..but I don't. this post was top notch!

- [Chris Ostermann Says:](#)

THAT WAS BEAUTIFUL.

I laughed my ass off at the picture.
Bravo for humor + content.

- [dark_knight Says:](#)

In some sitches, I find myself checking my M or Av settings against the P (Pro?) settings. If they aren't substantially different or I'm not shooting for "effect" - I go P, baby!

my \$.02 (\$.00003 adjusted for inflation)

- [nate Says:](#)

im down for toilet papering his/her house!

the way i remember it, is that the higher number, the more extended the mechanism is that makes the hole smaller. the smaller, the less of that mechanism is showing.

n

- [Mandy Says:](#)

Oooh this is great I've just bought my first DSLR so I can't wait to give these assignments a go!!!

I also like the way you teach, very easy to understand. Which with these subjects is appreciated.

- [Nadine Says:](#)

Natalie I love your posts! Thank you.

- [zulfadhli Says:](#)

good job.. it is true that when you use manual setting, your pictures will get much much better than using manual.. After all, what is the point of using auto mode after spending your money to get the DSLR.. it will be a waste of your money if you are only using auto mode. try to learn the basics or principles of aperture, shutter speed and ISO. It will worth your money and thanks to Natalie for her superb explanation of what aperture is really about.

- [Anthony Says:](#)

Well explained. I think a brief follow-up on this reviewing how focal length effects DOF would be very useful to the beginner as well.

- [Gayle Says:](#)

Natalie, thank you! I love the way you have explained aperture. I actually understand what you're saying! (Obviously I'm new to photography!) I will work on the assignment tomorrow!

- [Charity Says:](#)

Lens apertures have a smaller number the bigger they are. Body jewelry numbers are smaller the bigger they are. WHAT IS THE CONNECTION?

- wilsonian [Says:](#)

I love you.

- [Kris Says:](#)

I dig it!

- Shelly [Says:](#)

You're wonderful, Natalie. Have you considered a career in teaching?? I loved everything about this article!

- [Pete Langlois Says:](#)

Great article and excellent illustrations! Same thing with wire gauge, smaller the number the larger the wire and opening you'll need to fit the wire through.

Pete

<http://www.petelanglois.net>

- [Amanda Says:](#)

Great post! Now, I'm going to be the annoying student with the tricky question. I think I "get" the aperture lesson as well as ISO...but just the other day I was shooting outside (sorta cloudy) so I had ISO at 200, and I wanted everything crisp and focused (taking shots of newly finished flower gardens). I was using a 50mm fixed lens and found that I when I adjusted the shutter speed to get the proper exposure, I ended up with camera shake.

My question, you ask? To fix this I could a) use a tripod (blech - I'll soon have 2 kids under 2 and haven't the time nor the energy to do such a thing) or b) sacrifice some of my depth of field to find a shutter speed that wouldn't cause blur (again an option when shooting flowers that don't move much, but not fabulous for the fleeting faces of little ones).

Are these really my only options? I guess I just feel like my images lack the "crispness" that I see in so many other photos. And yes, I know I haven't begun talking post-processing here.

Again, my apologies - I just appreciate your candid explanations and feel like maybe your response is one I could actually understand!!! Thanks! :)

- [Amanda Says:](#)

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- [Saju Joseph Says:](#)

Great Post! ... I loved it ...

- [Adino Says:](#)

Thanks Natalie for this great post!

I love the Quiz and Assignments... it really helps me to stop to digest what I've read instead of just skimming through. Looking forward to the next tutorial on shutter speed.

- [jilske Says:](#)

Amanda:

What was your aperture? And did you have a certain DoF in mind?

To increase sharpness in pictures in general:

- try to use smallest aperture possible (higher f number)
- shortest shutter speed possible (if you do not want to use tripod, 1/30 of a second or higher)
- lower ISO (higher ISO will have more grain)

All of this in a combination that will allow you to have enough light coming in and focus where you want.

It would be hard to answer your question without knowing what the general lighting conditions were and which aperture you were using...

- [Cathy Says:](#)

AP is also good for fill flash too. I do tend to forget to change the aperture, instead I change the shutter speed. I think I will try the reverse. Thanks for keeping us on our toes. Don't forget to use the manual mode on your P&S cameras too. The pictures will be amazing !!!

- Ralph Knapp [Says:](#)

Small F number = Big Hole

Big F Number = Small Hole

And the left-over tip from the house wrapping could be used for any other holes we may need to encounter in our photographic excursions. :)

Since I latched on to technical jargon above, I've used AP quite a bit with confidence.

Good an ya for this and the tech illustration is perfect.

- [Jessica Says:](#)

What a great explanation! You have helped me grasp the intangible. Thanks!

- [Cheryl Says:](#)

Wonderful way of explaining aperture. One thing that has always helped me in understanding aperture is to remember it is 1 over the number. It is a fraction. I think of 1/2.8 and 1/4 then it is easy to remember that 1/2.8 is larger than 1/4, and 1/4 is larger than 1/8, etc. The larger the denominator(bottom number) the more light is let in.

- Pat [Says:](#)

The f-stop measuring system doesn't seem so strange if you look at it as a 'fraction' which is how it was explained to me. Then it makes sense that the smaller number is the 'larger' hole and the bigger the number, the 'smaller' the hole.

- [Melizzard Says:](#)

This is wonderful now if someone would only write something like this that shows how to specifically do it on my camera (D50)I'd be in heaven.

- [Shivanand Sharma Says:](#)

That's oversimplification at the least.

Exposure comprises of three technical factors at the least

a) The aperture

b) The shutter speed

c) The ISO

The right balance between these three gives you the best. But each factor at its either end brings in a distinct angle to the picture. For e.g High ISO means more noise (generally), High shutter speed means less light but better freeze of motion, high f stop means a shallow DOF. If it could be that simple all the photography books would not be there.

- [Jessica Says:](#)

Wonderful!!!!!! Loved it!

- Abby [Says:](#)

Jumps for joy I finally get it thanks to your post. Thank-you!!!!

- richard [Says:](#)

Awesome post! This info is SO good. Way to make it practical!

- Casie [Says:](#)

I thought it was very helpful, although I needed just a little more help. I didn't notice a very big difference when I was zoomed all the way out. To notice a big difference you have to zoom into your subject. That made all the difference in the world to see the difference between the depths of fields being thrown out of focus. Maybe this tip would help others. Thanks for the simple explanation!

- [Dawn @ My Home Sweet Home](#) [Says:](#)

Absolutely delightful post. Thanks for explaining it in a way that doesn't require a degree in mathematics.

- [Author: Natalie Norton](#) [Says:](#)

Amanda,

Bump up your iso. . . we'll talk about that in one of the follow up posts to this one. . . Even a small bump to 400 will make a substantial difference in the camera's ability to record the light. Give that a go. . . you won't get grain problems at 400. Let me know how it goes.

Best,

Natalie

- trout01 [Says:](#)

Great post! I am a beginner and this is really great for me now I have a better understanding on how my camera works.

- Deb [Says:](#)

I loved this article, very informative and funny, (my kind of reading material) and I think I'm getting it! Thanks. The F-stop deal is like a needle gauge, the larger the number the smaller the size of the needle, at least in the nursing profession. In other words if a nurse asks you "Would you rather get poked with a 22g. or an 18g.?" go with the 22. Thanks again!

- josworld [Says:](#)

simple. easy. fun! bravo!!

- Terri [Says:](#)

Thanks!! I am a total beginner on manual photography and just ordered a Nikon D60 after much research and with use of your articles. I love your work. Thanks!!!

Terri
Farmington, Utah, USA

- sandy [Says:](#)

So easy to understand.I just wish I could have had this when I was trying to learn.Thank you
Sandy

- nanasneedle [Says:](#)

Thanks for simplifying aperture. It took me forever to get this straight in my mind. Great article!!!

- Sharon [Says:](#)

Thanks!! This is as simple as it gets. Completely understand it!!Now off to do the assignments.

- Rob [Says:](#)

Cheryl hit the nail on the head. Think of F stops as fractions of available light entering the thru the lense. f4 is 1/4 of available light....f32 is 1/32 of available light and understandably is a much smaller hole than 1/4. When I realised this I started to understand what settings to use and when. Taking images at f2.8 or 3.5 and comparing the ones you take at f11 or 22 you will see what happens to the background. Flick your camera to Portrait mode and you will see the camera chooses a shallow (f3.5) to blur the background. Choose Landscape and the camera knows you want everything from a few feet in front of you way up top those mountains (infinity) sharp so chooses F11 or 22 etc. for you. If your camera doesn't have manual or A, use these settings instead. Try it this weekend.

- jen [Says:](#)

sounds interesting but when i take picture at different f stops.... i get exactly the same picture. see no difference.

- Chas [Says:](#)

Depth of field - the bigger the 'hole' in the lens the greater the bend in the light to focus - so shorter depth of field. Smaller hole - less bend - longer depth of field - QED.

- [Tony Freer Says:](#)

I own a Panasonic -dmc-fz30. My Mother called me sunny but I'm really not that bright . I have nothing but trouble trying to focus this camera no matter what mode or position I'm in. In 1000 words or less can u give me some tips as to how to get good focus on a regular basis. I have absolutely no one qualified enough so solve my problem. Considering my vintage, Dean Martin was a good friend, do you think that you can help, or send me to a Digital medical grad who can.

Thank you for your time

- Novice at heart [Says:](#)

This is exactly what I needed! Off to do my assignment and can't wait for the next post!

THANKS..

- Chas [Says:](#)

Tony - I had similar problems with my Samsung Pro815 Then I suddenly realised that the focus range in Green(on mine) was macro so autofocus doesn't work in this range - try it and let me know on here.

Good luck

Chas.

- Tammy [Says:](#)

Natalie,

What aperture setting should the camera be set on in the manual mode for a group of people?

The lighting is in the evening with sunny skies. I'm guessing the aperture should be in the middle to get everyone in focus? 7.1 & higher? For a deep depth of field?

- Norm [Says:](#)

I was looking for a simple document to help some boy scouts to understand these so they could get their photography merit badge.

Thanks,

- Lise [Says:](#)

I just spent the weekend shooting in AV mode and experimenting with depth of field. Wow .. what a difference .. this is now my new favorite shooting mode!

- [Author: Natalie Norton](#) [Says:](#)

Tammy,

Yes, any time you want a deep depth of field, you'll want a HIGHER number. Large groups of people should be shot around f8. . . depending on the look you're going for.

Does that make sense?

Natalie

- Tammy [Says:](#)

Natalie,

Yes that makes sense. I ran into a problem last week shooting a family of five at in the evening, some are in more focus than others. I switched to auto and the aperture set to F5.6 probably because it needed more light.

Would it of helped if I set the camera to manual and aperture to F8 , what about the shutter speed and ISO?

What is the lowest shutter speed I can set my camera at to keep everyone in focus and get sufficient light? I did have a tri-pod. Thanks

- [Author: Natalie Norton Says:](#)

Tammy,

The quick answer to your question is had you bumped your aperture up to 8 in low light, then yes you would have had to change your shutter speed (slow it down to let in more light) and perhaps bump up the iso (to make the digital sensor more sensitive to light). HOWEVER it's impossible for me to tell you exact numbers without being present to meter the light.

You're going to love the follow up to this post on shutter speed. It will answer all your questions. Look for it sometime this week!

Aloha,

Natalie

- Susan [Says:](#)

Wow - thank you SO much for this explanation. I finally feel like I understand this mystical thing. And the assignment really helped, too. I can totally see the difference and I understand why. Yay!

- [Ivy Says:](#)

I love you so much I just want to squeeze you! This blog is so helpful!
I just got a Canon XTi. I will do My homework and then read the next post you have put up. :)

- Sean [Says:](#)

“To increase sharpness in pictures in general:

- try to use smallest aperture possible (higher f number)
- shortest shutter speed possible (if you do not want to use tripod, 1/30 of a second or higher)
- lower ISO (higher ISO will have more grain)”

What is said here is true “in general” but those are the key words.

Keep in mind that every lens has a “sweet spot” that is actually a range of f/stops and not a “spot.” The “sweet spot” for most lenses is in the middle of the f/stop range. At the extremes, particularly wide open (small f/stop) the lens will be soft. But at the smaller apertures (higher f/stops) diffraction can take a toll on image sharpness.

As far as shutter speeds go there is an old rule which states “if you use a x mm lens, then your shutter speed should not be less than 1/x s, to avoid blurring due to camera shake when you don't use a tripod. e.g. if you use 300mm, then shutter speed should be more than 1/300s. With dSLR's the 35mm equivalent is used for the formula.

While I don't completely buy in to that rule, particularly with Vibration Reduction (or similar technology), I think you would have a very tough time getting a tack sharp photo a 1/30 even with Vibration Reduction. The longer the focal length the more true this becomes as even the slightest movement can cause blur at longer focal lengths.

- Rhonda [Says:](#)

Help! I can't figure out what I'm doing wrong. I go all the way throught the different levels of aperture and I don't see any difference in the depth field. I'm using an Olympus E-520. Any suggestions?

- [rj Says:](#)

there is no need to memorize all the full stops, all we have to do is remember 1 and 1.4 and multiply each of them by 2, then do the same with the results.

1 1.4
x2 2 2.8
x2 4 5.6
x2 8 11
x2 16 22

- Matthew Paver [Says:](#)

Wow. Coming from a beginner, you're an absolute saviour. No where else have I been able to find explanations that are so easy to understand. Fell like a pro already now ;)

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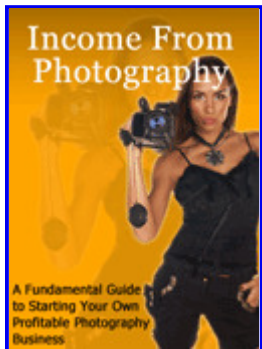
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