Vivitar Series 1 f3.5 70-210mm

(Tokina version – Serial #37******)

Cleaning Oily Diaphragm Blades and Lens Re-lubrication

By Prentice Fish, November 2010
version 1.1

Disclaimers: Here I am merely describing what I did on two manual focus, Tokina made, Vivitar Series 1 70-210 f3.5 lenses in Canon FD mount. I do this as a personal hobby and I lack lens repair skills/experience. What follows reflects that perspective – this is <u>not</u> written for, or by, an experienced lens technician. Don't hold me responsible if you try this procedure and something goes very wrong. That may happen. Don't call me and I don't want any lens repair work. You assume all risks for whatever you do, and carefully consider consulting others who are qualified and experienced. Also keep in mind that Kino Precision (Kiron was their brand name) probably made changes over time when producing this lens, so my lenses may be different from yours.

No parts/service manual (with parts lists, diagrams, and procedures, etc) could be found for this particular lens; perhaps one will be generally available in the future.

If you get into trouble, or don't want to bother with trying to fix the lens yourself, consider sending the lens to an experienced lens repair person such as Ralph Innes, a member of the Kiron Klub, whose website address is:

http://members.shaw.ca/f35mru20458/index.html

I don't know Mr. Innes, have not met him nor communicated with him, and of course have no financial connection to him. But several Kiron Klub members have mentioned his skills, and I'd talk to and consider him if I were looking for someone to work on a lens of mine. As always, evaluate your options and pick what you think is the best option for you at the time.

<u>The Problem – Is the lens aperture stuck wide open?</u> Oily lens diaphragm blades are not unusual for old lenses, since the grease used on these lenses breaks down over the years, and gets on the aperture blades, resulting in an aperture stuck wide open. Such was the case with my two Tokina version Vivitar Series 1 70-210 f3.5 lenses, in Canon FD mount, that I obtained in 2010. Here is one way to test (there are other test methods you may prefer) whether or not your lens has this problem: With the lens in a camera, open the camera back, put the shutter on B shutter setting, and set the f-stop wide open. Cock the shutter, look through the open camera back and the lens, press and hold down the shutter, and observe the size of lens opening in the "wide open" lens. Now release the shutter, and change the f-stop to (say) f16. Cock the shutter again, press and hold the shutter down, and look through the camera back and lens again, just like before. If everything is okay, you should see a much smaller opening in the lens. But if the diaphragm remains wide open – the same size as at the f3.5 setting you tried first – the aperture is not "stopping down" as it should, and oily shutter blades may be the problem. You may also see the opening slowly get smaller as you hold the shutter down. If this happens, the

aperture is not “stopping down” quickly as it should, and oily shutter blades may be the problem.

The diaphragm assembly (that is the part shown in this photo) can be removed, and the oily aperture blades cleaned, by removing only the rear mount assembly from the rest of the lens, and then some limited disassembly of the rear mount assembly, and then cleaning the diaphragm assembly. While that would fix the oily blade problem at least temporarily, this limited fix would leave the old grease/oil in the lens and ready, perhaps, to migrate again onto the aperture blades, or onto the glass surfaces, leaving an oily haze on the glass. And on my lens the zoom/focus movement was loose and sloppy. The likely cause was old lubricant breakdown, also the likely cause of oily aperture blades.

So I decided to take apart most of this lens, clean the oily aperture blades, clean any oily films on the exposed glass lens groups, and inspect them for haze/fungus/other problems, remove the broken-down old grease from the helicoids and other parts, and re-lubricate with a good synthetic grease having a wide temperature range. I'm satisfied with the end result.

List of Tools/materials used:

* Lens spanner wrench
* flat screwdriver 1.0x40 (for the really small screws), 1.5x40, 2.0x40, 2.5x40
* clamps (hose clamps and plastic clamps)
* tweezers
* JIS/Crosspoint screwdriver 1.7x40mm, 2.0x50mm, 2.5x50mm, and 3.0x50mm
* phillips screwdriver 0x50
* a cleaning fluid of your choice. I used denatured alcohol (from most any hardware store). Opinions differ, and some, with greater experience, prefer Coleman brand camp stove fuel and/or naptha (lighter fluid). You pick the fluid you decide you want to use; I'm not recommending anything. Be aware of all safety hazards and read all the product safety labels and take all recommended precautions.
* dish soap and water
* q-tips (lots of these)
* can of compressed air – readily available product
* good synthetic grease with a wide temperature range
* an Ottlite “Jupiter Magnifier Lamp”, or similar lamp with a magnifier built in, which relieves eyestrain. This is not an absolutely essential item, but it sure helps.
* a fluid of your choice for penetrating and loosening stuck threads on camera parts.

Take Lots of Photos and Notes during Disassembly. Take lots of photos and notes during disassembly. Go overboard here – you cannot have too many photos at different angles. Look carefully (before taking lots of pictures) for things such as slots or notches and anything different, so you can get the parts reassembled in the original position. Close-up photos from many different angles are a real help later.

JIS/Crosspoint head screws, phillips head screws, threadlocker, appropriate solvents for stuck threads, appropriate glass lens cleaning solvents, proper screw removal techniques, etc. If these subjects are unfamiliar, consider even more carefully sending the lens to an experienced lens repair person. Knowledge of these subjects is both helpful and beyond the scope of what is presented here. Search the Internet for helpful information on these subjects. You'll probably have to sift through the material to sort it out and find the "good stuff". If not familiar with lens disassembly, consider also finding a free or really cheap "beater lens" to practice taking apart and reassembling before disassembling your good lens.

Threadlocker: There are several kinds. MEK or acetone will at least soften most of them but are slow to penetrate deep threads. If all is metal, a red hot soldering tip on the screw head for 30 seconds often softens the threadlocker enough for a steady torque to move the screw. When cool, it becomes stiff as ever.

Set screws: Set screws have a sharp point and often are slot headed. The screwdriver should fit exactly to reduce the chances of breaking off one side. Remove as much paint as you can so the screwdriver blade can fit. When reassembling, it does not take much force to replace them adequately. Consider using threadlocker or something else to keep them there. If several are spaced around a ring tighten them evenly or else the ring could warp and bind.

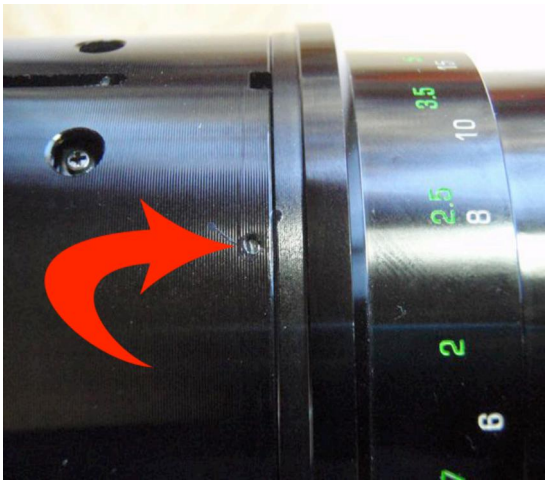
Disassembling the Vivitar Series 1 70-210 f3.5 Tokina version

On this particular lens the 70mm zoom position is all the way forward (lens fully extended) and the 210 mm position is all the way back (lens fully retracted). The infinity position is (viewed from the rear) full counter-clockwise rotation, and the close focus position is (viewed from the rear) full clockwise rotation. Filter threads do rotate when focusing. When zooming, a subject in focus remains in focus. Although I've not seen this lens in mounts other than Canon FD, from the way the lens is built, parts other than the rear mount assembly parts (which includes the diaphragm assembly) from other non-Canon mount lenses may well be interchangeable.

Step #1. Take off the "grip". It is the rubber-like cover on the "zoom ring". Red arrow in photo points to the grip, already partly rolled off. Curved red arrow points to the zoom ring. Red thumbtack points to the "distance ring". And the red triangle points to the "focus length indicator ring".

A bamboo skewer works well to get under the grip edge and start rolling it off. The grip slides or rolls off with your fingers. There may be a little glue under the grip, which you'll first need to separate from the zoom ring before taking the grip off. Again use the bamboo skewer, or something wood slipped under the grip, rather than a metal flat screwdriver, although that works also. Once the grip is off, you can see the black zoom ring and the two narrow slots (one on each side, 180° apart) in which there is a metal tab attached to a part under the zoom ring. You can also see round holes in the zoom ring.

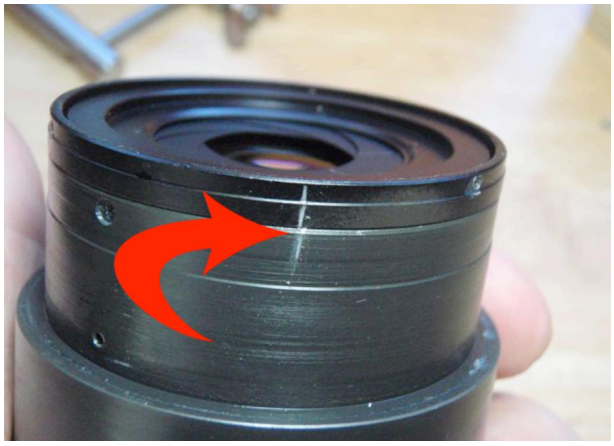
Zoom the lens out to the 70mm focal length position. Find the three very small set-screws (slot heads, often with some black paint, glue or silicone on the slot head) evenly spaced around the area of the zoom ring next to the distance ring. These 3 set-screws in the zoom ring hold the distance ring in place Loosen those 3 small set-screws in the zoom ring. Red arrow in photo shows the location of one on the 3 small set-screws. Try not to completely unscrew the 3 small set-screws so that they drop out of the zoom ring. Putting them back in is a "PITA" (pain in the arse). If one of the set-screws does fall out, use a piece of thin closed-cell foam with a hole in it to hold the small set-screw for re-installation.



Now find the three small screws (JIS headed) evenly spaced around the focal length indicator ring – that is the part having the 70 to 210mm scale on it – red triangle on previous page points to it. One screw is very near the "Lens Made in Japan" statement, as shown in right photo. Remove those 3 small screws carefully; expect threadlocker. It helps to keep groups of screws – such as these 3 – in separate containers with a label saying what they are. For instance, "3 focal length indicator ring screws".

Step #2. Pushing the now loosened focal length indicator ring towards the lens front, you can now see the 3 screws that hold the "rear mount assembly" to the rest of the lens. Red arrow in photo points to one of those 3 screws – screw is out in this photo. Scribe a line as shown in the photo, so you can reassemble in the position you found. Remove all three screws, and slide the rear mount assembly away from the rest of the lens. Also now slide the focal length indicator ring and the focusing distance ring off the lens – they come off easily. On one of my lenses, one of the 3 screws simply spun in its hole; using gravity it fell out. Appears the problem was stripped threads in the hole.

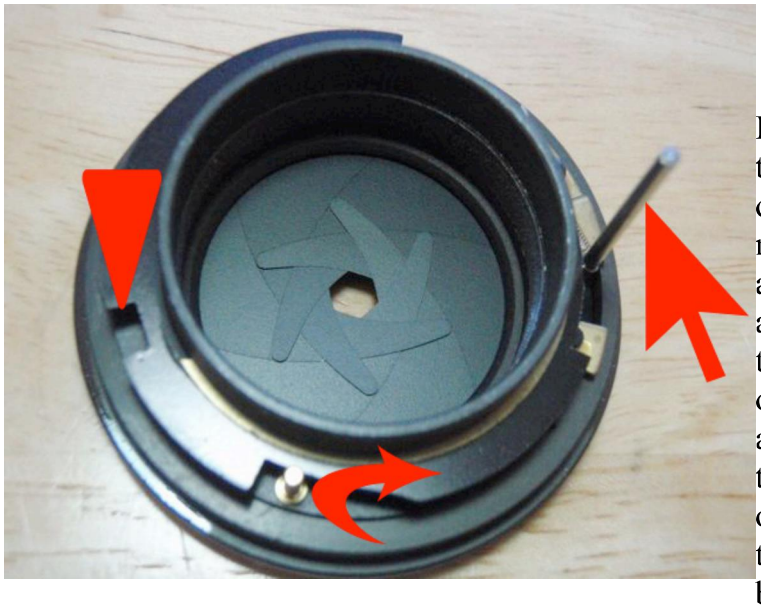
Photo below shows the parts now disassembled. Red arrow points to the "rear mount assembly".



Step #3. Observe the front part of the rear lens assembly, shown on top the photo right. There is the suspect diaphragm on the very top. Scribe a line as shown by red arrow, so you can reassemble in the position you found.

Step #4. Now remove the 3 screws connecting the two parts shown in photo left. Diaphragm blades are on right side of photo left. That part also includes the 4th (rear) lens group.

Unscrew the 4th lens group, as shown in right photo. Watch for any spacing washers when removing the 4th lens group. The diaphragm assembly is the right part, above the screwdriver. Avoid bending or altering the aperture control arms in any way. They are a precise link between the aperture and the aperture set ring.



Here's a picture from another angle of the diaphragm assembly. Examine the diaphragm assembly, and try gently moving the levers that move the aperture blades. Try to gently work the aperture blades open and closed, with the lever (sometimes called the "blade operating lever") that has a spring attached to it; red arrow points to it If the blades don't move, maybe the cam on the other lever (sometimes called the "aperture cam ring") is holding the blades open; curved red arrow points to the aperture cam ring. So gently move the aperture cam ring back and forth. This should move the blades so you can see them, as in the photo above. Try moving the blade operating ring again with gentle pressure, and see if the blades now move. When the blades are visible, you can often see clearly the sticky oil on the aperture blades, if oily blades are the problem but sometimes only the pivots are stiff with dry oil.

Try removing any sticky oil on the aperture blades the easy way – *without* disassembling the diaphragm assembly. Put the diaphragm assembly in the cleaning fluid of your choice, observing all safety precautions. I chose denatured alcohol and a glass jar. Gently work the aperture blades open and closed many times, with the blade operating ring or the aperture cam ring so the cleaning fluid can get at the sticky oil on the blades. If nothing moves, let the diaphragm assembly soak for a few hours in the cleaning fluid, and try again.

Often this will remove the oil and free up the aperture blades. When dry, the blades may be "snappy" once again, and "snap down" when you let go of the blade operating ring. Move the aperture cam ring as well, to see if the blades now open and close properly. Count your blessings if this happens! It worked on this particular lens, and I did not have to clean individual blades, a PITA. If denatured alcohol had not worked, one can consider using (and observing all safety precautions) other "more powerful" cleaning fluids commonly used on camera parts. But that's just an opinion – you decide. As a general rule, avoid using acetone or MEK because some lens aperture blades are plastic and will be warped by such solvents.

By moving the blade operating ring, check whether the blade operating ring fully opens the diaphragm, and stops just after fully opening the diaphragm. If an adjustment is needed, adjust the “diaphragm stopper plate” so that the blade operating ring stops just after fully opening the diaphragm.

Reinstall the diaphragm assembly into the rear mount assembly, making sure the parts mate correctly, and work properly. Use the f-stop ring to make sure the aperture assembly is working correctly. When checking this on Canon FD mount versions, keep in mind that, when the breech lock ring of the Canon FD lens is turned to the "off camera" position, the aperture controls on the back of the lens do not function the same as when the ring it turned to the "on camera" position. So on Canon FD lenses make sure the breech lock ring is in the “on camera” position before checking the aperture assembly.

Or you can test whether the aperture blades are working correctly by mounting the rear mount assembly in the camera, “stopping down”, and observing the action of the aperture blades at various f-stops. Photo right shows the rear mount assembly on camera, and aperture assembly being tested by “stopping down”.

A general thought before turning to the next step. While you have a chance to examine each lens group individually, do so carefully, as the lens groups are taken out. Besides examining the outer glass surfaces of each lens group for problems, look for fungus or oily haze on the interior (that is, the non-exposed) glass surfaces of each lens group. Hopefully there is no problem on the non-exposed glass surfaces; if there is, consider dealing with it. Here is a photo of the 4th lens group, taken apart. In the 4th lens group of one lens, there were numerous small “dots” on the interior side of one glass piece. This lens group was disassembled and cleaned, and reassembled onto the diaphragm assembly. What is the point of a mechanically good lens with hazy or oily glass? The goal here is clean and bright glass when everything is re-assembled, for those great pictures you'll be taking.

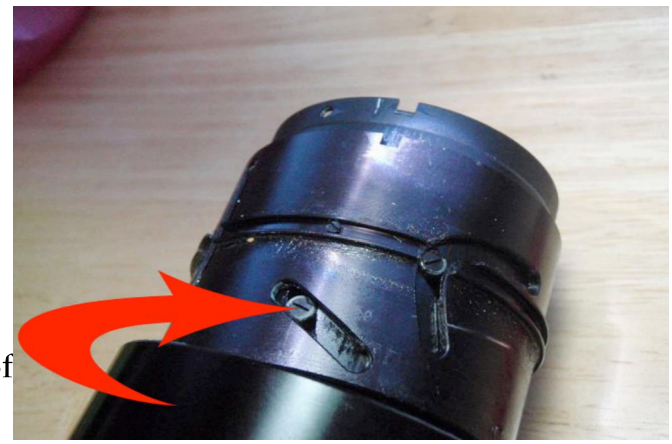
Step #5. [Having fixed the oily diaphragm blades, you could simply reassemble, and skip the following steps. The following steps assume that you've decided to remove the old grease that probably caused the oily diaphragm problem, and install new grease suitable for cameras.] Using a spanner wrench or other appropriate tool, remove the retaining ring that holds the cam ring in place. [Spanner wrenches are for holding, not turning. Hold the spanner wrench and turn the lens under it.] The triangle in photo right points to one of the two notches (for your spanner wrench) in this "hard to see" retaining ring.

Note: my spanner wrench tips would not fit far enough in to reach the slots here. So I held, at an angle, a flat screwdriver in the notch, and gently, with a small hammer and repeated hammer taps and the screwdriver held about at a 45 degree angle, drove the notch with the flat screwdriver, with the lens on a table held by hand from turning by another person. Unscrewed this cam retaining ring that way; this is not recommended in any way and I should have avoided it.

In both of my lenses, removing this cam retaining ring was difficult, in part because either threadlocker had previously been used or "junk" had gotten into the threads over the years, binding them. Either get a proper spanning wrench that will work in this tight spot, or make a proper special tool. On reassembly, this retaining ring needs to be carefully fit in, to avoid cross-threading and/or binding. Before putting this retaining ring back in, it was carefully cleaned, and some grease applied to it, as well with the threads into which it screws – these are in the zoom ring. The purpose being to make reassembly a little easier, and to make any future disassembly less difficult than it was. See also the pictures in the reassembly section, as this needed careful attention.

This photo shows the cam retaining ring off the rest of the lens, and cam ring moved towards rear of lens. Now slide the cam ring towards the lens rear, rotating the cam ring just a little to free it from the zoom ring shoulder onto which it fits on reassembly. With just a very little rotation, the cam ring will slide into the position in photo above.

Step #6. Note the 4 roller shafts and rollers, and the three other screws in the various slots in the cam ring. Arrow in photo points to one of the 4 roller shafts and rollers . A thread locking fluid may have been applied previously. Take great care in removing these roller shafts and rollers, as the parts are small and replacement parts unavailable, unless you find a "parts lens" to cannibalize. Once unscrewed a few turns, the roller shaft is out of its hole, but probably still in the slot because of friction with the white plastic roller. Use tweezers or another way to get the 4 roller shafts and rollers out of the slots. Also take out the other 3 screws in the cam ring slots.

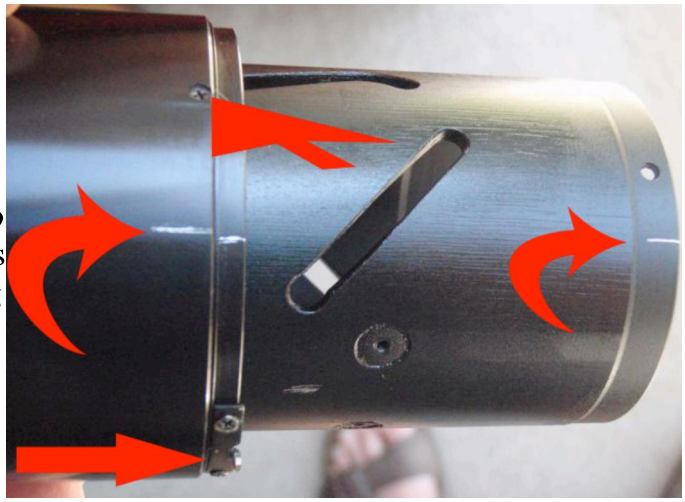


On one of my lenses all 4 roller shafts and the other 3 screws were slot headed. On the other lens all 4 roller shafts and 2 of the other 3 screws were JIS headed.

After all 7 screws/rollers/guides are out of the slots in the cam ring, the cam ring slides off. Photo right shows the 2nd and 3rd lens groups out (right side of photo); these lens groups are free to gently slide out once the 4 rollers and roller guides are removed. Cam ring is in center of photo right; slide it off when all 7 screws in its slots are removed. When reassembling, and it is time to put the 7 screws back in, it is a bit easier if you install the 4 roller shafts and guides first, and the remaining 3 right after that. Easier to turn the cam ring a bit and find the holes for the screws that way.

Step #7. Remove the zoom ring. Easiest to remove one of the metal slot tab units by using two of the round holes in the zoom ring to gain access to the two screws holding the metal slot tab unit, and leave the other one in place ; just tilt the zoom ring a bit, and get it off. Photo shows cam ring and zoom ring off.

Step #8. At this point, 1st lens group is in outer helicoid (left curved red arrow), which remains on inner helicoid (right curved red arrow), and there is a ring holding the metal tabs (to which the bottom red arrow points). That outer helicoid retaining ring had the two (now one, since one just taken off in previous step) metal tabs that go into the focusing ring slots. In this photo the helicoids are in the "full counterclockwise viewed from lens rear" position. This is the fully retracted or "bottomed" position. Note that this outer helicoid retaining ring is held on by 3 screws connecting that retaining ring to the outer helicoid; top arrow points to one of those 3 screws in the outer helicoid. The two curved arrows also point to scribe marks that line up in three parts – the outer helicoid, the outer helicoid retaining ring, and the inner helicoid – while they remain in the "full counterclockwise viewed from lens rear" position. This is the fully retracted or "bottomed" position.



The reason for this aligned scribe line: When reassembling the two helicoids, in the "full counterclockwise viewed from lens rear" position, the helicoid lines should line up as shown. Then the outer helicoid retaining ring is put on, and it lines up as shown. *All back to original position as found before removing the retaining ring and disassembling the two helicoids.* Right photo shows retaining ring off, and two helicoids separated. Must realign all 3 to original position – scribe line helps you do that.

Also, when separating the two helicoids, at the place where they finally separate, put a mark (say, a white dot big enough to see easily) anywhere on one helicoid and another similar mark directly opposite on the other helicoid. Then, upon reassembly, start mating the helicoids where those two white dots are opposite each other. Saves time. And when in the "full counterclockwise viewed from lens rear" position, the helicoid scribe lines should line up as shown in the photo with red arrows.

**** Note for future consideration: perhaps clean these 3 parts as a unit, and then re-grease unit. Then no need to disassemble the helicoids or remove the retaining ring for the outer helicoid, but cleaning will not be quite as good. *****

Once parts cleaned and re-greased, they are ready for reassembly.

Re-Assembly.

At this point, the old grease and oil have been cleaned off the parts. The oily diaphragm assembly has been cleaned and (if taken apart, re-assembled) is ready for re-installation. The individual lens groups have been examined and found to be clear, bright, and without significant problems, with any oily films on the exposed glass surfaces removed. No irreplaceable parts were ruined during disassembly. So the lens will be re-assembled, and you've got great modern synthetic wide temperature range grease on hand, which you've decided will give your lens just the right feel (for you), when zooming and focusing. In general, reassembly is the reverse of disassembling. See disassembly notes.

After lightly greasing the inner and outer helicoids, rest the outer helicoid vertically on a table, and align the white dots – that marks where the helicoids came apart. Try to get the helicoids started; do not push hard. A light pressure is all that is needed; getting them aligned is the hard part. They must be square with each other and the slope of the threads fools your eyes.

Once the helicoids mate, turn the inner helicoid so that it is "all the way bottomed", and your scribe marks should line up. If the scribe marks do not line up, take out the inner helical, and rotate it a little as needed one way or the other depending on what happened the first time, and reinsert, and bottom, and see if the scribe marks line up as they should. Repeat this process until the scribe marks line up in the "full counterclockwise viewed from lens rear" position. This is the fully retracted or "bottomed" position. Then re-install the ring with the metal tab, align its scribe mark with the scribe mark on the outer helicoid, as shown on photo left. Now the helicoids and the ring with the metal tabs are as you found them.

Here are some additional thoughts.

1. If you forget to put proper scribe lines on before separating the helicoids, doing the best you can with your photos, temporarily re-assemble without the distance ring or focal length indicator ring, and mount lens on camera. Move zoom ring to infinity position and check whether an object at infinite distance (like a tall telephone pole on the distant

horizon) is in correct focus, or blurry. Probably will be off focus because the two helicoids are not back to the original position. Now move zoom ring so object at infinite distance is sharp and clear. With the zoom ring not rotating from that sharp and clear focus position, do the following:

a. remove lens from camera, and rear mount assembly from lens, and

b. put aligned scribe lines on the inner and outer helicoids and the outer helicoid retaining ring, as shown in photo above. Remember this is correct position for focus at infinity. Now separate the two helicoids, and try different mating positions until the three scribe lines line up as closely as possible, with helicoids in the "full counterclockwise viewed from lens rear" position – this will be the fully retracted position. Assemble again, and check in camera whether infinity focus is now correct. Keep disassembling and re-assembling as needed until you get it right.

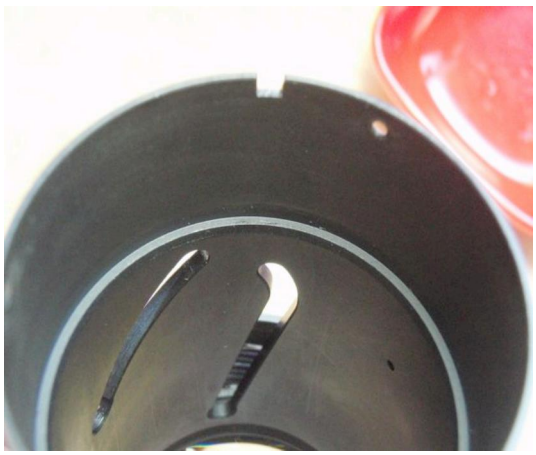
Let me know if you find a better way; this is a PITA. Much better to put proper scribe marks in, as noted earlier, before disassembling the helicoids.

2. On this lens, note that there is no readily apparent way to adjust slightly the infinity focus. On one of my lenses the infinity focus is ever so slightly short of correct; on the other the infinity focus is ever so slightly past correct. But perhaps the front lens can be turned in the front threads of the outer helicoid? If it can turn in those threads, it will move a little forward and back as it turns in those threads. And maybe that is the infinity focus adjustment for this lens? Not sure; do not have the correct rubber tool to try to turn that large lens from the front. Perhaps ….? I chose not to turn the front lens, and leave things in the condition as found. I invite comments/suggestions from experienced persons.

3. Note the front name plate ring with the serial number and such. Very steep angle. One possibility, if the ring is stuck in the threads, is to drill a couple of small holes for spanner wrench, if necessary. But first try a large rubber band pressed against the steep ring with your fingers, and turn. That may be enough to remove that name ring.

4. Remember not to tighten too much the retaining ring for the cam ring, or the zoom ring will not move. If the retaining ring for the cam ring is tightened too much, there is too much friction and zoom ring binds, even with grease. Test the zoom ring as you do the final tightening of the retaining ring for the cam ring. And be sure the cam ring is properly seated before putting the retaining ring in. You probably will need to rotate the parts a little, to get the cam ring all the way in. Check visually with a flashlight here.

5. Some additional photos to help understand a little more how the parts work now follow.

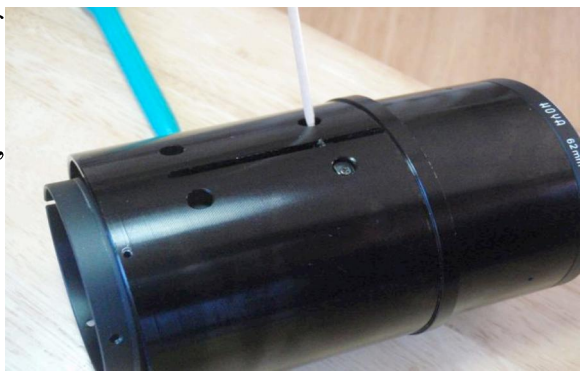


Left photo shows inside of cam ring, and the shoulder, which is where the 2nd and 3rd lens groups go. Right photo (left side) shows inside of zoom ring, and one of the two stops, and the grooves and shoulders for the proper alignment of the cam ring against those shoulders, before re-installing the retainer ring for the cam ring. Fine threads for the retaining ring for the cam ring are there as well.

6. The 2nd and 3rd lens groups are held together in a "rubber cage" for easier installation and disassembly. They move fairly easily inside the cam ring, when re-installing and attempting to find the holes through the slots of cam ring, to reinstall the roller shafts and rollers. Be patient, don't force anything. This picture shows 3rd lens group in its housing, and the 2nd lens group removed from its housing for some cleaning of that particular lens group.

7. Be sure to install the zoom ring <u>before</u> installing the cam ring and 2nd and 3rd lens groups, and their associated screws and roller shafts and rollers. There are shoulders and grooves inside the zoom ring against which the cam ring rides, so the zoom ring must go on before cam ring.

An easy way to get zoom ring on: have one of the metal tabs already installed on the retaining ring; the other with its tab laying in its slot on zoom ring with only gravity holding it, and move zoom ring on, and move the metal tab part into place with gravity and pointed tools. Once in place, hold in place with toothpick into one screw hole, rotate toothpick to top; put screw into other hole.



Suppose you forgot to put one of the metal tabs on before installing the cam ring and its retaining ring, so you can't put the metal tab in through the back. It is possible to maneuver the metal tab through one of the round holes in zoom ring, and then maneuver the metal tab into place on the outer helicoid retaining ring with gravity and pointed tools.

8. Note that the notch in the cam ring goes toward the lens rear, and lines up with the notch in the inner helicoid.

Finally, I'd like to gratefully acknowledge the excellent help and comments of Mel Smith, who kindly reviewed earlier drafts. That said, any mistakes here are the responsibility of the author alone. Should you detect something(s) that needs correction, please send your constructive comments to: *prenticefish*@*msn.com*. All such comments welcomed and appreciated. [The e-mail address is not correct in the hope that spammers can't grab it and use it to peddle stuff. Please cut and paste the address into your e-mail, then remove the *.]