APERTURA

Dobsonian Performance Upgrade Kit

Installation Guide

Congratulations on your purchase of the Apertura Dobsonian Performance Upgrade Kit!

There is no doubt that the factory configuration of Dobsonian telescopes offer fantastic performance. The many positive user reviews and recommendations back this statement. And while this is true, we took things a step further by looking to increase the performance of this telescope. The multifaceted Apertura Dobsonian Performance Upgrade kit does just that!

How do we improve this already great performance?

Reduction of Stray Light

The open end of a telescope not only lets in the light that we want to view through the eyepiece, but it also lets in unwanted stray light. This rogue light can come from many sources; such as security lights, street lights, the moon, and even bright stars that can sit just outside the field of view. This stray light then reflects off the inner surfaces of the telescope and eventually winds up being viewed through the eyepiece. This causes the dark background of the sky to brighten slightly, muddying the view and decreasing contrast.

There are a couple different methods available to decrease the negative effects of stray light. The most effective option is the installation of precision cut knife edge baffles in the telescope's tube. These baffles are painstakingly designed and positioned for maximum performance. These baffles provide the largest decrease in stray light, but can have a negative side effect outside of being costly to produce and difficult to implement. The baffles can push air currents that normally ride along the inner topside of the tube, into the light path. These currents in the light path act much as a turbulent atmosphere does; stirring the view and causing unsteady conditions. Not all systems are like this, but it is a common negative side effect of a fully baffled open tube telescope like a Newtonian.

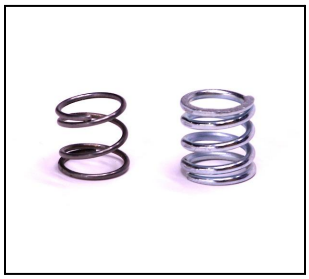
The most readily available option is a velvet-like material known as Flocking Paper. This material has many small strands that stick up, much like a carpet. When the stray light hits this surface, the light is dampened and absorbed, creating a positive impact on your view. This method allows internal tube currents to ride smoothly along the interior surface of the telescope. These currents remain mostly out of the light path just as they did in the scope's factory configuration, unlike many baffled systems.

While every surface on the inside of the telescope, with the exception of the mirrors, can be flocked - it would be quite an involved and costly process. This kit provides contrast improving flocking for the most critical areas of the telescope that have the largest positive impact and are easiest to install. In an unbaffled tube, there is still the possibility of stray light entering the focuser in some situations, but with the placement of the flocking material in these key areas, that chance occurrence is greatly reduced.

Secondary Mirror Collimation Knobs

What are these knobs and why are they useful? This is a great question! As you might know, Newtonian telescopes require careful alignment of their two mirrors for optimal performance. When adjusting the secondary mirror so that it lines up with the focuser and the primary mirror at the bottom of the tube, the three screws of the secondary support need to be manipulated. These screws change the angle that the secondary mirror points. To do this in most telescopes requires the use of a screwdriver or hex key to turn the adjustment hardware. This can be a hassle at night, requiring the user to step away from the eyepiece or collimation tool being used, and devote all of their attention to turning these screws. By replacing the screws with Apertura Collimation Knobs, the secondary mirror adjustments can be made by simply turning the knob with one's hand. This makes adjustments fast, safe, and simple; without the risk of dropping a tool down the telescope. After becoming accustomed to the telescope and Apertura Collimation Knobs, users may even find that they are able to make adjustments to the secondary mirror without ever taking eyes off the collimation tool or focuser.

Primary Mirror Collimation Springs



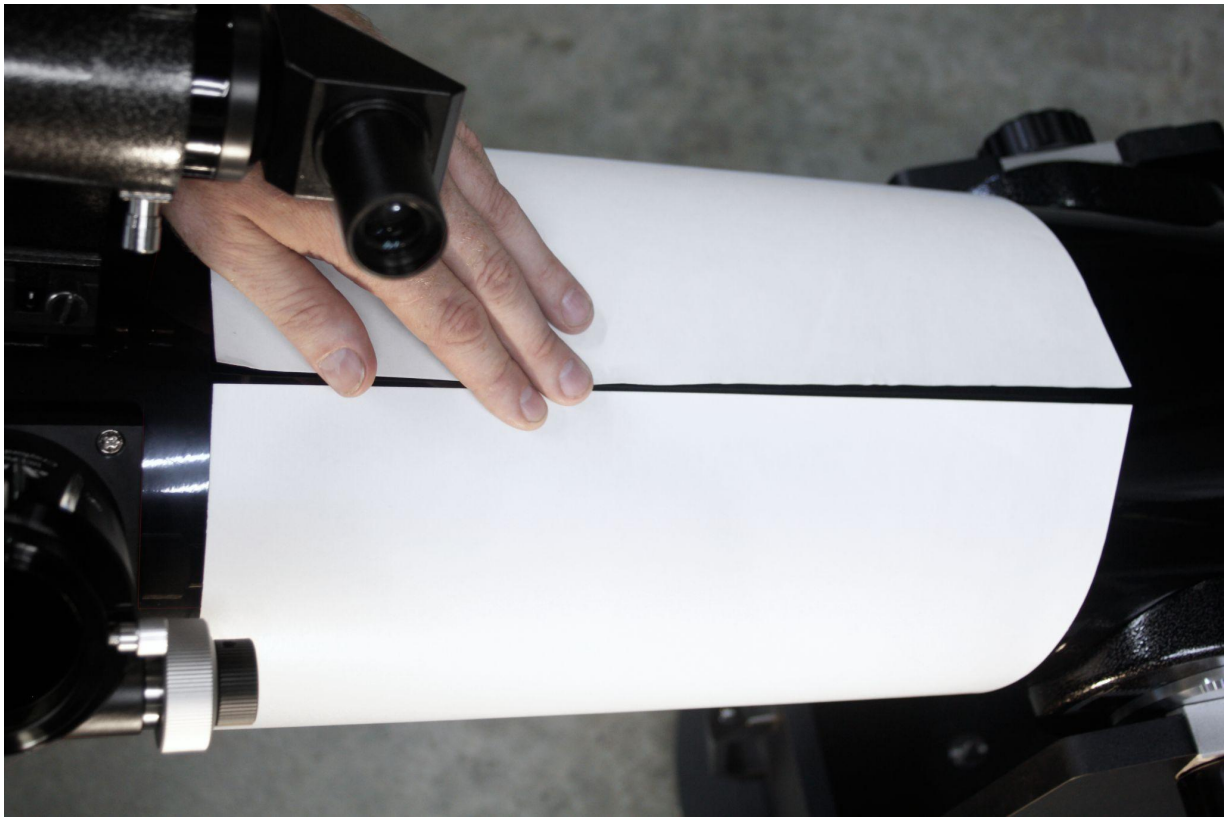
The primary mirror cell is the device that supports and positions the primary mirror. It uses springs to support the weight of the mirror and allows for some adjustability in its positioning. The upgraded collimation springs take more energy to compress them than the factory springs do, which can help to keep the mirror positioned correctly. This is true both when making adjustments and after they have been completed. The image to the left shows a factory spring, and the stiffer upgrade spring to the right.

Needed for Installation:

- Flat clean area to work that is well illuminated
- Phillips head screwdriver (included in the kit)
- Cleaning Wipes (Included in the kit)
- Box Cutter or Razor Knife (Optional)
- Masking Tape (Optional)

Before installing any components from this kit, please verify that the kit you received is the correct one for your telescope.

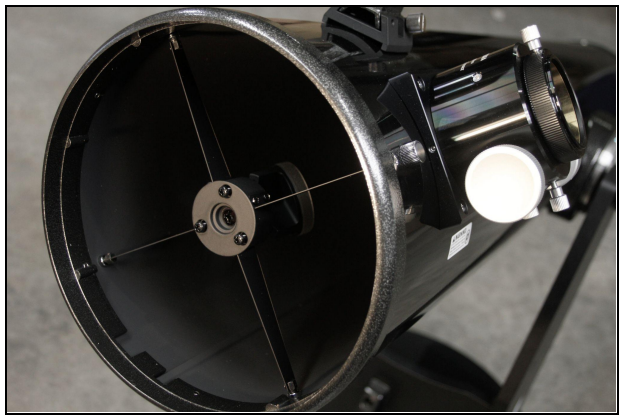
To do this, take the larger of the two sheets of flocking paper included in the kit and wrap it around the exterior of the telescope, without removing the paper backing. It should essentially cover the full circumference of the tube as seen in the following image. If this sizing is drastically different, please pause, take an image, and contact us!



Installation Process

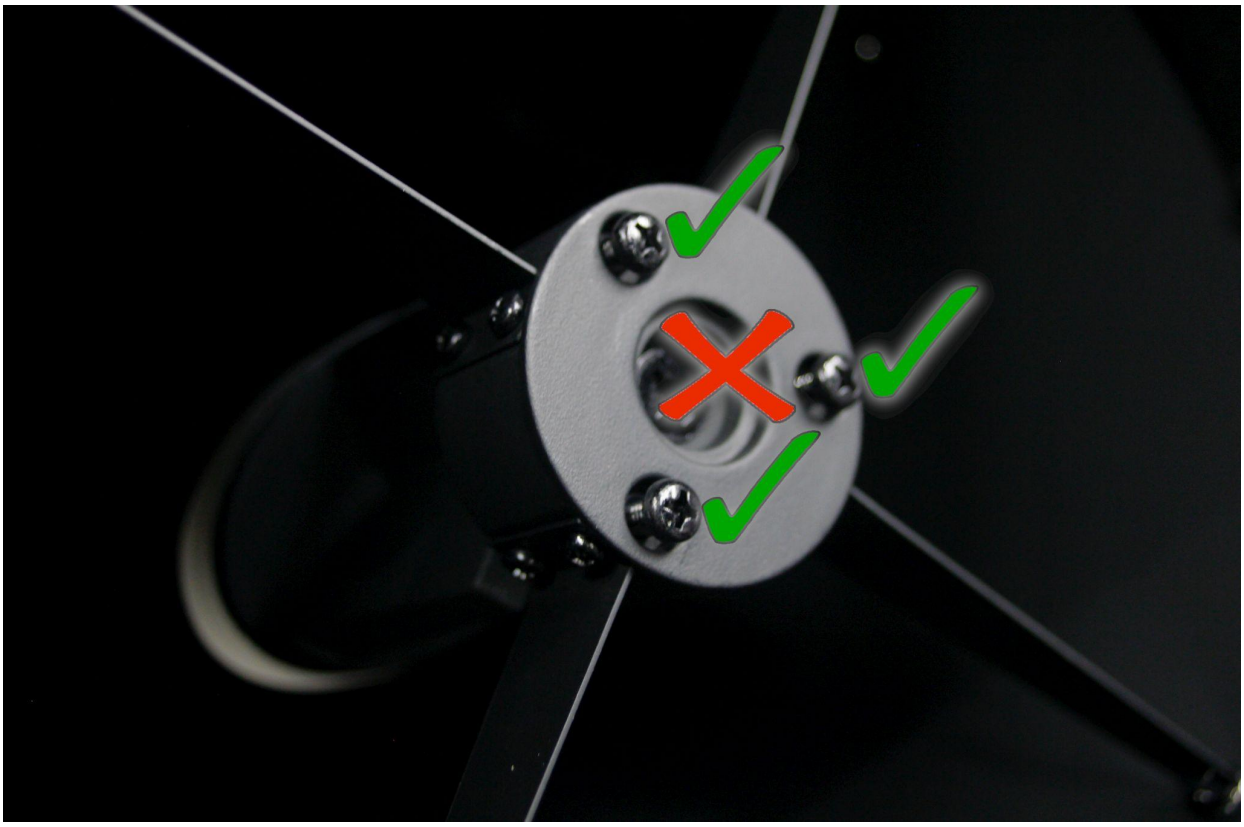
The upgrades will be installed in most major internal assemblies of the telescope. It is important to understand the process of each Sub Section prior to installing any upgrade parts. The installation of the upgrade has been planned in a systematic process; starting at the front or top of the telescope and working towards the bottom. This means that the first parts that will be installed are the secondary mirror collimation screws.

Collimation Knob Installation

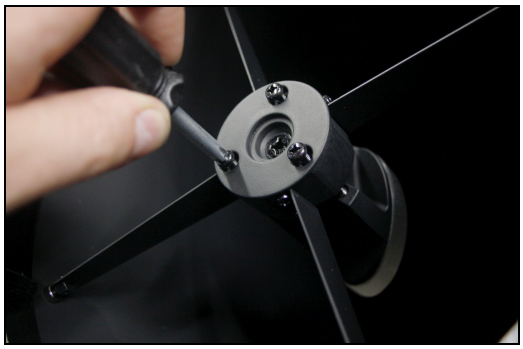


Prior to installing any parts, the scope should be set up in a well lit area. Position the telescope so that the collimation screws can easily be seen, and then lock the altitude knobs on the side of the scope. It is best to keep the scope in a somewhat horizontal position, so that if a tool or screw is dropped, it is less likely to contact the primary mirror or cause any damage.

Begin by removing the front cover of the telescope. Then, gather the collimation knobs and screwdriver from the AD Upgrade box. Take notice of the three outer screws on the face of the secondary hub, plus the one central screw. The central screw should never be tightened or loosed unless there is a very good reason to do so.



Note:
So long as only one screw is removed at a time and the other two installed screws are not adjusted while one is removed, the collimation of the scope should be fairly close once we have replaced all three screws.

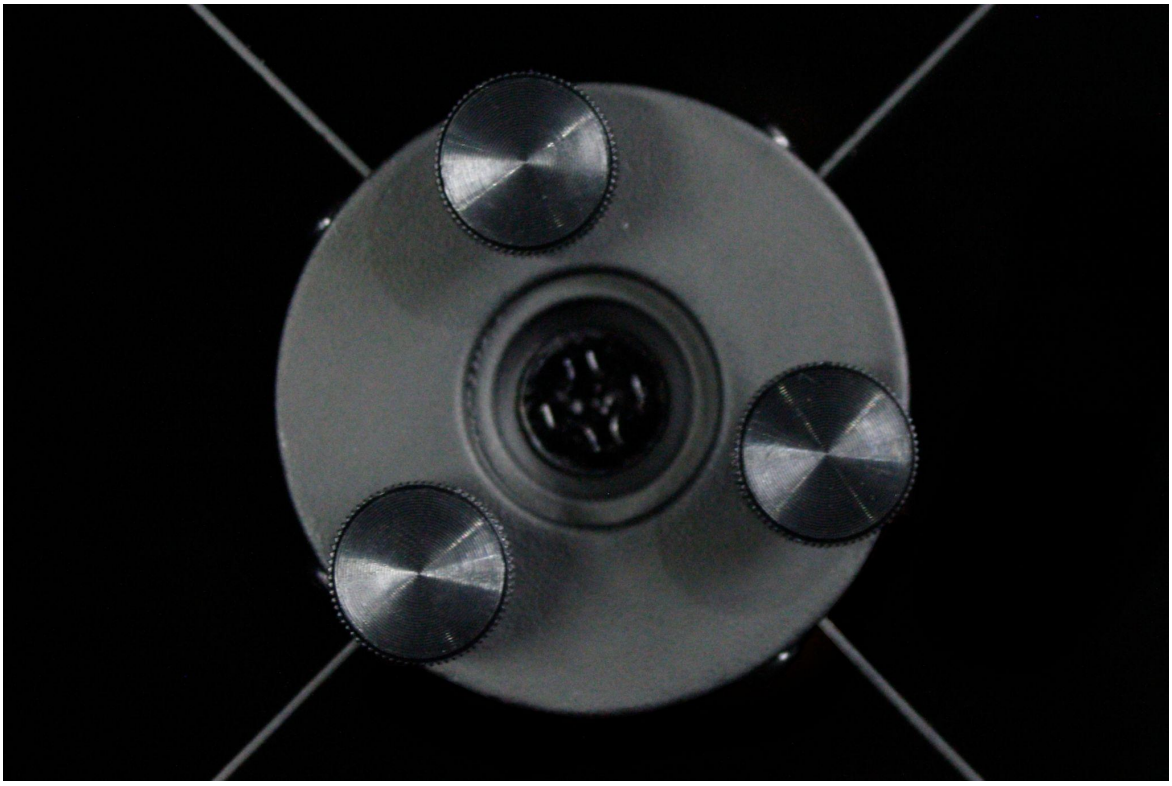


<u>Do not remove all three screws at once!</u>

Start by removing one of the three Phillips head screws. After the first screw is removed, replace it with an Apertura Collimation knob. Thread the replacement knob into place. If any resistance is encountered while installing the knobs, please remove the knob, check for debris and try the installation process again. Once the knob is installed it should be snug but not extremely tight. Continue to replace the screws one at a time until all three have been changed to the Upgraded Knobs.

Step One, Complete!

The next step will be the upper flocking material installation.



Upper Flocking Material

The key to a successful installation of the flocking material is a clean surface, careful preparation, a warm environment, and patience.

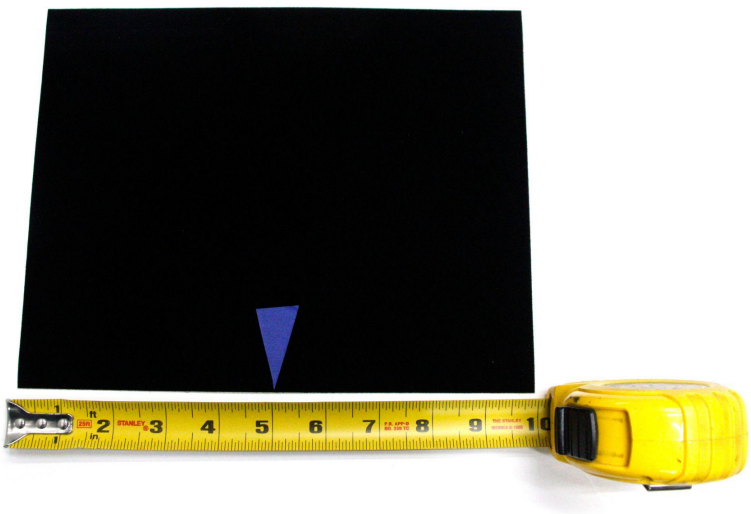
To perform the installation, make sure that the telescope and the flocking material are warmer than 40 degrees Fahrenheit so that there is proper adhesion of the material to the Optical Tube. Once installed the material has a very large working temperature range, well beyond what we would experience as amateur astronomers.

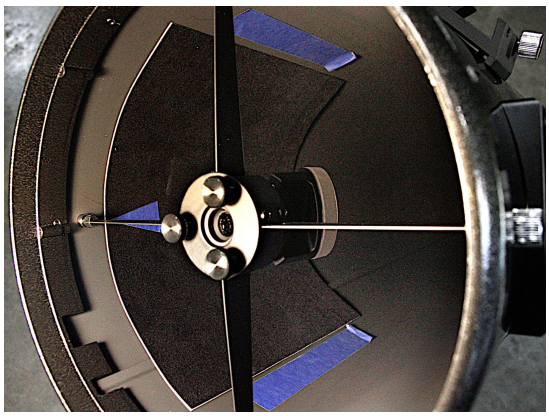
The flocking material has a white backing on it that covers the adhesive on the flocking paper. Before installing any of the flocking material, it is a good idea to do a “dry run” with the backing still in place. This mock installation allows for the checking and testing of material placement and positioning, without having to worry about getting it right the first time. **Once the adhesive back is removed from the flocking paper, there is only one chance to place the material correctly in the tube**. This is why preparation is key to a successful installation.

Please keep in mind that any wrinkles, lines, or slight misplacement will have little impact on the view through the telescope. Any of these conditions are OK and should not be stressed over.

The upper flocking material is the smaller of the two sheets included in the kit. It can be found by unrolling the material that is stored in the rear compartment of the packaging. This small sheet will be installed directly opposite the focuser, inside the tube, behind the secondary mirror support. The short edge will go front to back and the long edge side to side.

A great way to position the flocking paper is to use masking tape as a guide. Start by positioning a small piece of masking tape on the black side of the secondary flocking material, in the center of one long side. A triangle shape of tape works great. The piece of tape should be aligned with the spider vane opposite the focuser, once it is in the telescope.





Temporarily place the flocking material inside the telescope tube, leaving the white paper backing of the flocking in place, this is a test fitting. Rolling the flocking paper can allow it to be more easily inserted into the tube. The flocking should be positioned with less than ⅛" of space between it and the spider vane. Once the center mark of masking tape is aligned with the spider vane, place two pieces of masking tape inside the telescope tube on either end of the flocking paper. Leave some room between the flocking paper and the tape, ¼" should suffice. These pieces of tape will help to guide the final positioning during installation, so that it is known where to start when adhering the flocking to the tube.

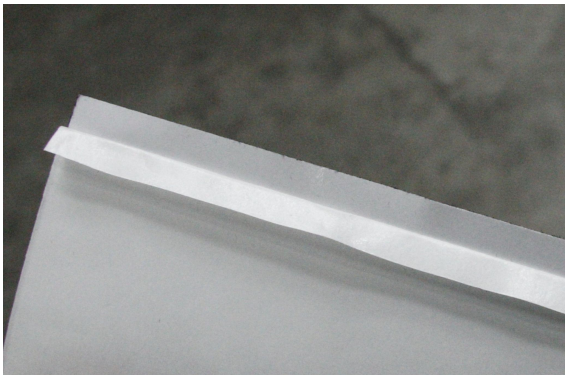
The flocking cannot be removed once it is in place, without destroying it.

The masking tape is not required and one can simply judge the placement and install. The placement is not extremely critical, in that if the flocking is placed off by an inch or so, there is no consequence. That said, it is a good idea to use masking tape to guide the installation.

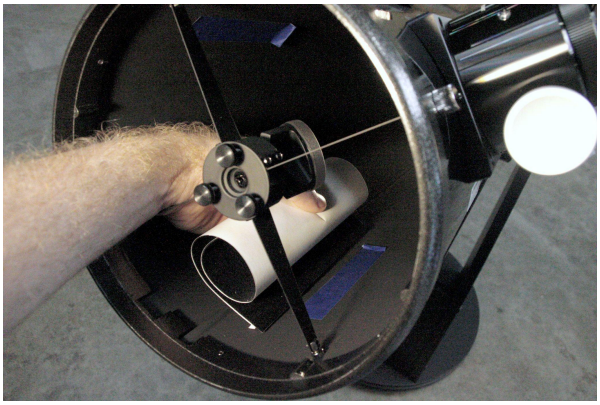
Once the position of the flocking has been determined, use one of the cleaning wipes to wipe any dust from inside the OTA, between the masking tape marks. Then, let the tube dry.

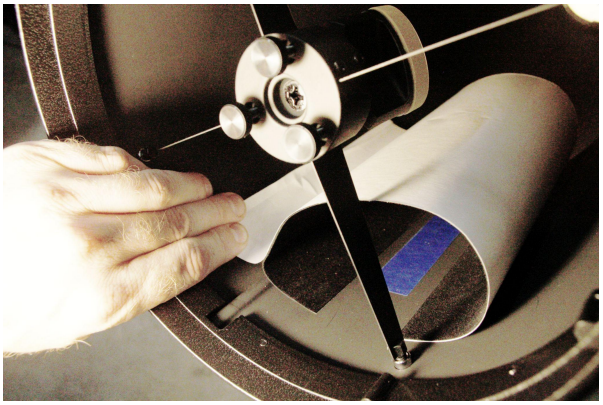
DO NOT REMOVE THE ENTIRE BACKING AT ONCE!

To install the secondary flocking material, carefully fold back approximately ⅛" to ¼" of the backing to expose the adhesive. Fold the backing flat against the flocking. Remember that this will install along the masking tape mark.



Roll the flocking paper and position it inside the optical tube (OTA) where you want it to sit, and then gently press down along the edge where the adhesive back is exposed. Now that the edge is adhered to the OTA. Slowly peel back the paper backing while pushing the flocking paper against the inside of your telescope, sticking it in place.

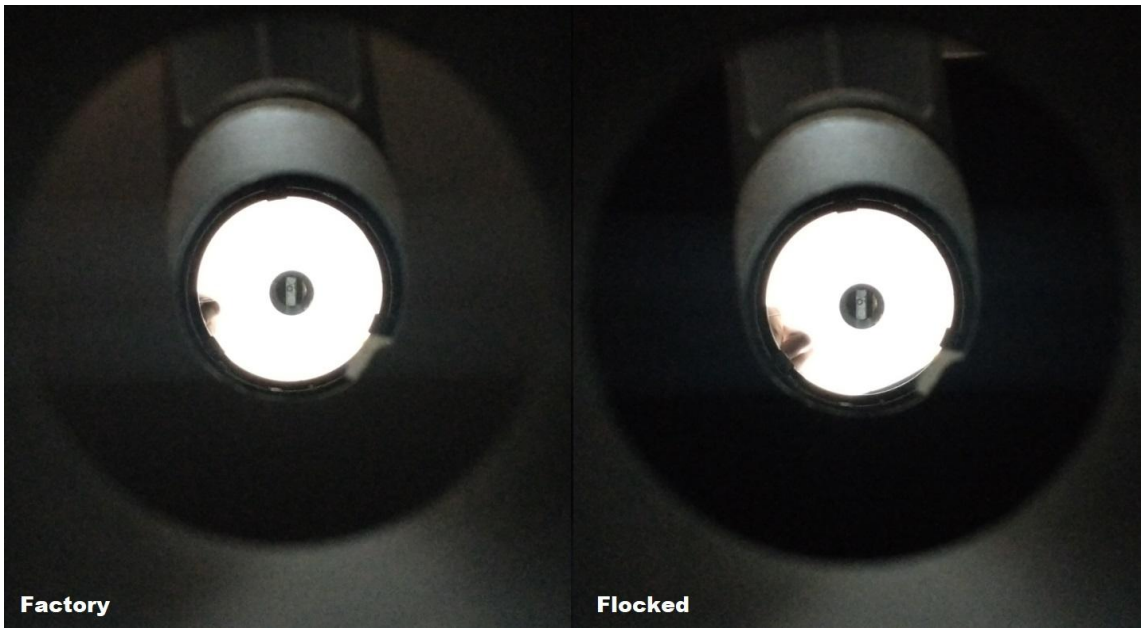




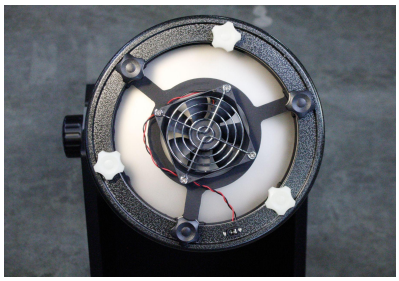
If any wrinkles or lines form, do not be discouraged. These are only cosmetic and the flocking will still perform incredibly well. A utility knife can be used to cut the paper releasing air trapped behind the flocking or to help smooth wrinkles or folds.

The first half of the kit has been installed!

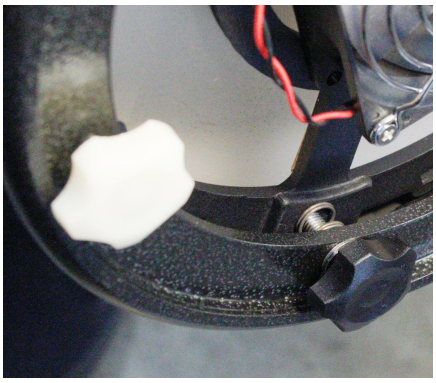
This image shows a before and after view when looking in the focuser.
Notice the much darker background.



Primary Mirror Collimation Springs Installation



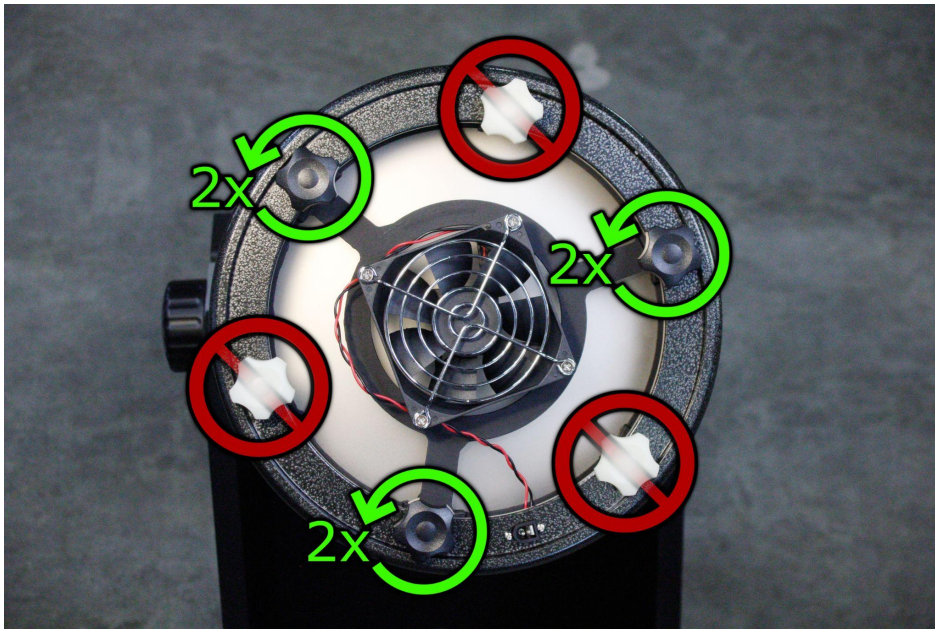
Just like the secondary collimation knobs, the springs will be replaced one at a time. Turn the telescope so that it is horizontal and the rear portion of the scope is easy to see.



There are three white and three black knobs. Behind the black knobs, small springs can be seen. These are the springs that we will be replacing.

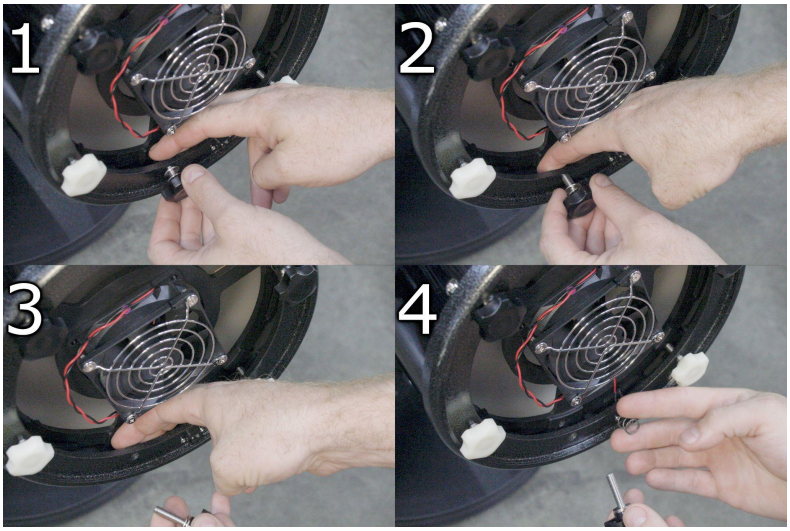
During this installation process, do not use the white screws at all. Leave them as they are. By leaving these screws in their position, there remains the highest chance of the collimation remaining close to how it once, once finished. If you do accidentally turn the white knobs, it is not disastrous, but does make for a bit more work when collimating the telescope later.

The first step is to turn each one of the black screws counter clockwise (loosen) two to three turns each.



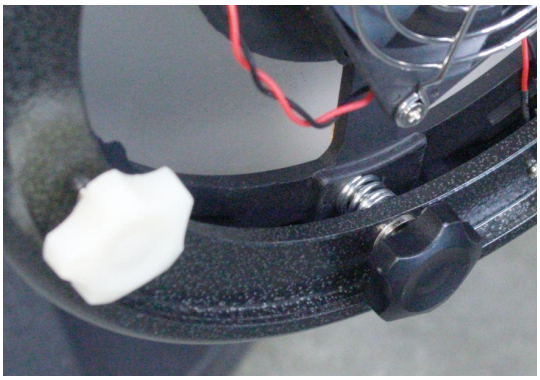
DO NOT FULLY REMOVE THE SCREWS AT THIS POINT. NEVER REMOVE ALL THREE AT ONE TIME. If they are all removed at the same time, the primary mirror will fall out into the telescope and could be damaged.

The springs can be replaced in any order, however it is recommended to start with the lowest spring; as it is the easiest to see and access while getting a feel for the process. Completely remove this knob and then reach in to remove the spring. To prevent the stock spring from slipping into a difficult to reach place or falling out and getting lost, hold on to the spring as the knob is being loosened.



Replace the spring, holding it between two fingers much like what is demonstrated in the last step of the above image, and then insert the knob. Tighten the knob several turns but do not completely tighten it. Repeat the above process for each of the remaining springs. If you have trouble engaging the threads of the knob that you are installing due to the primary mirror cell being too far away, try tightening one of the other black knobs a turn or two – then try again.

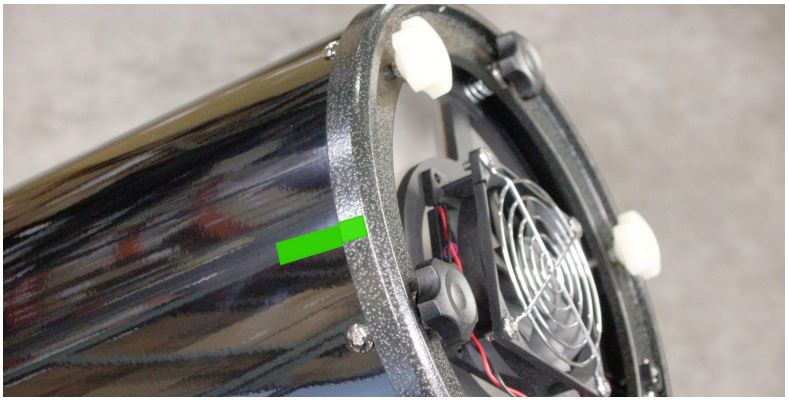
All three springs have been exchanged with the upgraded model, and it is time to fully tighten all three black knobs. Rotate through the knobs, slowly tightening each one a small amount before moving to the next knob. Do this until all three knobs are once again tight. The primary mirror collimation springs take more energy to compress which can help to keep the mirror positioned correctly. You might feel this increased tension when tightening the knobs.



Primary Mirror Flocking

It is time to install the last and largest part of the kit; the primary mirror flocking material. Before starting this step, be sure that there is a clean flat space available to place the primary mirror assembly while installing the flocking material.

The telescope should be pointed down, with the rear of it in the uppermost position possible, so that the primary mirror cell can be removed from the telescope. When the cell is removed, the telescope will want to fall forward and rest against the front board of the Dobsonian Base. This can happen in a hurry and can dent the tube. To prevent any damage it is a good idea to place a towel or rag at this location and gently rest the telescope against the front support of the base before removing the cell. Lock the base's altitude and azimuth knobs to prevent rotation. This can help to keep things steady during the installation process.



Mark the rear plate and OTA with a piece of masking tape, so that they can easily be reassembled in the same orientation.

Using the included screwdriver, remove all of the Phillips head screws around the perimeter of the bottom of the scope.

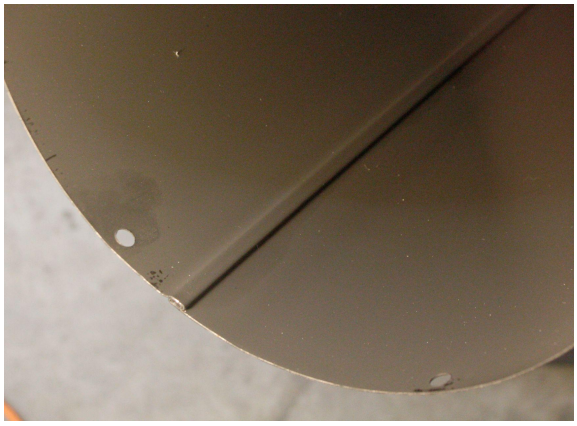
It is best to leave the "top" screw for last, as it is easy to see and this also makes controlling the scope and primary mirror easier when we remove the primary mirror assembly. Remove the last screw and then the assembly. Place it on the clean flat area that you have prepared, mirror face up, knobs down. Be sure that the mirror can not fall or be accidentally damaged.

Looking down the mostly empty tube, the dark flocking by the secondary mirror is easily visible. Compared to the flat painted tube it appears to be very dark. Neat-O!

The primary (lower) flocking material should be installed about 1” to 1 ¼” in from the edge. The space can be as short as ¾”, to 1.5” or even longer; but aiming for 1-1.25” is a good goal. Looking at the following photo, one can see the space that is left between the edge of the flocking, and the edge of the telescope tube.

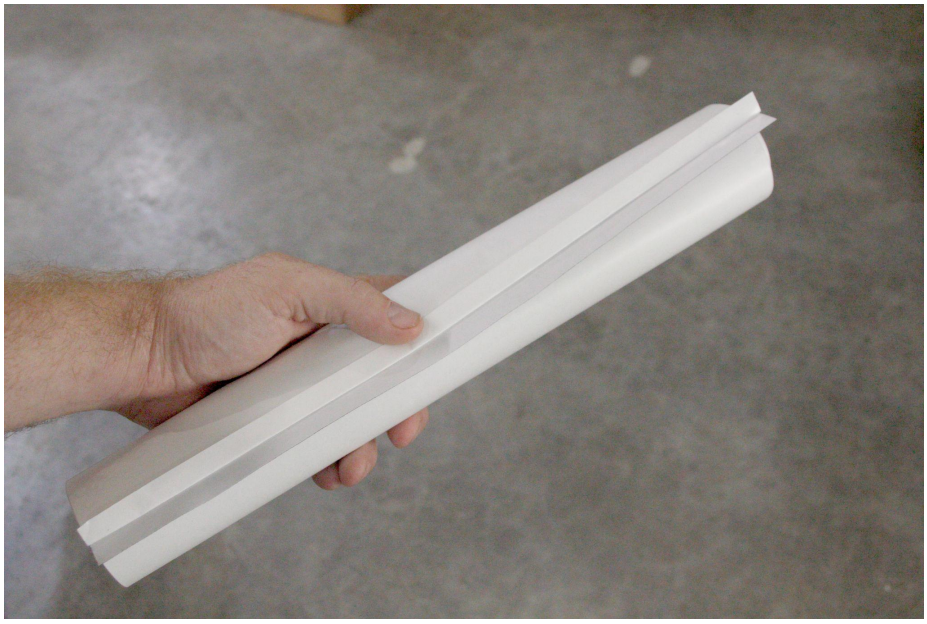
Just like the upper flocking, use one of the wet cleaning wipes provided in the kit to clean the inside of the OTA. Clean just past the screws that you can see about 15” up the tube. *When installing the flocking, it might cover these screws. This is ok and on some models it is unavoidable.*

There is a seam that runs the length of the tube. This is where the flocking material will be applied. Use this seam as a guide to help to get the material properly aligned. Doing so will minimize any corkscrewing of the flocking as it is applied. The flocking paper can have a tendency to spiral and when this happens the ends will not line up exactly. If this happens during your installation, it is perfectly ok. That being said, it is best to limit this if possible.



It is recommended that a “Dry Run” is performed before removing any of the backing. This allows the user to work through the movements involved in the installation, prior to making a commitment to permanently place the flocking material.

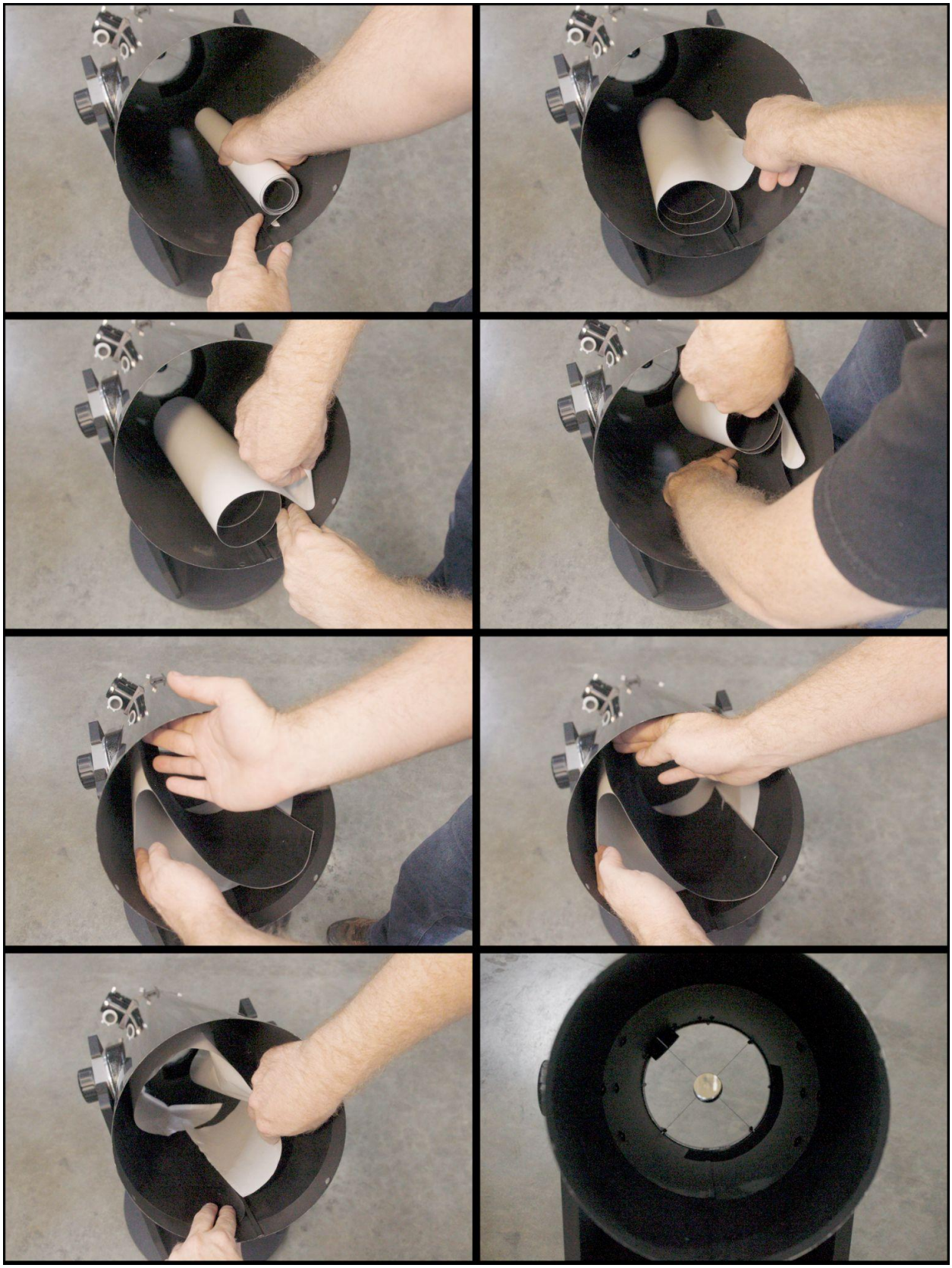
Much like when the upper flocking material was installed, peel back 1/8” to ¼” of the backing to reveal the adhesive. Keep the flocking rolled and insert it into the telescope tube. Keep the exposed adhesive away from the tube until you are ready to line it up and stick it in place. Remember to place the flocking at least 1” inside of the edge of the tube end. Align the flocking with the seam and gently press down to secure it into place.



Please review the step by step imagery on the next page, prior to installing the flocking. This imagery corresponds with the following description.

Once it can be verified that the flocking is lined up adequately with the seam, slowly remove a little backing at a time, exposing the adhesive and pressing the flocking material to the OTA. **Go slowly and take time, there is no need to rush here; it will only increase the chance of mistakes. If a wrinkle forms or air is trapped, we can deal with this. It will be OK. Work slowly, smoothing as you go.**

As the ends come closer there will be some overlap and this is designed to be this way, maybe 1/8” worth. Slowly smooth and shape the flocking over the seam and back to where it starts. Any trapped air spots can be cut with a utility knife and wrinkles pushed flat. Any cosmetic flaw should not negatively affect the views to any discernible level. Even wrinkled flocking will reduce the effects that stray light has on your view!



Once the flocking is in place, the primary mirror assembly will need to be reinstalled. Take note of where the masking tape alignment marks are. Gently install the assembly back into the OTA maintaining contact with it at all times until several of the screws are installed. If someone is available to lend a hand, it could be beneficial here. Do not fully tighten the screws until all have been started.

Congratulations!

All components of the Apertura Dobsonian Performance Upgrade Kit have been installed! Now the telescope can be collimated using your favorite method, enjoying all that this upgrade has to offer! From the simplified collimation adjustments, to the improved ability of the primary to hold collimation while adjustments are being made. Enjoy the contrast increasing reduction of stray light!