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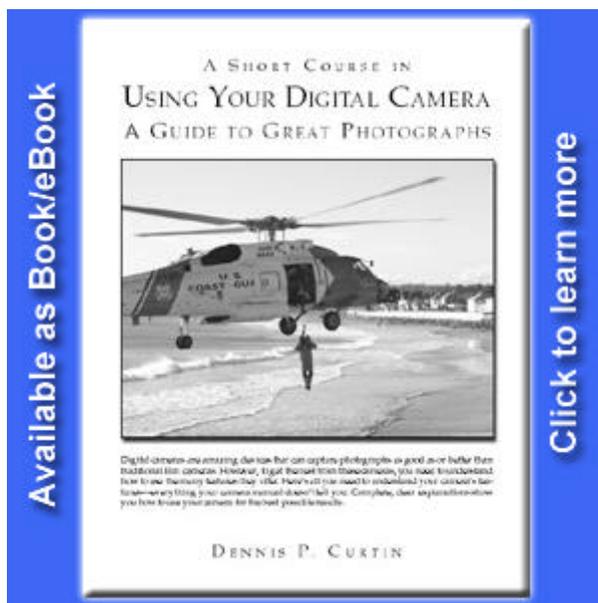


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A Short Course in Using Your Digital Camera

1. Camera Controls and Creativity



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Serious **digital cameras** give you creative control over your images. They do so by allowing you to control the light and motion in photographs as well as what's sharp and what isn't. Although most consumer **digital cameras** are fully automatic, some allow you to make minor adjustments that affect your images. The best ones offer a wide range of controls-in some cases more than you'd find on a 35mm SLR. However, regardless of what controls your camera has, the same basic principles are at work "under the hood." Your automatic exposure and focusing systems are having a profound affect on your images. Even with your camera on fully automatic, you can indirectly control, or at least take advantage of the effects these controls have on your images.

In this chapter, we'll first explore how you use the camera in various automatic modes and see what effect each of the settings has on your images. In the chapters that follow, we'll

explore in greater depth how you take control of these settings, and others, to get the effects that you want.

Automatic All the Way

All **digital cameras** have an automatic mode that sets focus, exposure, and white-balance for you. All you have to do is frame the image and push the shutter-release button. You'll find that this auto mode of operation is great in the vast majority of situations because it lets you focus on the subject and not on the camera.

- ⌘ **Getting Ready.** Turn the camera on and set it to automatic mode. To conserve your batteries, turn off the LCD monitor and compose your image through the optical viewfinder. If the camera has a lens cap, be sure to remove it.
- ⌘ **Framing the image.** The viewfinder shows you the scene you are going to capture. To zoom the lens to frame your image, press the zoom-out button or lever to widen the angle of view and the zoom-in button or lever to enlarge subjects. If the image in the viewfinder is fuzzy, see if the camera has a diopter adjustment dial you can use to adjust it.
- ⌘ **Autofocus.** The area you place in the focus area in the center of the viewfinder is used to determine the sharpest part of the scene. How close you can focus depends on the camera you are using.
- ⌘ **Autoexposure.** Programmed autoexposure measures light reflecting from the scene and uses these readings to set the best possible exposure.
- ⌘ **Autoflash.** If the light is too dim, the autoexposure system will fire the camera's built-in flash to illuminate the scene. If the flash is going to fire, a flash lamp usually glows red when you press the shutter-release button halfway down.
- ⌘ **Automatic white balance.** The color cast in a photograph is affected by the color of the light illuminating the scene so the camera automatically adjusts color balance to make white objects in the scene look white in the photo.

How To: Taking a Picture in Automatic Mode

1. Turn the camera on and set it to automatic mode. Be sure to remove the lens cap.
 - ⌘ Look in your camera manual for a section on selecting automatic exposure
 - ⌘ Look in your camera manual for a section on turning the LCD monitor on or off
2. Compose the image in the viewfinder making sure the subject that you want sharpest is in the focus area in the center of the viewfinder.
3. Press the shutter-release button halfway down so the camera can set focus, exposure, and white balance. When the camera has done so, a lamp may glow or the camera may beep.
4. Press the shutter-release button all the way down to take the picture. When you do so, the camera may beep. The camera then saves the new image onto the camera's flash card.

5. When done, turn the camera off.

▲ Choosing Image Quality and Size

The size of an image file and the quality of the picture it contains depend in part on the number of pixels in the image and the amount of compression used to store it.

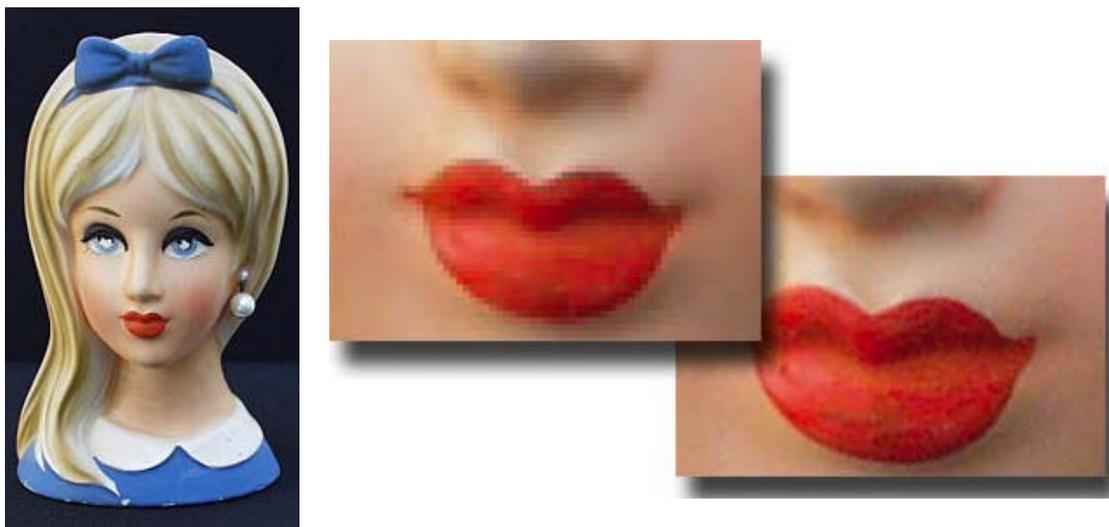
Compression

To make large image files smaller and more manageable, **digital cameras** store images in a format called JPEG after its developer, the Joint Photographic Experts Group and pronounced "jay-peg." This file format not only compresses images, it also allows you to specify how much they are compressed. This is a useful feature because there is a trade-off between compression and image quality. Less compression, sometimes called Fine mode, gives you better images so you can make larger prints, but you can't store as many images. More compression, in modes such as Normal or Basic, lets you store more images and makes the images better for making smaller prints, posting on a Web page, or sending as e-mail attachments. The only problem is that your prints won't be quite as good. For the highest resolution, some **cameras** offer an uncompressed format.

Here, two versions of the same image have been enlarged. The image on the left is uncompressed. The one on the right is a compressed JPEG file.

Image size

In addition to offering two compression modes, many **cameras** let you also change image size as a way of controlling the size of image files. Because you can squeeze more 640 x 480 (VGA) images into a storage device than you can squeeze 1600 x 1200 images, there may be times when you'll want to switch to a smaller size and sacrifice quality for quantity.



The left top image of lips is a detail blown up from the image (left) shot in a low res mode at a small size. The

*bottom right lips were shot at a high res mode at a larger size. These are the widest extremes you'll find with most **digital cameras**.*

How To: Selecting a Quality Mode

Look in your camera manual for a section on **image quality**, **image size**, or **compression**.

▲ The Shutter Controls Light and Motion

The shutter keeps light out of the camera except during an exposure, when it opens to let light strike the image sensor. The length of time the shutter is open affects both the exposure of the image and how motion is portrayed in it.

The shutter and exposure

Slower shutter speeds let more light strike the image sensor making an image lighter. Faster shutter speeds let less strike it and make the image darker.



In these pictures, the shutter was left open longer for the image on the left than for the one on the right. It's this longer exposure time that has made the image lighter.

The Way It Was: Early Shutter Designs

The shutter, used to control the amount of time that light exposes the image sensor, has changed considerably over the years. The earliest cameras, using materials that might take minutes to be properly exposed, came with a lens cap that the photographer removed to begin the exposure and then replaced to end it. As film became more sensitive to light and exposure times became shorter, faster shutters were needed. One kind used a swinging plate while another design used a guillotine-like blade. As the blade moved past the lens opening, a hole in the blade allowed light to reach the film.

The shutter and motion

In addition to controlling exposure (the amount of light that reaches the image sensor), the shutter speed is the most important control you have over how motion is captured in a photograph. Understanding shutter speeds is vital if you want to anticipate if a moving subject will appear in your image sharp or blurred. The longer the shutter is open, the more a moving subject will be blurred in the picture. Also, the longer it's open the more likely you are to cause blur by moving the camera slightly.



A fast shutter speed (left) opens and closes the shutter so quickly a moving subject doesn't move very far during the exposure, a slow speed (right) can allow moving objects to move sufficiently to blur their image on the image sensor.



Katie turned a little just as the shutter opened causing unwanted blur in the image.

Understanding shutter speed settings

Although **digital cameras** can select any fraction of a second for an exposure, there are a series of settings that have traditionally been used when you set it yourself (which you can't do on many **digital cameras**). These shutter speed settings are arranged in a sequence so that each setting lets in half as much light as the next slowest setting and twice as much as the next fastest. The traditional shutter speeds (listed from the fastest to the slowest speeds) include 1/1000, 1/500, 1/250, 1/125, 1/60, 1/30, 1/15, 1/8, 1/4, 1/2, and 1 second. Although speeds faster than 1 second are fractions of a second most **cameras** display them without the numerator. For example, 1/2 second is displayed as 2.

The Decisive Moment

Henri Cartier-Bresson is famous for his photographs that capture that "decisive moment" when random actions unfold into a single instant that makes an interesting photograph. His eye-hand coordination is unrivaled, and he was able to get the results he did because he was always ready. There was never any fumbling with controls and lost opportunities. Most **digital cameras** have an automatic exposure system that frees you from the worry about controls. However, these **cameras** have other problems that make decisive moments hard to capture.

There is a delay between the pressing the shutter release and the actual taking of the picture. This is because when you first press the button, the camera quickly performs a number of tasks. It first clears the CCD, corrects white balance to correct for color, meters and sets the exposure, focuses (on auto focus **cameras**) the image, and finally fires the flash (if needed) and takes the picture. All of these processing steps take time and the action may have passed its peak by the time the picture is actually taken.

There is an even longer delay between pictures because the captured image must first be stored in the camera's memory. Because the image must first be compressed, a lot of processing is required and this can take a number of seconds, an eternity in action photography because you can't take another picture until the first is compressed and saved.

How To: Selecting a Shutter Speed

Look in your camera manual for a section on **shutter preferred** or **shutter priority mode**, or **shutter speeds**.

The Aperture Controls Light and Depth of Field

The aperture diaphragm, a ring of overlapping leaves within the camera lens, adjusts the size of the opening in the lens through which light passes to the image sensor. As it changes size,

it affects both the exposure of the image and the depth of field in which everything is sharp.

Aperture and exposure

The aperture can be opened up to let in more light or closed (stopped down) to let in less. Like the shutter speed, the aperture is used to control exposure. The larger the aperture opening, the more light reaches the image sensor in a given period of time. The more light, the lighter the image.

The Way It Was: Early Apertures

A variety of designs in the past century and a half have enabled photographers to change the size of the lens opening. A form of the iris diaphragm, used in today's cameras, was used as early as the 1820s by Joseph Nicéphore Niépce, one of the inventors of photography. Waterhouse stops, used in the 1850s were a series of blackened metal plates with holes of different sizes cut in them. To change apertures the photographer chose the appropriate one and slid it into a slot in the lens barrel. With wheel stops, different size apertures were cut into a revolving plate. The photographer changed the size of the aperture by rotating the plate to align the desired opening with the lens.

Aperture and depth-of-field

Like shutter speed, aperture also affects the sharpness of your picture, but in a different way. Changing the aperture changes the depth of field, the depth in a scene from foreground to background that will be sharp in a photograph. The smaller the aperture you use, the greater the area of a scene that will be sharp. For some pictures—for example, a landscape—you may want a smaller aperture for maximum depth of field so that everything from near foreground to distant background is sharp. But perhaps in a portrait you will want a larger aperture to decrease the depth of field so that your subject's face is sharp but the background is soft and out of focus.



A shallow depth of field can make part of an image stand out sharply against a softer background. This emphasizes the sharpest part of the image.



Great depth of field keeps everything sharp from the foreground to the background.

Understanding aperture settings

Aperture settings are called f-stops and indicate the size of the aperture opening inside the lens. Each f-stop lets in half as much light as the next larger opening and twice as much light as the next smaller opening. From the largest possible opening to increasingly smaller ones, the f-stops have traditionally been $f/1$, $f/1.4$, $f/2$, $f/2.8$, $f/4$, $f/5.6$, $f/8$, $f/11$, $f/16$, $f/22$, $f/32$, $f/45$. No lens has the full range of settings; for example, the standard lens on a **digital** camera will range from about $f/2$ to about $f/16$. Notice that as the f-stop number gets larger ($f/8$ to $f/11$, for example), the aperture size gets smaller. This may be easier to remember if you think of the f-number as a fraction: $1/11$ is less than $1/8$, just as the size of the $f/11$ lens opening is smaller than the size of the $f/8$ opening.

How wide you can open the aperture, referred to as its "speed," depends on the lens's maximum aperture (its widest opening). The term "fast lens" usually applies to lenses that can be opened to a wide maximum aperture for the focal length. For example, a lens with a maximum aperture of $f/2.6$ opens wider, and is faster, than a lens with a maximum aperture of $f/4$. Faster lenses are better when photographing in dim light or photographing fast moving subjects. With zoom lenses the maximum aperture changes as you zoom the lens. It will be larger when zoomed out to a wide angle, and smaller when zoomed in to enlarge a subject.

How To: Selecting an Aperture

Look in your camera manual for a section on **aperture preferred** or **aperture priority**, or **apertures**.

▲ Using Shutter Speed and Aperture Together

Both shutter speed and aperture affect the exposure, the total amount of light reaching the image sensor, and so control a picture's lightness or darkness. The shutter speed controls the length of time the image sensor is exposed to light and the aperture controls the brightness of that light. You, or the camera's autoexposure system, can pair a fast shutter speed (to let in light for a short time) with a wide aperture (to let in bright light) or a slow shutter speed (long time) with a small aperture (dim light). Speaking of exposure only, it doesn't make any difference which of the combinations is used. But in other ways, it does make a difference, and it is just this difference that gives you some creative opportunities. You're always balancing camera or subject movement against depth of field. This is because a change in one causes a change in the other. Let's see why.

Each setting is 1 "stop" from the next and lets in half or twice the light of the next setting. A shutter speed of 1/60 sec. lets in half the light that 1/30 sec. does, and twice the light of 1/125 sec. An aperture of f/8 lets in half the light that f/5.6 does, and twice the light of f/11. If you make the shutter speed 1 stop slower (letting in 1 stop more light), and an aperture 1 stop smaller (letting in 1 stop less light), the exposure doesn't change. However, you increase the depth of field slightly and also the possibility of blur.

For general shooting you need a medium shutter speed (1/60 sec. or faster) and a medium aperture (f/5.6 or smaller). Slower shutter speeds will show up on the image as overall blur unless you support the camera, perhaps with a tripod.

- ⌘ For fast-moving subjects you need a fast shutter speed (although the focal length of the lens you are using, the closeness of the subject, and the direction it's moving also affect motion).
- ⌘ For maximum depth of field, with the entire scene sharp from near to far, you need a small aperture (although the focal length of the lens and the distance to the subject also affects depth of field).

An Analogy

One way to think of shutter speeds and apertures is as faucets. You can fill (expose) a bucket with a small faucet opening (aperture) over a long time (shutter speed), or a large faucet opening in a shorter period. No matter which combination you choose, the bucket can be filled the same amount.

Photographing these fast-moving Blue Angels from the deck of a moving boat took a fast shutter speed to prevent blur caused by subject or camera movement. Great depth of field was also needed to keep the boats in the foreground and background sharp.



▲ Choosing Exposure Modes

Many cameras offer more than one exposure mode. In fully automatic mode the camera sets the shutter speed and aperture to produce the best possible exposure. However, there are two other automatic exposure modes that are widely used in photography—aperture-priority and shutter-priority. All modes give equally good results in the vast majority of photographic situations. However, when you photograph in specific kinds of situations, these alternate exposure modes may have certain advantages.

Let's take a look at each of the available modes.

- ⌘ **Fully Automatic** mode sets the shutter speed and aperture, white balance, and focus without your intervention. This mode allows you to shoot without paying attention to settings so you can concentrate on composition and focus.
- ⌘ **Programmed mode** lets you select from a variety of situations such as portrait, landscape, or sports. The camera then sets the aperture and shutter speed for these situations.
- ⌘ **Aperture priority** (or aperture preferred) mode lets you select the aperture (lens opening) needed to obtain the depth of field you want and the exposure system automatically sets the shutter speed to give you a good exposure. You select this mode whenever depth of field is most important. To be sure everything is sharp, as in a landscape, select a small aperture. The same holds true for close-up photography where depth of field is a major concern. To throw the background out of focus so it's less distracting in a portrait, select a large aperture.
- ⌘ **Shutter priority** (or shutter priority) mode lets you choose the shutter speed you need to freeze or deliberately blur camera or subject movement and the camera automatically sets the aperture to give you a good exposure. You select this mode when the portrayal of motion is most important. For example, when photographing action scenes, such as those encountered by wildlife photographers, sports photographers, and photojournalists, shutter-priority mode might be best. It lets you be sure your shutter speed is fast enough to freeze the action or slow enough to blur it

≈ **Manual mode** lets you select both the shutter speed and the aperture.

One of the things that makes photography so enjoyable is the chance you get to interpret a scene in your own way. Shutter speeds and aperture controls are two of the most important ways you have of making a picture uniquely your own. As you become more familiar with their effects on a picture, you will find yourself making choices about them more instinctively: knowing, for example, that you want only the main subject sharp and so turning to a larger aperture.



Photographing the U. S. Constitution from the deck of a moving speedboat with a long lens took a fast shutter speed.



Here the shutter speed was fast enough to freeze the central dancer but slow enough to blur the others. This makes the central dancer the most important person in the photograph and also conveys a feeling of motion.



Leaving the shutter open for an extended period of time, leaves light trails in the image created by the taillights of a passing car.

How To: Changing Exposure Modes

Look in your camera manual for sections on **aperture preferred/priority mode, shutter preferred/priority mode, automatic mode, program mode, shutter speeds, and apertures.**

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