Reikan Technology

FoCal

Testing Guide

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Introduction

This Testing Guide is intended to help you get the best from FoCal.

The first section explains how camera autofocus works, leading on to why you need to calibrate your camera and lens to get the best shots.

The second section talks through how you should set up your test environment and explains the reasoning behind a lot of the requirements. This should help you understand how to get reliable results each time you calibrate or test your equipment.

Section three is a brief step-by-step guide of how to calibrate your lenses.

The manual contains extensive information about each test and all the functions and features of FoCal, so it's worth reading through the relevant sections of the manual for the tools you want to use.

Section 1 – All about Autofocus

An Introduction to DSLR Autofocus

What is AF and why do you need it?

When you take photo, you usually want at least part of it to be sharp. By making adjustments to the position of the glass elements in a lens, the plane of sharpness can be made to move either towards or away from the lens – this is "focusing".

When you use your fingers to rotate the focus ring on the lens you are manually focusing. But modern cameras can do it all for you: they can automatically decide what you want in focus or can be guided by you (selecting focus points and modes), and then move the lens to get as close as they can to the focus you want. That's *autofocus (*AF).

Modern AF systems are fast and pretty accurate, but not infallible. This section describes how the system works and why some of the problems come about.

What are the common types of AF?

Most modern cameras use one or both of 2 common types of AF systems – *phase detect AF* and *contrast detect AF.*

Contrast detect AF uses the image sensor (that actually captures the photo) to determine the best point of focus. As such, it can be used in almost any camera, and is the typical focus method for compact point-and-shoot and mirrorless cameras as well as DSLR cameras that autofocus in Live View. Contrast detect AF is generally slow compared to phase detect as it has to work by trial and error, but it's very flexible in where on an image you can focus and usually pretty accurate.

In a DSLR, phase detect AF uses a dedicated autofocus sensor, usually in the base of the camera. It is fast and can be used with the mirror in the "down" position which means it can work while you can still see an image through the optical viewfinder of your camera.

Just to confuse the issue, many cameras now support on-sensor phase detect as well which use special pixels on the image sensor to speed up the focusing. However, for DSLR cameras these are only used when the camera is capturing in Live View mode[1].

[1] Sony SLT cameras are a special case that actually run in Live View mode all the time. They don't have on-sensor phase detect pixels but can use the dedicated phase detect sensor all the time.

Some detail: How it all works

This section is a bit technical, but gives a rough idea of how the 2 systems operate.

Contrast Detect AF

Contrast detect AF works by trying to maximise the contrast in a small area around the chosen focus point. The image below shows the a rectangle with low contrast and high contrast edges – it's easy to see that maximising the edge contrast brings this point of the image into the best focus:

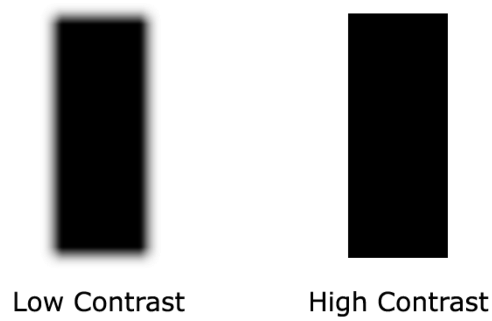


Figure 1 Low and high contrast edges

The only way this contrast maximum can be found is to try adjusting the focus of the lens in one direction and see if it makes the contrast better or worse, then keep moving in the direction that improves the contrast until it doesn't get any better (i.e. just *past* the perfect point).

As long as the part of the image being analyses has enough contrast, the analysis algorithm usually works well. The focus movement algorithm can be quite clever – analysing changes and moving in variable size steps to get to the best point as quickly as possible.

Phase Detect AF

Phase Detect AF works with a separate sensor, which consists of various lens elements and some linear light sensors (i.e. arranged in a line, rather than a rectangle like the main image sensor). Two light paths from opposite sides of the lens are routed via mirrors and lenses to the AF sensor which then compares the two images.

In the picture below, the dotted line shows the light path coming from the lens, going through a semi-transparent region of the main mirror and hitting the secondary mirror behind, then travelling down to the AF sensor assembly at the bottom of the camera:

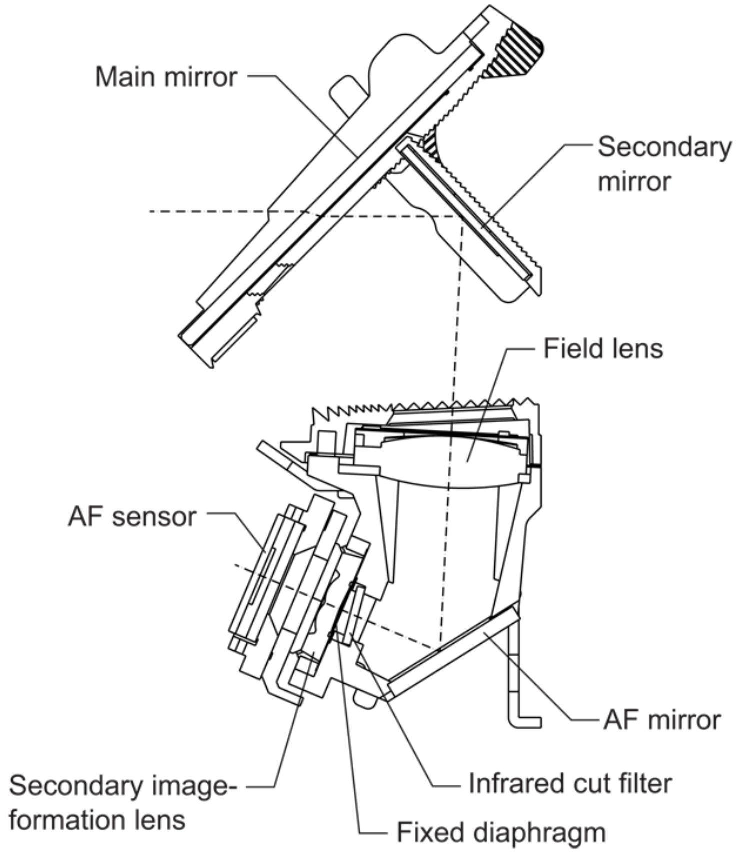
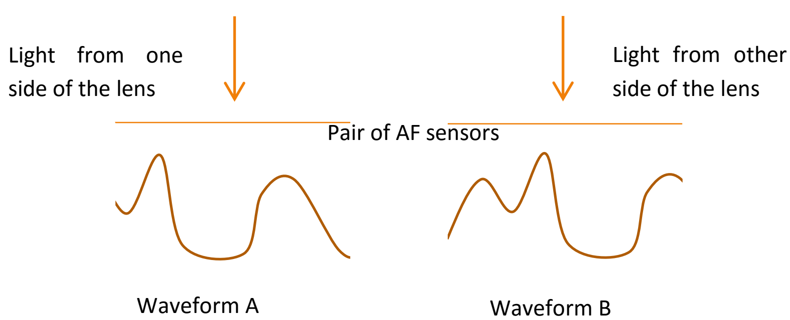
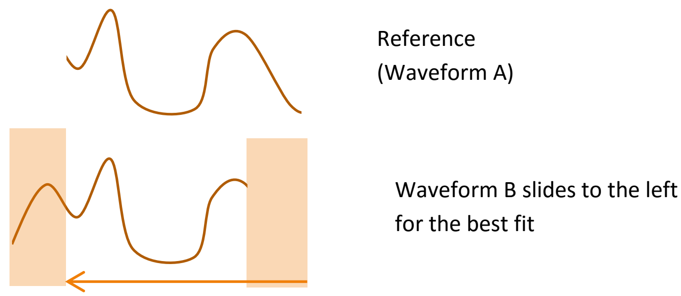


Figure 2 Typical DSLR mirror and autofocus sensor arrangement

What ends up at the 2 sensing regions of the AF sensor is a pair of lines (one from each side of the lens) of light and dark areas, one offset a little when compared to the other:



A correlation operation is performed which finds out how much you have to move one waveform past the other (and in which direction) in order to get the best match, for example:



By comparing the two waveforms and working out how much to move one compared to the other, the AF sensor and processor can immediately determine two things before any movement of the lens:

1. The amount of focus shift to apply to get the correct focus, and
2. The direction to shift the focus.

This information can then be used to drive the lens by an appropriate amount and in the appropriate direction to get good focus (in reality, it gets to roughly the right place, then the process is repeated a few times to get to a suitable accuracy). Because the comparison of the two images gives you both an amount to shift *and* a direction, the lens can be quickly moved to approximately the right place – this is what makes phase-detect AF much quicker than contrast detect.

Why do you need Microadjustment?

The critical thing to note above is that the sensor for phase-detect AF is **NOT** the same sensor as the one that captures the image. The cutaway image below (of a Canon EOS 500D) shows the image sensor and AF sensor highlighted:

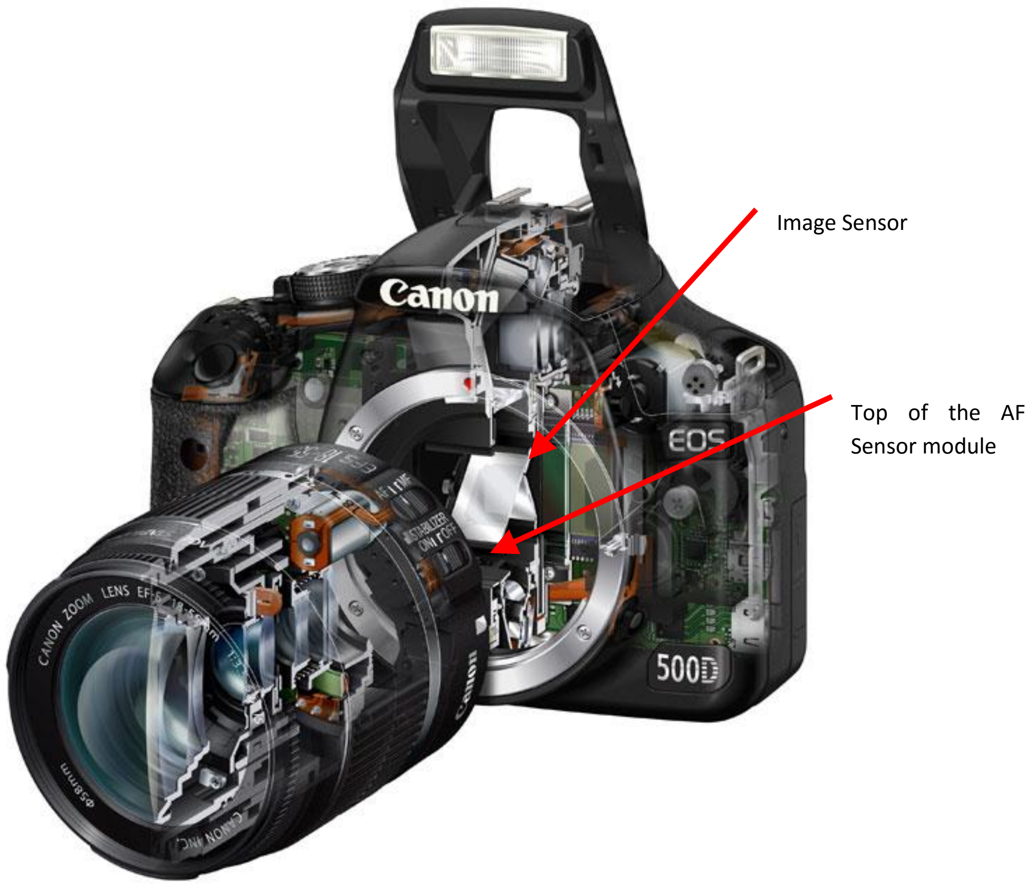


Figure 3 Cutaway view of a DSLR

The AF processor (which interprets the waveforms from the AF sensor and determines how to drive the focus of the lens) knows how to adjust the lens to achieve the correct focus for the *image sensor*, which is where you want the image to be sharp as that's where the final, complete image is captured.

But what if something is not quite right… maybe the AF sensor was positioned just a tiny bit incorrectly when the camera was manufactured, or the lens mount has become slightly looser over time (fractions of a millimetre difference), or maybe a knock to the camera has moved part of the complex AF sensor assembly by a tiny amount…

The AF system cannot know about this problem, and so continues to work normally, determining focus for where the image sensor *should* be. The AF sensor does the job and as far as it's concerned the image will be in focus… but the shot you take is not quite in focus where you expected.

And *this* is where AF microadjustment comes in.

You don't need to physically adjust components in the camera – you just tell the camera that things are slightly different from "factory perfect" and by how much it needs to shift the *AF processor* result so the image is perfect at the *image sensor*.

Problem solved… right?

Well, sort of. There are two problems remaining:

- AF microadjustment doesn't fix *every* situation, and
- How do know what adjustment to make?

What does AF Microadjustment Fix?

As explained above, AF microadjustment simply shifts the result of the phase-detect algorithm a bit to compensate for differences between the ideal factory setup and the current setup. So, it can fix static situations, such as:

- the camera has suffered a knock and the sensor or AF sensor has moved fractionally
- the lens mount is slightly out of alignment
- the optics in the lens are slightly misaligned
- things have moved due to temperature variations (e.g. the difference between shooting outside in Finland in winter, and in a hot desert in summer)
- the secondary mirror is in a slightly different position due to mirror cushion wear
- and other situations which create a constant difference between the AF sensor and image sensor result.

It *cannot* fix differences that change every time the camera is used, for example:

- an AF sensor or image sensor that can continuously move fractionally due to damage,
- or problems that cause the result to vary during normal focus operation, for example seriously misaligned lens optics.

How to calibrate AF Microadjustment

The next step is to determine the best microadjustment value for your setup, and *all* of the following aspects affect the microadjustment value required:

- The camera body in use
- The lens in use
- The distance to the thing you want to focus on
- The focal length of the lens if it's a zoom lens
- Even the colour of the lighting you're shooting under!

In theory, to calibrate the AF microadjustment setting on a camera, you simply take some shots at various different microadjustment settings and pick the best, but as ever things are not quite that simple as you will see below.

AF behaviour

In order to correctly perform AF microadjustment, it is important to understand a little about the performance of the phase detect AF system of your camera. It's almost certainly not as good as you think it is!

The biggest issue is the repeatability of the results. The camera manufacturers must make compromises between accuracy, speed, repeatability and performance in different situations (e.g. different light levels).

Take the following example: if a manufacturer decided that ultimate accuracy was the critical factor, they could gear their AF algorithm towards very small step changes when comparing the phases of the two different images. They would choose to use a sensor with a very high resolution, and get great sensitivity by averaging the results over a relatively long period of time. All this would lead to fantastic accuracy… but it would take a comparatively long time to reach the result, and in reality the system would be useless in most situations as it would be too slow or never reach a satisfactory focus due to movement of the camera while trying to focus.

The accuracy of the overall system is dependent on all of the components:

- **the AF sensor** - Cross-type sensors which operate at wider apertures are generally more accurate, but they are often only used at certain AF points on the sensor (and obviously only with wider aperture lenses).
- **the AF processor and the algorithm** – the algorithm chosen is most likely geared towards a compromised between accuracy and speed, so the result will never be 100% perfect all the time.
- **the lens optics** – cheaper optics which do not try to correct many forms of distortion can lead to slightly different results depending on the image – e.g. the brightness or colour of the image at the AF point.
- **the lens motors** - Consumer grade lenses generally use cheaper motors to drive the focusing elements, and these are less accurate than more expensive lens motors.

Each time an AF operation is performed (i.e. from half pressing the shutter button to the lens being focused), each component above has a little inaccuracy which can lead to slightly different results each time you press the button.

See this for yourself

It would be perfectly reasonable to assume that with a good setup – bright lighting, high contrast target, static camera firmly mounted on a tripod – that the AF point across a number of shots would be identical.

Well… it isn't!

As explained above, the point that is actually in focus is dependent on the performance of the lens getting the light to the AF sensor, the AF sensor doing its job, the processor calculating the result and sending drive signals to the lens, the lens motors driving the lens elements appropriately and finally the optical performance of the lens at the final focal point.

If all of these elements behaved perfectly 95% of the time, then adding all those small errors together you would only achieve perfect focusing around 70% of the time.

You can check this for yourself. Mount your camera on a good tripod. Stick a high contrast target (black and white squares generally work well as long as they are not too small) to a solid wall some distance away from the camera, under good lighting conditions (e.g. a nice sunny day). Make your setup really solid – use mirror lockup, use a remote release. And take 10 shots, but in between each shot make sure you manually move the focus to infinity so the AF system has to work fully each time (otherwise the AF system will often see that the focus is "good enough" and not change it in any way).

Now inspect the images at 100% magnification. Are they all focused identically? No! Maybe 6 of the 10 are similar quality... maybe 7 or even 8 if you have a really good camera and setup (and some luck!). But you will almost certainly not see 10 identical images.

Microadjustment Step Size

When you change the microadjustment value on the camera for a particular lens, the focus position determined by the AF system is shifted a tiny amount. This amount depends on the lens and the camera and is decided by the camera manufacturer for each type of lens.

It is important to understand that all of the things that can create inaccuracies in the AF system (see section 0) can lead to shot-to-shot inaccuracies that are greater than a single AF microadjustment step!

That last statement is so important, it's here again:

The ERROR in focus position caused by the whole AF system can be BIGGER than an AF microadjustment step. This means that there isn't *one* perfect AF microadjustment value for this setup.

How does FoCal help?

During the development of FoCal, a large number of cameras have been tested with a huge variety of lenses. This section explains about what you can expect from using FoCal.

Lens Performance

Generally, a professional grade modern manufacturer own-brand lens will give the best AF performance. Cheaper, consumer grade lenses are often less accurate in their positioning of the lens elements for focussing and can result in poorer performance. Third party lenses – even good quality ones – can be more likely to suffer from similar problems to the consumer grade lenses with more inaccuracies in focusing than manufacturer own brand professional level lenses.

How does FoCal determine the best AF Microadjustment value?

FoCal takes a series of shots at various AF microadjustment values and looks for the best one. Whilst this sounds simple, it has taken hundreds of hours of development and testing to create FoCal so that the results are reliable and consistent.

All of the AF performance issues described above are random and will mess up any shots you take, so FoCal has been developed to *identify random errors and remove their effects* while predicting and validating the best AF microadjustment value in as few shutter actuations as possible.

Using sophisticated image analysis which has been developed in close conjunction with the FoCal target, the software can detect tiny changes in the AF result. The analysis can also check for and adjust against small changes in the test environment to get the best set of data possible. A finely tuned mathematical lens model developed from the results of profiling a large number of lenses can quickly determine the best microadjustment value.

So, whilst it all looks quite simple, when you click the button on a Fully Automatic Calibration operation, you are taking advantage of an incredibly sophisticated and finely tuned system.

Further Reading

The following two links are articles published by Roger Cicala of LensRentals, and give a good view of camera and lens focus variations from an independent third party with a *lot* of experience in this industry:

http://www.lensrentals.com/blog/2011/10/notes-on-lens-and-camera-variation

http://www.dpreview.com/articles/7333489584/variation-facts-and-fallacies

Section 2 – Getting Ready with FoCal

Getting Ready

FoCal is intended to provide help in calibration of the microadjustment value for a lens against a camera body. There are some points to note when doing this calibration, described below.

Software Installation

If you haven't yet installed the FoCal software, please have a look through the *Getting Started* guide for information about how to install onto your PC or Mac.

Choosing your Test Location

The image analysis algorithm used in FoCal has been specifically designed to provide a consistent measure of sharpness and minimise the effects of small movements (e.g. vibrations) and small changes in light level. However, there are things you can do when choosing a test location that will improve the reliability of the results from FoCal.

Testing Indoors

FoCal will operate best if there is as little movement as possible. For example, a lot of the FoCal development was done in an area with a raised wooden floor, and walking on the floor during a test could move the camera enough to alter the test results slightly. Therefore, for the duration of the test, it's best to not jump around near the camera!

Testing Outdoors

Testing outdoors is perfectly acceptable – indeed it is often necessary to ensure a large enough distance between the camera and the target as the focal length of the lens increases.

As mentioned above, minimising movement is critical so when testing outside it's important to pick an area sheltered from any wind.

Lighting on the target must be stable, so it's best to test on either day with no clouds or a day with an even cloud cover – passing clouds changing the light level on the target will definitely affect FoCal's ability to produce an accurate result.

Setting up the Camera

In order to use FoCal, your camera needs to be stable and unable to move, so typically should be attached to a sturdy tripod. If the tripod needs to be raised, extend using the thicker (higher) legs first and try to avoid extending the centre column of a tripod if possible as this will make the camera more susceptible to vibration.

For extra stability, a lot of tripods have a hook underneath where you can hang something heavy (e.g. a camera bag) in order to further stabilise the tripod and camera.

Figure 4 Hanging something heavy on the tripod can increase stability.

You'll need to connect your camera to the computer with the USB cable supplied with your camera. You can use a USB extension cable if it helps, but remember to keep the *total* length of cable between the camera and computer to less than 5 metres.

Although FoCal takes control of the camera there are some settings that cannot be changed from the computer and it's worth making those changes before running a test. Where possible, settings are verified before running a test and a message will be shown if the camera is not set up appropriately.

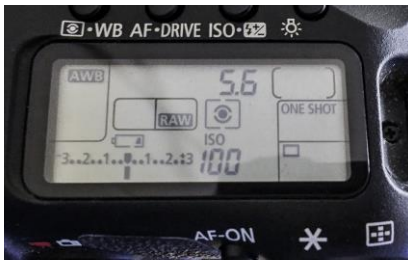
Before running a test you should:

- **COVER the eyepiece of the camera!** This is very important as the camera is not being used in a normal mode where your eye and head is usually blocking stray light from entering the viewfinder. Failure to cover the eyepiece may result in bad metering and/or failure to achieve focus during the test.

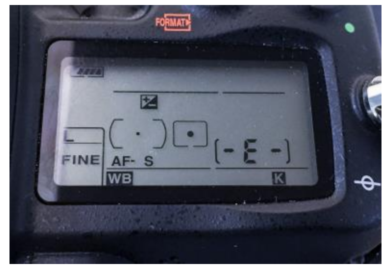
- If you are using a battery grip, it is best to remove this as it can cause extra vibration when the camera is mounted on a tripod.

- Where available on the camera you should ensure that the custom settings **do not limit** the choice of AE Mode (ensure A/S/M are allowed), or limit the shutter speed, aperture or ISO range. Failure to observe this requirement may lead to unexpected failure to run tests.

- You must ensure the AF mode is set to **ONE SHOT** (Canon) or **AF-S** (Nikon) :

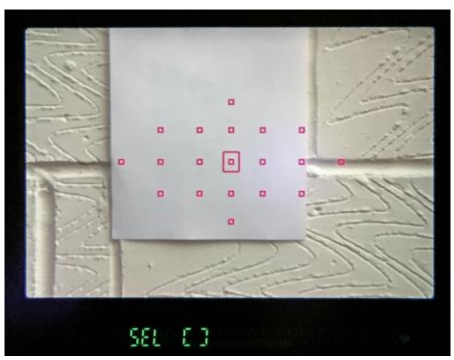


Canon – choose ONE SHOT

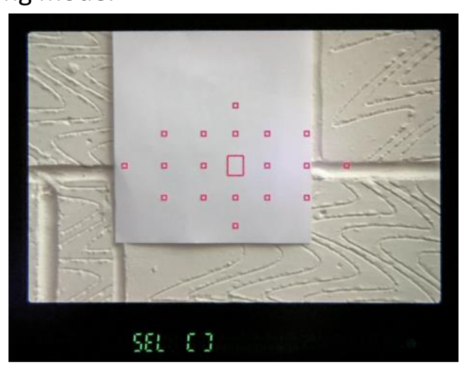


Nikon – choose AF-S

- CANON ONLY: For the Canon 7D, 7D Mark II, 5D Mark III and 1D X, you should choose the normal single point AF mode (*not* Spot AF) – the software is not able to validate this and the results may be less accurate if you are in the wrong mode.



Spot AF - Incorrect



Normal AF - Correct

- If you are using a lens with IS (Image Stabilisation) or equivalent it is recommended that this is switched **off**.

Figure 5Ensure Image Stabilisation/Vibration Reduction is OFF

- If you have a lens with a focus limiter (e.g. the Canon 100 f/2.8L IS Macro or the Canon 100-400L IS), please ensure it is set appropriately for the test distance.

- The minimum light level to run the Fully Automatic test is around an EV of 5 (1/4s at f/2.8, ISO100), but the lighter the environment the more reliable and consistent the AF performance of the camera will be, therefore leading to better results. It is recommended that the light level on the target is around an **EV of 8** (1/30s at f/2.8, ISO100) or above.

- NIKON ONLY: If available, the camera USB mode in the SETUP menu must be set to PTP/MTP (and NOT Mass Storage) otherwise the camera will not correctly communicate with the computer and FoCal will not be able to open the camera.

- NIKON ONLY: The Live View mode in the SHOOTING menu should be set to **Tripod** (rather than hand-held) if available on the camera (this setting is only available on older Nikon cameras). This is an important setting to ensure correct operation of tests.

Setting up the Target

The FoCal target is specifically designed to work with the FoCal software and the camera autofocus system to allow not only reliable calibration, but also the ability to warn and/or adjust various settings under changing test conditions.

For best results we recommend you use a FoCal Hard Target as your target will then be the same as what is used during the development and testing of the FoCal software. A FoCal Hard Target is available from the FoCal store at http://store.fo-cal.co.uk.

Figure 6 A wall mounted standard size (150mm) FoCal Hard Target

Alternatively you can print your own target from the image files supplied in the *Target Images* directory of the downloaded installation package. We recommend you use an ink jet printer and print on matte paper for best results.

The target should be firmly attached to a vertical surface at the same height at the camera lens. The Target Setup utility will help you ensure the target is in the correct position, but to get a good initial position you should look through the camera viewfinder and position the centre focus point over the middle of the target as shown below:

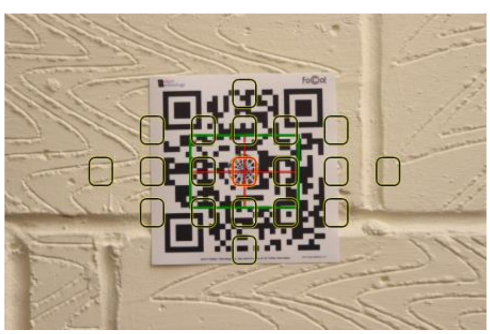


Figure 7 Correct target positioning

Ensure the target is not excessively rotated and that you are aimed head on rather than from the side or above/below the target:

Figure 8 Target rotated too much

Figure 9 Camera too far to one side

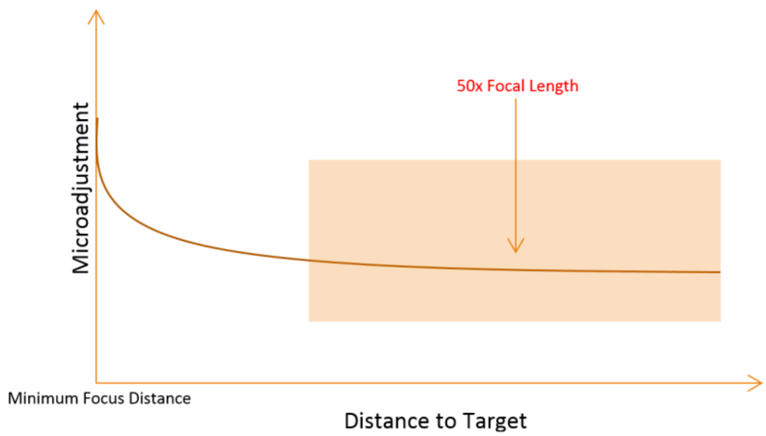
Target Distance

FoCal allows you to calibrate the combined AF system of your camera and lens in order to achieve the best possible performance. The result of the testing is a single value which is applied to the AF Microadjustment setting (Canon) or AF Fine Tune setting (Nikon) of the camera.

Unfortunately, this single number is applied to the camera-and-lens combination for *all* focus distances, whether the subject is 1m or 100m from the camera, but each distance often requires a slightly different value.

In reality, as you move the focus point towards infinity, the required microadjustment/fine tune value stabilises, so generally the rule is to calibrate at a "far" distance from the camera.

The following graph shows an example of the change. When the distance is close to the minimum focus distance (the far left of the graph), the microadjustment value can change a large amount with small changes in distance, making calibration both difficult and not very useful for general shooting. However, as you focus further from the minimum focus distance, the value stabilises – the shaded region has about the same AF microadjustment value required for all the focus distances out to infinity.



As a rule-of-thumb, testing at around 50x the focal length of the lens gives good results (so for a 50mm lens you test with the target around 2.5m from the camera). However, for longer focal lengths, this can prove impractical, but luckily also unnecessary.

When you start testing with longer telephoto lenses – e.g. 300mm and above – you can generally test at around 20x the focal length as the curve starts to stabilise earlier for longer lenses.

Recommended Test Distance

Focal Length	Recommended *minimum* test distance
<10mm	0.5m (50x or greater)
24mm	1.2m (50x)
50mm	2.5m (50x)
85mm	3.5m (40x)
100mm	4m (40x)
200mm	6m (30x)
300mm	7.5m (25x)
400mm	8m (20x)
500mm	10m (20x)
600mm	12m (20x)
800mm	16m (20x)
1000mm	20m (20x)
Macro lenses	Typical working distance – e.g. 0.3m for 1:1 shooting.

Note that Focal length is the actual focal length of the lens (and teleconverter combination if applicable) – the sensor "crop factor" can be ignored.

The chart below shows this visually (not to scale):

Lighting the Target

Low light will affect the AF performance of a camera. Phase detect AF works by looking for comparable features in two copies of small sections of the same image which take different paths through the lens (see the section on how AF works at the back of this document for more information). If the light level is too low the two copies can appear very similar and the AF system will not be able to lock. So it is important to ensure you have a good light level.

Ideal lighting

Bright daylight would be ideal, but you want to try to ensure that the light level doesn't change too much over the course of a test (typically 1 or 2 minutes), so if the sun is going in and out of the clouds then you may have problems. The FoCal algorithm does have features which allow it to produce consistent and reliable results with *small* changes in light level, and it will also stop the test if the light level changes too significantly while the test is running.

During development of FoCal, it was found that the low-light AF performance of different cameras degrades at different light levels. FoCal has built in detection for the light level and will warn if you are running with the not enough light (specific to each supported camera).

Lighting to avoid

There are some lights which should *not* be used for testing with FoCal.

- Some mains powered LED lights can flicker at 50 or 60 times per second, and if you are running with high shutter speeds this can lead to serious problem with the analysis.
- Some fluorescent lights can also flicker which can cause the same problems

Whilst the target is black-and-white, the analysis does take into account the way different colours travel through the lens, so it's a good idea to try and light the target with a light that is relatively close to white.

This is not an absolutely critical requirement (any normal household lighting, studio lights etc will all be fine), but you will find, for example, that if you illuminate the target with a purely red or purely blue light you may find the results differ.

Behaviour of different lenses

FoCal has been developed and tested regularly with a wide range of lenses, and then been through an extensive beta testing program with hundreds of different lenses of all types.

During the testing and development, it was noted that the consistency of the focus with the cheaper and older designed lenses (e.g. the Canon EF 50mm f/1.8) was poorer when compared to professional lenses. This makes it more difficult to calibrate as two shots (at the same microadjustment value) can produce quite differently focused images!

It's worth noting that the AF microadjustment "step" size is different for different lenses (see section 0). If the step size is small and the lens is not particularly sharp, it is quite possible that there is more than one perfectly valid AF microadjustment value (in the case of our in-house Canon EF 24-70mm f/2.8L lens, it is a very soft copy and AF microadjustment values between about 2 and 5 give exactly the same results visually. In this instance, the FoCal software can quite legitimately return Fully Automatic test results between 2 and 5).

Zoom Focal Length

Zoom lenses can be calibrated at whatever FoCal length you choose, but as stated above the calibration will only be the ideal result for the selected test setup – which includes focal length.

So, if you calibrate a 24-70mm lens and find that you get a value of +4 for 24mm and +7 for 70mm, you have a choice. Setting +4 will give better results close to 24mm, and if you mainly shoot at this end then that's probably a good choice. If you mainly shoot at 70mm, choose +7. If you use the lens at all sorts of focal lengths, maybe choose +5 or +6 as an in-between.

While this may sound a bit of a hack, Canon have openly admitted that a single AF microadjustment value is not appropriate for a zoom lens by offering the feature in the newer cameras (starting from the 1D-X) of entering AF microadjustment values for both ends of the zoom range.

Generally, the advice is to calibrate at the telephoto end of a zoom lens (e.g. 70mm in the example of the 24-70mm). The depth of field at the telephoto end will be shallower so will lead to an easier to obtain result from testing. FoCal lets you test easily at both ends, so it is worth getting values for both ends then you can make an informed decision about the value you enter on the camera.

Section 3 – Calibrating your Lenses

Check the Setup

At this point, we should have the software installed and ready to go. The camera will be on a sturdy tripod on solid ground with the eyepiece covered and no battery grip and the appropriate settings configured. The target is the correct distance from the camera for the calibration and the target is well lit with the right sort of lighting.

If any of this doesn't make sense, then please read the previous section which has all the details on how to set everything up for testing.

Connecting the Camera

On the software, we're going to connect to the camera. From the main screen, hit the Connect button.

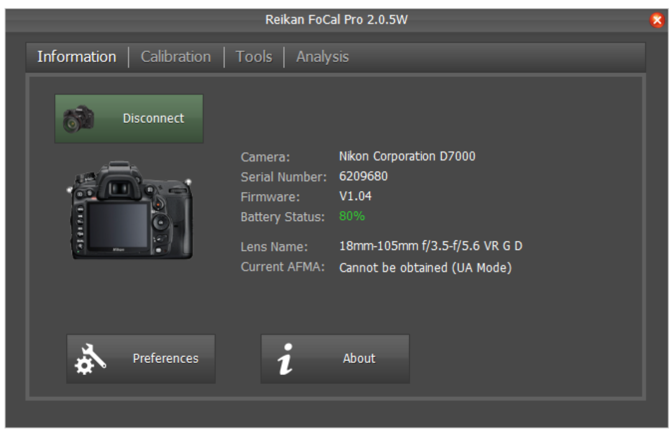


Figure 10 The camera is now connected

When the camera is connected, the main screen will be populated with information. Click the *Calibration* tab then choose *Automatic Focus Calibration*.

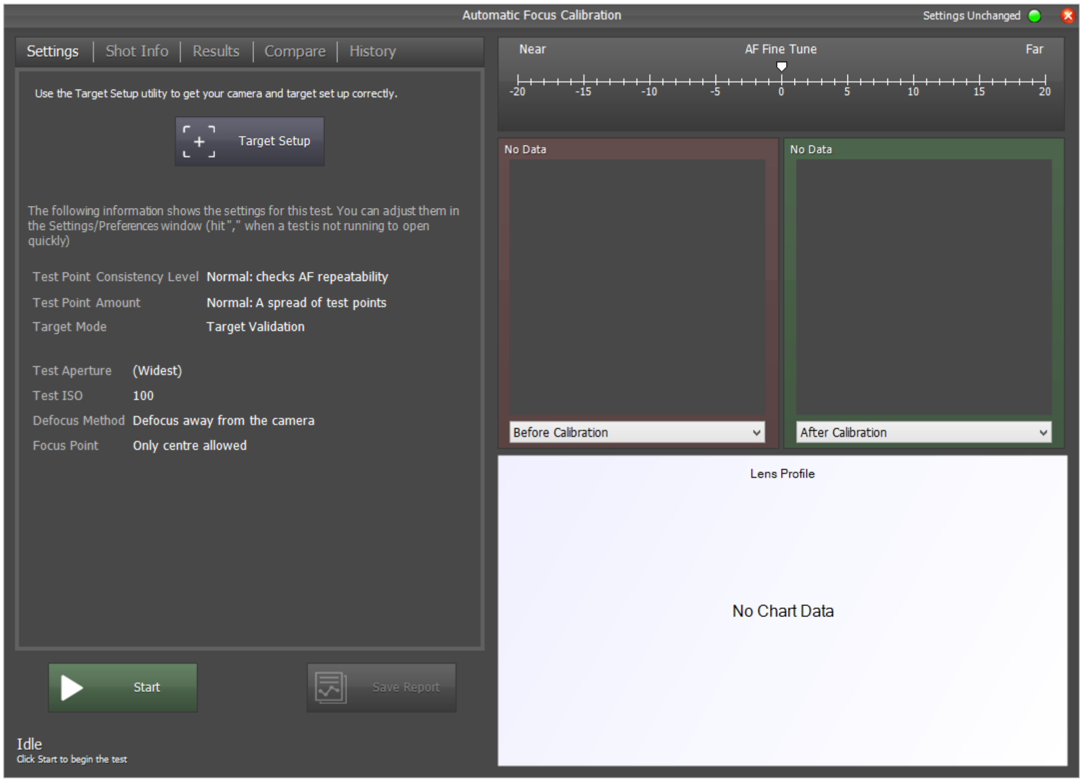


Figure 11 The automatic focus calibration window

Check the position of the Target

Hit the *Target Setup* button to open the Target Setup utility:

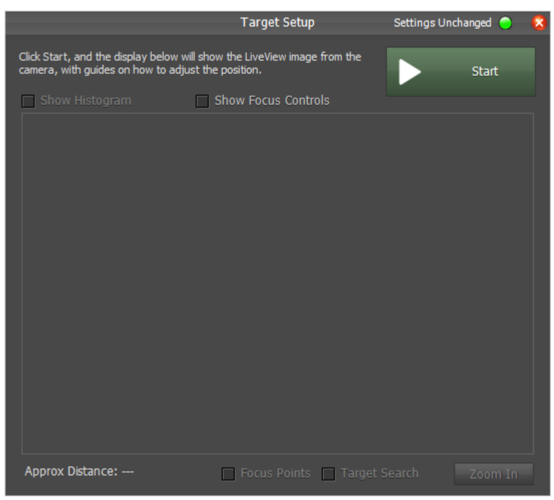


Figure 12 The Target Setup utility

Click *Start* to begin the Target Setup utility. After a few clicks you'll see a live video stream from the camera.

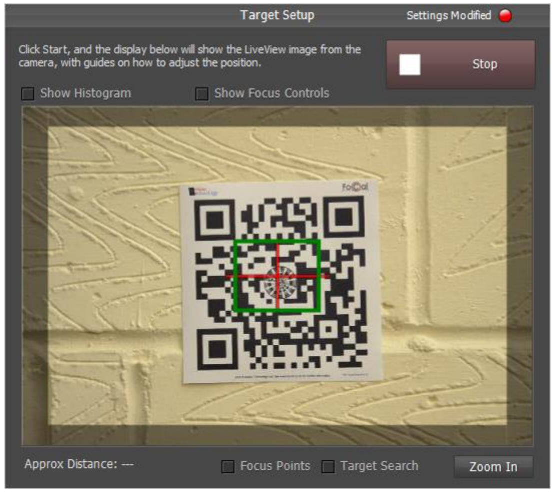


Figure 13 The camera live view feed in Target Setup

Hit the *Target Search* button and if the camera and target are appropriately aligned then you should see a green tick as shown below:

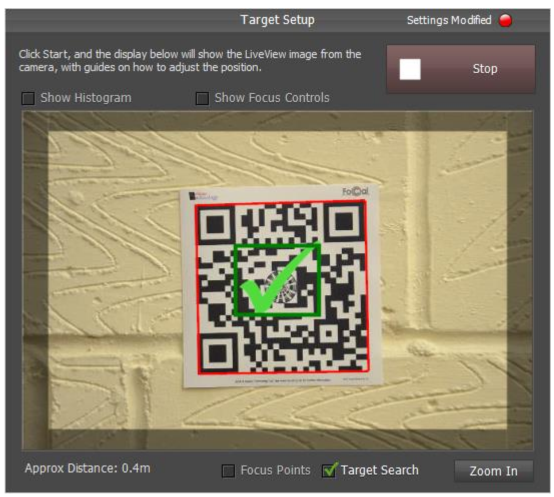


Figure 14 The green tick shows everything is setup OK

If you get the green tick, you can click the *Stop* button and close the Target Setup window – we're now ready to run the test. If you **don't** get the green tick, have a look at Troubleshooting section at the back of this document to figure out why.

Run the Calibration

User Assisted Mode Camera Initial Setup

If you're using a UA Mode camera (all Nikon except the D3s and most Canon cameras later than the EOS-1D X) then you should navigate to the AF Microadjustment or AF Fine Tune screen before starting the test. You don't need to make any changes, just go to the appropriate setting page so it's ready to go when FoCal instructs you to change the value (see below for examples of the screen to navigate to on the camera).

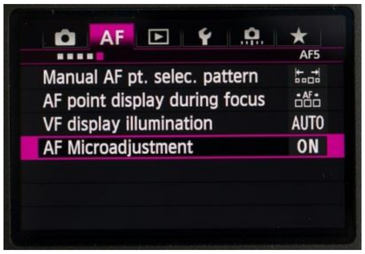


Figure 15 Canon AF Microadjustment option screen

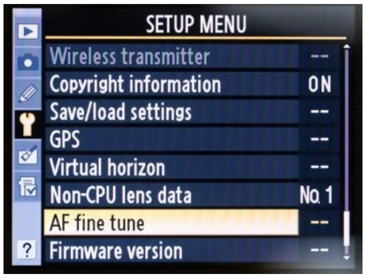


Figure 16 Nikon AF Fine Tune option screen

Start the Calibration

Everything is ready to go now, so just hit the *Start* button in the *Automatic Focus Calibration* window begin the calibration.

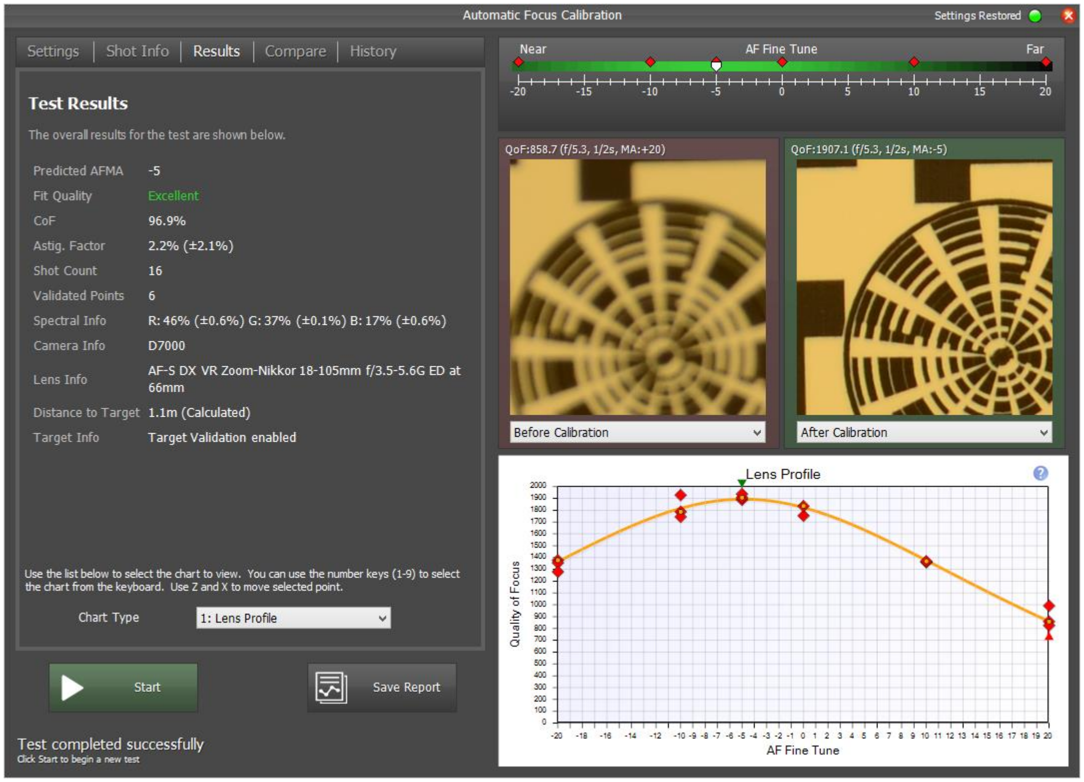


Figure 17 The completed Automatic Focus Calibration

When complete, the best AF Microadjustment/Fine Tune value will be set on your camera and you can review the information within the test window.

Target Setup – Target Search

The Target Setup utility is an assistance tool which in many cases can give you confidence that your target is set up in the right place for getting the best results from the test.

However, it does have some limitations and knowing these will help with understanding why sometimes you won't get the green tick even though everything is set up correctly for a calibration.

In order for the Target Setup utility to work (and other features that use Target Detection, for example the Target Validation and Target Optimisation options), the image captured from the camera must contain the **complete** black-and-white coded area of the target within the *detection area* of the utility window (this is the area of the live view image that is inside the darker outer border - approximately 90% of width and height of the image).

The following images show examples of when the target will be detected and when it will not:

The grey guide around the edge of the LiveView images shows the extent to which the target can be detected. If the *whole* coded area is clear of the outer guides, it will still be detected as shown in this image.

The icon in the centre of the window shows which way to move the camera to correct the setup.

Again, this target is detected as the coded area is completely within the central section.

But when zoomed, not all of the target can be seen so it is no longer detected.

In this instance, the red “X” is shown as the target cannot be found. You will have to make your own judgement as to whether the target is in the correct position – if it’s parallel to the camera sensor and straight in front of the camera lens then your calibration will be accurate and successful.

Again, although this target is a good size, the coded area crosses the guides and is not completely within the detection region so it cannot be detected.

Finally, if the target is too small in the image, it will not be detected. If this is the case, either move the camera closer to the target or use a larger target.