

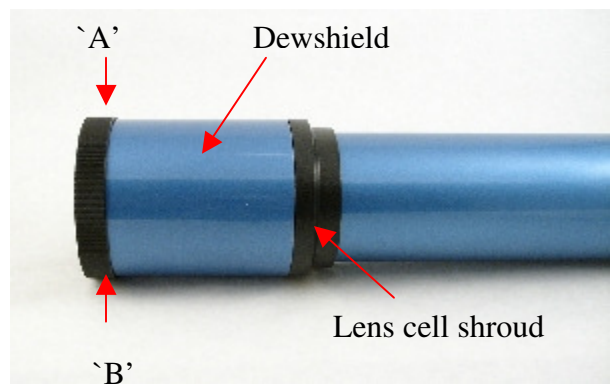
# Removing and Disassembling a Refractor Lens for Cleaning

By: Nightfire Scientific, Ltd.

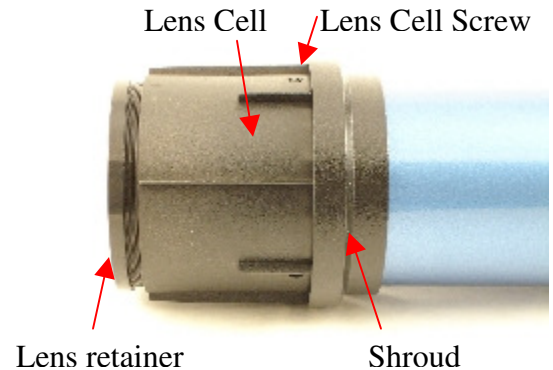
Before we begin... here's the typical disclaimer about lens removal and lens cleaning.

***\*Notice: We are providing this information to refractor owners a courtesy. Cleaning any telescope optic can do more harm than good. The information contained in this document explains how to dismantle your refractor's lens cell and how to remove the lenses from the cell. These instructions show, what we believe, are the safest steps to follow for removing the lenses. As always, exercise normal safety precautions when working with tools. Remember, you will be handling optics so exercise care accordingly. There is no information contained in this document about lens cleaning or lens cleaning procedures. Nightfire Scientific, Ltd. assumes no liability or responsibility of any kind for damage resulting from this document provided.***

Ok...with that out of the way, let's roll up our sleeves and get to work. Your refractor optical tube assembly should look like the one shown in the picture at the right. We've included some basic descriptions in each picture that should help you as we go through the whole disassembly process. Please review this entire document before proceeding and familiarize yourself with each of the parts shown in the pictures. This will eliminate a lot of guesswork and will make the disassembly much easier when you are ready to proceed.



The first order of business is to remove the dewshield so you can gain access to the lens cell itself. The dewshield is a "pressed-on fit". In most cases, you will find it necessary to rock the dewshield by pressing downward on the extreme outside edge of the dewshield. The picture above illustrates how to do this. Press downward at point 'A', then press upward at point 'B'. Take your time. The dewshield will come off. Set the dewshield aside and your OTA should now look like the picture at the right.



Now let's start the main part of the disassembly. We are now going to remove the complete lens cell from the tube. This is done by first removing the three lens cell screws that hold the lens cell to the tube. These three Phillips screws are equally spaced around the circumference of the lens cell. Remove the three screws and set them aside.

After you've removed the three screws, you should be able to pull the lens cell off of the tube. It should look like the picture at the right when you've finished. You will now be able to clearly see the lens system and the lens retaining ring which hold the lenses in position in the lens cell. If you look closely between the lens cell and the retaining ring, you will note that the retaining ring is threaded. We will be removing this retaining ring in the next step.



The next step is to find a lens stand somewhere in your house. You will need to locate something smaller in diameter than the telescope tube and taller than the lens and cell assembly as shown in the picture. "Handy Wipe" containers, or something equivalent, will work just fine. If you have lens paper, place it over your lens stage ("Handy Wipe container) and secure it in place with a rubber band. You can use a paper towel if you don't have lens paper. Trim off the excess paper as close to the rubber band as you can.



Your new lens stage should fit inside the lens cell as shown in the photo. ***Make sure you have the lens paper or a paper towel covering your stage before placing it inside the cell!*** Remove the lens stage from the lens cell and set it aside for now.



Next, we are going to remove the lens retaining ring. The lens retaining ring probably hasn't been removed since the day of its factory installation so it may feel like it won't come off. Sometimes they come off easily and other times it takes a bit of effort. Keep the lens cell in the vertical position as shown and untighten the lens retaining ring. (You might want to elicit an extra pair of hands to hold the lens cell while you loosen and remove the retaining ring.) Set the lens retainer aside after you've removed it. **IMPORTANT!!** From this point on, keep the lens cell in the vertical orientation as shown in the picture. Since you've removed the retaining ring, the lenses are now free to fall out if you tip the lens cell over.



With the retainer removed, look down at the lens system. You should be able to see three small black squares between the two lens elements. These are the lens spacers. Do not loose these as they are vital to ensuring the correct spacing of the lens elements!

Now let's get set up to remove the lenses from the cell. In addition to your lens stage (that you constructed from the "Handy Wipe" container and covered with a paper towel), you'll need a couple extra paper towels so you have a place to lay the lenses once they are removed from the cell.

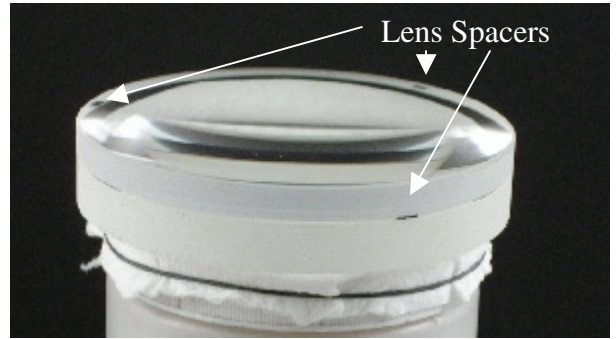
Place your lens stage in front of you. Grasp the lens cell in both hands (**DO NOT TIP THE LENS CELL OR THE LENSES WILL FALL OUT**) and gently lower the lens cell over your lens stage. Let the lens cell lay on the table and your lens set will be neatly balanced on top of the lens stage. Before anything further is done to the lenses, it's wise to mark the orientation of the lenses relative to one another. This can be done quite simply. Draw a line across both lens edges (not the surfaces) using a permanent Sharpie type marker. Put arrowheads on these lines where the two lenses come together. You can then use this line to realign the lenses during reassembly.



You can now lift the lenses off of the lens stage and place them on the extra paper towel you laid out. Handle the lens by their edges only and never touch the lens surfaces with your fingers.

The picture at the right shows the lens spacers between the lens elements. When you separate the two lens for cleaning, be sure to put these spacers in a safe place where they will not get lost. You will need to reinstall these spacers when you reassemble the lens system.

After your lenses have been cleaned, you can reassemble the lens system by simply reversing the steps given in this document. Here are a few pointers to keep in mind when reassembling your lenses. When you've separated the lenses, you should note that neither of the two lenses is symmetrical. The top lens, shown in the photo above, will have two convex surfaces (bowing outward). One side of this lens will have a more pronounced "bow", or will be more deeply convex, than the other. The "shallow" bow side faces away from the second lens (the lower lens in the picture above).



The second lens (the lower lens in the picture above) will have one shallow convex side and the other will be concave. The concave side of this lens faces the top lens in the picture above. If you drew the arrowheads on the alignment marks as instructed above, you won't need to remember any of this. These alignment marks could be washed away during the cleaning process so it's always good to know the proper orientation.

We hope this article has been helpful. Good luck with your cleaning project!