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QuickGuide to Accurate EOS Autofocus

This guide will provide tips on how to ensure that you and your EOS cameras and lenses can focus accurately and consistently. This is most important for lenses that have a very narrow plane of acceptable sharpness (depth-of-field). Examples include fast aperture lenses (f/2.8 or larger), macro lenses, and telephoto lenses. The narrower a lens' depth-of-field, the more critical it is for you to precisely position the plane of focus and for the lens to focus where you intend. The better you understand your camera's focusing system, the better your ability to achieve the results you expect.

Viewfinder Diopter Adjustment

Accurate focus begins with making sure the focusing screen itself is in proper focus. EOS DSLRs have a diopter adjustment dial next to the viewfinder that allows you to adjust the sharpness of the AF points. To make sure your eyes focus on the AF points rather than a scene, point the camera towards an evenly lit wall without a lens. Adjust the diopter dial until the AF markings are as sharp as possible. If you aren't able to get the AF points into sharp focus by using the diopter knob you may need corrective lenses.

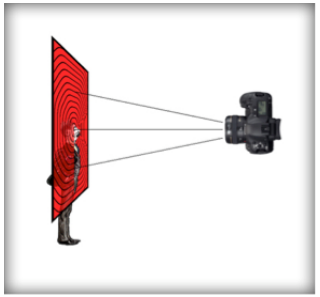
AF System Sensitivity

All EOS cameras have focus points that can autofocus lenses with a maximum aperture of f/5.6 or faster. Some camera models have additional sensors that provide extra high-precision AF capability for lenses with a maximum aperture of f/2.8 or faster. All current EOS cameras also have "cross-type" AF sensors at the center point. Cross-type AF sensors are able to read subject detail regardless of whether it's essentially horizontal or vertical in the scene. Many (EOS 50D, 60D, 7D and so on) have cross-type sensors at all locations—a noteworthy benefit.

Although the viewfinder doesn't indicate what types of sensors your camera has, it does indicate the number of AF points available and where they're located. Many EOS cameras have a 9-point array. Advanced models such as the EOS 7D have 19 points. Professional models such as the EOS-1D and EOS-1Ds use a 45-point array with extremely dense AF point coverage.

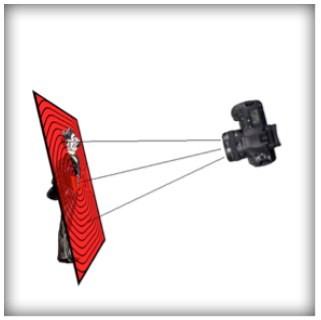
The Importance of AF Point Selection

Modern AF systems provide virtually the same AF performance with the outer AF points as with the center. Photographers who are used to more centralized focusing systems may nevertheless prefer to use the only the center AF point. When shooting off-center subjects they must lock focus and re-compose before releasing the shutter. The problem with this technique is that at high magnifications and close distances, reframing can significantly shift the plane of focus. Consider the following example:

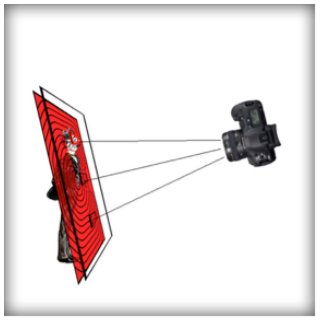


Let's say you use the center AF point to focus on a subject five feet from the camera. In this case the camera is focused on the subject's eyes. Notice however that even along the red

plane of focus, the focusing distance gets progressively longer as you move from the center to the outer edges of the frame.



Now let's suppose you recompose by tilting the camera downward. This not only changes the subject's position in the frame, it shifts the plane of focus; in this case, backwards. Although the plane of focus and the camera's imaging plane have not changed their relationship with each other, both planes have changed in relation to your subject.



If your lens is set to a small aperture it may provide enough depth-of-field that this backwards shift in focus may not be apparent. On the other hand, if your lens is set to a large aperture (f/2.8 or wider), has a long focal length, or the subject is close, the backward shift can be obvious. In either case, you would achieve more accurate focus by first framing the subject to your liking and then using whatever AF point is closest to where on your subject you wish to focus. For example, if you were shooting a portrait, you would normally focus on the eye closest to the camera.

Changing the Size of an AF Point

When you manually select a single AF point, some Canon DSLRs, such as the EOS 7D and EOS-1D Mark IV, have custom functions that allow you to change the area that the AF points cover, ranging from one highly focused (spot)

Changing the Size of an AF Point (continued)

AF point to a group (zone) of surrounding AF points. (Refer to the QuickGuide to EOS 7D Autofocus Modes for more details.)

The benefit of using a Spot AF point is that it allows you to focus on a tiny area of a scene. It's particularly useful for focusing on an area that may be partially obscured by objects in the foreground, such as one bird among other birds or amid tree branches.

In contrast, AF Point Expansion adds a cluster of supplementary points that surround the primary point you've selected to provide broader coverage when needed. Another option is the EOS 7D's Zone AF, which automatically selects a group of AF points to focus on whatever is closest to the camera.

The Benefits of Live View Focus

Many recent EOS DSLRs have a Live View focusing feature. Live View allows you to see the image as is projected onto the sensor by the lens. This provides two major benefits:

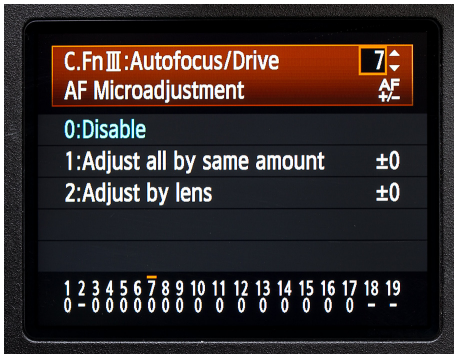
1. What you see is what you get. If the image is in perfect focus on the camera's LCD monitor it will be in perfect focus when you release the shutter. Live View also provides an accurate preview of depth-of-field, especially at larger apertures.

2. You can magnify a Live View image up to 10X for greater focusing precision. As we will explain below, this makes Live View an excellent way of confirming and calibrating the accuracy of your camera's standard AF system.

Although it allows more precise visual confirmation, Live View AF is slower than the camera's normal predictive AF system and can not perform continuous AI Servo AF of moving subjects. Live View is therefore best suited for situations when focusing precision and control are more important than speed.

Micro-Focus Adjustment and Calibration

All Canon lenses and cameras are built to tight manufacturing tolerances that assure consistently satisfactory performance from one lens and camera body to the next. Under very demanding circumstances, such as when you're using fast-aperture lenses at close distances, you may see room for improvement.



Many professional and semi-professional EOS DSLRs therefore have a built-in micro-focus adjustment feature. This is a Custom Function (C.Fn) that allows you to precisely adjust the focusing tolerances of a particular lens (or set of lenses) to match those of your camera body.

There is no one "right" way to perform a micro-focus adjustment; however, the following method has the benefit of being accurate and easy to perform. (Note: This procedure applies only to DSLRs that have a micro-adjustment feature, such as the EOS 40D, 50D, 5D Mark II, 7D, and 1D-series.)

1. Mount the camera and lens on a tripod. If the lens has IS, shut it off.
2. Use Live View to manually focus on a stationary, flat, high-contrast object that is at the center of the viewfinder and parallel to the plane of focus. The camera-to-subject distance should be no less than 50 times the focal length of the lens. For a 50mm lens this would be at least 2.5 meters, or approximately 8.2 feet.
3. Focus the lens at its maximum aperture. Use Live View magnification if necessary to assure that the image is as sharp as possible.
4. Without touching the focusing ring or moving the tripod, turn off Live View, and return the camera to One-Shot AF, using only the center AF point.
5. Gently press the shutter button down halfway (or the AF button if using back-button AF) while observing the focusing ring or scale on the lens. It should not move. If it does, take note of whether AF moves the plane of focus closer (front-focus) or further away (back-focus). If there is no shift in focus your lens is well-calibrated and requires no adjustment.
6. To determine the correct amount of adjustment necessary, take three sets of images at micro-adjustment settings of -10 , 0 and +10; in other words, three consecutive images at -10, three consecutive images at 0, and three consecutive images at +10.
7. Examine the resulting images on your computer monitor at 100% pixel magnification.
8. Take additional sets of test images at different microadjustment settings if necessary until you can determine which setting produces the sharpest image.
9. Register the corresponding microadjustment setting in the camera.

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