

OCAL Electronic Collimator User's Manual



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Version : 1.30



Version

Date	Version	Content
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Contents

1	Introduction.....	4
1.1	What is OCAL?.....	4
2	Product Description.....	5
2.1	Product Parameter.....	5
2.2	What's in the Box.....	5
2.3	Software.....	6
2.4	Product Safety Issues.....	6
3	Prepare to Use OCAL.....	6
3.1	Install the Collimator.....	6
3.2	Connect to the computer.....	7
3.3	Precautions Before Use.....	7
4	Step by Step Collimation.....	13
4.1	Define Orientation.....	13
4.2	Four-steps to Collimate Your Telescope.....	14
5	A Case of Actual Sharing.....	19



1 Introduction

1.1 What is OCAL?

Thank you for purchasing and using OCAL electronic collimator. OCAL electronic collimator is an ideal and superior tool for carrying out precise collimation of Newtonian reflector, Ritchey-Chrétien telescope and other reflecting telescope.

Collimating your telescope by our OCAL is an easy and comfortable experience. By ideal condition, it's easy to archive minimum 0.08mm primary mirror axial error.

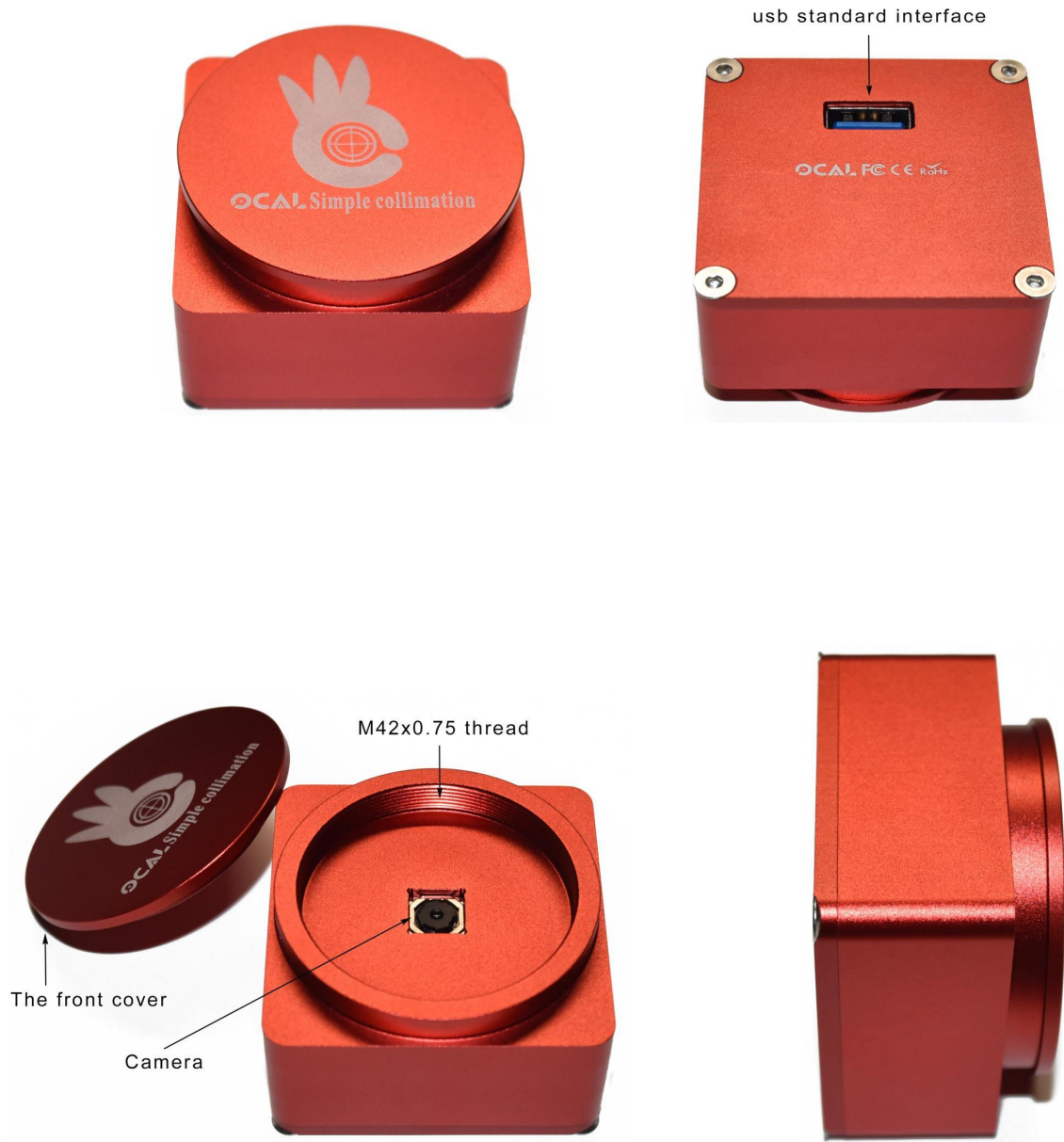
Before using OCAL, we strongly suggest you read this manual at first place. If you have any question about OCAL and collimation of your telescope, please contact us via email : huogo558@gmail.com or WeChat ID: 175768073. We will reply you ASAP.

2 Product Description

2.1 Product Parameter

ocal side length is 51mm, height 32mm, weight 134 gram. Connect PC by a USB type A male / USB type A male cable. Support by Microsoft Windows 7 and above operation system.

2.2 What's in the Box





2.3 Software

Please download the OCAL operation program on the official website. Both PC Windows base and Android Tablet/mobile phone are supported.

2.4 Product Safety Issues

OCAL is certificated by U.S. FCC and EU CE to ensure property safety.



3 Prepare to Use OCAL

3.1 Install the Collimator

There is M42 x 0.75 female threads on OCAL after open the top cover. We recommend the following methods to setup initial OCAL

- 3.1.1 If your focuser has M42 x 0.75 male threads, just screw up OCAL to the thread on focuser directly.
- 3.1.2 If there is no threads at ending of focuser and it use compressing ring or screw fixed brass ring. Please use some kind of extension adapter, such like 2-inch to m42Screwing OCAL to the coupling threads of coma corrector lens, and insert coma corrector lens into focuser directly. This method will get more precise collimation.

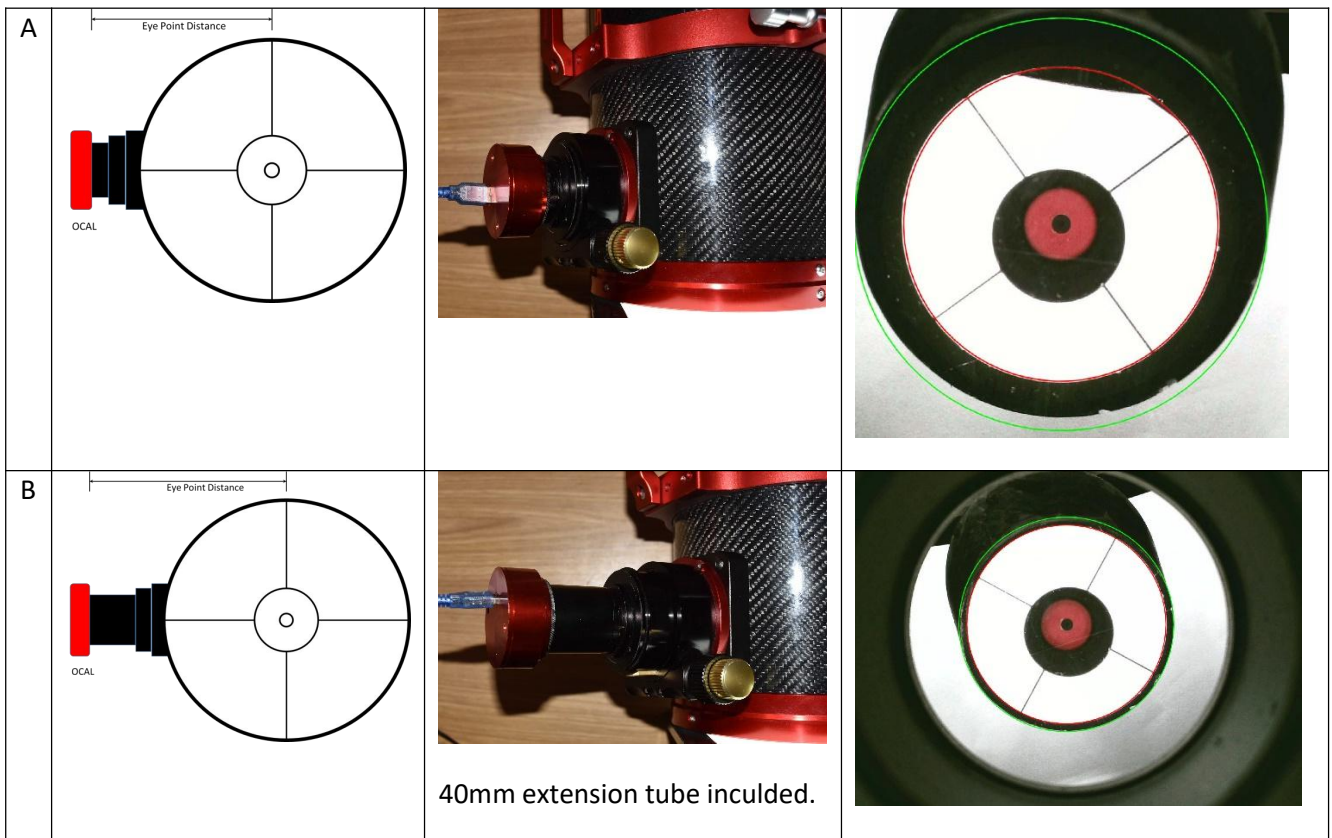
3.2 Connect to the computer

Just connect OCAL to the computer through the USB type A cable which attached with OCAL product. Plug and play on Windows operation system.

3.3 Precautions Before Use

3.3.1 Eye Point

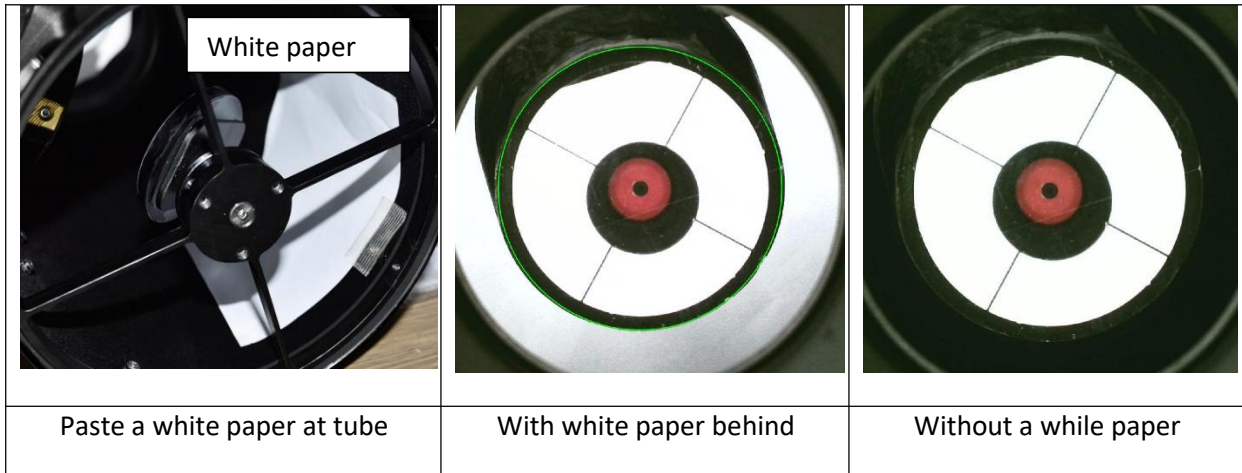
We define the distance from secondary mirror to OCAL as "Eye Point Distance." The OCAL view of A and B have little difference between red and green circles.



The eye point of type A is shorter distance than type B. We will see large gap between red and green circles, that means we are easy to distinguish red and green circle. However, OCAL at type B eye point distance, we will get more precise collimation result due to the its near real well focused position. We recommend you trying type B while carry out collimation in order to get best result.

3.3.2 Attached a White Paper

Paste a suitable size of white paper behind the secondary mirror at side wall of telescope tube. That makes the shape of secondary mirror is easier to observe.



3.3.3 Center calibration code

Each OCAL has its individual center calibration code. At first, find printed series number on your OCAL, look up SN and paste the data in that row and paste into focus.txt that in the same folder with OCAL program.

	<table border="1"> <tr><td>237</td><td>1d27</td><td>0 0 1623.08 1224.35</td></tr> <tr><td>238</td><td>1d28</td><td>0 0 1625.03 1242.58</td></tr> <tr><td>239</td><td>1d29</td><td>0 0 1644.03 1240.87</td></tr> <tr><td>240</td><td>1d30</td><td>0 0 1665.56 1219.51</td></tr> <tr><td>241</td><td>1d31</td><td>0 0 1636.99 1247.87</td></tr> <tr><td>242</td><td>1d32</td><td>0 0 1652.13 1229.49</td></tr> <tr><td>243</td><td>1d33</td><td>0 0 1658.33 1241.07</td></tr> <tr style="border: 2px solid red;"><td>244</td><td>1d34</td><td>0 0 1656.27 1218.68</td></tr> <tr><td>245</td><td>test1</td><td>0 0 1600.05 1180.57</td></tr> </table>	237	1d27	0 0 1623.08 1224.35	238	1d28	0 0 1625.03 1242.58	239	1d29	0 0 1644.03 1240.87	240	1d30	0 0 1665.56 1219.51	241	1d31	0 0 1636.99 1247.87	242	1d32	0 0 1652.13 1229.49	243	1d33	0 0 1658.33 1241.07	244	1d34	0 0 1656.27 1218.68	245	test1	0 0 1600.05 1180.57
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245	test1	0 0 1600.05 1180.57																										

SN is 1d34

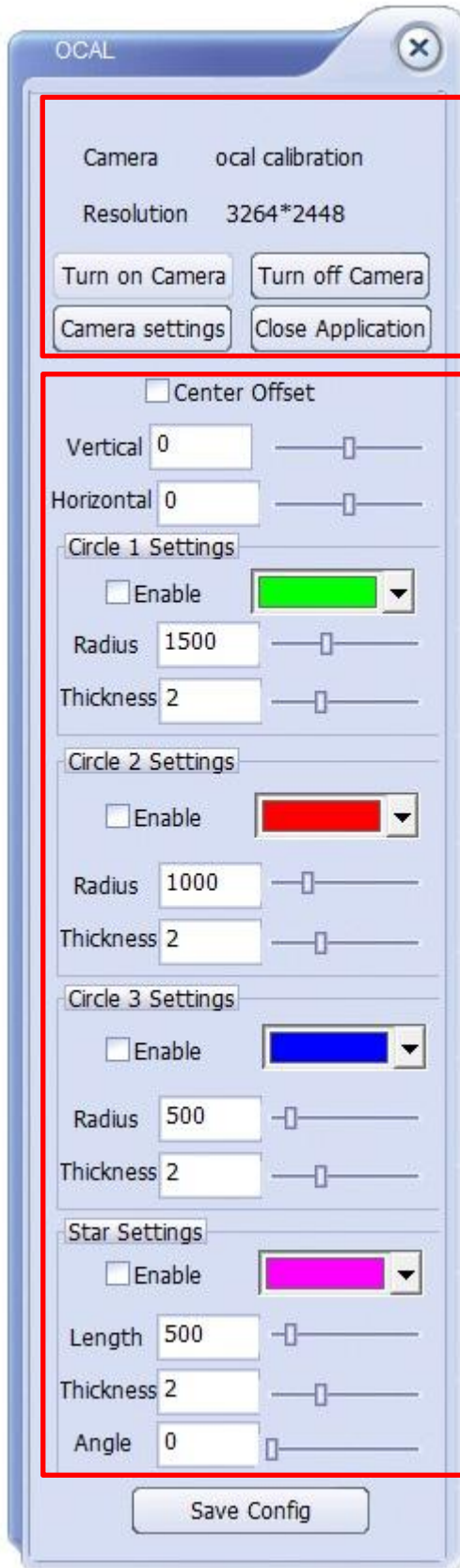
Find 1d34, then copy the string of 0 0 165.27 1218.68

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Edit focus.txt	Paste the string of 0 0 165.27 1218.68 into focus.txt and save the file.
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3.3.4 Operating OCAL program
Main screen



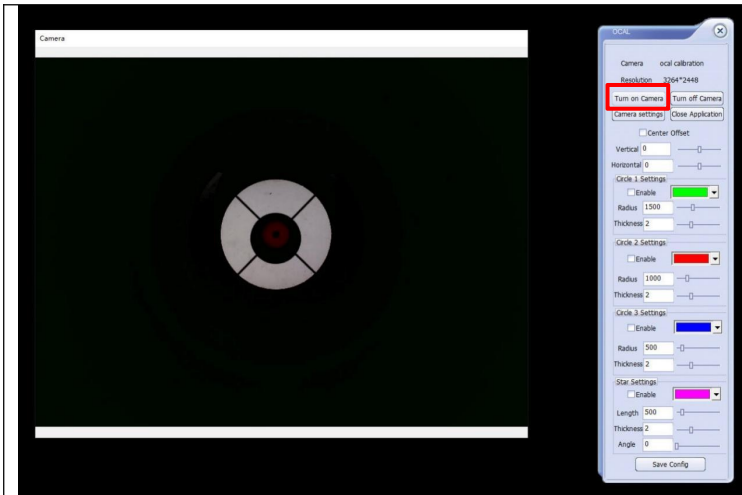
Main Function :

View windows resolution, turn on/off camera, camera settings and close application

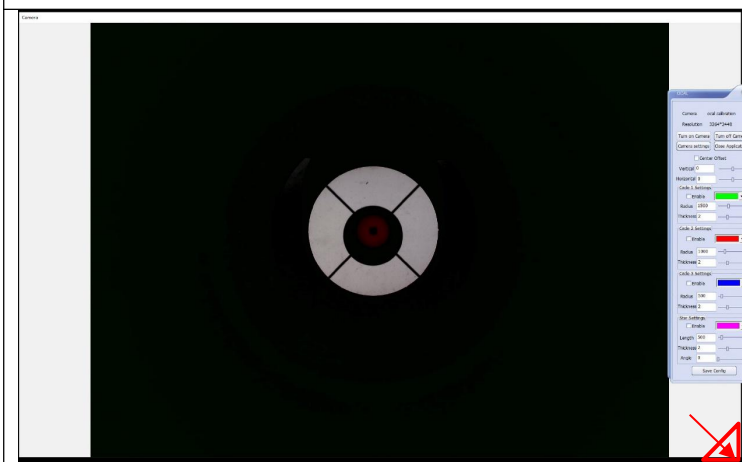
Center offset function, small adjust the reticule position of OCAL

Check to enable circle and adjust the radius and thickness by scroll wheel of mouse.

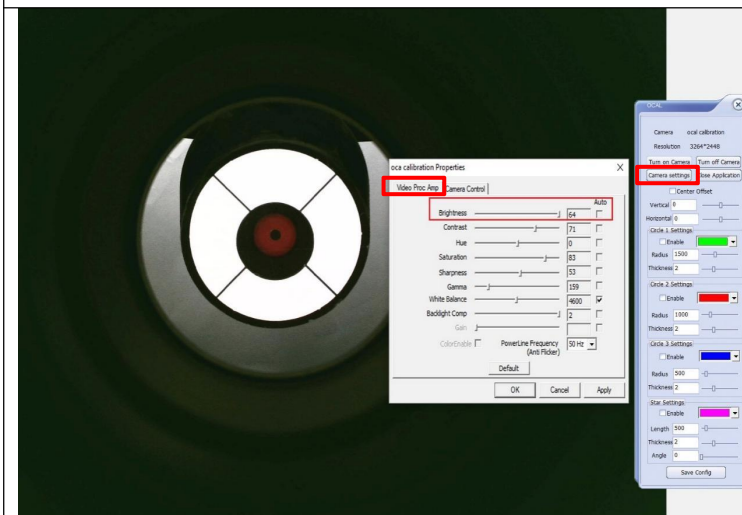
Save all parameters and setting. Next time you execute the program, initial setting will accordly.



After execute OCAL.exe, then "Turn on Camera".



Drag the corner of Camera window, to enlarge the display size.



Click "Camera Settings". There are some video setting. Adjusting Brightness, Contract or other setting to a suitable value.

	<p>Click "Camera Control". Try to adjust Focus and Exposure to suitable value.</p>
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3.3.5 Center offset function

Due to manufacturing and telescope adaptor tolerances, the OCAL program reticule may not perfectly in geometric center, we use center offset function to do slight adjustment.

The adjustment method is quite simple. Just find a circumference inside coma corrector or focuser. Then use it as reference to adjust the offset value.

	<p>Check Circle 1 on, it shows a "green" circle. Adjust it's size to match the inner circumference of coma corrector lens.</p>
	<p>Here have gap. Adjust offset value to make green circle to fit the inner circumference of coma corrector lens.</p>



In this example, green circle is perfect matched. And center offset value is

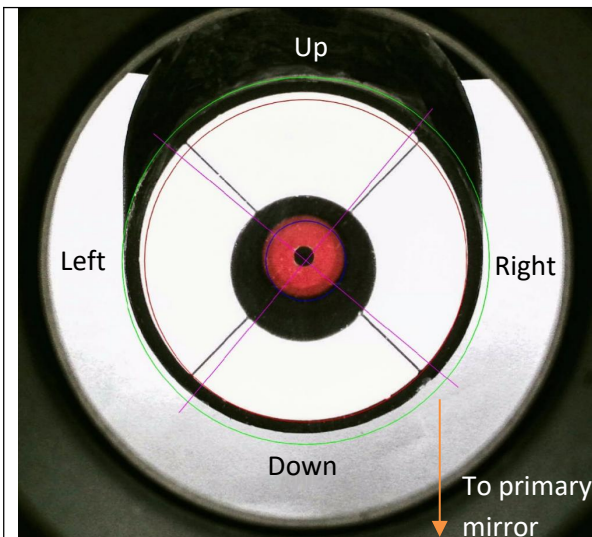
Vertical: 2; Horizontal: -3;

You may save these parameters by click "Save Config."

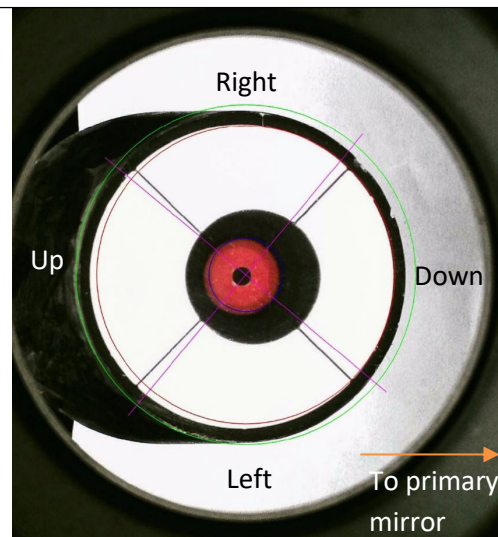
4 Step by Step Collimation

4.1 Define Orientation

Before we start collimating the telescope, we define the orientation in order to understand more clearly.



You may rotate OCAL some angle to make video display as above.



The most important collimation step of Newtonian telescope is secondary mirror positioning. Once secondary mirror positioning is done, then you have done the most difficult steps to carry out.



4.2 Four-steps to Collimate Your Telescope

4.2.1 The first step position of secondary mirror

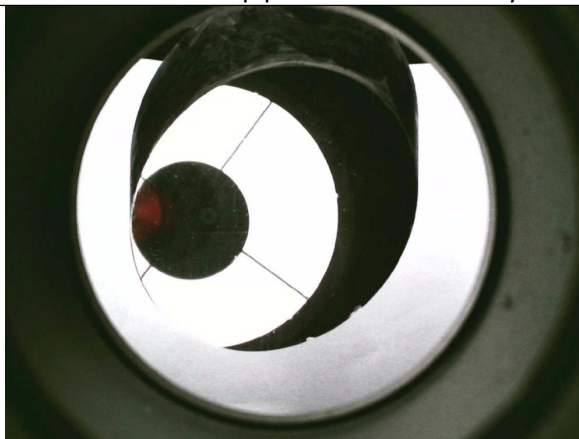


Figure 1

At beginning, this is a no collimation example. Let's go.

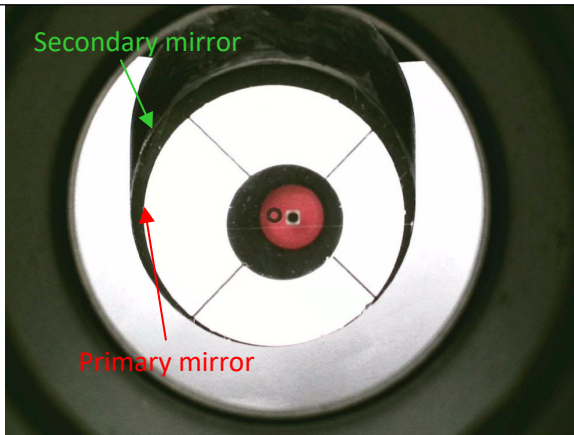


Figure 2

Slight loose the center screw of secondary mirror holder. Rotate the holder and let the secondary mirror towards to OCAL.

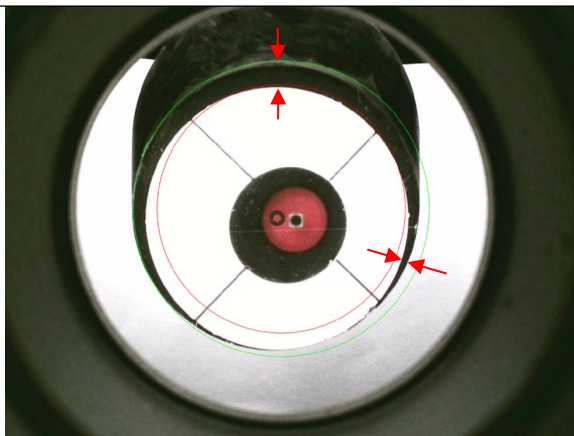


Figure 3

Check "Enable" to show circle 1 and 2. In the example, they are red and green circle. Then adjust the size of both circles to roughly equal secondary and primary mirror.

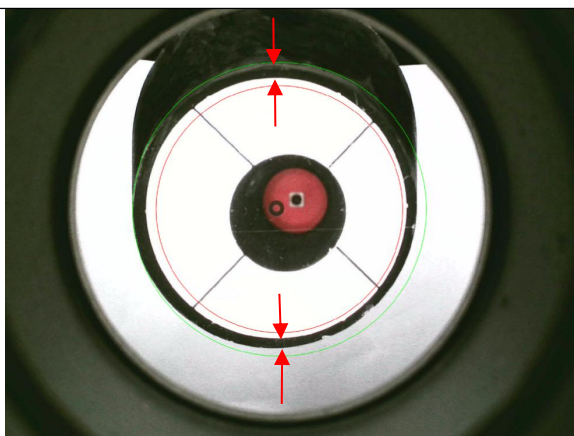


Figure 4

Try to adjust A, B, C screws of secondary mirror holder. Let primary mirror to roughly in the center of secondary mirror.

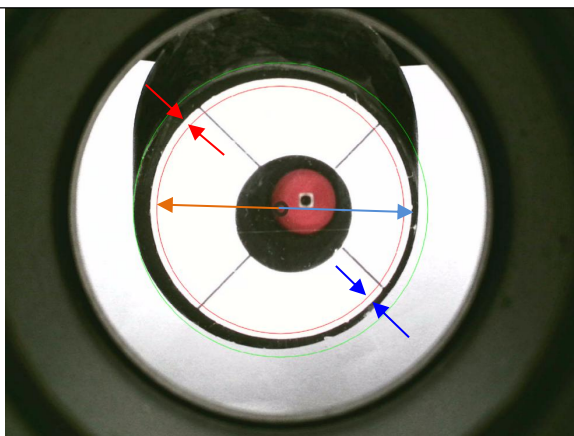


Figure 5

Rotate secondary mirror. To make sure the reflection of primary mirror in the secondary mirror is **concentric** with "red circle".

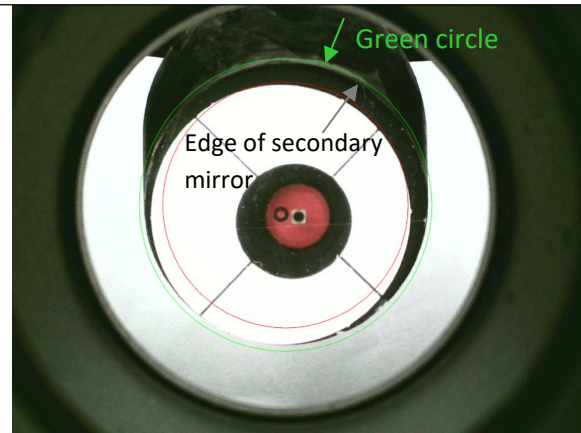


Figure 6

Now, we skip notice primary mirror. Adjust B and C screw of secondary mirror holder to make the outer shape of secondary mirror fit to "green circle".

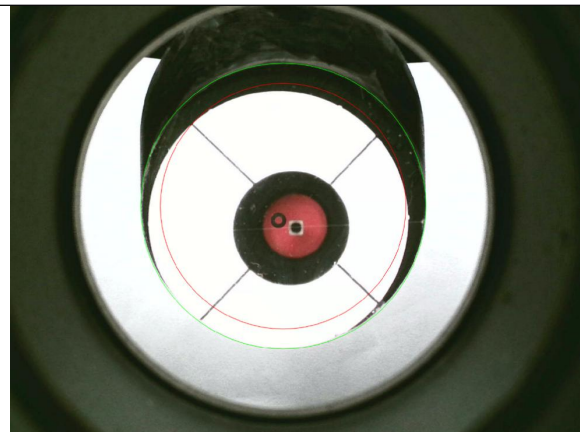


Figure 7

Change the radius of green circle on main program, let the size of green circle matching secondary mirror. Same as the adjustment of figure 6, fine tune secondary mirror holder screws.

4.2.2 The position of the secondary mirror and the primary mirror

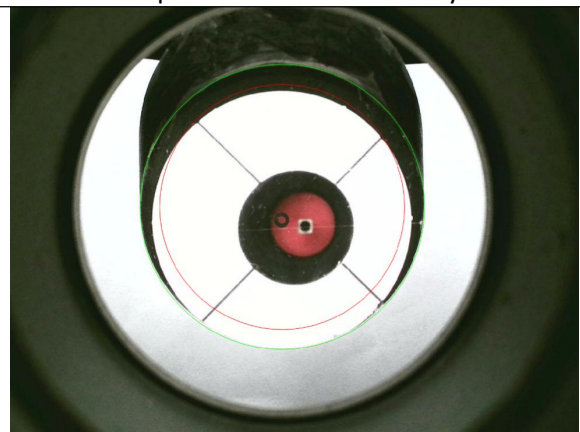


Figure 8

After the adjustment at figure 7, position of **secondary mirror is correct**, however the position of **primary mirror become incorrect**. All we need to do is to **repeat the adjustment from figure 2 to 5**.

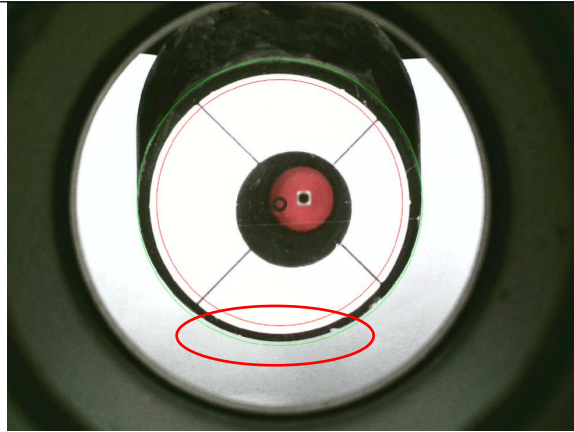


Figure 9

After few adjustments, secondary and primary mirrors are **concentric**.

In this example, there is some gap between bottom side of secondary mirror and green circle. Try to adjust screw A to change the angle of secondary mirror.



Figure 10

Change the radius of **red circle** on main program, let the size of red circle matching primary mirror.

4.2.3 The height of the secondary mirror

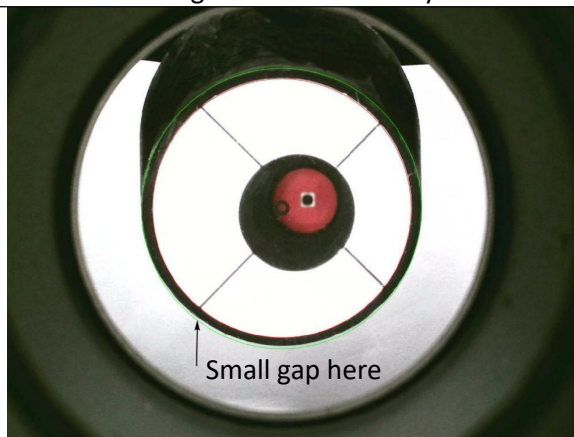


Figure 11

After all above adjustments. You may still find there is gap between green circle and edge of secondary mirror. In this case, loosen 1/4 turn (or less) of main screw of secondary mirror holder to downward it's height. And repeat the adjustment from figure 2 to 5 again.

If the gap is at top side of secondary mirror, all you have to do is tighten the main screw.

4.2.4 Adjustment of the primary mirror

In this step, we are going to deal with the three collimation screws of the primary mirror support. Before this, we must loosen the three lock screws at first. This step is a fairly easy compared to the secondary mirror adjustment that we have just dealt with.

OCAL program have following assistant indicator to help you to carry out primary mirror collimation. That are crosshairs and small size blue circle. In the next step, we will explain how to use this function to carry out primary mirror collimation.

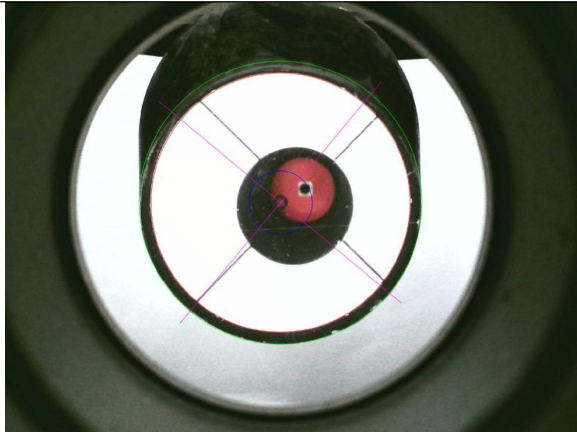


Figure 12

Check "Enable" to turn "blue circle" and "purple crosshair" on. Adjust to the similar size of blue circle to OCAL. Then loosen the three lock screws of primary mirror holder. Try to tighten one of collimation screw in order to find out the direction of movement of OCAL and primary center mark which reflected on secondary mirror.

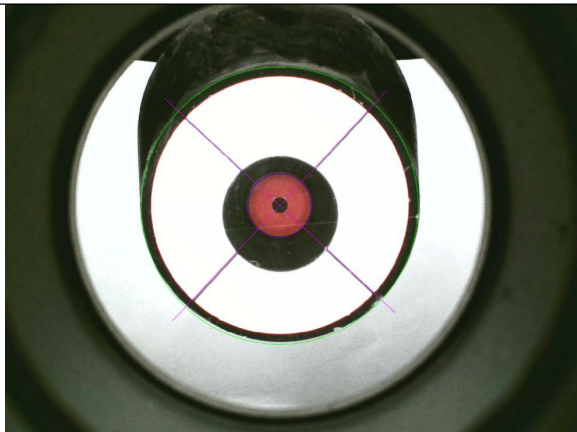


Figure 13

Adjust 3 collimation screws to make blue circle fit OCAL outer shape and center mark on primary mirror is also correct centering. In left result, your telescope is perfect collimated. Every circles are concentric.

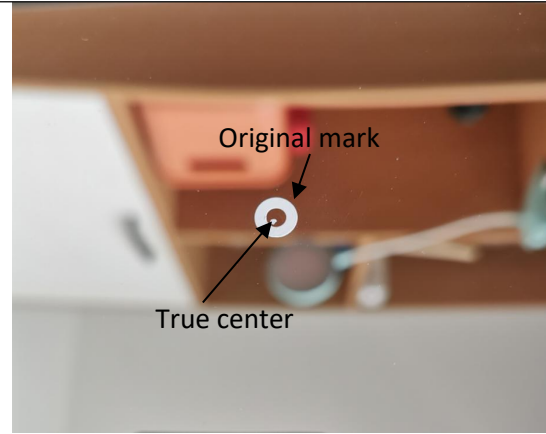
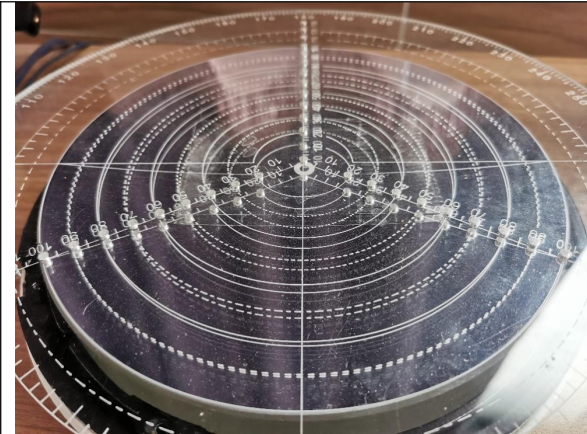
However in some cases, the center mark on the primary mirror is not able to perfect centering. That because some telescope makers made flaw on paste center mark. We will explain how to do in addendum.

4.2.5 Addendum

A perfect collimated Newtonian telescope by OCAL will find the following features:

- (a) Green circle and secondary mirror are concentric; red circle and primary mirror are concentric.
- (b) Crosshair and spider vanes are overlapped.
- (c) Blue circle and OCAL are concentric.
- (d) Center mark on primary mirror are overlapped to carema lens of OCAL.

In this example, features (a), (b) are true, but no matter how to adjust, (c) and (d) are not able to archive. Then maybe the position of center mark of primary mirror is not correct. Here is a example:



Using a concentric jig to find the center of primary mirror.

True center

5 A Case of Actual Sharing

