



FoCal for Windows

Version 2.0.0.1757 Test Release 1 (TR1)

Automatic Focus Calibration and Camera/Lens Analysis Software

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1 Introduction

Welcome to FoCal 2! We're really excited to be releasing this second version of what is still the only fully automated autofocus calibration solution for Digital SLR cameras.

1.1 Test Release Software

It's important to note that this is Test Release software. That means it's not complete but it is functional, although there are likely to be some features that still need fixing. If you notice any odd behaviour, we'd appreciate you letting us know so we can make the software better for the final release.

1.2 Reporting Feedback

If you have any comments or suggestions about FoCal 2 Test Release, or wish to report any issues, we've made this easy from within the software:

Open the *About* window and there's a *Send Feedback* button at the bottom of the window. If you click this, a browser window will open with the feedback contact form specifically for FoCal 2 Test Release.

If you want to manually leave feedback, you can go to www.fo-cal.co.uk/trfeedback to open the same contact form.

We won't be able to reply to most of the feedback left but we will read all the information sent and use it to make FoCal better. *Please try to leave as much information as possible – e.g. what problems you saw, the text from any error messages, how any problem occurred and any steps to repeat the issue, as well as which camera and lens you were using if relevant.*

1.3 What is this document?

This document is not a complete manual, but rather information about the things that are different between FoCal 1 and FoCal 2 so you can get using the new features. We will produce a full manual when FoCal 2 is complete, but for now we will continue to enhance this document with future releases.

It may seem quite long, but there are a lot of screenshots so it should be quick to get an overview of the features of the software. It's worth at least skimming through all the sections before using FoCal 2, and revisiting appropriate areas of the manual if you want more information when actually using the software.

2 What's New?

This document is intended to explain all the new features in FoCal 2, but this section gives a brief overview of the new features available.

Firstly, please note that FoCal 2 does **not** bring completely automatic calibration for the Canon 5D Mark III, 1D X or 7D Mark II or any Nikon bodies. The camera communications library has been enhanced from FoCal 1 but we still need to run the bodies mentioned above in what we are now calling *User Assisted Mode* (this is the new name for Manual Setting Change or MSC mode as this name was a bit confusing and implied complete manual operation).

2.1 FoCal Database

The big feature of FoCal 2 is the FoCal Database – an online data library which allows you to automatically compare your results with those of other FoCal users to determine how your camera and lens is behaving compared to typical copies of your equipment.



Within this document, the database symbol (shown to the left) is used to represent features which require a FoCal Data Subscription. You can read more about this in section 6.

2.2 Test History

When you have run tests in the past, FoCal has stored a copy of the results on your computer. FoCal 2 now brings the ability to see these previous test results and take another look at the results from any tests you have run in the past. At present, the tests available to view are limited to the *Reworked Tests* described below, but we will bring functionality to allow review of all data over the course of the next Test Release versions.

2.3 Reworked Tests

The underlying architecture of the way FoCal handles test data has been changed completely, and we are in the process of porting all the tests over to the new method. So far, the following tests have been updated:

- Fully Automatic Calibration
- Autofocus Consistency
- Aperture Sharpness

You will notice that these tests look significantly different and offer many more features than were previously available.

Other tests which were present in FoCal 1 have not yet been ported completely so they will operate in very much the same way as FoCal 1.

There are some test buttons in the FoCal 2 user interface which are disabled but will be enabled over subsequent releases to offer the new functionality.

2.4 User Assisted Mode (previously Manual Setting Change (MSC) mode)

Back in 2012 when support for Nikon cameras was added to FoCal, we found that most Nikon cameras could not have their AF Fine Tune value automatically adjusted from the computer. In order to enable calibration, we introduced MSC (Manual Setting Change) mode which asked the user to change the AF Fine Tune value when required, but left all other settings automatically controlled by the computer.

Unfortunately, calling this function *Manual* Setting Change has led to lots of confusion about automatic calibration within FoCal!

In order to remove some confusion, we've renamed this to User Assisted Mode. The concept is the same – if there's a setting that FoCal can't control from the computer then you'll be prompted to adjust the setting, but *all* other settings are automatically controlled.

So, if you see UAM (User Assisted Mode) mentioned, it's just the new name for MSC Mode.

3 Installation

Installation of FoCal is very similar to FoCal 1.

3.1 Downloading the Software

You can download the software from the FoCal License Management System which can be reached at `lms.fo-cal.co.uk`.

In order to log in, you will need your registered email address, and your Password as stated in the email received from Reikan on purchase. If you do not have a Password, you can use the password reset option at `lms.fo-cal.co.uk`.

The downloaded file is a ZIP file which you must decompress (normally by right-clicking on the file and clicking **Extract All**).

In the file, you will see 3 directories:

- **Documentation** – contains software related documentation
- **Software** – contains the software installation files
- **Target Images** – contains the target image file to print

3.2 Installing the Software

The file in the **Software** directory is supplied as a Windows setup package (MSI). To install, simply execute the `setup.exe` file.

Once installed, the software will appear on the Start menu under **Programs | Reikan | FoCal 2 (Test Release)**.

3.3 Camera Connection

You will need to connect the camera to the computer with a USB cable supplied with the camera. You can use a USB extension cable, but keep the maximum total length between the computer and the camera under 5 metres.

If you are using a camera with a USB 3 connector, it is recommended that you either connect to a USB 2 port on the computer, use a USB 2 hub or use a USB 2 extension cable – this will force the computer to use slower USB 2 mode with the camera. This will not affect the overall speed of operation of FoCal but improves reliability under some circumstances.

3.3.1 Verification of Correct Connection

For Canon cameras, If the EOS Utility application (supplied by Canon) can connect to the camera, then FoCal should be able to properly communicate with the camera (but ensure that any Canon software is **not** running when starting FoCal otherwise there will be communication problems).

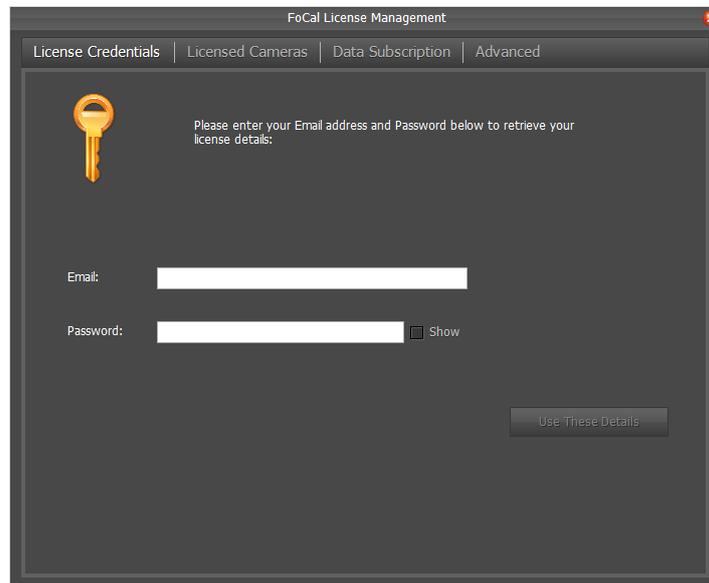
For Nikon, if the camera appears within Windows Explorer or is indicated as connected by the operating system, then it should work with FoCal.

3.4 EOS Utility

If the Canon EOS Utility is running, this will stop FoCal being able to connect to your camera. Since the middle of 2014, EOS Utility can be installed such that it is always running and waits for a camera to be connected. Please ensure that this function is disabled in EOS Utility before using FoCal.

4 Stating Up

When you first start FoCal 2, you will need to enter your license credentials. This is the same information you used to log in to the LMS in order to download FoCal in the first place.



The screenshot shows a window titled "FoCal License Management" with a close button in the top right corner. The window has a dark gray background and a navigation bar at the top with four tabs: "License Credentials" (selected), "Licensed Cameras", "Data Subscription", and "Advanced". On the left side, there is a yellow key icon. To the right of the icon, the text reads: "Please enter your Email address and Password below to retrieve your license details:". Below this text are two input fields. The first is labeled "Email:" and the second is labeled "Password:". To the right of the password field is a small square icon labeled "Show". At the bottom right of the dialog box is a button labeled "Use These Details".

Enter your email address and password into the boxes then click the *Use These Details* button. Your license will be applied to FoCal and the software will exit.

From now on, FoCal will start without requesting any license details.

5 Licensing Cameras

5.1 Adding a camera to your license

You can add a camera to your license by simply connecting the camera to your computer and hitting the *Connect* button. FoCal will then offer to license the camera if it is not already licensed. Note that you will need an internet connection to add a camera to your license.

Please refer to the FoCal 1 manual for more details on how to add a camera to your license.

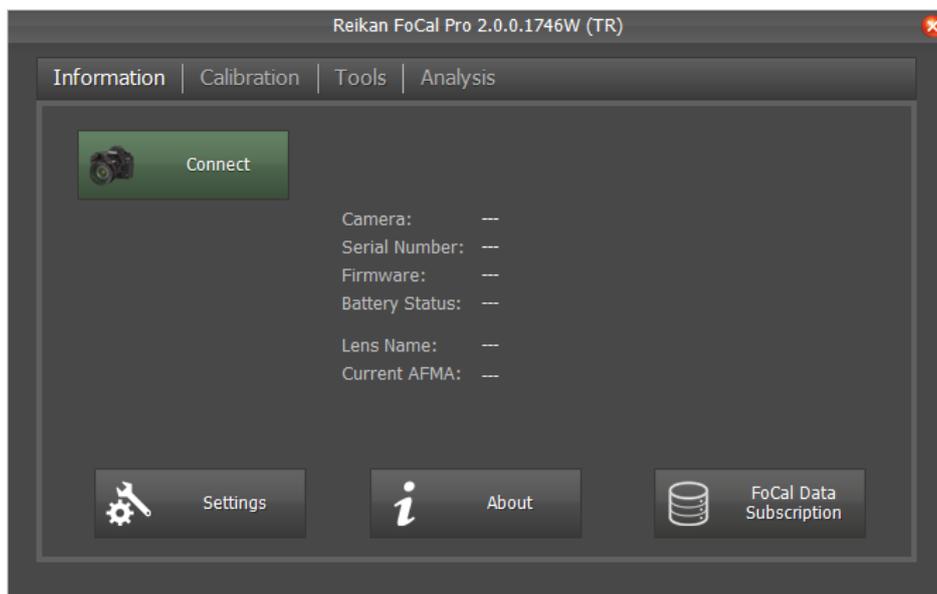
6 FoCal Data Subscription

Over a number of years we have collected hundreds of thousands of test results to build profiles for thousands of combinations of cameras and lenses and in FoCal 2 we can now give this information back to you as a FoCal user to allow comparison of *your* equipment against the typical behaviour of other users with the same camera/lens combination.

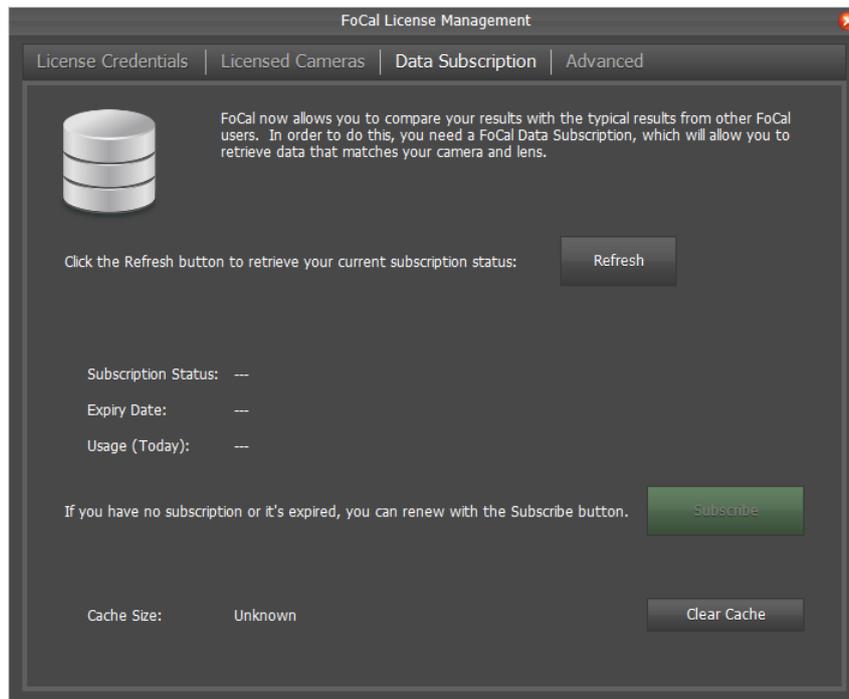
In order to receive this information, you will need a FoCal Data Subscription.

6.1 Subscribing to the FoCal Data

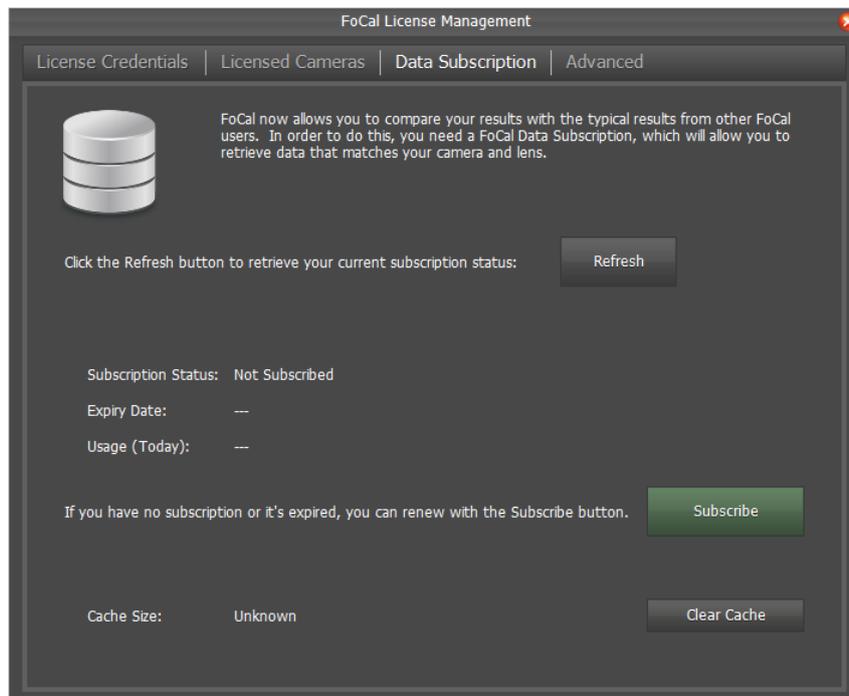
During the Test Release phase for FoCal 2, we are offering a **free** period of use of the data subscription service. In order to obtain your free subscription, click the *FoCal Data Subscription* button on the main FoCal window.



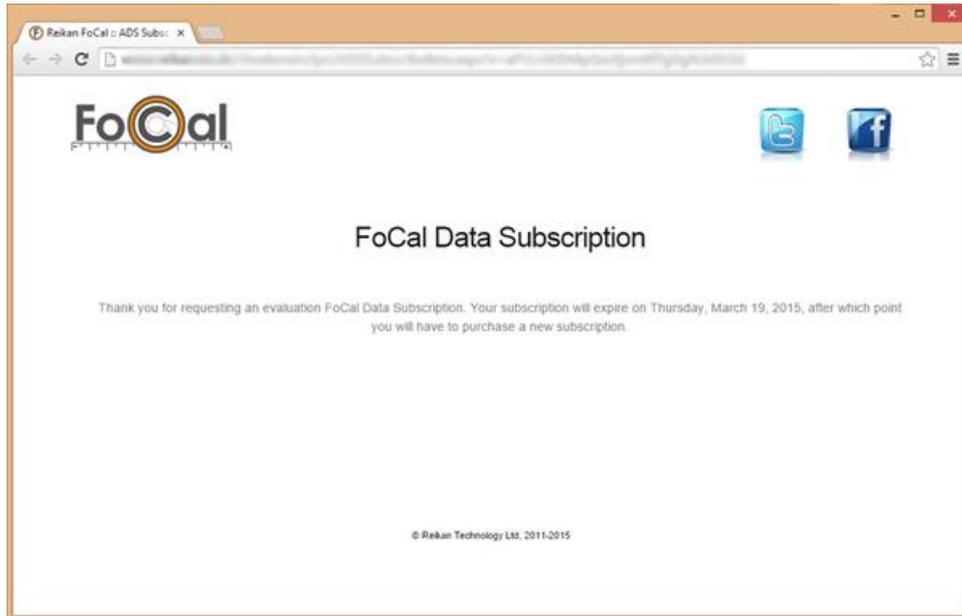
This will open the FoCal License Management window on the FoCal Data Subscription tab as shown below.



To find the current status of your subscription, click the *Refresh* button. If you don't already have a subscription, the *Subscription Status* text will show *Not Subscribed* as below, and the *Subscribe* button will become active:

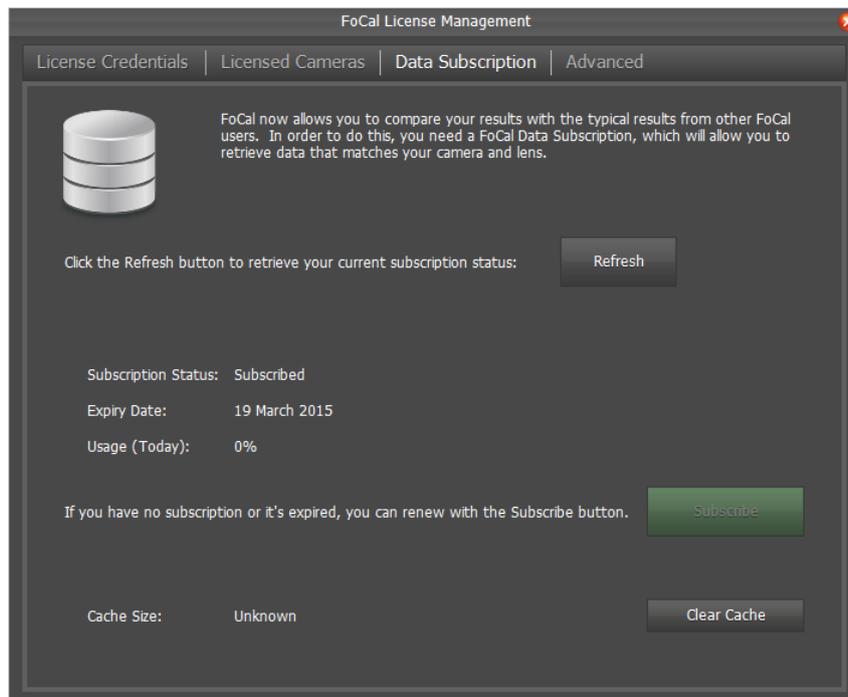


Click the *Subscribe* button and your browser will open and you should see a page similar to this:



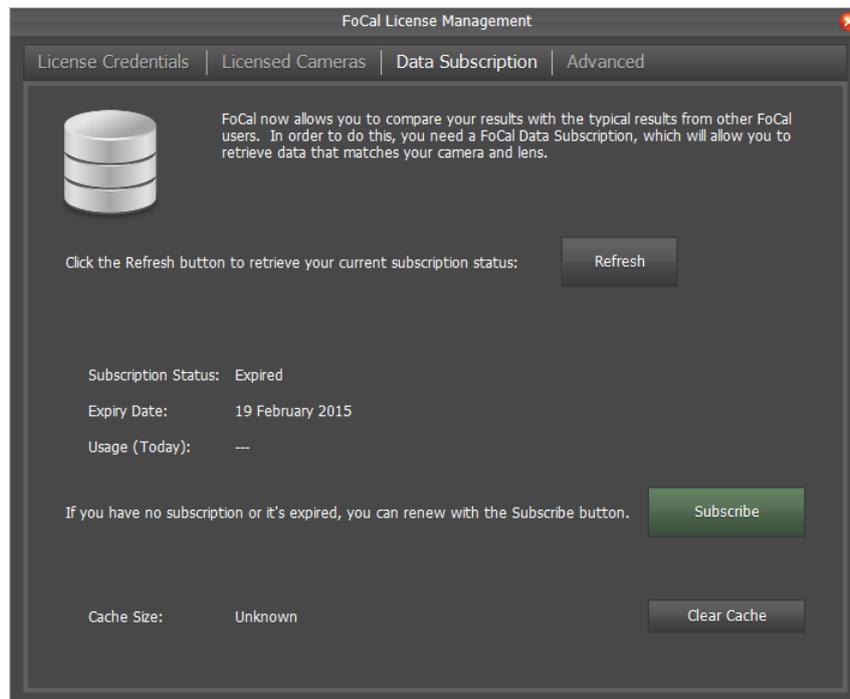
You have now activated your free 2 week subscription, and you will be able to use the features available with a FoCal Data Subscription described throughout this manual.

Clicking *Refresh* again in the *Data Subscription* tab of the FoCal License Management window will indicate that you are now subscribed and will show your expiry date.

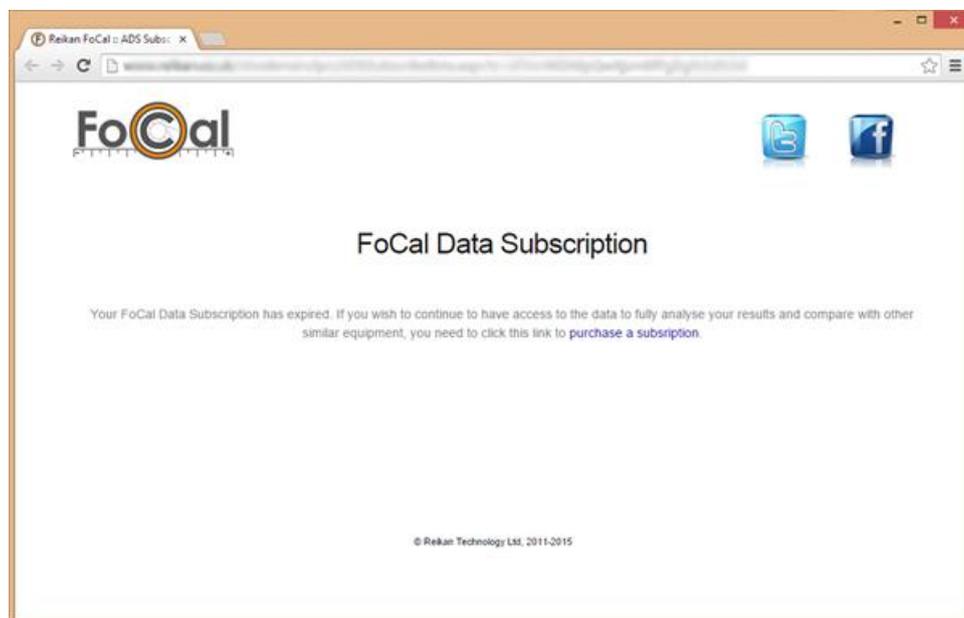


6.2 Renewing your FoCal Data Subscription

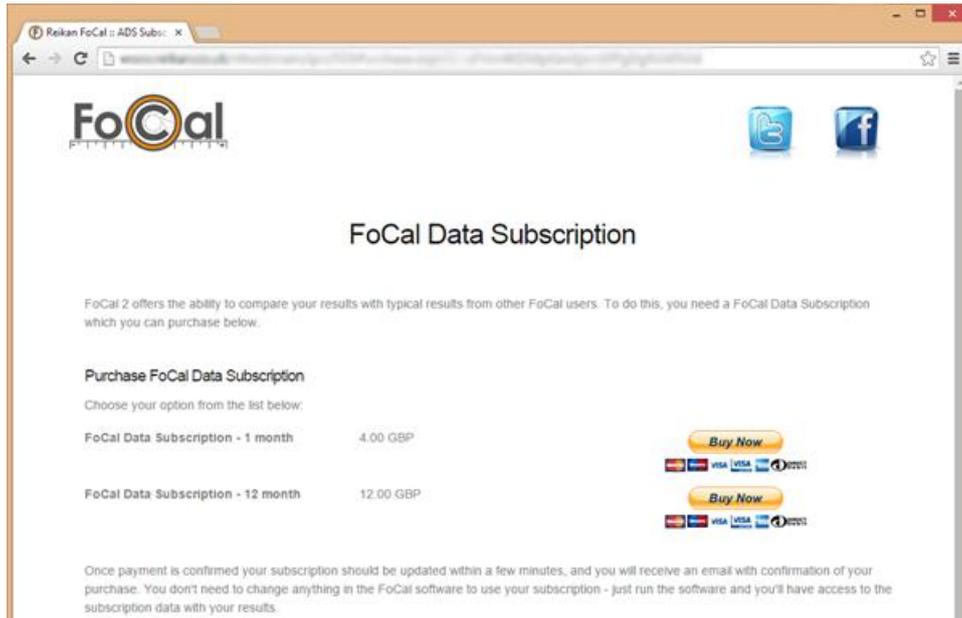
When your free data subscription expires, you will no longer have access to the features related to the data. At this point, if you open the *Data Subscription* tab in the FoCal License Management window and click *Refresh*, your *Subscription Status* will be shown as *Expired*:



If you then click the *Subscribe* button, you will be taken to a web page as shown below:



Click the [purchase a subscription](#) link, and you will then be taken to the purchase page for either a 1 month or 1 year data subscription:



Choose either 1 month or 1 year subscription, click the *Buy Now* button and you will be taken to the FoCal Store to purchase your subscription.

Once the purchase process is complete, your subscription will be activated within a few minutes. You should receive an email to confirm this, but simply hitting the *Refresh* button in the *Data Subscription* tab of the FoCal License Management window will indicate that your subscription is now active.

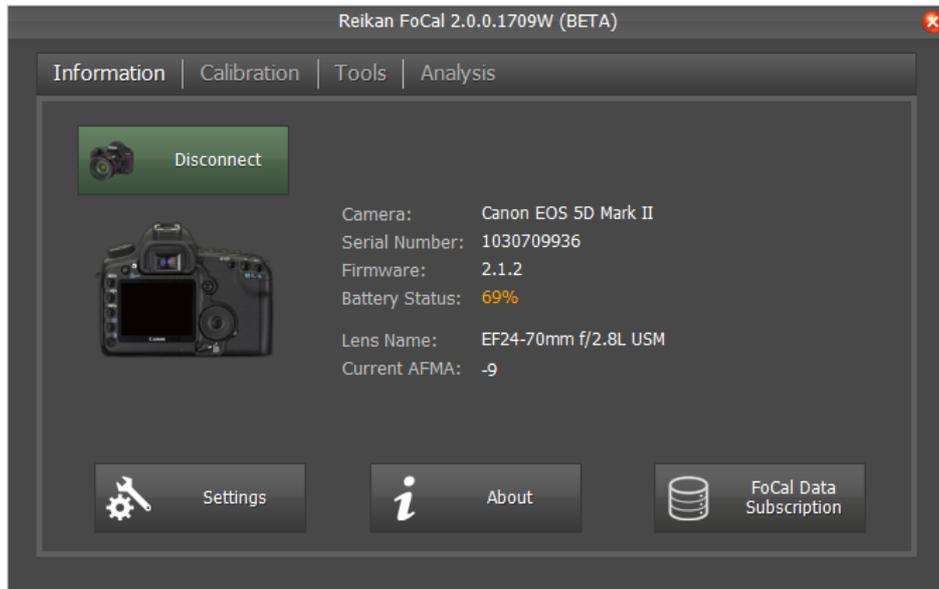
You can also purchase a data subscription and check the expiry date of your current subscription in the License Management System, available by logging in at lms.fo-cal.co.uk.

7 Main FoCal Window

The main FoCal 2 window is now organised into a number of tab pages.

7.1 Information

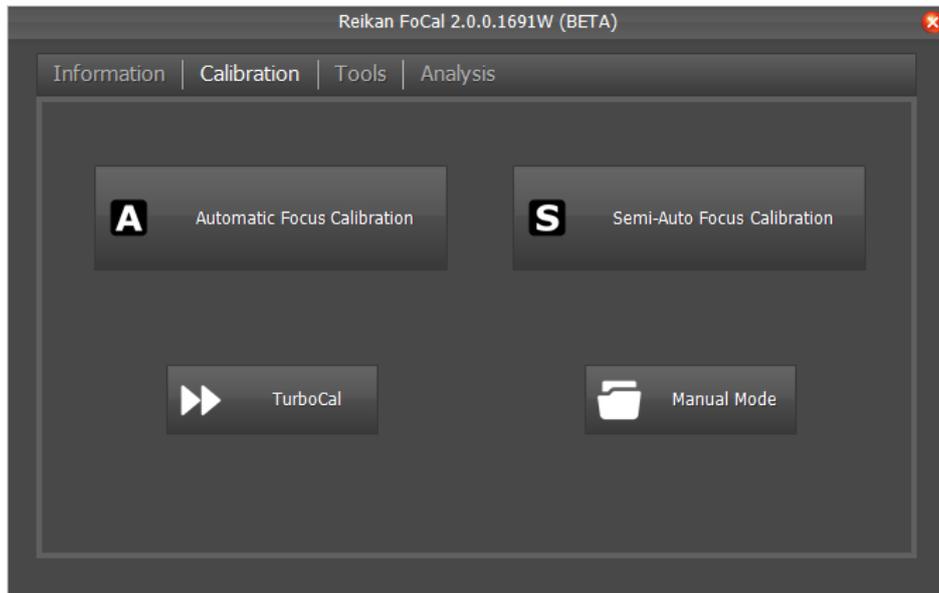
The information page shows you details about the camera that is currently connected to the software. To start using a camera, you must connect the camera via USB to the computer using the cable supplied with the camera, ensure the camera is switched on and then click *Connect*.



This page also allows you to access the software settings and get information about the software, including your license and subscription information.

7.2 Calibration

The Calibration page shows you options available to calibrate your camera autofocus system.

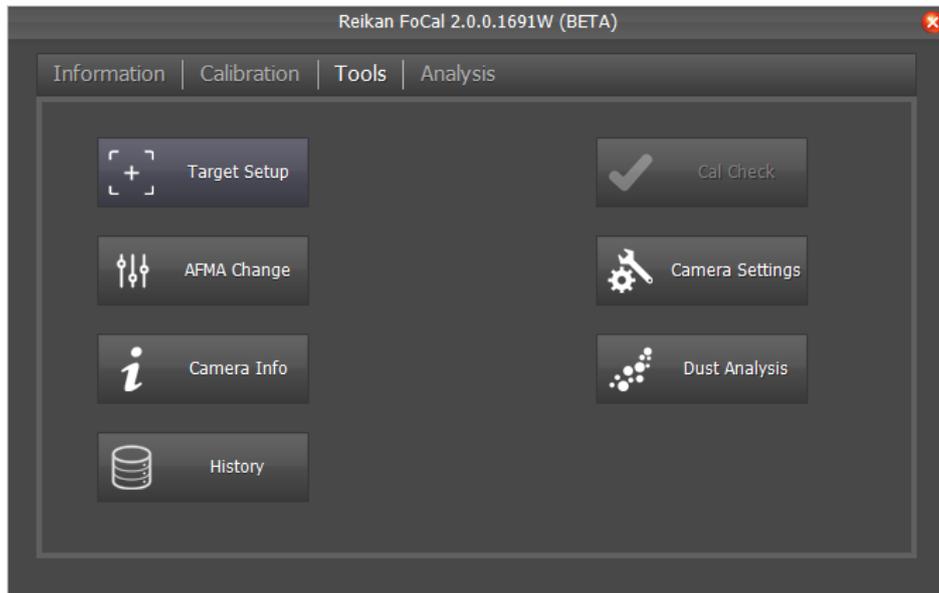


Option	Shortcut	Description
Automatic Focus Calibration	CTRL+F	Fully automated calibration of AF Microadjustment / Fine Tune See section 9 for further information.
<i>Semi-Auto Focus Calibration</i>	<i>CTRL+S</i>	<i>You control the shots, FoCal reports the quality and you can make your own adjustments to investigate and get the best from your focus system.</i>
<i>TurboCal</i>	<i>CTRL+Q</i>	<i>A rapid test based on focus confirmation</i>
<i>Manual Mode</i>	<i>CTRL+U</i>	<i>Analyse files you've captured yourself to get a focus calibration value</i>

* Items shown in *italics* have not changed significantly from FoCal 1 and you should refer to the FoCal 1 manual for information on how to use these features.

7.3 Tools

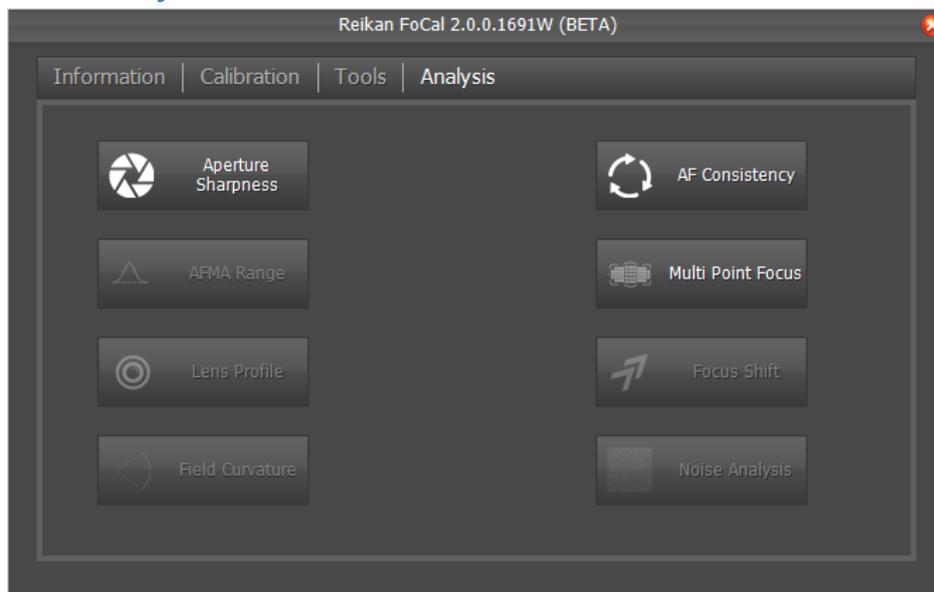
The Tools page has quick access to useful utilities.



Option	Shortcut	Description
Target Setup	CTRL+T	Video-assisted setup of the target positions See section 8 for further information.
Cal Check	CTRL+K	Disabled in this version
<i>AFMA Change</i>		<i>Change the camera AF Microadjustment / Fine Tune setting</i>
<i>Camera Settings</i>		<i>Save / Restore camera settings</i>
<i>Camera Info</i>		<i>Get information about the camera</i>
<i>Dust Analysis</i>	<i>CTRL+D</i>	<i>Analyse the sensor for dust</i>
History	CTRL+H	View previous test results See section 12 for further information.

* Items shown in *italics* have not changed significantly from FoCal 1 and you should refer to the FoCal 1 manual for information on how to use these features.

7.4 Analysis



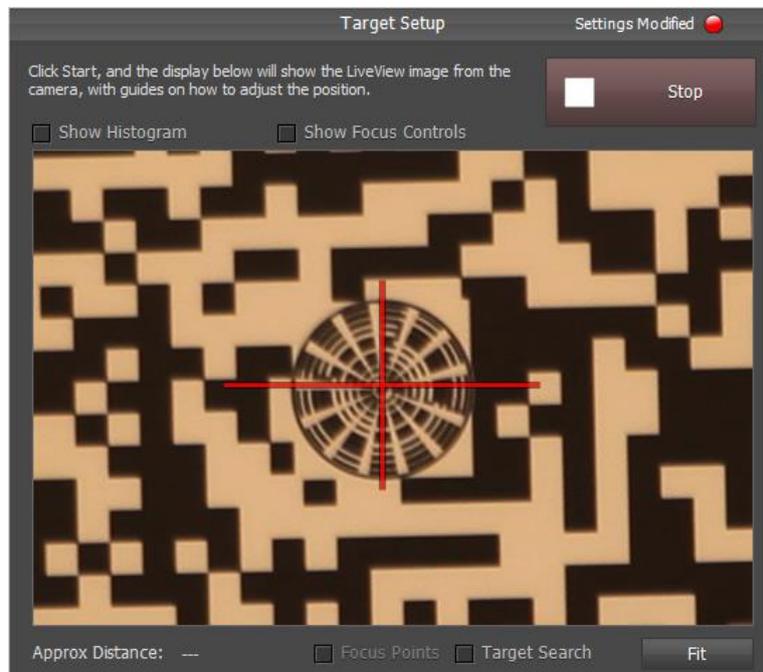
Option	Shortcut	Description
Aperture Sharpness	CTRL+A	View information about your camera and lens across the full aperture range See section 10 for further information.
AF Consistency	CTRL+C	See information about the repeatability of the focus for your camera and lens See section 11 for further information.
AFMA Range	CTRL+R	Disabled in this version
<i>MultiPoint Focus</i>	<i>CTRL+M</i>	<i>See how individual focus points compare with each other</i>
Lens Profile		Disabled in this version
Focus Shift	CTRL+O	Disabled in this version
Field Curvature	CTRL+L	Disabled in this version
Noise Analysis	CTRL+N	Disabled in this version

* Items shown in *italics* have not changed significantly from FoCal 1 and you should refer to the FoCal 1 manual for information on how to use these features.

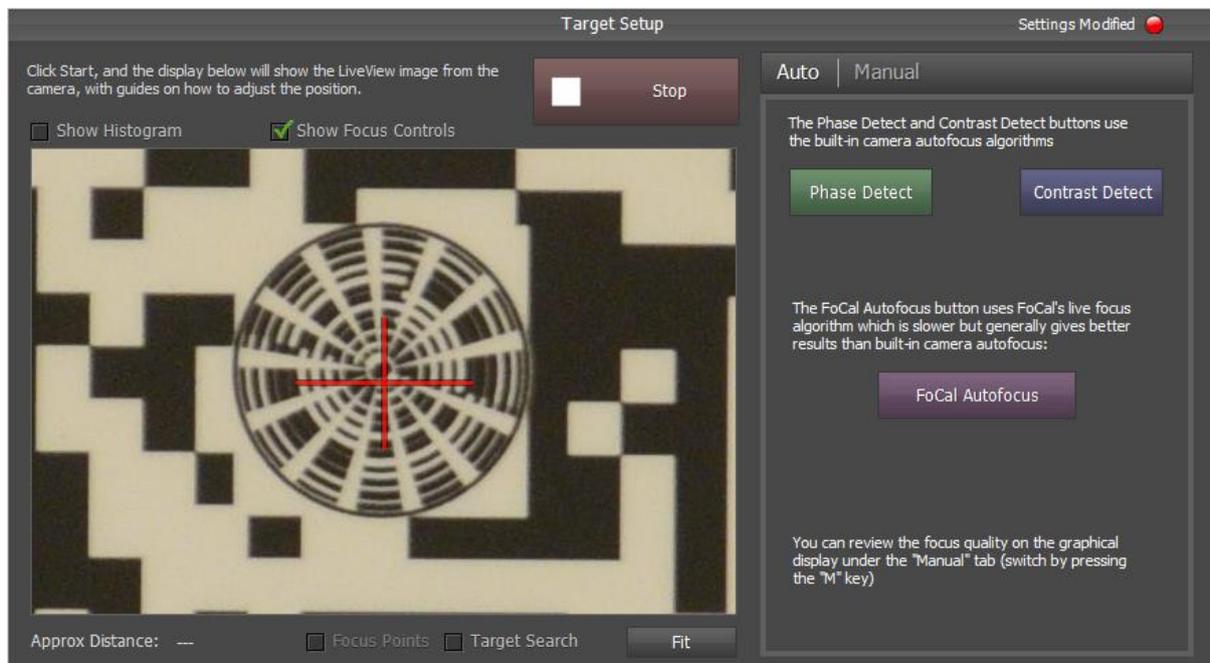
8 Target Setup

The Target Setup utility in FoCal 2 behaves similarly to FoCal 1 except for offering useful features for optimising manual focus before certain tests.

Open the utility by clicking the Target Setup button on the main FoCal window, then start the Live View display by clicking the *Start* button in the test.



The layout of the *Focus Controls* area of the window has changed in FoCal 2:



8.1 Auto Tab

The Focus Controls are now divided into 2 tabs – Auto and Manual.

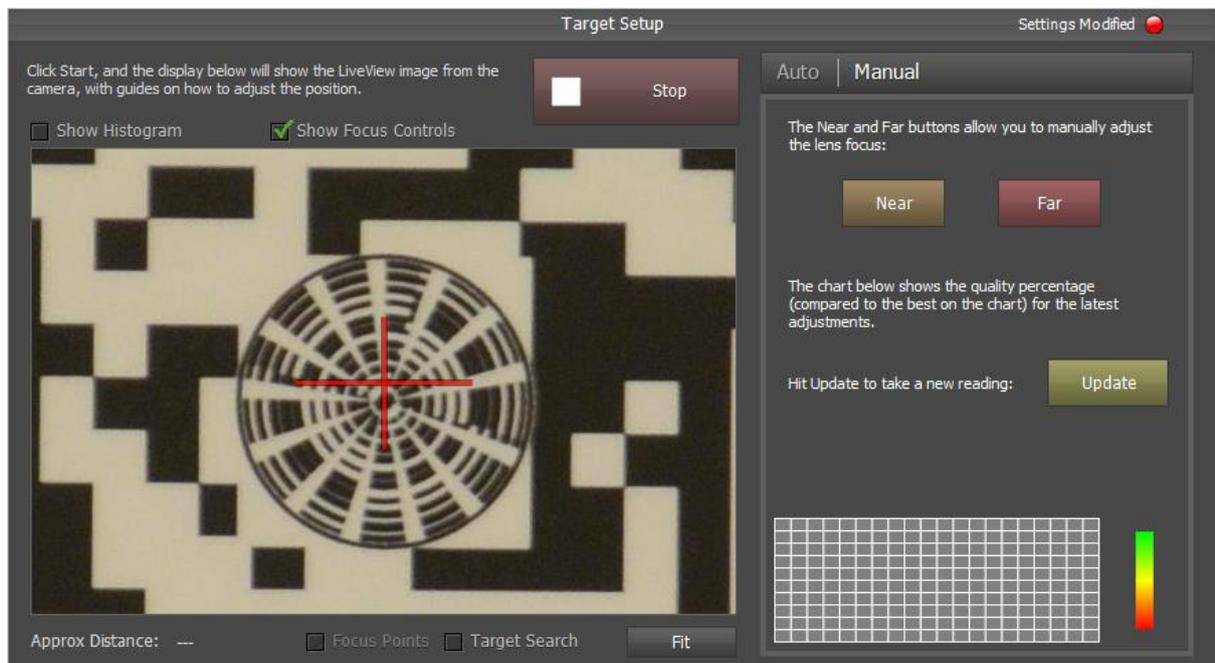
The Auto tab (which can be selected at any time with the “M” key) shows the autofocus controls – Phase Detect, Contrast Detect and FoCal Autofocus.

Clicking any of these buttons will trigger the appropriate focusing operation. You can also use the following keys:

P	Focus using the camera’s Phase Detect system.
C	Focus using the camera’s Contrast Detect system.
L	Use the FoCal Autofocus algorithm to focus the lens.

8.2 Manual Tab

The Manual tab offers the ability to manually adjust the focus of the lens using the *Near* and *Far* buttons. It also displays the focus quality of the previous 20 focus operations (including any autofocus operations):



You can move the focus point nearer to the camera with the *Near* button, or farther from the camera with the *Far* button. You can also use the following keys:

,	Move the focus point nearer to the camera.
.	Move the focus point farther from the camera.

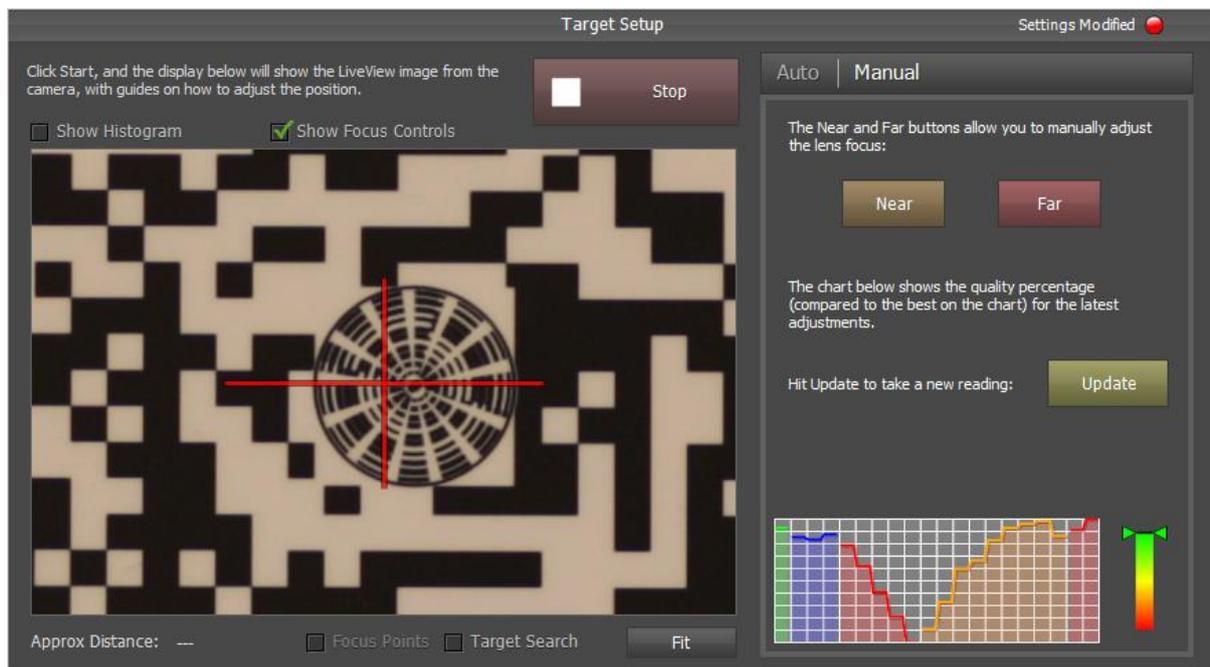
8.2.1 Focus Quality Indication

The Focus Quality Indicator comprises the chart and quality indicator displayed at the bottom of the *Manual* tab.

Each time a focus operation is complete, a new reading of the quality is taken from the Live View images and displayed on the chart, colour coded depending on the operation that produced the result:

Green	Phase Detect autofocus
Blue	Contrast Detect autofocus
Purple	FoCal autofocus
Orange	Manual <i>Near</i> focus shift
Red	Manual <i>Far</i> focus shift
Yellow	No adjustment – just add a new reading from the current image (<i>Update</i> button)

The example below shows a typical use case:



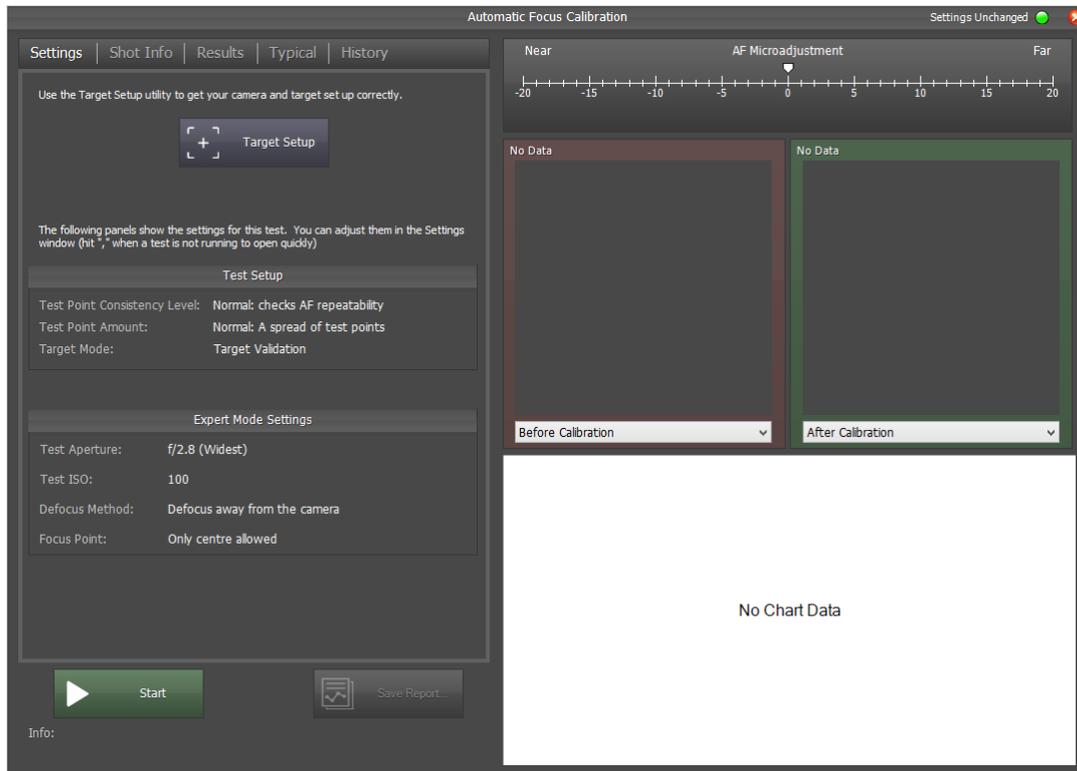
The green bar shows an initial Phase Detect autofocus operation (press “P”), then the blue bars show the results from 3 consecutive Contrast Detect operations (press “C”). To get a proper measure of these values, a number of *Far* focus operations were performed (the red area on the chart, from pressing “.”) and the quality can be seen to drop. Then the *Near* focus operation was used (press “,”) to improve the quality in the orange area until the quality just started dropping again. With a final tweak of focus back to *Far* (the final red area) we can be sure we’ve got the best focus quality.

The current value is also expressed with the vertical quality indicator on the bottom right of the window – when the markers are in the green area at the top of the bar, this indicates that the current quality is close to or equal to the maximum value of all the values captured on the graph.

With results as shown above, we can quickly and easily be confident of having achieved very close to the best possible focus achievable by this camera/lens combination.

9 Automatic Focus Calibration

The initial Automatic Focus Calibration test window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results, Typical comparison and History
- Calibration results indicator (top right)
- Control buttons (bottom left)
- Analysed Image panels (mid right)
- Chart (bottom right)

The calibration algorithm in FoCal 2 has been optimised to give a result in fewer shots than FoCal 1, so you should find that you achieve a calibration result faster and more easily than before.

9.1 Tab Pages

The following pages are available, along with a shortcut key shown in brackets:

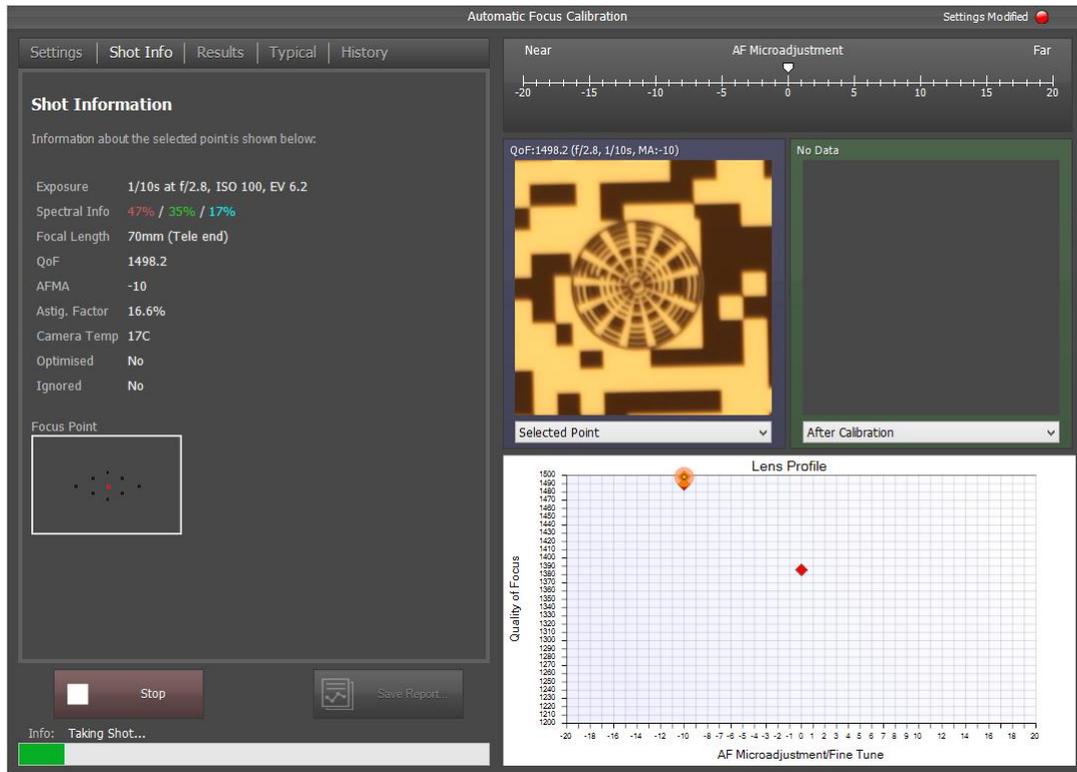
- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (required FoCal Data Subscription, see section 6)
- History (H) – previous results for this camera and lens

You can select a tab page by clicking the title or pressing the appropriate key at any time.

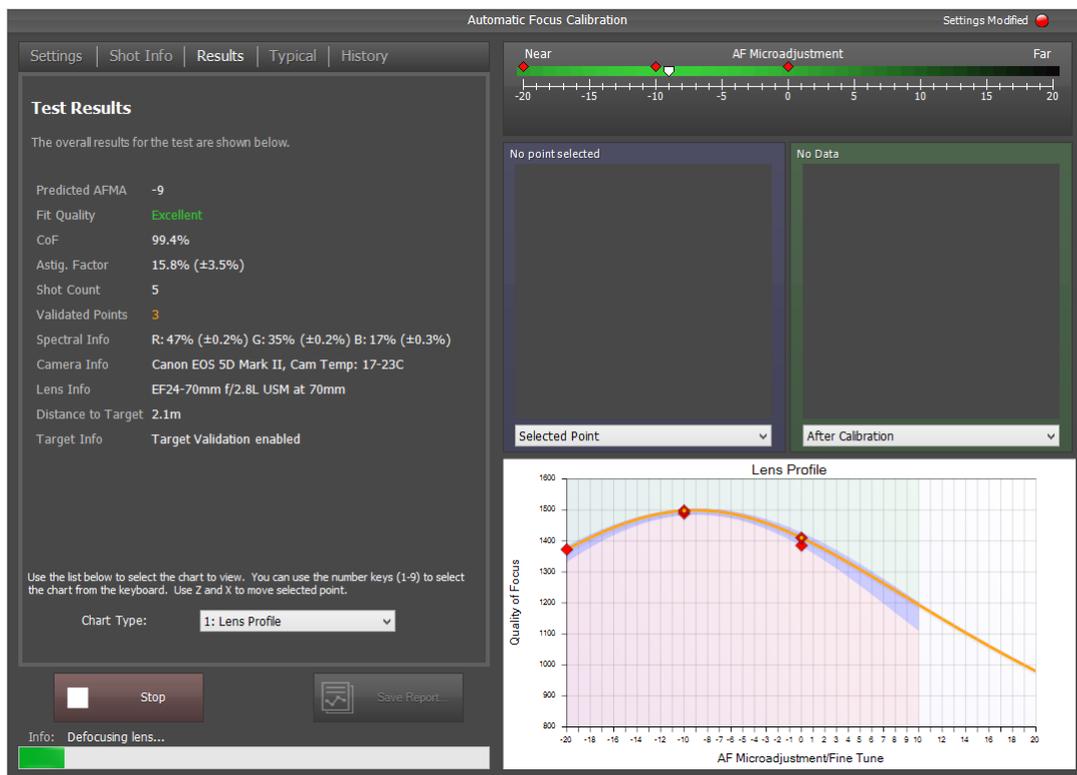
9.2 Running the Test

Click *Start* to begin the test.

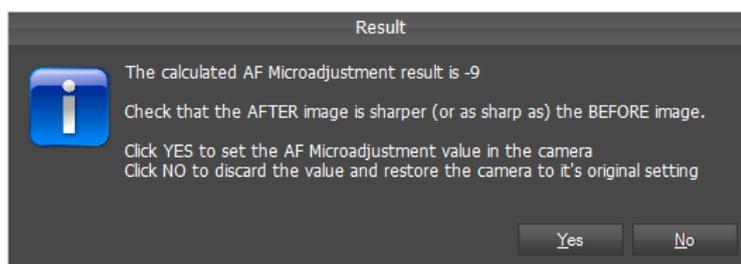
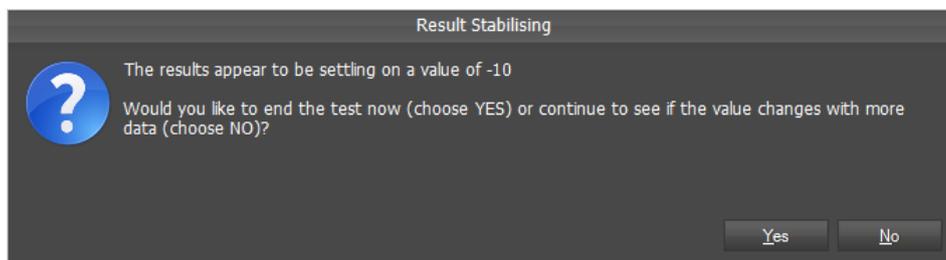
As the test runs, you can click on any point on the chart to see information about the shot in the *Shot Info* page:



The *Results* page will be updated with the results as the test runs.



When the test is complete or the results appear to be settling on a result, one of the following messages will be shown:



9.3 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

- Lens Profile (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Focus Consistency (2) – the consistency of focus for each tested point (requires the Test Point Consistency Level in the Settings to be set to something other than *None*)
- Astigmatism Factor (3) – a value showing how the horizontal and vertical sharpness compare
- ADS Difference (4) – the difference between your test data and the typical data for this camera/lens combination (requires a FoCal Data Subscription)
- Result Convergence (5) – how the result progressed as each shot was taken

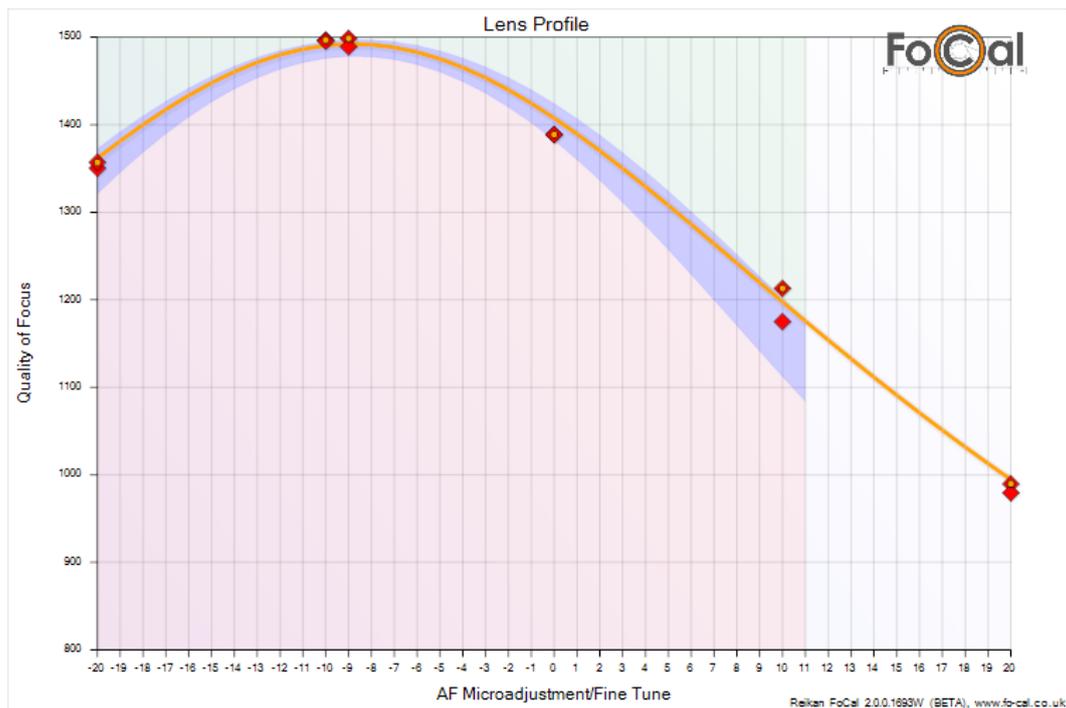


If you have a FoCal Data Subscription (see section 6), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The **blue** areas shows typical results for this camera/lens combination, the **green** area indicates performance above or better than the typical case and **red** indicates the result falls below or worse than the typical case.

9.3.1 Lens Profile

The lens profile shows the sharpness of the analysed region across the AF Microadjustment/Fine Tune range. The highest point on this chart is the best quality image, and usually represents the best AF Microadjustment value to set in the camera.

If you have a FoCal Data Subscription and there is information for your camera and lens, the chart will be shown with the *FDS Overlay* displayed – the red, blue and green areas as shown below. These show the typical results from other users of your camera and lens. If your data fits fairly well within the blue area (as shown below) then your lens is behaving similar to typical data from other users.



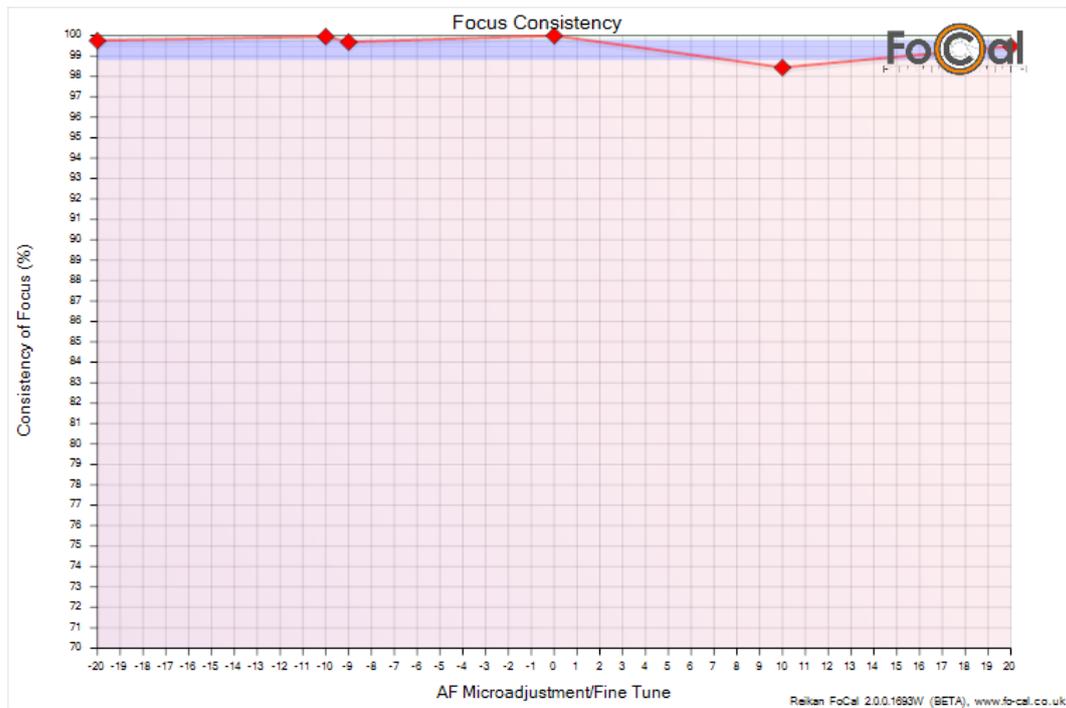
FDS Interpretation

When the focus of a lens is shifted away from perfect focus, the sharpness of the image will drop and this produces the familiar curve shape shown in the Lens Profile chart. The FDS overlay highlights the typical way a lens will defocus in the blue area. However, it's important to realise that under certain conditions (e.g. very close or far from the target) the curve shape may be a little different and fall outside of the blue area, and may even have a significantly sharper drop-off from the peak point. The overlay for the Lens Profile is not something to use on its own to decide if a lens is faulty or not – it can be used along with other information to get some idea of whether the focus characteristics of a specific lens are unusual.

9.3.2 Focus Consistency

When more than one shot is taken at any particular AF Microadjustment value, the consistency of the focus is measured and displayed on this chart.

The Consistency of Focus is calculated by dividing the average sharpness value by the maximum sharpness value at each point, and has a maximum possible value of 100%. Typically, a value above about 97% is considered acceptable.



FDS Interpretation

The FDS overlay shows the typical focus consistency results from other FoCal users with the same camera and lens combination. As with other FDS overlays, the blue area signifies typical performance. The green area indicates better than typical performance (and is very small in the chart above), while the red area indicates poorer than typical performance.

With the example above, the points lie mostly in the typical or better than typical area and indicate that the lens is generally performing slightly better than average. The single point just in the red area is not something to be concerned about as it's only slightly in the red and only a single test point – if the line and points were all (or mostly all) in the red you might want to consider getting the lens focusing checked.

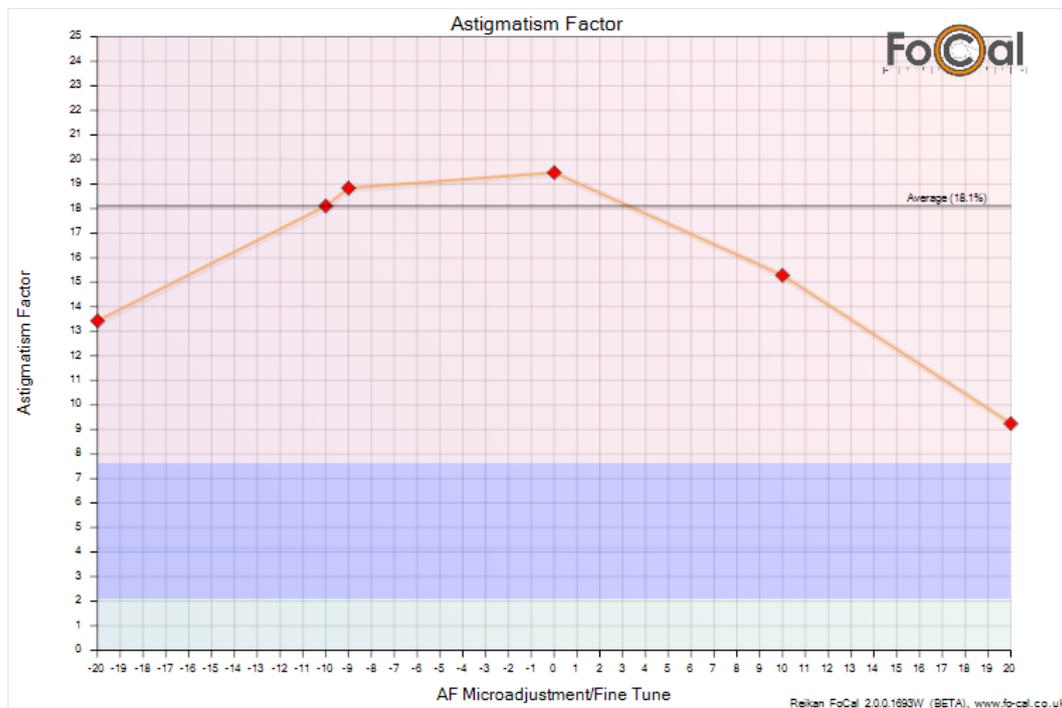
9.3.3 Astigmatism Factor (vs AFMA)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a high average Astigmatism Factor of around 18%.



FDS Interpretation

As with other FDS overlays, the blue area signifies typical performance. The green area indicates better than typical while the red area indicates below typical performance.

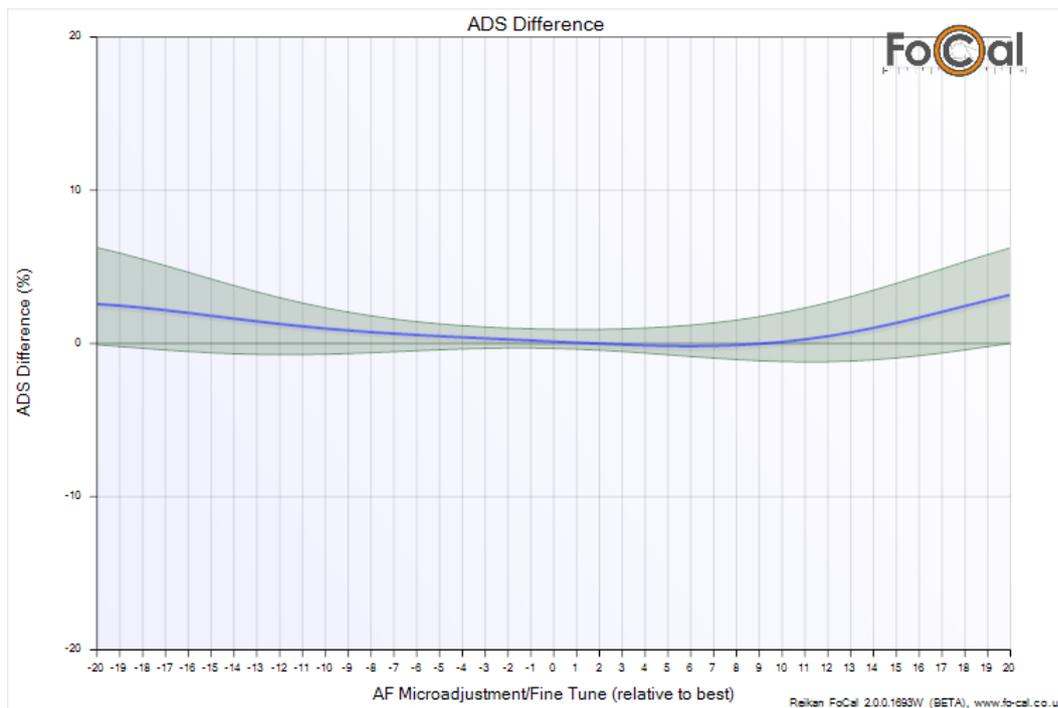
The example above shows that there is quite a range of average values for this lens (between about 2% and 8%), so if the points *mostly* fell within this region we could consider the lens behaving typically. However, the line above is most definitely outside of this area, and indicates a serious anomaly when compared with other FoCal users with the same camera and lens. This is a known defective lens – if during a test you see astigmatism factor results well outside of the blue area it would be well worth rerunning the test under a few different conditions (e.g. different focal lengths

and/or target distances) to check that the results are repeatable. If all results are outside the blue area, you would almost certainly want to get this lens checked.

9.3.4 ADS (Aggregate Data Set) Difference

The ADS Difference indicates how your data compares to the typical data from other users of the same camera and lens. Note that this chart will not be shown if you do not have a FoCal Data Subscription or there is no data available for your camera and lens combination.

A value that is generally close to 0 is good (this means your data is very similar to the typical data). Odd peaks away from zero are nothing to worry about, but if the data is – on average - a long way from the 0 line then this may indicate issues with your camera or lens.



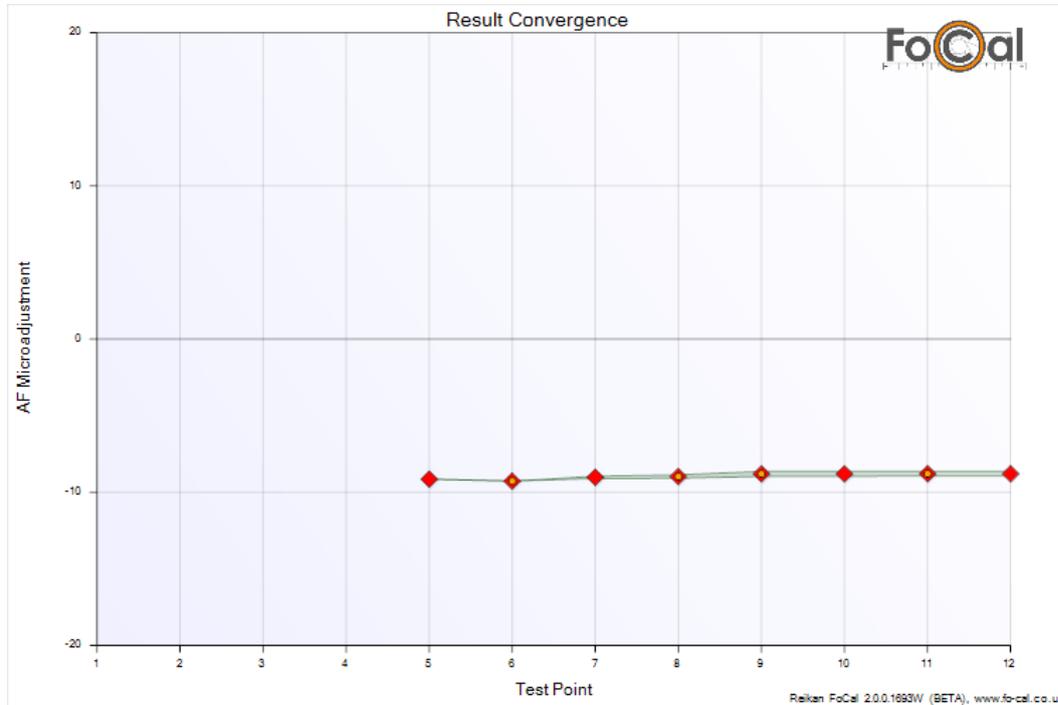
FDS Interpretation

What you are looking for in this chart is a line that is close to flat and running close to 0 (the above example is well within limits). Remember that this is based on the Lens Profile results and these can be affected by target distance and other environmental factors, so treat these results as supplementary when making any diagnosis about lens behaviour.

9.3.5 Result Convergence

The Result Convergence chart shows how the result was calculated after each shot was taken.

The thickness of the green area on the chart shows the confidence of the value (the example below is a very good, quick settle on a value of around -9).



Interpretation

This chart can give a good idea about reliable the final value can be considered. The above example shows immediate convergence on a value of around -8 or -9 and a very steady and precise (small green band) result while more points are added to the test data. This result can be considered reliable and repeatable.

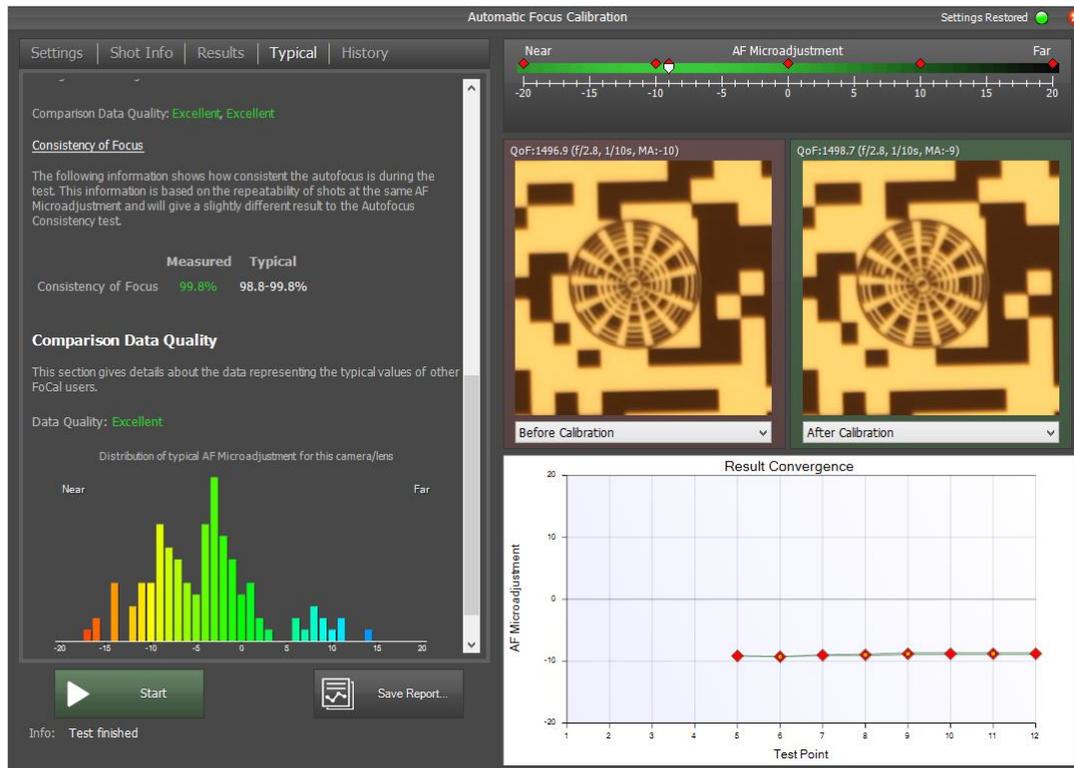
If you notice that the Result Convergence line jumps around a lot or has a very wide green band even towards the end of the test (right hand side of the chart) then you may want to check for possible issues during testing – e.g. vibration or light level changes.

9.4 Typical Comparison

If you have a FoCal Data Subscription you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

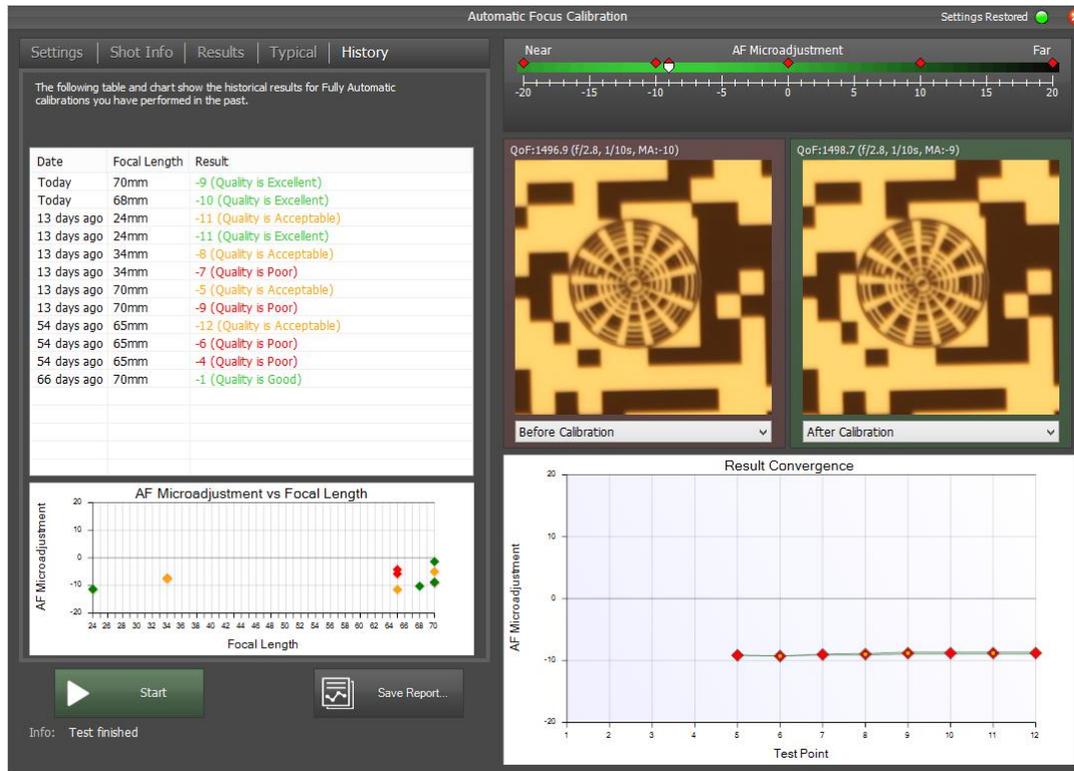
NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.

The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



9.5 History

In the *History* page you will be able to see the results from previous tests you have performed with this specific camera and lens. For a zoom lens, a graph will be shown at the bottom of the page showing the results across the focal range. This should allow you to gauge where to set your AF Microadjustment value for zoom lenses on cameras that only offer a single setting for the full zoom range.



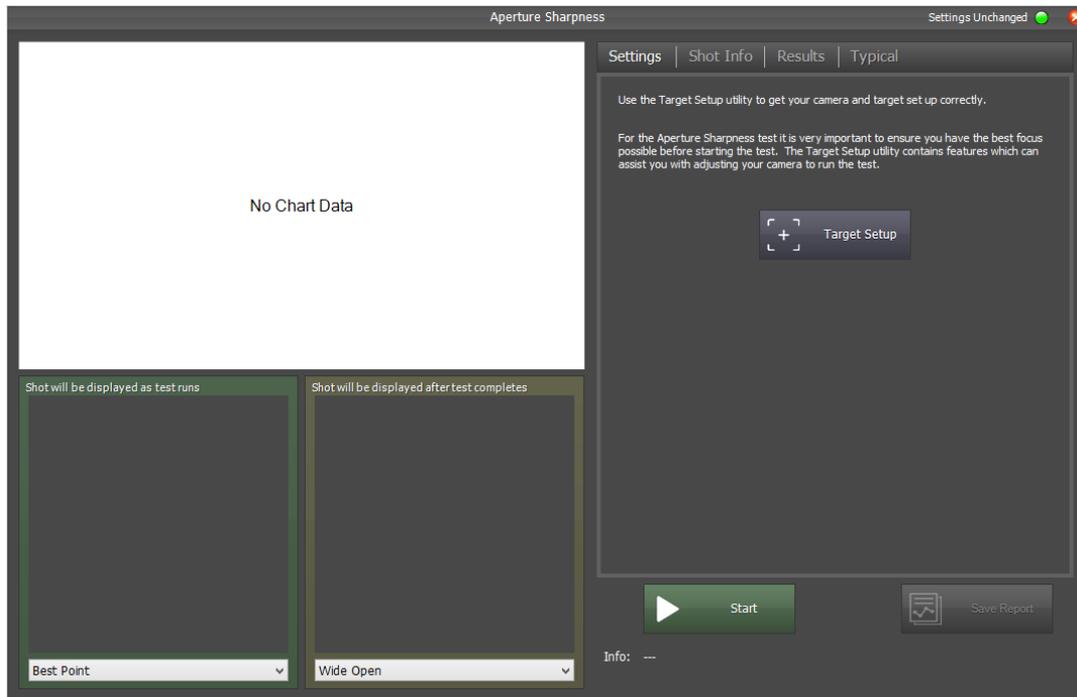
9.6 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T, H	Select the (S)ettings, Shot (I)nterface, (R)esults, (T)ypical or (H)istory tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

10 Aperture Sharpness

The Aperture Sharpness Test window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results and Typical comparison
- Control buttons (bottom right)
- Analysed Image panels (bottom left)
- Chart (top left)

10.1 Tab Pages

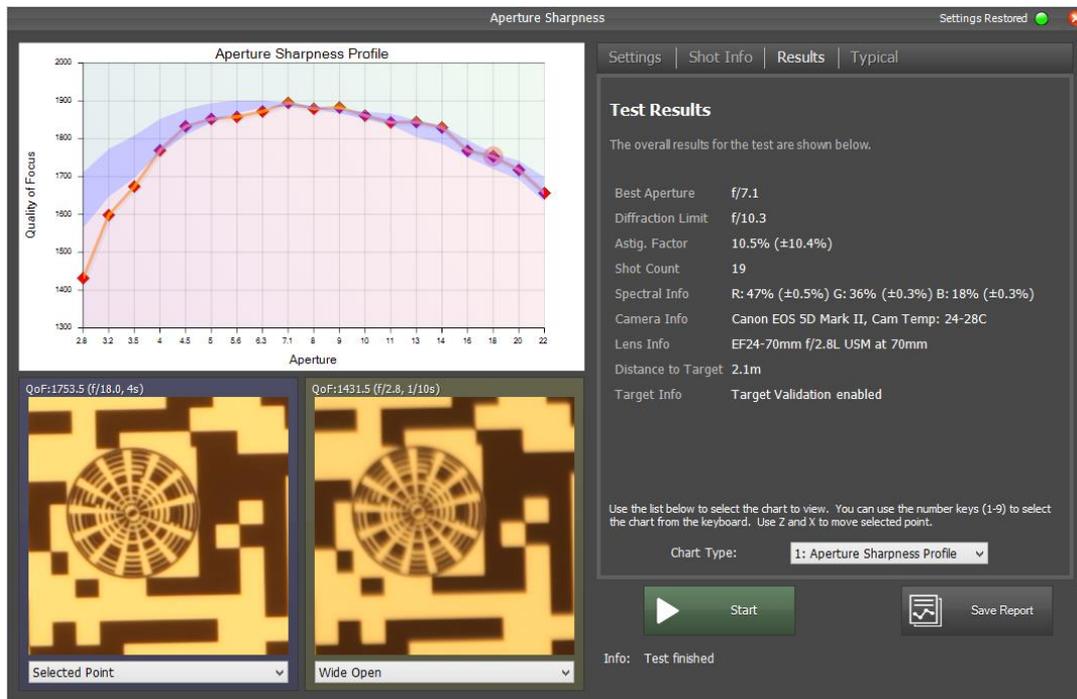
The following pages are available, along with a shortcut key shown in brackets:

- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (required FoCal Data Subscription, see section 6)

You can select a tab page by clicking the title or pressing the appropriate key at any time.

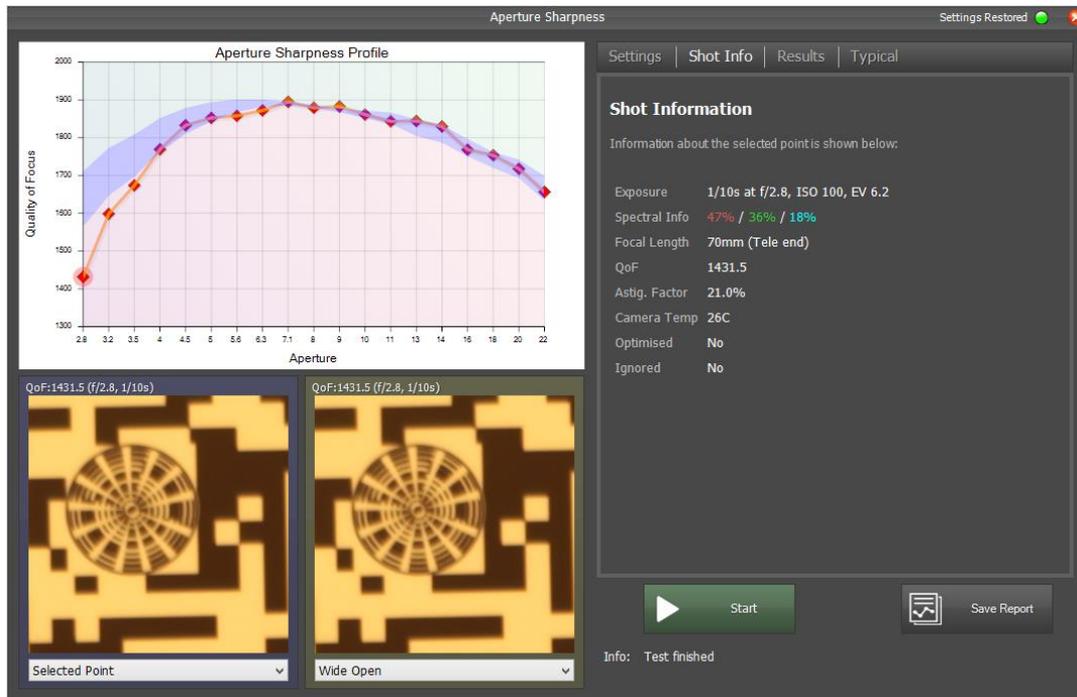
10.2 Running the Test

Once Target Setup has been confirmed, you can hit *Start* to begin the test. The test will run, analysing images at different apertures and displaying the overall results in the *Results* panel:



Note that the red/blue/green overlay is only visible with a valid FoCal Data Subscription.

Clicking on any point on the chart will show the *Shot Info* panel for details about the specified selected point:



10.3 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

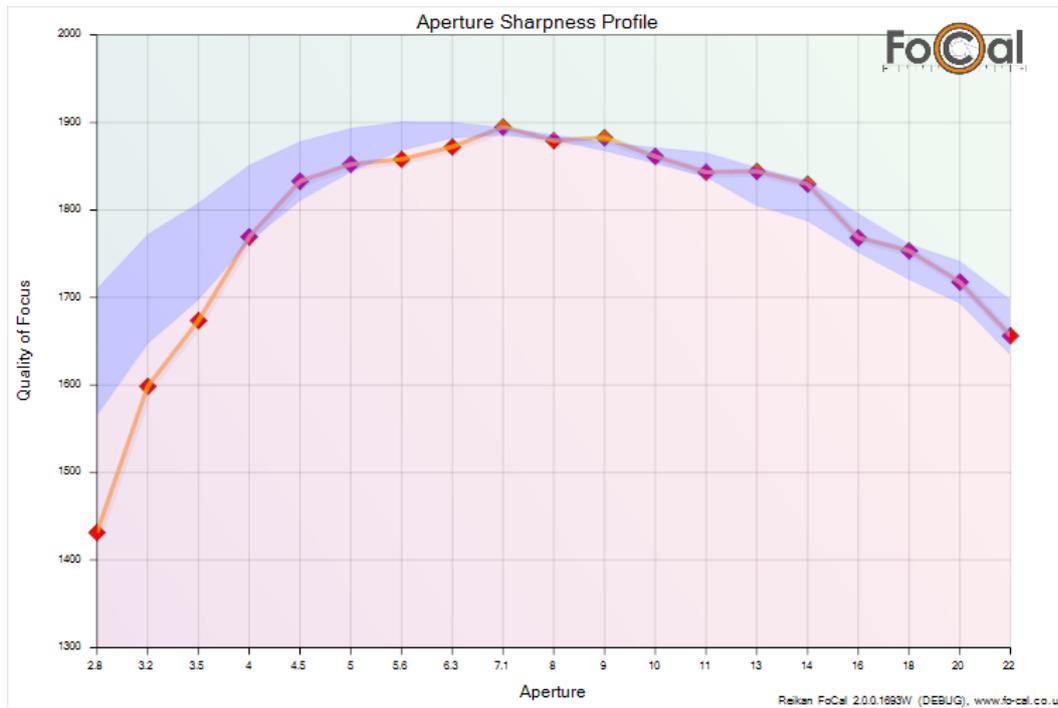
- Aperture Sharpness Profile (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Astigmatism Factor (2) – a value showing how the horizontal and vertical sharpness compare
- ADS Difference (3) – the difference between your test data and the typical data for this camera/lens combination (requires a FoCal Data Subscription)



If you have a FoCal Data Subscription (see section 6), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The green area indicates your data is better than the typical, the blue are indicates the typical region for data, and the red area indicates your data is worse than typical.

10.3.1 Aperture Sharpness Profile

The Aperture Sharpness Profile shows the sharpness of the captured images across the aperture range.



FDS Interpretation

The FDS overlay shows the typical sharpness obtained by other users of the same camera/lens combination, with the blue area representing the majority of user results, and the green and red values showing better and worse sharpness values respectively.

In the example above, we can see that the tested lens fits within the typical range from f/22 through to f/4 but then starts to degrade below expected performance.

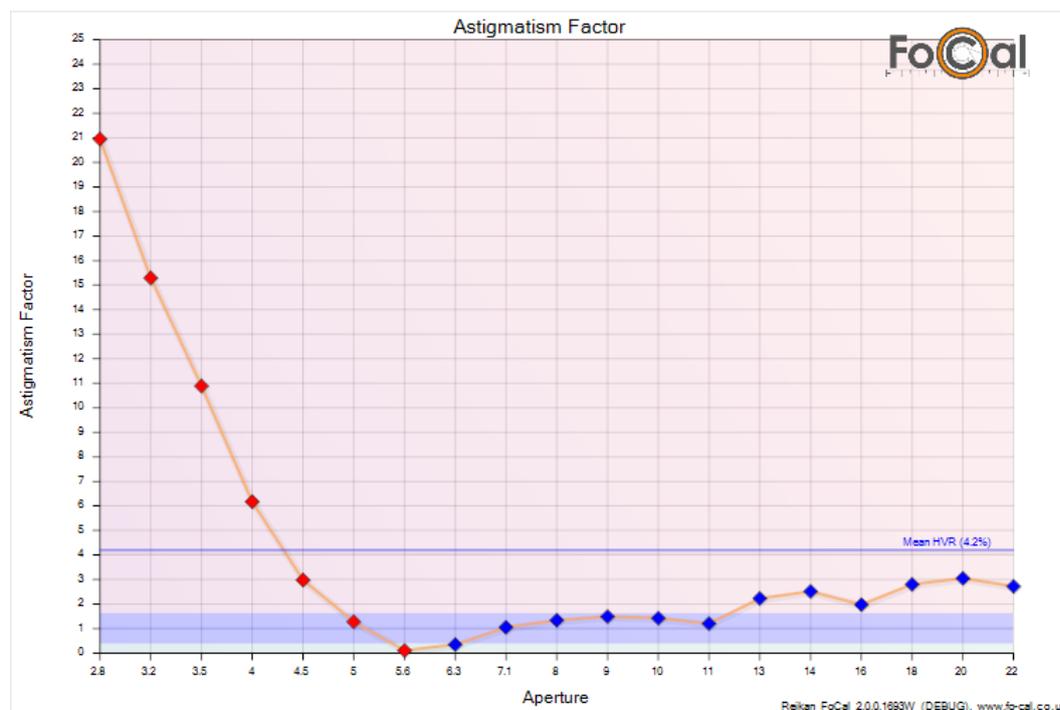
10.3.2 Astigmatism Factor (vs Aperture)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a large increase in the astigmatism factor as the lens is stopped down below f/5.6.



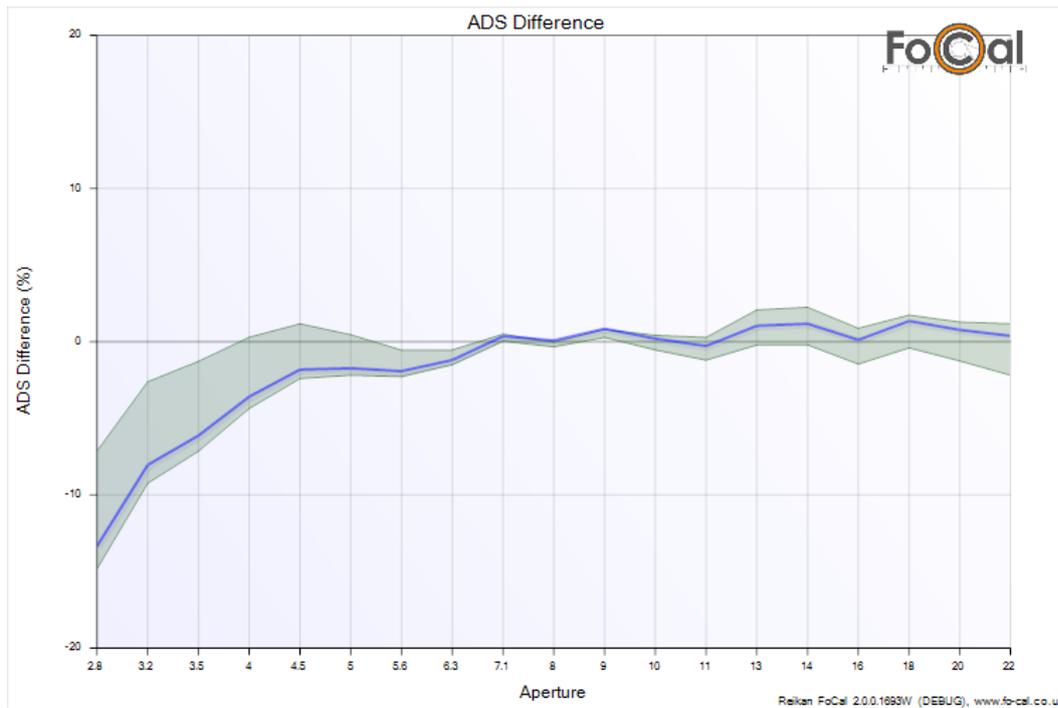
FDS Interpretation

The FDS overlay shows the typical results obtained from other users of the same camera/lens combination. Points in the blue area (or close to it) indicate no real issues, but if the points rise into the red area (as shown below f/5 in the example above) this can indicate lens element alignment issues or other problems with the lens itself.

10.3.3 ADS (Aggregate Data Set) Difference

The ADS Difference indicates how your data compares to the typical data from other users of the same camera and lens. Note that this chart will not be shown if you do not have a FoCal Data Subscription or there is no data available for your camera and lens combination.

A value that is generally close to 0 is good (this means your data is very similar to the typical data). Odd peaks away from zero are nothing to worry about, but if the data is – on average - a long way from the 0 line then this may indicate issues with your camera or lens.



FDS Interpretation

What you are looking for in this chart is a line that is close to flat and running close to 0 (the above example is within limits with apertures smaller than f/5 but starts to diverge as the lens reaches maximum aperture).

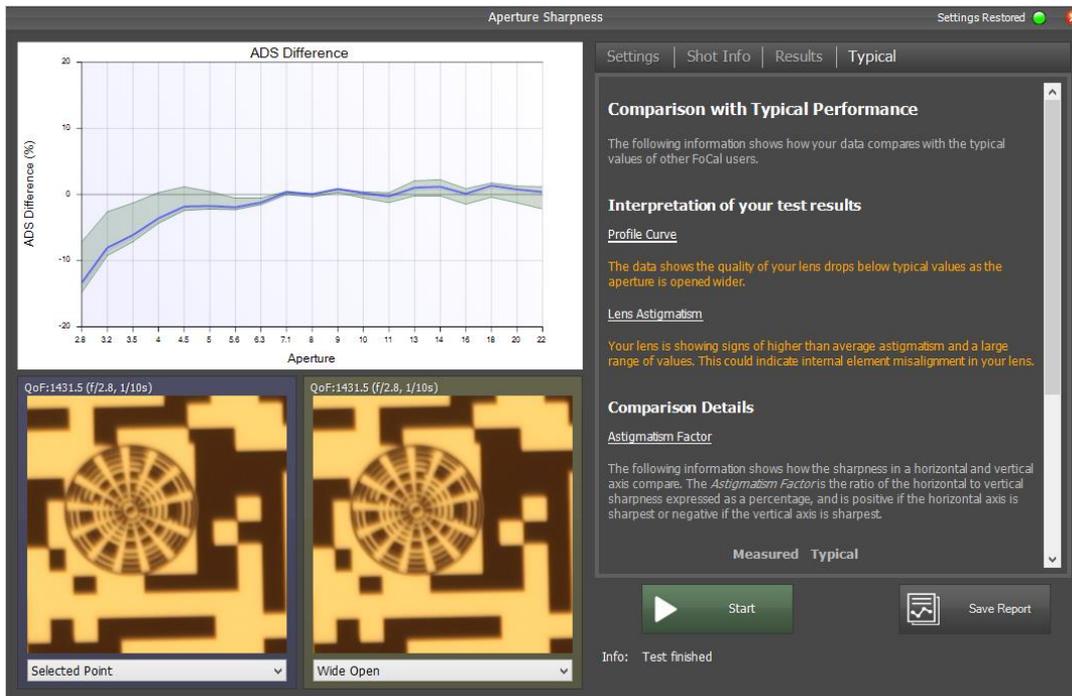


10.4 Typical Comparison

If you have a FoCal Data Subscription you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.

The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



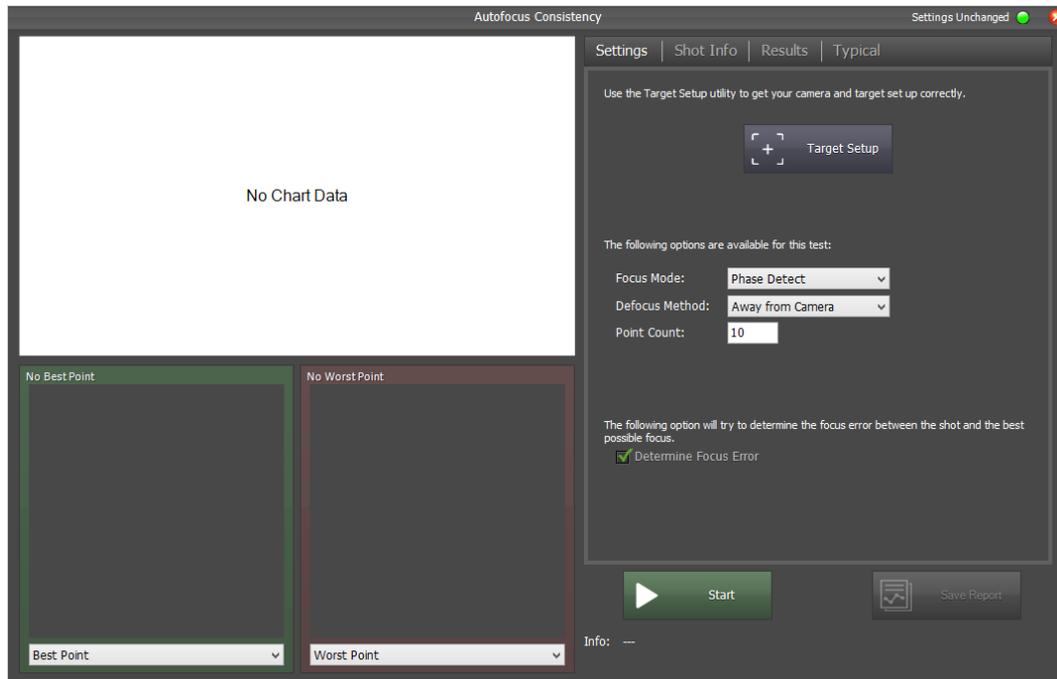
10.5 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T	Select the (S)ettings, Shot (I)nfo, (R)esults or (T)ypical tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

11 AF Consistency

The initial AF Consistency window is shown below:



Features include:

- Tabs for Settings, Shot Info, Results and Typical comparison
- Control buttons (bottom right)
- Analysed Image panels (bottom left)
- Chart (top left)

A new feature – *Determine Focus Error* – is enabled by default in the Settings panel. When enabled, this will allow FoCal to attempt to determine the difference between the focussed point quality and the absolute best quality that could be achieved if manually focussed. This is determined after each shot and will extend the test time, but will provide extra information in the results. *Note that this feature is experimental and may not operate perfectly.*

Note that the AFMA Range option of FoCal 1 is no longer available in this test, but will be implemented as a new *AFMA Range* test in a future version of FoCal 2.

11.1 Tab Pages

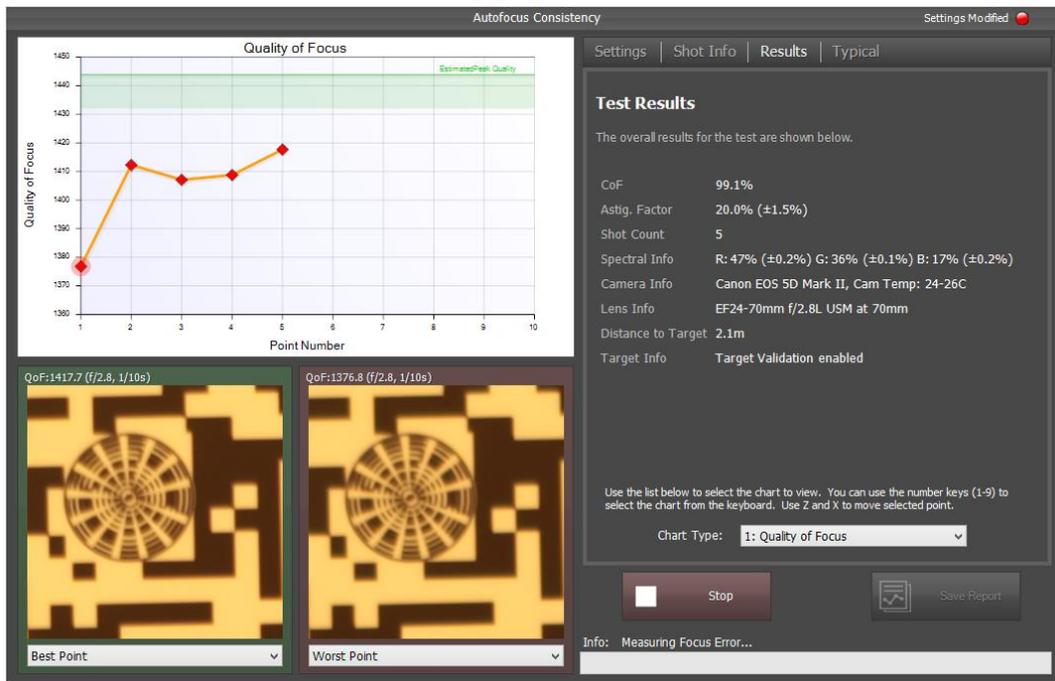
The following pages are available, along with a shortcut key shown in brackets:

- Settings (S) – the settings for the test
- Shot Info (I) – information about the currently selected point
- Results (R) – overall test results
- Typical (T) – comparison with typical data of other FoCal users (required FoCal Data Subscription, see section 6)

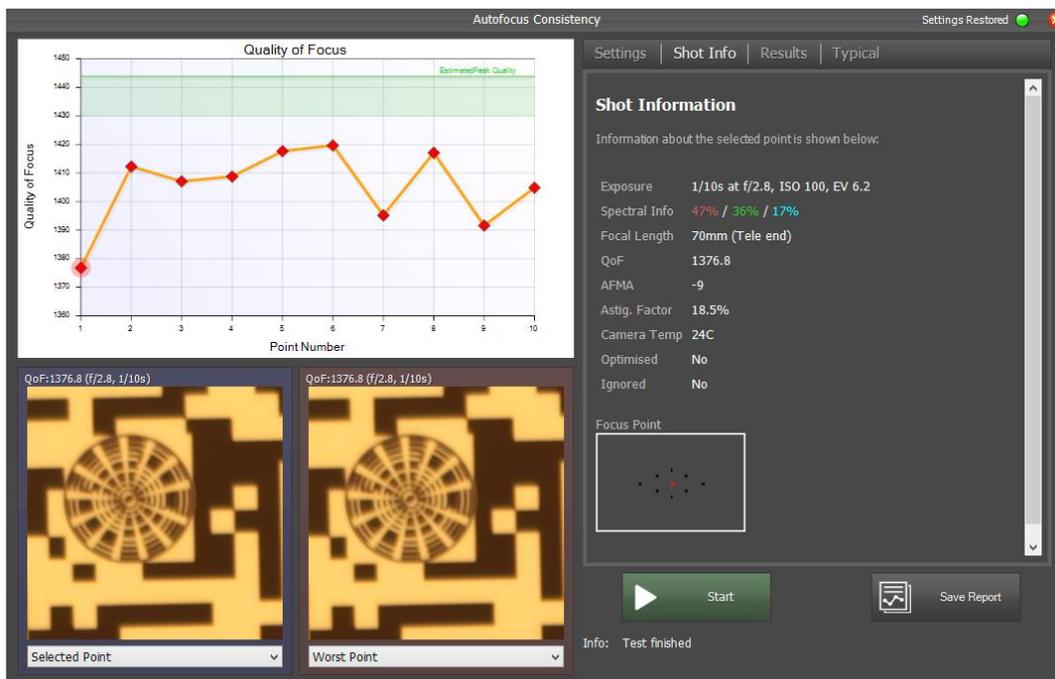
You can select a tab page by clicking the title or pressing the appropriate key at any time.

11.2 Running the Test

Once Target Setup has been confirmed, you can hit *Start* to begin the test. The test will run, analysing images at different apertures and displaying the overall results in the *Results* panel:



Clicking on any point on the chart will show the *Shot Info* panel for details about the specified selected point:



11.3 Charts

There are a number of charts that can be shown giving information about the results from your test.

Note that hitting the CTRL+C key at any time will copy the current chart to the clipboard.

You can select the charts from the list in the *Results* page or using the shortcut key shown in brackets below:

- Quality of Focus (1) – the sharpness across the AF Microadjustment / AF Fine Tune range
- Result Progression (2) – how the final result calculation has changed as the test has run
- Astigmatism Factor (3) – a value showing how the horizontal and vertical sharpness compare
- Absolute Focus Error (4) – the difference between the autofocus shot quality and the best possible quality
- Percentage Focus Error (5) – the difference between the autofocus shot quality and the best possible quality as a percentage
- Focus Position Error (6) – the autofocus position error in either lens drive motor units or AF Microadjustment units if the data is available.

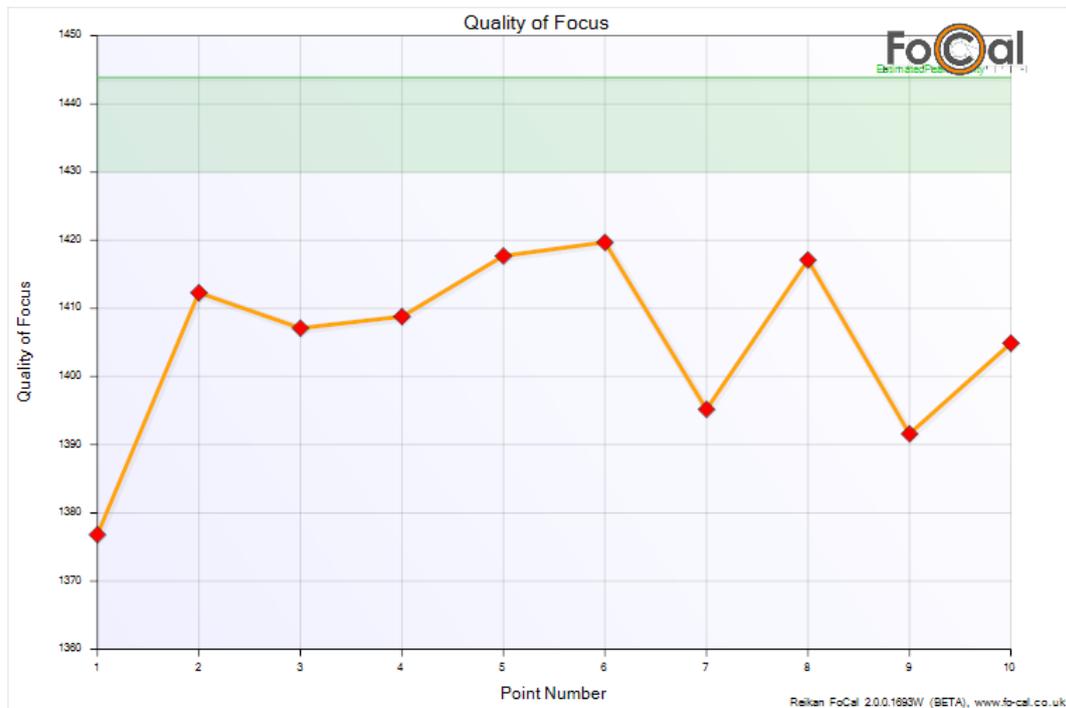


If you have a FoCal Data Subscription (see section 6), the charts will show indications about how your data compares to the typical data from other FoCal users with the same camera body and lens. These indications are shown as coloured areas. The **green** area indicates your data is better than the typical, the **blue** are indicates the typical region for data, and the **red** area indicates your data is worse than typical.

11.3.1 Quality of Focus

The Quality of Focus chart shows the sharpness for each tested point during the test.

If the *Determine Focus Error* option is enabled, a horizontal green band will be displayed on the chart. This represents the range of the estimate for the best sharpness of the camera/lens with perfect focus.



Interpretation

A wide variation of Quality of Focus values across the test could indicate issues with focusing for this camera/lens combination.

If the *Determine Focus Error* option is enabled, the green band displayed will help determine if there is a fixed focus offset that needs calibration. If the green band is significantly higher than the average values of the test points, this could indicate the need for focus calibration.

The example above shows a gap between the test points and the green band, but the absolute Quality of Focus values are not so different. The band ranges from 1430-1440, and the average test point value is around 1400. This represents a focus error of around 2-3% which is not a huge difference.

11.3.2 Result Progression

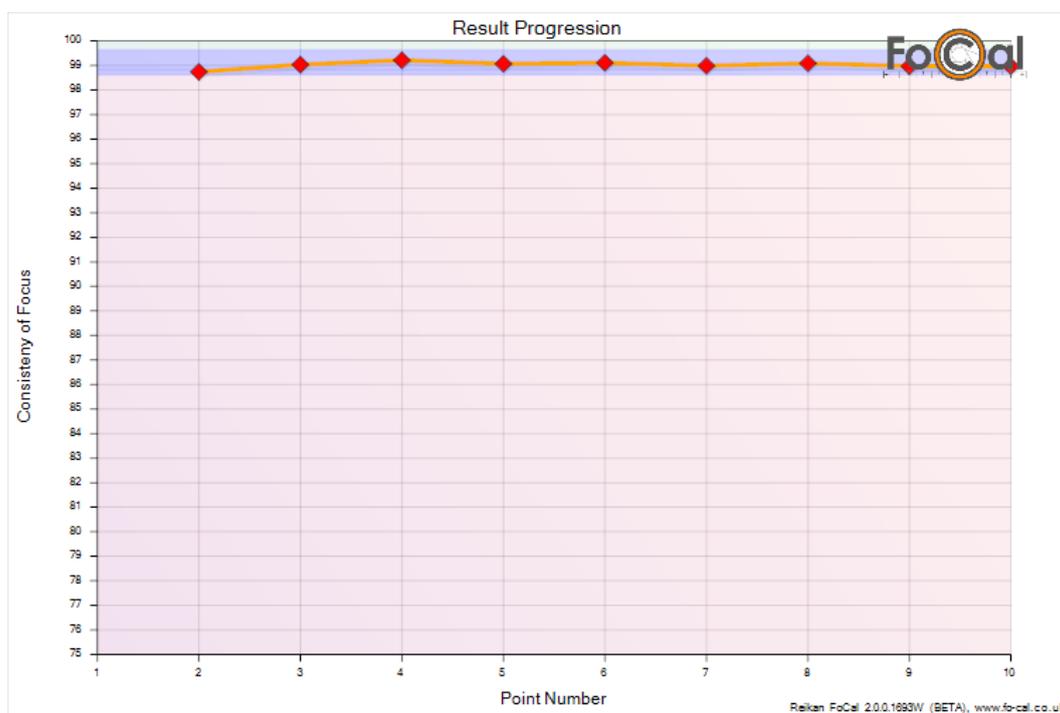
This chart shows the how the Consistency of Focus value progresses across the test.

The quality of the AF system as a whole is indicated by the Consistency of Focus (CoF) value. This is the peak-to-mean Quality of Focus (QoF) ratio expressed as a percentage, calculated as follows:

$$\left(\frac{QoF_{mean}}{QoF_{best}} * 100 \right) - 100$$

A theoretically perfect AF system will have all points at exactly the same QoF value, resulting in a CoF of 100%.

The points shown on this chart indicate how the value settles across the test, so the far-right value is the point representing the most complete result.



FDS Interpretation

The FDS overlay shows the typical green/blue/red bands representing the typical values from other FoCal users with the same camera/lens combination.

The bands show the final results from other users tests (so the values don't vary across the chart). A camera/lens under test that behaves in a typical way will have the right-most point of the chart above within the blue area, while a poorly performing camera and lens will have a value that drops significantly into the red area. If the test results show a value in the green then the camera/lens combination is performing better than average.

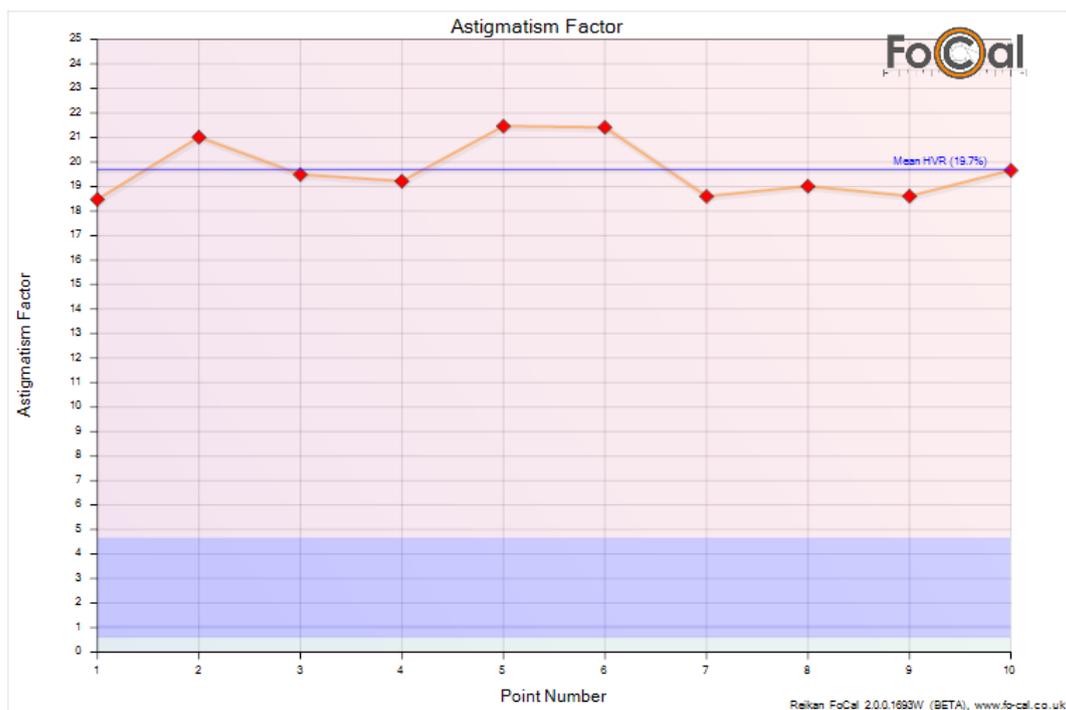
11.3.3 Astigmatism Factor (vs Shot)

The Astigmatism Factor is an indication of how the sharpness differs between horizontal and vertical analysis.

This is still a developmental analysis metric, but it can be used to indicate misalignment of lens elements, lens mount or possible damage to the lens or camera.

Blue markers are used to represent points where the sharpness is highest in the vertical direction, while red markers show points where sharpness is highest in the horizontal direction. For values close to 0 the colour is irrelevant, but for higher values this can give an indication of specific lens-element alignment problems within the lens itself.

Typically, the results should be fairly consistent across the range, and the average value should be below about 10%. The example below shows a known defective Canon lens which sustained some impact damage and shows a large astigmatism factor with an average of 19.7% (the points are red so the horizontal sharpness is around 20% higher than the vertical sharpness).



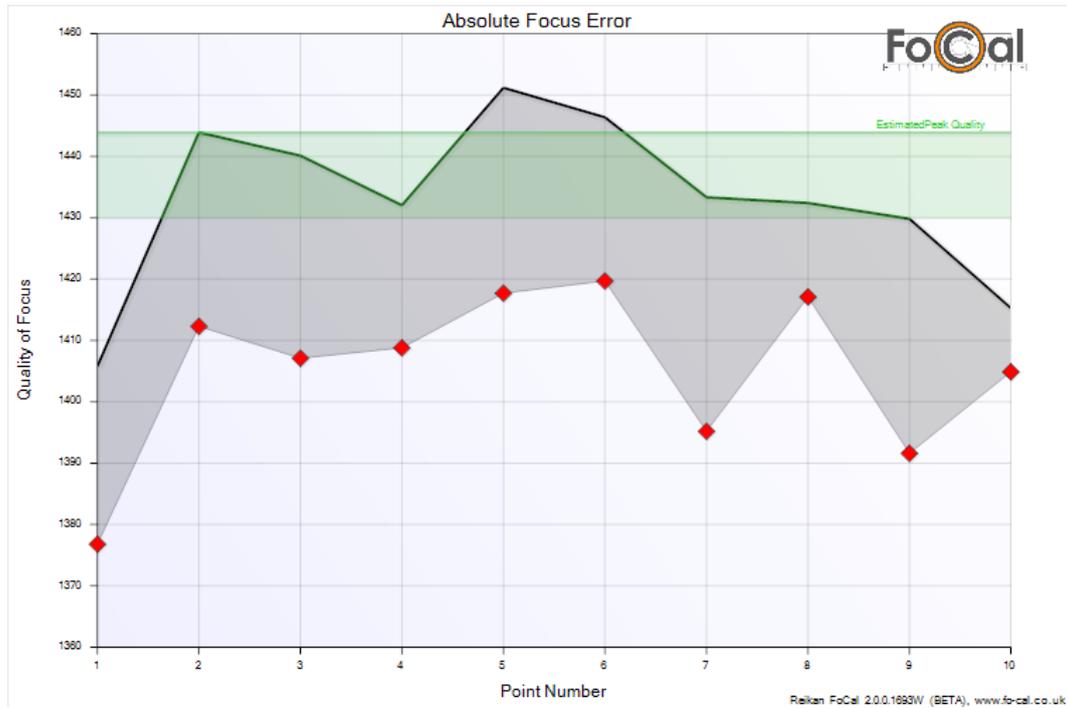
FDS Interpretation

The FDS overlay shows the typical results obtained from other users of the same camera/lens combination. Points in the blue area (or close to it) indicate no real issues, but if the points rise into the red area (as shown in the example above) this can indicate lens element alignment issues or other problems with the lens itself.

11.3.4 Absolute Focus Error

This chart is only available if the Determine Focus Error option is enabled.

This chart shows the estimate of the best possible quality achievable for each test point. Due to the way that this value is calculated there is some variance in the estimated best quality, but the combination of the values across the test provides a statistically significant result.

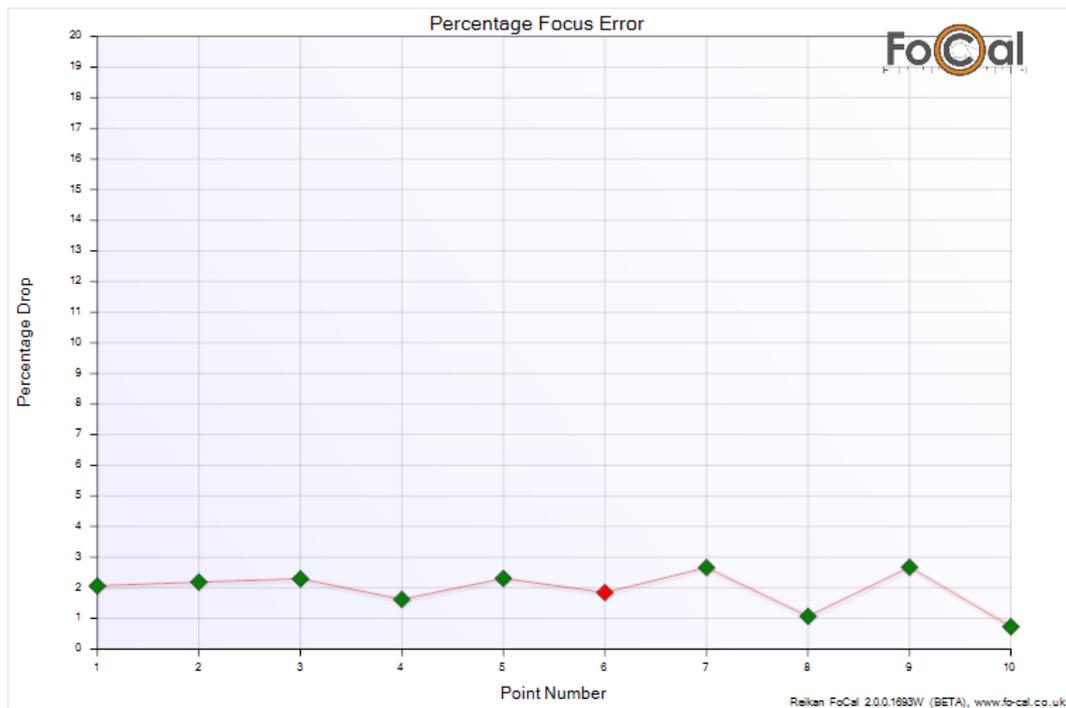


11.3.5 Percentage Focus Error

This chart is only available if the Determine Focus Error option is enabled.

This chart indicates the percentage quality increase that could be achieved by refocusing the lens to the best possible sharpness for each shot.

Points marked in **green** are deemed to be fair representations of the absolute quality achievable, while points marked in **red** may be less accurate.



Interpretation

A line that has pretty stable, even values across the range (as shown above) indicates that the results were similar for all test points and gives confidence to the quality of the result.

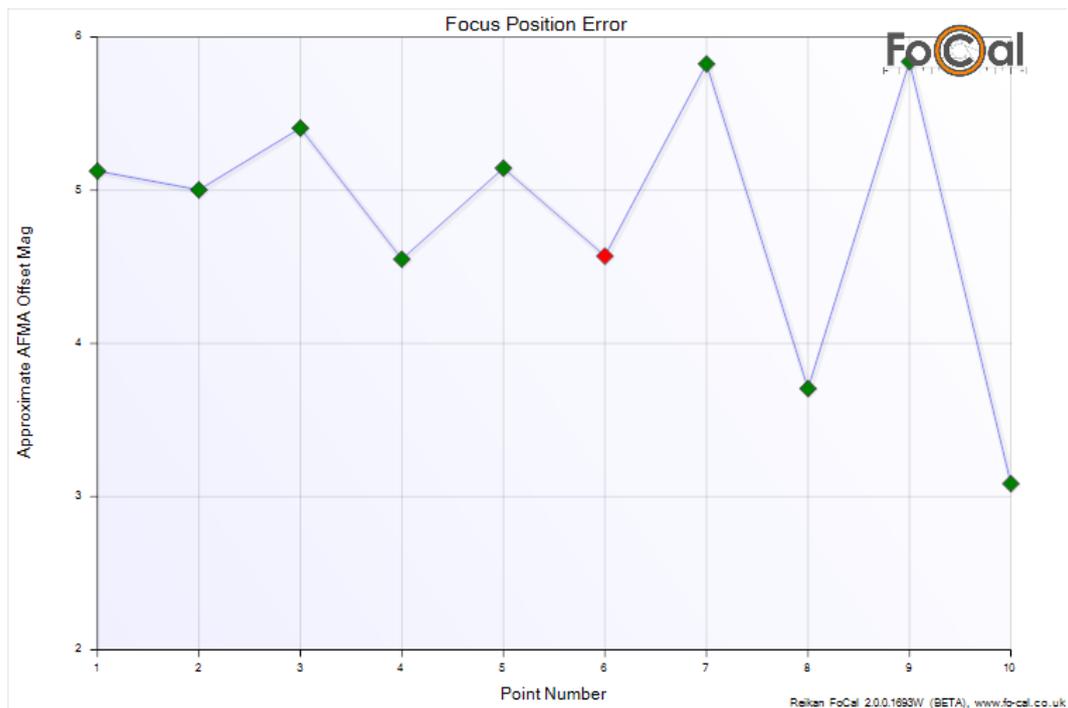
A small error indicates that the focus achieved by the camera during the test is close to the best possible quality. If the line is similar to above, but rising above about 5% on average, the camera focus is very likely to require calibration which you can do by running the *Fully Automatic Calibration*.

11.3.6 Focus Position Error

This chart is only available if the Determine Focus Error option is enabled and there is a valid FoCal Data Subscription.

By using the FoCal lens profile model and information obtained from other FoCal users with the same camera/lens combination, it is possible to approximately predict the AF Microadjustment/Fine Tune error indicated by the focus position error data.

In the example below (which is built from the same data used in the other charts above), the average value is around 4-5 AF Microadjustment units so it would be well worth running this camera/lens through the *Fully Automatic Calibration*.

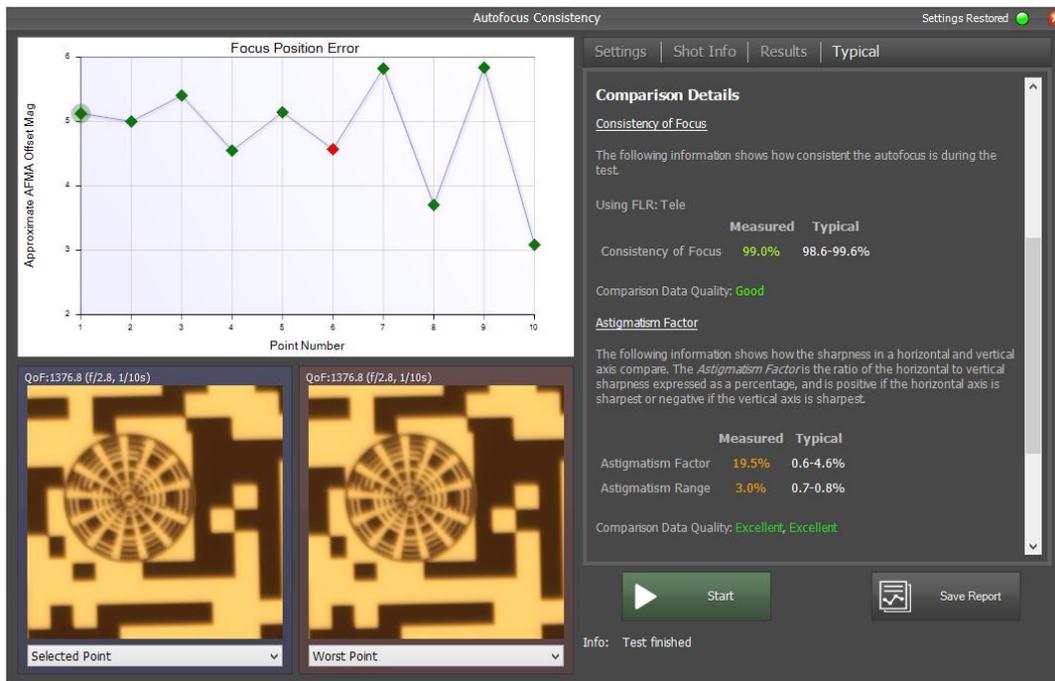


11.4 Typical Comparison

If you have a FoCal Data Subscription you will be able to see information about how your test results compare to typical FoCal users with the same camera and lens.

NOTE: This is a new feature and will be developed more over the course of the initial FoCal 2 Test Releases.

The *Typical* page will show information about different aspects of your test results, and towards the bottom of the page you will see the numeric values for your results and the typical results from other users.



11.5 Useful Keys

The following is a list of the keyboard shortcuts available for this test:

Z,X	Highlight the previous or next point on the chart and display the Shot Information for this point.
1-5	Switches to a specific chart view
CTRL+S	Enable/Disable RGB mode
R, G, B	When RGB mode is enabled, show the analysed Red, Green or Blue images and highlight the information on the chart
S, I, R, T	Select the (S)ettings, Shot (I)nfo, (R)esults or (T)ypical tab.
,	When not running a test, display the FoCal Settings window.
CTRL+C	Copy the chart image to the clipboard.

12 History

A new feature in FoCal 2 is the ability to review the results of previous tests run on your computer. This applied to tests run with FoCal 1 as well as FoCal 2, so from the first time you run FoCal 2 you should find you have a populated history already on your computer.

12.1 Accessing the History

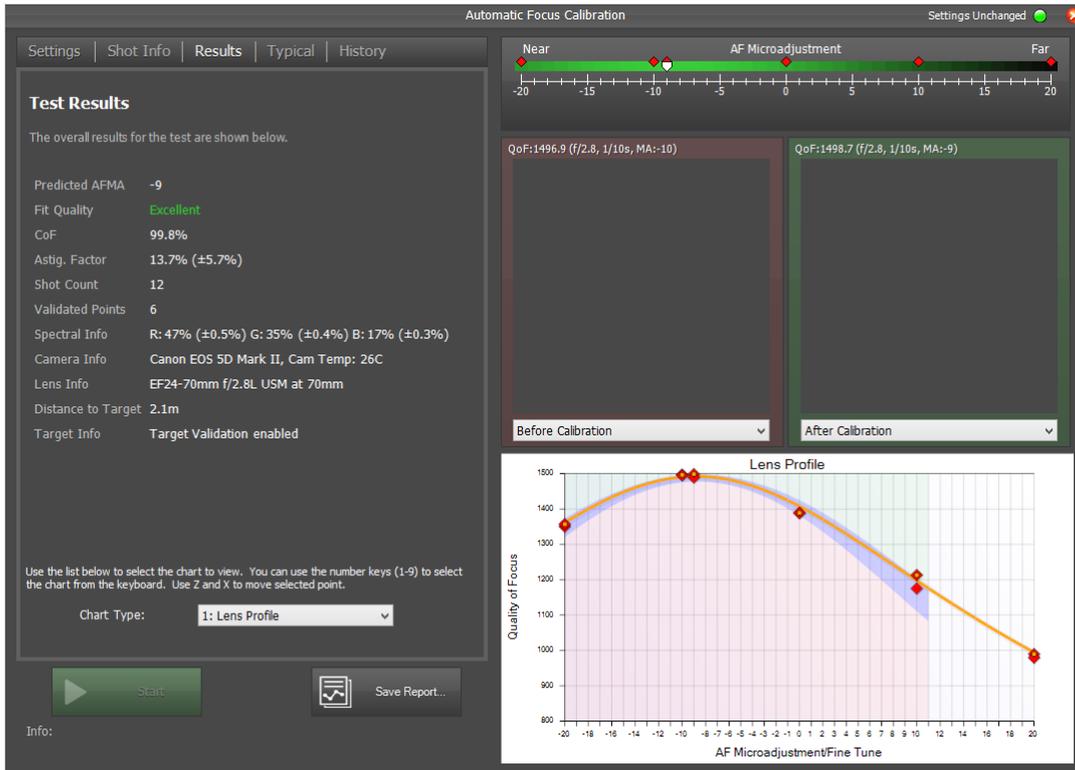
To see the history on your computer, you can select the *History* button from the *Tools* tab of the main FoCal window. This will show the window below:

Test Time	FoCal Version	Focal Length	Result Summary
Yesterday	2.0.0.1693W	70mm	-9 (Quality is Excellent)
Yesterday	2.0.0.1692W	68mm	-10 (Quality is Excellent)
14 days ago	2.0.0.1652W	24mm	-11 (Quality is Acceptable)
14 days ago	2.0.0.1652W	24mm	-11 (Quality is Excellent)
14 days ago	2.0.0.1652W	34mm	-8 (Quality is Acceptable)
14 days ago	2.0.0.1652W	34mm	-7 (Quality is Poor)
14 days ago	2.0.0.1652W	70mm	-5 (Quality is Acceptable)
15 days ago	2.0.0.1652W	70mm	-9 (Quality is Poor)
55 days ago	2.0.0.601W	65mm	-12 (Quality is Acceptable)
55 days ago	2.0.0.601W	65mm	-6 (Quality is Poor)
55 days ago	2.0.0.601W	65mm	-4 (Quality is Poor)
67 days ago	2.0.0.601W	70mm	-1 (Quality is Good)

From here, you can use the drop down lists to choose the camera, lens and test that you want to see results for. Any tests that can be displayed are shown in the big list view in the window – this will include the time the test was run, the version of FoCal used and some extra information about the test (this will depend on the test that was run).

12.2 Test Details

By clicking on an entry in the list, you can then see the details for this test.

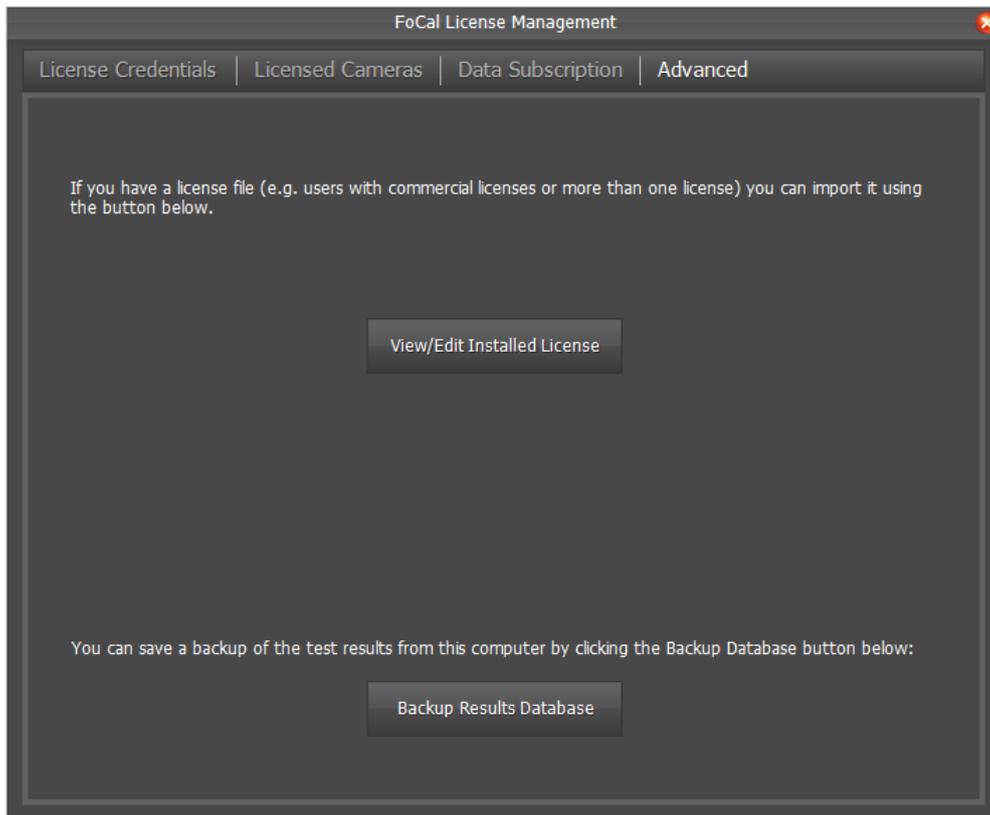


This will include as much information as possible, but may not include all the features available within FoCal 2. For example tests run for FoCal 1.9.5 and later will have populated Astigmatism Factor, but tests run before FoCal 1.9.5 will have no results for this specific metric.

Note also that the history information does **not** include any images, so although you will be able to see the numeric data and charts for the results, you will not be able to review any images.

12.3 Backup Local Results

FoCal 2 offers the ability to back up your results data that has been captured for all your previous tests. In order to do this, open the License Management window (click *About* in the main FoCal window, then click *License*) and choose the *Advanced* tab. At the bottom of the window is *Backup Results Database* – click this and choose a location for the file to be saved.

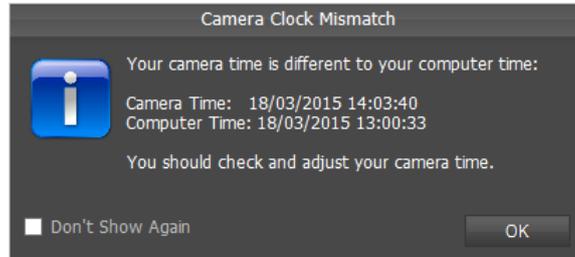


At present, there is no way to import this backup data into FoCal, but this feature will be added in a future version. *It is a good idea to periodically back up your results database and store on another computer so in the event of computer failure the results can be restored.*

13 Camera Time Check

FoCal 2 will now inform you if the time of your camera clock is significantly different compared to the time on your PC. This can be very useful in catching daylight saving time changes and keeping your camera time correct.

If you connect a camera with a time significantly different to the computer it is connected to, you will see the following message:



If necessary, you can disable this feature by unticking the *Inform of camera time difference* option in the *Settings* window.

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