Primary mirror cell for GSO RC telescopes 14”/16”

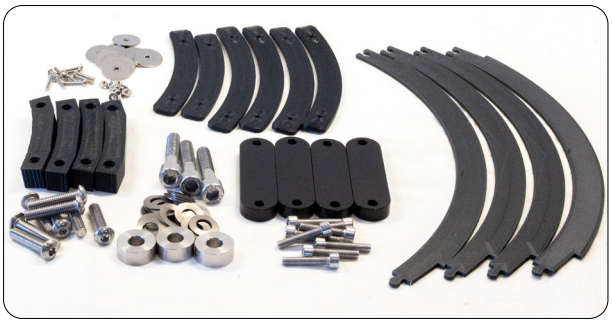
Installation instructions

Contents

Scope of delivery

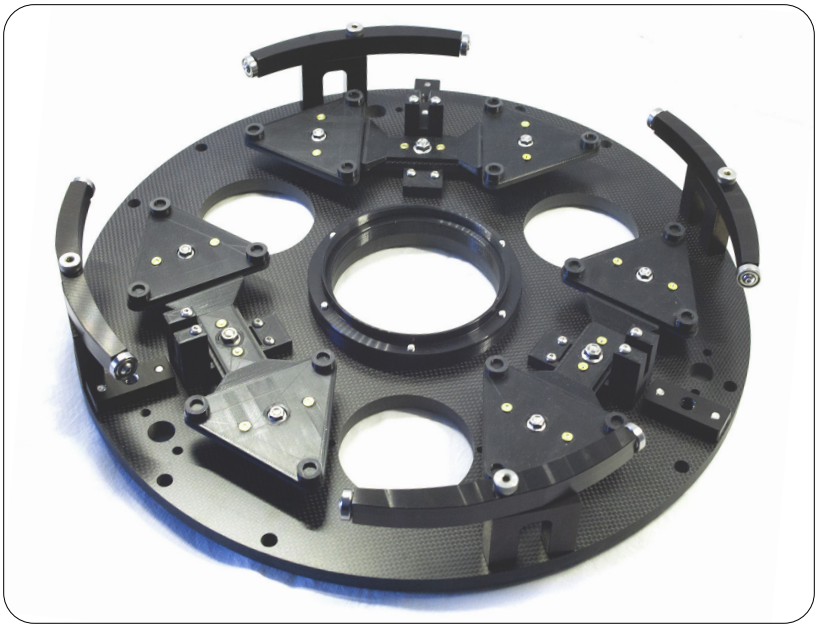
The picture on the left shows the parts that are included with the cell for a 14“ telescope, and on the right those for the 16” telescope.

Not shown is a strip of 0.05 mm thick sheet steel. The sheet serves as an adjustment aid.



There are four variants of the cell: 14“ and 16”, for the standard and lightweight versions respectively.

The cell for the 16” lightweight telescope is shown.



Preparation

Place three felt glides with a diameter of 30-40 mm on a clean and stable surface. The main mirror will later be placed on the felt glides. Do not use any soft material, as the mirror lying with the mirror surface facing downwards could sink in and the surface could touch the supports.

Remove the protective cover of the primary mirror and place the telescope with the front end facing downwards on a thin, soft surface (e.g. doormat).

The cover of the secondary mirror must not be removed (protection against falling parts).

Removing the back plate and mirror cell

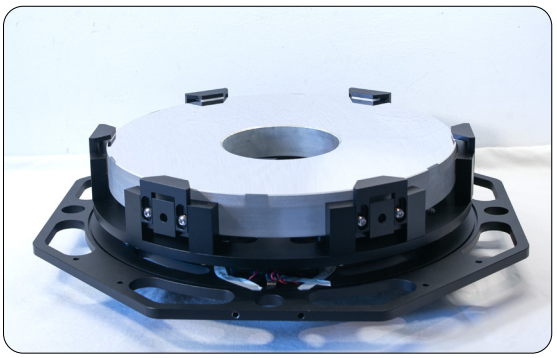
First unscrew the focuser.

Loosen the screws - four or six depending on the telescope model - that connect the prism rails to the back plate and the eight screws that connect the grid tube holders to the back plate.

Then carefully remove the back plate with the mirror cell from the tube. Secure the tube to prevent it from falling over or have a second person help you.

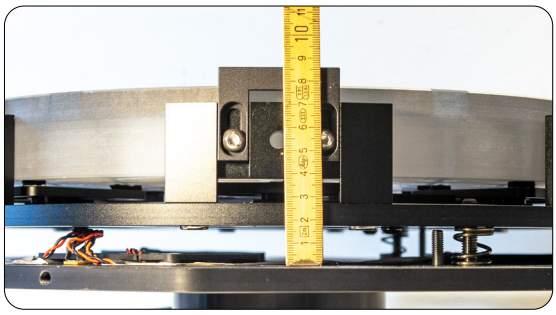
Removing the baffle tube

Place the back plate with the cell on a protective surface and remove the baffle tube. Take care not to touch the mirror.

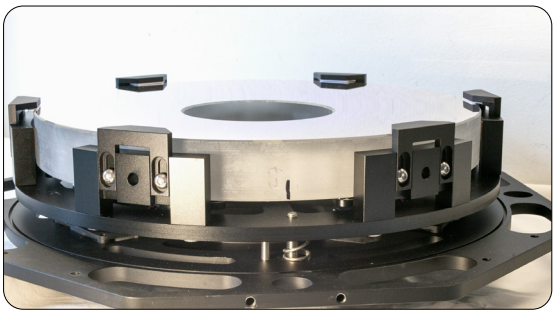


Prior to removing the mirror

Measure and note the distance between the back plate and the mirror cell base plate.

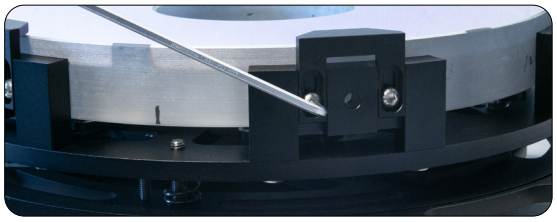


Make a smudge-proof mark on the side of the mirror to show the position of one of the collimation screws.

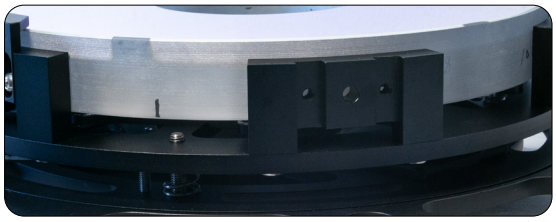


Removing the mirror

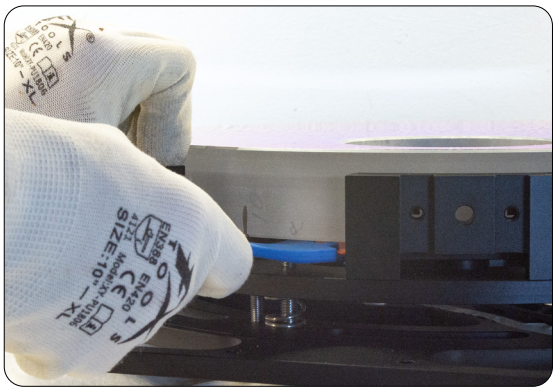
Remove the retaining clips.

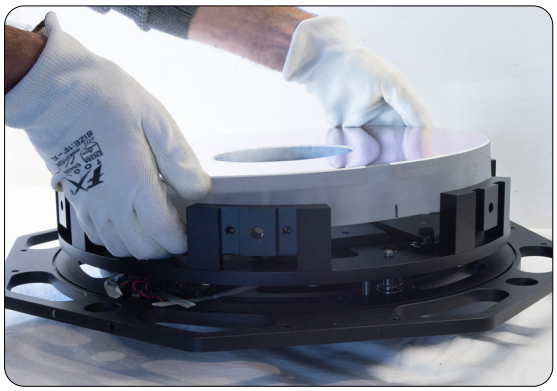


Four of these brackets are reused together with the corresponding screws and washers.



The mirrors of the Lightweight telescopes are glued to the mirror supports. Use a plastic scraper to remove the glued areas in turn from the outside inwards and wear suitable protective gloves when working on the mirror.





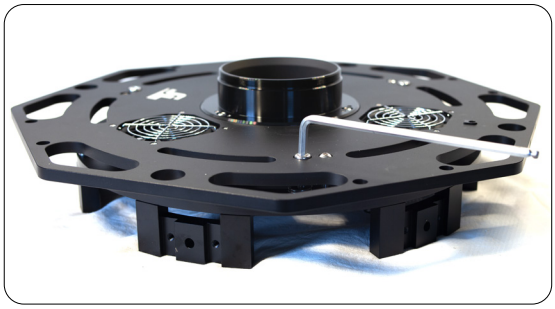
Carefully place the mirror upside down on the felt glides and remove all adhesive residue with the scraper, a suitable solvent (spirit, isopropyl alcohol or similar) and cloths. Even if it is the back, do not use any metal tools!

Make sure that the mirror is stored safely until it is reinstalled.

Separating the cell and back plate

Place the entire assembly on a soft surface as shown and remove the three large adjusting screws (pull screws).

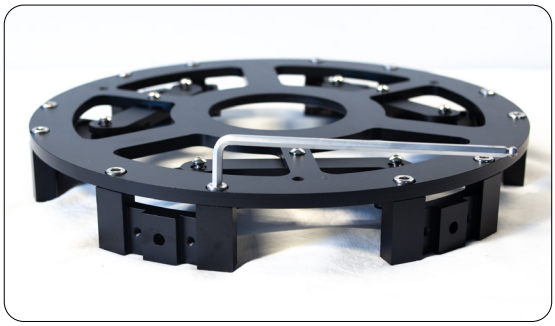
You can now remove the back plate and also unscrew the small adjusting screws (push screws). The adjusting screws and the springs between the plates are no longer needed.



Dismantling and preparing the lateral bearings

Unscrew four of the lateral bearings from the original cell and remove the cork pads and adhesive residue from these as well.

If the surface is damaged during this work, blacken the damaged areas with a suitable pen.

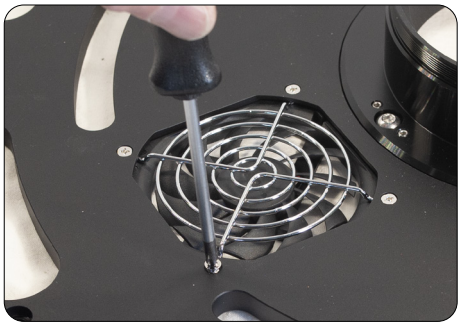


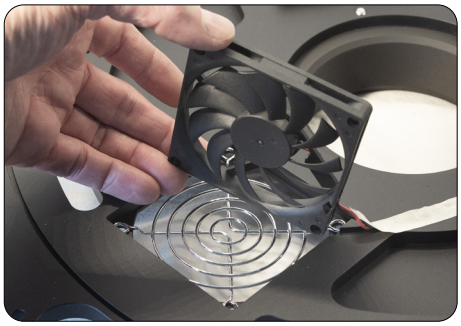
Note: The four lateral bearings of the original mirror cell are re-used and serve as axial bearings. Accordingly, this designation is now used.

Flipping the fans

The fans are positioned in such a way that the outside air is blown towards the mirror cell and largely exits through the openings in the back plate. Some of the air flows past the mirror and into the pipe.

This arrangement results in insufficient cooling and can lead to air turbulence in the tube. Thanks to the optimized air flow, the air flows out of the tube past the edge of the mirror and between the rear of the mirror and the cell base plate to the fans.

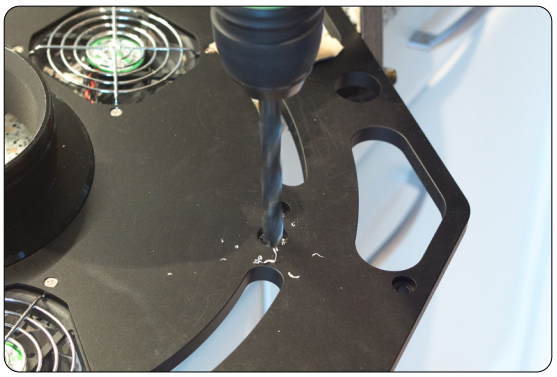




Drilling out the holes for the collimation screws

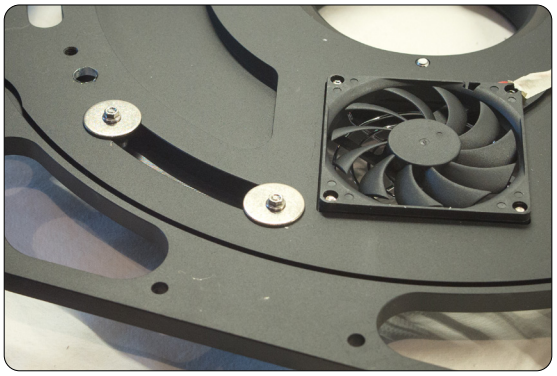
More stable pull screws are used for the new mirror cell. For this reason, the existing holes must be enlarged to 10.5 mm.

Secure the back plate against slipping and drill the holes to the specified size. Deburr the holes.



Fitting the air slot covers

Attach the covers as shown in the pictures.



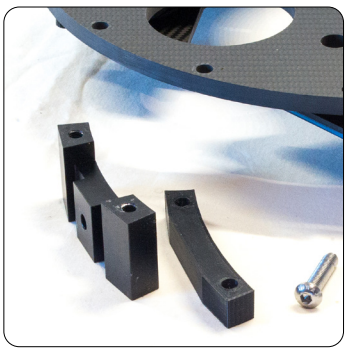
Unscrewing the focuser flange

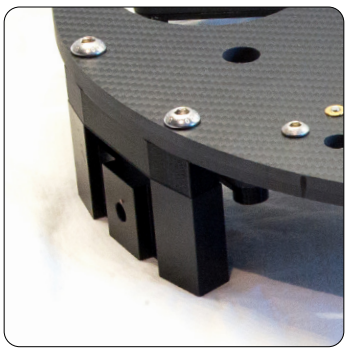
Unscrew the focuser flange. Pay attention to the springs which hold the focuser free of play during adjustment.

You should unscrew the push screws (grub screws) so far that they no longer protrude beyond the telescope-side flange surface. This ensures that you start with a focuser that is not tilted when adjusting for the first time.

Mounting the axial brackets

Attach the four prepared holders together with the bases and (longer) screws from the conversion kit to the cell base plate.

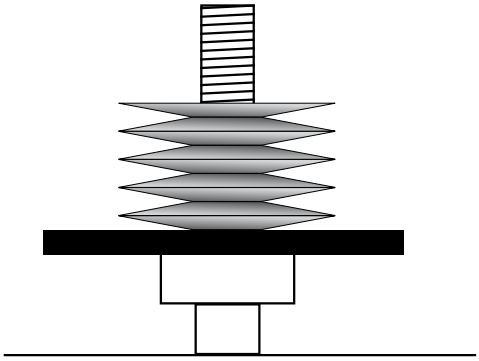


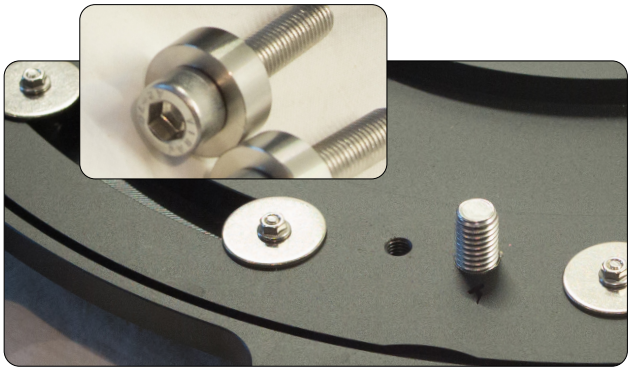


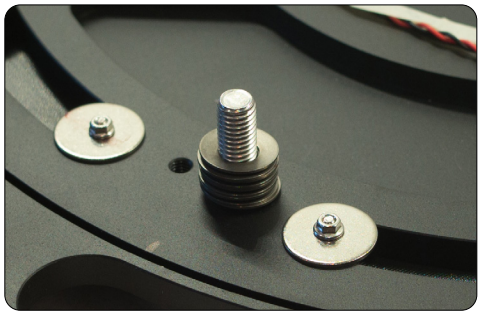
Inserting the pull screws

Attach a spacer sleeve to each of the three collimation screws and then insert them into the holes intended for this purpose. The back plate then rests on the screw heads (and spacer sleeves).

Now slide nine disk springs onto the adjusting screws in the arrangement shown on the right.







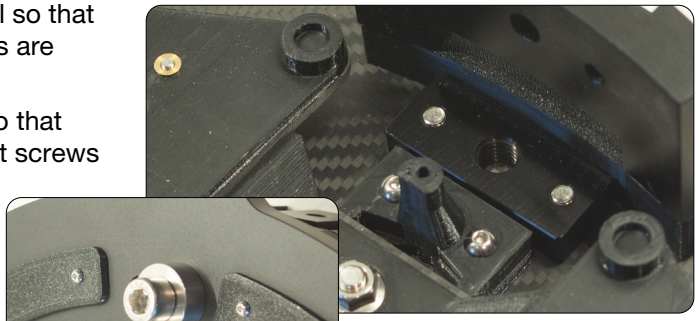
Attaching the primary mirror cell and setting the collimation gap

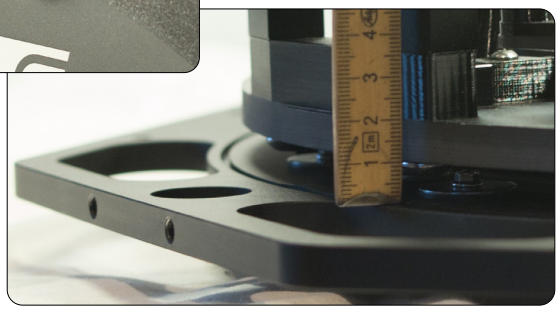
Carefully place the primary mirror cell so that the threaded holes for the pull screws are positioned on the screws.

Carefully place the main mirror cell so that the threaded holes for the adjustment screws are positioned on the screws. Slide the back plate with the cell to the edge of your work surface so that you can reach under the back plate and screw in the first screw until you feel resistance. Do the same with the other two screws. You can then lift the entire assembly and tighten the screws step by step (one turn at a time). the collimation gap must be seven millimeters narrower than that of the original cell, but must not be narrower than 10 millimeters.

Example:
Original gap 18 mm - 7 mm = 11 mm
-> Set the adjustment gap to 11 mm

If the gap falls below ten millimeters, the position of the secondary mirror cell may have to be changed in order to achieve the correct mirror distance.





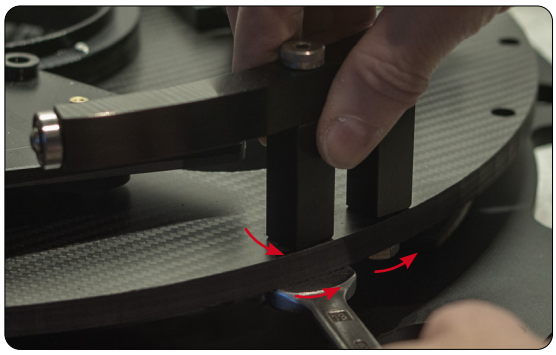
Example:

Original gap 15 mm - 7 mm = 8 mm
-> Set the adjustment gap to 10 mm,
move the secondary mirror cell by 2 mm.
The adjustment of the secondary mirror cell is described on page 14.

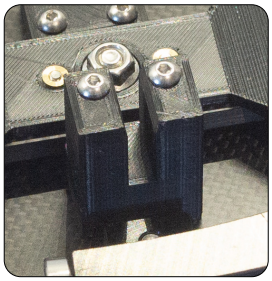
Installing the mirror

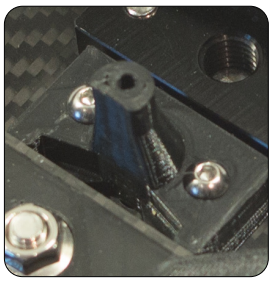
Set the lateral bearing supports to the outermost position and tighten the screws slightly.

Note: Because the horizontally arranged rockers of the lateral bearings are very smooth-running, it is possible to accidentally touch them when inserting the mirror and swing them under the mirror. It may therefore be useful to have a second person help you insert the mirror.



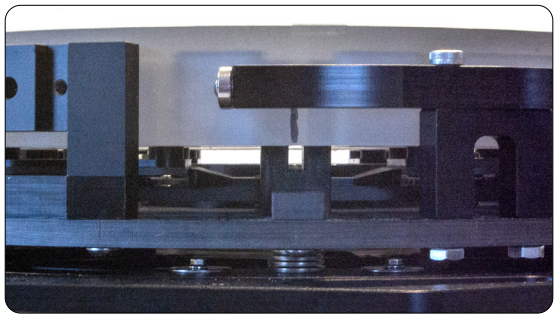
The mirror cells for the Lightweight telescopes are equipped with a rotation protection for the mirror. When inserting the mirror, you must ensure that (for the 16“ model) a rib on the underside of the mirror is inserted into the slot in the anti-rotation mechanism or (for the 14” model) that the anti-rotation mechanism is positioned in a slot in the mirror.





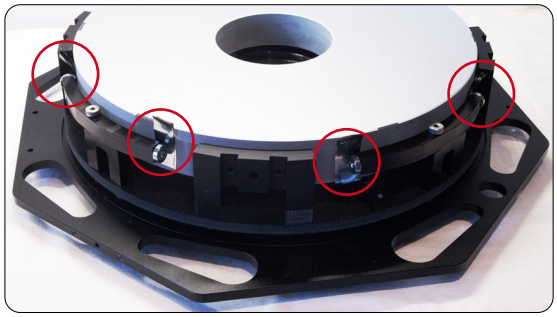
Important: Make sure that all moving parts of the cell move smoothly and are not jammed.

Insert the mirror so that when you look at the mirror from the side, the mark you have made on the side is in line with the rotation protection. Only then the mirror will rest on the correct points of the mirror supports.

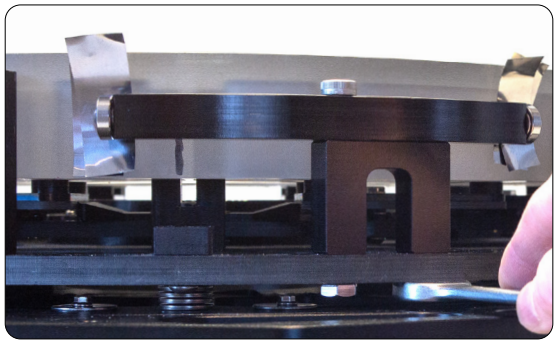


Adjusting the lateral bearings

Slightly loosen the screws of the lateral bearing supports again so that the rocker supports can be moved with slight force but are free of play.
Now turn the supports until the rollers of the rockers are in contact with the mirror. Make sure that the distance between the mirror and the edge of the cell is the same everywhere. This can be seen or felt by the position of the supports. Then tighten the screws on two adjacent brackets.



Use a pair of scissors to cut the thin metal sheet supplied with the conversion kit into eight strips of approximately the same size and slide two of each behind the four rollers of the still loose lateral bearings.



Tighten the screws in small steps and check again and again whether the metal sheets can still be moved.

The plates must neither fall out nor be firmly stuck.

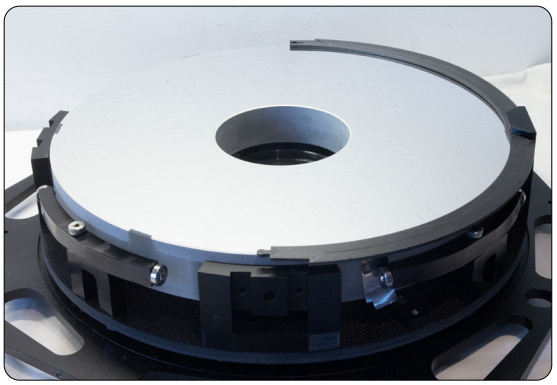
Mounting the aperture ring

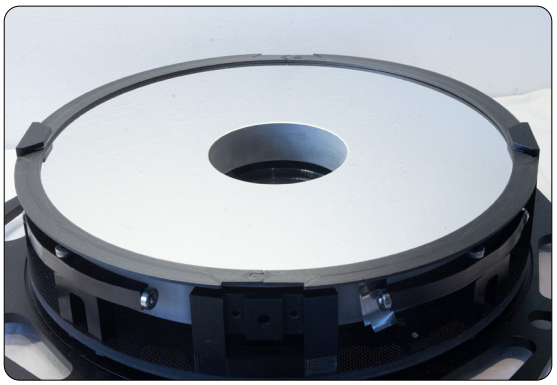
Note: In the 14” conversion kit, the aperture ring is in one piece and can simply be laid on. In the case of the 16” kit, the ring is made up of four parts. The procedure for adjusting the distance is identical.

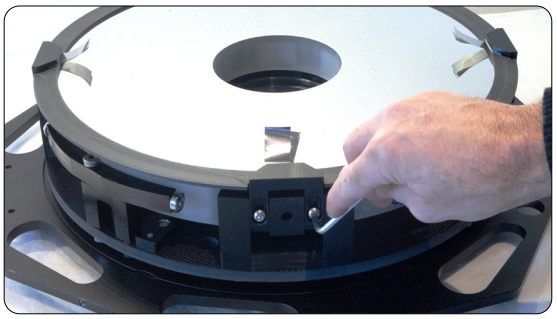
Attach an axial bracket and fix it in the highest position. Connect two elements of the aperture ring and slide the connection under the bracket so that it fits into the recess of the aperture ring. Proceed in the same way on the opposite side of the mirror and then connect the two halves of the aperture ring.

Attach the two remaining axial bearings, but do not tighten the screws completely yet, but loosen the screws of the two holders fitted first a little.
Now slide the metal strips that you used to adjust the lateral bearings between the aperture ring and axial bearing. Tighten the screws of the axial bearings and make sure that the metal strips are not jammed.

Remove the metal strips and check whether the aperture ring can still be moved easily.







Inserting the baffle tube

Carefully insert the baffle tube and screw it tight.

Installing the spacer plates

Correct mirror spacing is essential for RC telescopes, so the mirror spacing must be the same as before after the conversion.

The mirror support in your new primary mirror cell is a few millimeters higher than in the original cell, this difference must be compensated for. One part is compensated for by changing the collimation gap height (and the secondary mirror position if necessary), another by lengthening the tube. Spacer plates are installed for this purpose.

Place the truss tube with the front end facing upwards on the mat already used. Because the tube only stands on the ends of the dovetail bars, it can be helpful to either remove the bars or place suitable supports under the truss clamps.

Now remove the screws from the central connection. The screws are no longer needed.

Caution: The plate is clamped between the two tube halves, so it will inevitably be loosened.

Remove the front half of the tube and place the spacer plates as shown in the picture. Connect the tube parts with the supplied screws.

Mounting the back plate

Turn the tube over (front end down) and check that the secondary mirror cover is in place, then attach the back plate and screw it to the clamps and the dovetail bars.

First insert all the screws and only then tighten them, starting with the tube screws. Make sure that no part is under tension at any time.

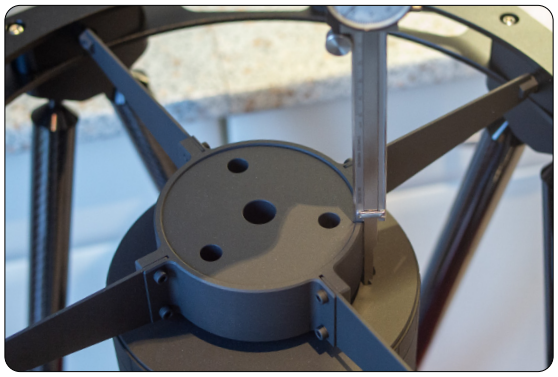
Adjusting the secondary mirror position

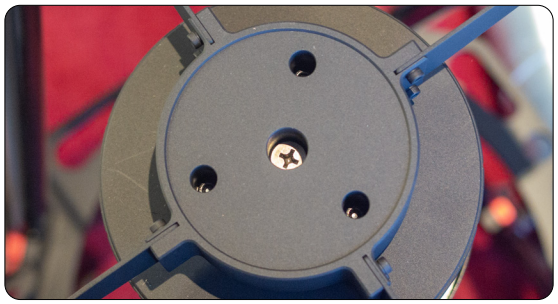
If it is necessary to change the position of the secondary mirror cell, you must first determine the initial position. To do this, use a caliper.

If the distance is to be changed by two millimeters (as in the example on page 11), the cell must be moved closer to the bracket by this amount.

To do this, loosen the three hexagon socket screws in small steps (e.g. half a turn per screw), tighten the central screw firmly and check the distance after each pass.

As soon as the correct value is reached, check that all screws are firmly tightened.





Collimating the telescope

An alignment laser and an alignment aid are required to collimate the telescope. It is advisable to use an collimation telescope, e.g. the TSCOLLIT. In terms of achievable accuracy and reproducibility, such a device is superior to other alignment aids.

The collimation procedure is described in detail in the TSCOLLIT manual.

Checking the mirror spacing

If you had to adjust the mirror distance by moving the secondary mirror cell, it makes sense to check the mirror distance. This can be done with a Ronchi eyepiece (TS item “Ronchi”).

An incorrect mirror distance leads to spherical over- or undercorrection. How this error shows up in the Ronchi eyepiece is described in the corresponding manual.

If you change the mirror distance, the telescope must then be adjusted again. Only then can the mirror distance be checked again.

Note: The back focus distance (distance from back plate to focus position) is reduced by approx. 17 mm as a result of the conversion.

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