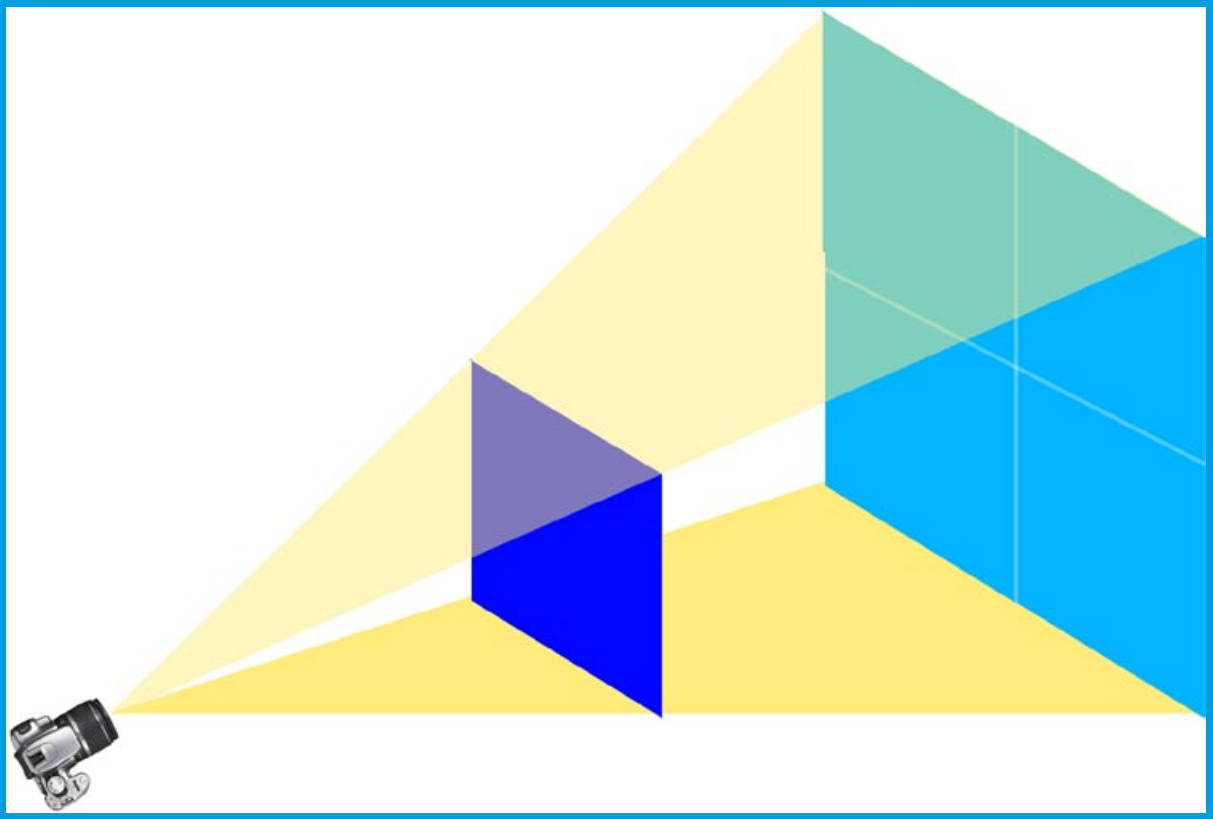
An Extension to
The Textbook of Digital Photography

Flash Guide Numbers



DENNIS P. CURTIN

HTTP://WWW.SHORTCOURSES.COM

HTTP://WWW.PHOTOCOURSE.COM

ShortCourses and PhotoCourse Publishing Programs

Short Courses, the parent site of PhotoCourse.com, is the leading publisher of digital photography books, textbooks, and guides to specific cameras. Be sure to visit the Short Courses bookstore at http://www.shortcourses.com/bookstore/book.htm. One of our specialities is high-quality, easy to follow, camera guides so be sure to visit the store to see if there is a guide to your camera. If you find any errors in this book, would like to make suggestions for improvements, or just want to let me know what you think—I welcome your feedback, even though I can't always respond personally.

Contact/Feedback Information

ShortCourses.com
16 Preston Beach Road
Marblehead, Massachusetts 01945
E-mail: denny@shortcourses.com

Copyright Notice

Web Sites

To learn more about digital photography visit our two Web sites:

- http://www.photocourse.com
- http://www.shortcourses.com

Extension

Click to view a PDF document on how copyright law protects photographers and other artists.

Extension

Click to view a PDF document on how copyright law protects photographers and other artists.

EDUCATORS

PhotoCourse and Short Courses books are used by hundreds of schools, major camera companies, police and military training programs. If you are an instructor, you should know that special pricing is available for classroom use.

For details on using this and other texts in the classroom, please call us at 781-631-8520, Boston Massachusetts USA time.

Flash Guide Numbers

A flash has the power to light the entire scene, but light falls off that farther it is from the camera.

When buying or using a flash, you can calculate its maximum range from its *guide number*—a measure of its light output. The higher the guide number, the greater the intensity and range of the flash. Guide numbers are determined experimentally, usually by the manufacturer. To determine the number, a flash unit and subject are set up and exposures are made at a variety of f/stops. When the best exposure is determined, the guide number is calculated from the distance and the f/stop used as follows:

guide number = f/stop x flash-to-subject distance

More powerful flash units with higher guide numbers have a greater range, have faster recycle times, and make bounce flash more effective. Canon's Digital Rebel is a good example of how guide numbers indicate flash range. The camera's built-in flash has a guide number of 43 (in feet, with ISO set to 100). The accessory 550EX flash has a guide number of 180. When using an aperture setting of f/3.5, the range of the built in flash is about 12 feet and that of the external flash is over 50 feet.

In addition to being an indicator of a flash's power and range, you can use a flash's guide numbers to calculate aperture setting and subject distance when using the camera and flash on manual mode as when you are using a flash not designed to work with the camera.

• **To calculate the f/stop needed**, divide the guide number by the distance to the subject.

$$\text{f/stop} = \text{guide number} \div \text{flash-to-subject distance}$$

• **To calculate the maximum flash range**, divide the guide number by the f/stop you plan on using.

$$\text{flash-to-subject distance} = \text{guide number} \div \text{f/stop}$$

When making these calculations, there are a few things to be aware of:

• Guide numbers are usually given for a setting of ISO 100. If you increase the ISO setting, the camera needs less light for a good exposure so the range of the flash increases. Doubling the ISO setting, say from 100 to 200 increases the guide number by a factor of 1.4x; quadrupling the ISO, say from 100 to 400, doubles the guide number.

• It is the flash-to-subject distance that you use, not camera-to-subject. These two distances are the same when using on-camera flash but not when using flash on a cable or a slave flash. When using bounce flash, the distance is the longer path which the light travels.

• Guide numbers are usually given for both feet and meters so be sure you use the right one in your calculations. The differences can be substantial. For example, a guide number of 12, when using meters as a unit of measure, is the same as a guide number of 39 when using feet. Conversions between a guide number for feet and a guide number for meters are as follows:

- From meters to feet: GN(ft) = GN(m) x 3.28
- From feet to meters: GN(m) = GN(ft) x 0.328

Excel

Click to open the Excel worksheet used to explore flash guide numbers.

EXPLORING THE WORKSHEET

The Excel worksheet "Flash Guide Numbers" lets you explore how a flash's guide number is determined and how that number affects the aperture you can use and the flash to subject distance.

Flash Guide Numbers
from
"The Textbook of Digital Photography"
http://www.photocourse.com

Enter data only in the light green boxes (the ones with background colors matching this box's.)

Calculating a Guide Number		
1	f/stop used	16
2	Flash to subject distance	3
3	ISO	100
4	Guide number in feet	48
5	Guide number in meters	16

Lookup Table	
ISO	Factor
100	1
200	1.44
400	2.07
800	2.99
1600	4.30
3200	6.19

Calculating an f/stop		
1	Guide number	64
2	Flash to subject distance	16
3	f/stop	4

Calculating the Maximum Flash Range		
1	Guide number	33
2	f/stop	2.6
3	Distance	12.7

Calculating a Guide Number section

1. *f/stop used* is where you enter the f/stop used to take the photo.

2. *Flash to subject distance* is where you enter the subject's distance in feet or meters.

3. *ISO* is set to 100, the setting most often used to calculate the guide number you find in flash specifications.

4. *Guide number in feet* formula multiplies the *f/stop used* times the *Flash to subject distance* to calculate the guide number at an ISO of 100. Since the guide number increases by 1.44x each time you increase the ISO one stop, you can determined the adjusted guide number by looking up the ISO you want to use in the lookup table. Once you find it, multiply the guide number at 100 by the factor to the right on the table. You can use the original, or any of the adjusted ISOs to explore the next two sections of the worksheet.

5. *Guide number in meters* multiples the *Guide number in feet* by 0.328 to convert feet to meters.

Calculating an f/stop section

1. *Guide number* is where you enter the flash's guide number. You can get this from the manual that came with your camera or flash.

2. *Flash to subject distance* is how far the flash is from the subject in feet or meters.

3. *f/stop* formula divides the *Guide number* by the *Flash to subject distance* to calculate the aperture you would use at ISO 100. Each time you double the ISO you can stop this down one stop.

Calculating the Maximum Flash Range section

1. *Guide number* is where you enter the flash's guide number. You can get this from the manual that came with your camera or flash.

2. *f/stop* is where you enter the camera's f/stop.

3. *Distance* formula divides the *Guide number* by the *f/stop* to calculate the flash range at ISO 100. Each time you double the ISO, the distance increasses by 1.44x.

Exercises

Open the worksheet by clicking the Excel button to the left and enter numbers in the green cells to explore the questions that follow.

1. If you get the best exposure at f/8 while photographing from 8 feet, what is the flash's guide number?

2. If you set the aperture to f/4, the flash to subject distance is 10 feet, and the ISO is 100, what is the guide number? What is it if you change the distance to 20 feet?

3. If your flash has a guide number of 60 and you are 12 feet from the subject, what f/stop should you use at ISO 100? At ISO 800?

4. If your flash has a guide number of 90, how far can a subject be from the flash when the aperture is ste to f/4?