How to Adjust the Back Focus for TCM-5311

Category Type	Configuration Note
Camera Model	TCM-5311
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Contents

Introduction of Back Focus

TCM-5311 is a high class camera that has a built-in back focus ring, by which it is convenient to fine tune sensor position in order to achieve the ideal distance of the sensor from lens.

By rotating the back focus ring it is possible to slide the sensor back or forth inside the camera. The back focus ring is shown on the image 1.

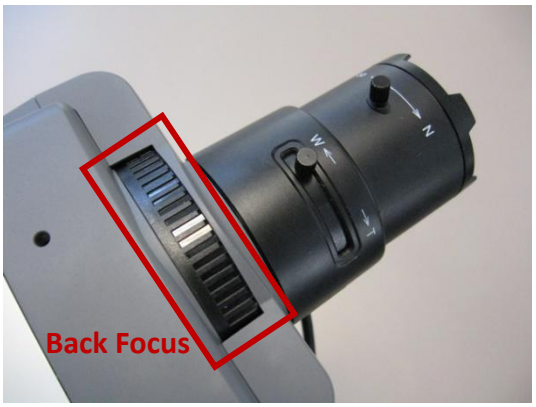


Image 1: Back Focus of TCM-5311

Once the back focus has been adjusted properly, the lens has been successfully adapted to camera, and there is no need to re-adjust the back focus thereafter. All the following adjustments are done on the lens itself by changing focal length (zoom) and front focus, depending on the camera location and the distance to the monitored object.

The Purpose of Adjusting Back Focus

For the cameras with changeable lens, there may exist some positions in the zoom scale which cannot be focused at all. Which means that the practically usable focal length will be shorter than shown in specifications. However, with the help of correctly adjusted back focus you can benefit from the maximum possible scale of focal length of the given lens.

By adjusting the back focus we can achieve following:

- Make the maximum possible zoom range focusable
- Maximize the depth of field for each zoom position
- Enhance the focus in the corners of the image

In other words, properly adjusted back focus can achieve optimal performance of the camera and the lens.

The Compatible Lenses for TCM-5311

Although it is possible to attach almost any C or CS mount lens available, there is a risk that an uncertified lens does not give satisfying result. Two lenses are recommended for TCM-5311. Below you can see the specifications of those lenses.

Lens name	Old name	Size	Mount	Type	Iris	Aperture	Focal length	Angle (HOR)
PLEN-0203	LEN-207	1/3”	CS	IR	Auto	1.3	2.8-12 mm	102.2~23.7
PLEN-0205	LEN-210	1/2”	C	IR	Auto	1.6	8-80 mm	46.6~4.7

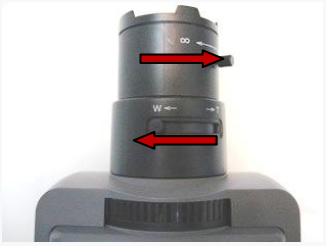
PLEN-0203

PLEN-0205

The Procedure of Adjusting Back Focus with PLEN-0203

Depending on the type of lens used, the ideal back focus position will be different. Also, the lens type will determine the starting position for lens focus and zoom. Below are the step-by-step instructions of adjusting back focus. Before starting the adjustment process, login to Web Configurator and display the live video from TCM-5311 camera.

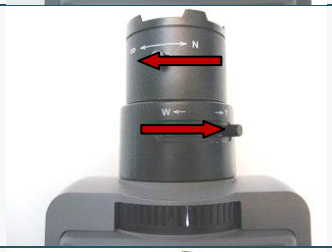
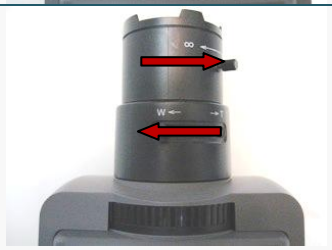
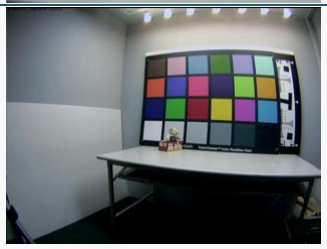
Back Focus Adjustment:

Procedure	Action View	Camera View Result
Rotate the **back focus ring to the left**, until the end. The positions of zoom and focus are still random at this point.		
Set **zoom to widest** (W) and its corresponding **focus to nearest** (N). We are now at one end of zoom scale and we trying to get perfect focus there. Point the camera at an object 75 cm away (2.5 feet). The object is out of focus.		
Slowly turn back focus to right, until the object will attain focus. It means the camera can attain focus with widest zoom angle of the lens. The adjustment of back focus is complete.		

Now that the back focus adjustment is complete, there is no need to adjust it again. The sensor is now at ideal distance from lens, allowing the whole range of zoom to be focusable.

The following steps are done by adjusting zoom and focus of the lens, depending on how far the actual monitored object is at the camera site and how big you want it to appear on the screen. In the following table, two example scenarios are provided.

Lens Zoom and Focus Adjustment:

Procedure	Action View	Camera View Result
Case 1: We need a zoom-in view from a distance. For testing, put the camera several meters away from the object.		
In order to zoom-in, change **zoom angle to telephoto** (T) and then slide **focus towards infinity** (∞) until you get clear focus.		
Case 2: We need a wide view over the site. Change the **zoom angle to widest** (W) and then slide **focus towards nearest** (N), until you get clear focus.		

The Procedure of Adjusting Back Focus with PLEN-0205

PLEN-0205 is a lens with very deep zoom with the focal length of 8mm - 80mm. Due to its different structure, its wide zoom angle is focused with “Far” instead of “Near”. For better understanding of this difference, you can refer to the graph at the end of this document.

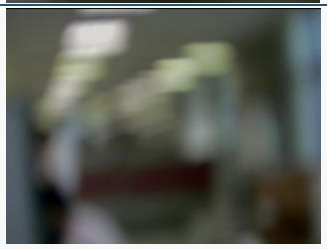
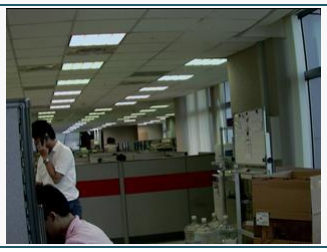
Back Focus Adjustment:

Procedure	Action View	Camera View Result
Rotate the **back focus ring to the left**, until the end. The positions of zoom and focus are still random at this point. Point the camera at an object 100-200m away.		
Set **zoom to telephoto** (80 mm) and its corresponding **focus to FAR**. We are now at one end of zoom scale and we trying to get perfect focus there.		
Slowly turn back focus to right, until the object will attain focus. It means the camera can attain focus with deepest telephoto zoom of the lens. The adjustment of back focus is complete. The fine tuning can be done later with zoom and focus if needed.		

Now that the back focus adjustment is complete, there is no need to adjust it again. The sensor is now at ideal distance from lens, allowing the maximum possible range of zoom to be focusable.

The following steps are done by adjusting zoom and focus of the lens, depending on how far the actual monitored object is at the camera site and how big you want it to appear on the screen. In the following table an example of wide angle focusing process is shown.

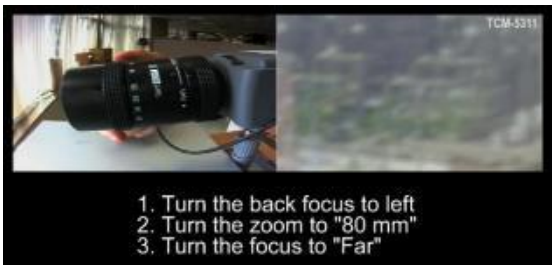
Lens Zoom and Focus Adjustment:

Procedure	Action View	Camera View Result
Case: Widest Zoom (8 mm) Point the camera at an object 4-5 meters away, which is the minimum recommended working distance for such lens.		
Adjust the zoom to widest angle (8 mm). For better tuning of focus, it is recommended to leave a bit space at the end of zoom scale, for example set zoom to 9-10 mm.		
Move focus slowly towards left until the focus is obtained. The camera is now set for a wide angle view and with a very long depth of field.		

Demo Videos of Back Focus Adjustment

After reading the instructions of back focus adjustment above, you can refer to following videos for hands-on practice:

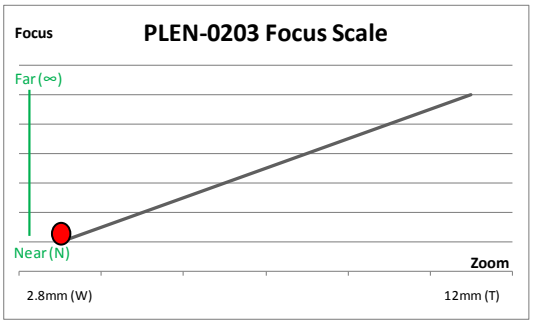
TCM-5311 back focus adjustment with PLEN-0203

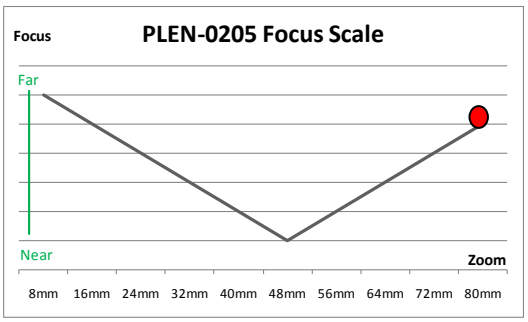


TCM-5311 back focus adjustment with PLEN-0205

References

Below you can find the graphical explanation of the difference of two lenses. On both graphs, the trend line shows the position of focus for each zoom position.





The ● mark shows the starting position for adjusting back focus. For the lens PLEN-0203 the starting position is Wide (2.8mm) and Near (N). For the lens PLEN-0205 the starting position is Telephoto (80mm) and Far. You may notice that if we slide the zoom of PLEN-0205 all the way to 8mm, then we need only a small movement with focus ring (around Far) to obtain focus.