A Telescope Maintenance

ноw то Clean Your Optics





GARY SERONIK

Keeping your telescope and eyepieces in tip-top condition doesn't have to be intimidating or time consuming.

THE DELIVERY TRUCK has just pulled away leaving you with a big cardboard box containing your brand new telescope. A few minutes later, the scope is unpacked and you marvel at the sight of factory-fresh, pristine optics — mirrors, lenses, or a combination of both. Enjoy it. Chances are your optics will never be this clean again. If that thought fills you with worry and consternation, don't let it. Consider these basic facts. A little dust has virtually zero impact on the views your telescope will deliver. And even if your efforts to clean the optics won't restore them to factory-fresh condition, with a little care and effort, you can get pretty darn close.

To Clean or Not To Clean

When you're taking care of telescope optics, it pays to follow the medical dictum: first, do no harm. A cautious approach is warranted. A mirror or lens that has dust on it can always be cleaned, but one that gets scratched through overzealous attention is damaged for keeps. Thus, the most important step in the cleaning process is deciding if it's really time to take action. How will you know? If you look at your optics and aren't sure, it's not yet time. Here's why.

Dust and smudges on your telescope's optics are bad mainly because they absorb and scatter light, reducing contrast and making the resulting images dimmer. How bad things can get really depends on how much dust we're talking about. But even if so much crud accumulates on your optics that only 50% of the incoming light makes it through to the eyepiece, you're only losing ½ magnitude of brightness. In other words, your 10-inch reflector will work like a 7-inch. That's not good, but it's not exactly catastrophic either. And your optics need to be quite dirty to suffer that much light loss. Usually when things are bad enough that you feel like you need to clean your telescope's objective, you're in the 20% or less lightloss range.

Another important consideration is the material we're trying to clean. Most glass is pretty hard stuff — just ask anyone who has ground a telescope mirror. It takes serious effort with silicon-carbide abrasive to grind away a significant amount of glass. Unfortunately, what we're really trying to clean most of the time is a relatively fragile coating deposited on the surface of the glass. This is true whether we're talking about a reflector's mirror, a refractor's objective, or the corrector plate of a Maksutov or Schmidt-Cassegrain telescope.

Regardless, cleaning optics is a two-step process. First, we remove the loose dust and debris, and then we use some kind of solvent to take care of the more stubborn material. If you've decided it's time to clean your optics, let's roll up our sleeves and get started.



For many telescope mirrors, a simple running-water rinse described in the accompanying text is all that's needed to keep them clean. All images are courtesy of the author.

Telescope Mirrors

Among common telescope designs, the primary mirror in a Newtonian reflector requires the most involved cleaning job because it's usually not readily accessible. But there's also a substantial benefit of the Newtonian design, and that is once you've removed the optics from the tube assembly, the cleaning task is very easy. In most cases you'll only have to undo a few screws to liberate the



After rinsing, most of the water will naturally slide off the mirror's surface when it's stood on edge, but you can remove any remaining droplets with puffs of air from a rubber dusting bulb.



For removing stubborn grime after the initial running-water rinse, you can lightly drag pure cotton balls soaked in a highly diluted solution of dishwashing liquid across the mirror's surface. This should be followed by another rinse and drying of the mirror's surface.

primary-mirror cell from the tube, and then a few more screws to remove the mirror from the cell. There are too many variations to give specific instructions here, but if you take care to note which screws come from where (using a digital camera to record step-by-step photos is a big help), you should do fine.

Before you begin the cleaning process, take a moment to remove any rings or other jewelry you may be wearing.



Although not for everyone, the author's preferred method for removing stubborn dirt involves substituting soapy fingertips for cotton balls. The process relies on the incredible sensitivity of human touch to avoid damaging optical surfaces.

There's no point in risking a scratch that can be avoided with a little preparation. Next, lay a clean, folded towel in a sink and place the mirror on it with the reflective surface facing up. Aim the faucet at the surface of the primary and run warm (not hot) water over its entire face. If you can direct the stream at the mirror's center, you'll get a nice flow radiating outward over the entire mirror. This will wash away all the loose dirt and dust particles. After five minutes or so, turn off the tap. If you live in a location with especially hard water, it's a good idea to give the mirror a quick, final rinse with distilled water.

Carefully remove the mirror from the sink and place it on its edge on a new towel to let the water run off the mirror's surface. Be very careful not to let your mirror roll away or fall face-first onto the countertop. I find it helpful to chase the last few water droplets off the mirror by blowing them to the edge of the glass with a rubber dusting bulb. If you don't have one handy, you can also wick up these droplets by touching them with the corner of a paper towel.

Once the mirror is dry, carefully inspect it. In many cases this running-water bath is all the washing your mirror will require and you can call the job done. But if the surface still looks a little grubby, it's time to move on to stage two.

Begin by stopping up the sink drain and putting the mirror face up on a folded towel. Fill the sink with warm water until the mirror's reflective surface is completely submerged. Let it soak while you prepare a cleaning solution by mixing a couple of drops of dishwashing liquid (Ivory and Dawn are the brands most often recommended) with a half cup of warm water. Drop a few cotton balls into this solution. Be sure to use pure cotton balls, not ones made of rayon or other synthetic "cotton." Leaving the mirror submerged, take a soapy cotton ball and gently drag it across the surface of the mirror, rolling the cotton as you do.

The idea is to keep fresh cotton continually in contact with the mirror's surface — you don't want to pick up a tiny piece of grit and drag it across the mirror. You'll use a lot of cotton this way, but if you take your time and change the cotton frequently, you'll minimize the risk of creating fine scratches (called sleeks) in the reflective coating. Once you've made your way over the entire mirror, give it a good rinse (again, finishing with distilled water if needed), then dry and inspect as before. Your mirror should now be nice and clean. While you have all your supplies handy, you might as well clean the scope's secondary mirror using the same techniques, but only if it needs it!

Another Way

The method outlined above is tried and true, and it's the one most often described in books and online. But it's not how I clean my mirrors. I prefer an approach that I find is quicker, easier, and often produces better results. Here's how I go about it.

First, I do the full 5-minute, running-water rinse described above. Then I adjust the water stream so that the entire mirror's surface has water flowing over it. For the next cleaning step I use a much stronger concentration of dish soap — 1 part soap to 3 parts water. I dip the fingers of one hand into this cleaning solution, ensuring my fingertips are completely coated. Then, while the water continues to run, I very gently place my fingertips on the center of the mirror and wipe its surface, using a slow, circular motion, spiraling out toward the edge of the mirror. The key to this technique is to not exert any pressure — my fingertips should feel as if they're gliding over the surface of the glass, floating on the stream of flowing water. As soon as I feel my fingers starting to stick to the glass, I recoat them with fresh cleaning solution and continue where I left off. Once I've done the entire mirror, I let the water continue to flow for another five minutes to ensure any residual soap is washed away. I dry the mirror as outlined above.

The beauty of this approach is that it takes advantage of the superb sensitivity of your fingertips — you can feel the tiniest grit particles and react before any harm is done. I also find that this technique works better than the cotton-ball method for getting rid of any buildup of haze that sometimes forms on a mirror's surface with age. That said, this approach isn't for everyone. If touching your mirror makes you nervous, stick with the tried and true.

Corrector Plates and Refractor Lenses

The good news is that if you own a refractor, Maksutov, or Schmidt-Cassegrain, your cleaning task is relatively straightforward because no disassembly is required only the glass's front surface is exposed to dust and dew, so it's almost always the only one that needs attention. As with mirrors, this is a two-step cleaning process. The first step is to remove all the loose dust with a rubber blower bulb or a camel's hair brush. Take your time and do a thorough job.

Next, it's time to use a cleaning solvent. Everyone seems to have an opinion about which ones are safest and most effective. I, and many others, use regular Windex glass cleaner. I find it works well. Al Nagler of Tele Vue Optics suggests using acetone and lens-cleaning tissues, but only if there is no chance that the acetone will come into contact with any plastic parts or paint.

The key to this process is to never apply the solvent directly to a lens. Instead, I lightly dampen a cotton ball



To clean stubborn material from a refractor's objective, after blowing or brushing the loose dust away, use a pure cotton ball dampened with a cleaning solution. The result (shown on the following page) will be a lens that appears almost as clean as the day it was new.



Cleaning the small lenses in eyepieces is just like cleaning a telescope objective lens, except that cotton swabs rather than cotton balls are used.

with Windex, then slowly and gently wipe from the center of the optic outward with a circular motion, continuously using fresh cotton. I don't need to apply pressure for the cleaning solution to do its work, but I may need to go over the glass a couple of times before it's completely clean. Finally, I fog the glass by breathing on it, and I use a fresh



Telescopes and eyepieces will deliver a lifetime of first-rate views if cleaning is done carefully and only when necessary.

cotton ball to wipe the surface one last time.

Sometimes you'll see spots and blemishes that simply won't go away. Chances are these aren't stains, but rather places where the coating has been damaged by acid dew or some other cause. There's nothing you can do about these, just recognize them for what they are and console yourself with the knowledge that they don't affect the view.

Eyepieces and Filters

Eyepieces and filters should receive the same treatment as objective lenses, except that they require more frequent attention because they get handled a lot. Even if you're careful, it's likely that the outermost lenses of your eyepieces will eventually accumulate a coating of eyelash oil. This means that you'll need to use a cleaning solvent once you've blown away or brushed off all the loose dust. The only real difference with cleaning these small surfaces is that you'll use Q-Tip cotton swabs rather than cotton balls. As above, Windex works well, but acetone is an option if you're certain there are no plastic or painted parts in the eyepiece or filter. It's also important to ensure you don't apply liquids directly to the glass — lightly dampen the Q-Tip with the liquid, then gently and slowly wipe the lens, using a circular motion.

Use as little of the cleaning solution as you can and avoid wiping too quickly. If you don't, little droplets of solvent can remain on the glass, and when these evaporate they often form small spots that require additional cleaning. As a final step, fog the lens with your breath, then go over the surface with a clean Q-Tip. If you have a lot of oily build up on your eyepiece, you may have to repeat the process several times before it's completely removed.

Under no circumstances should you ever take an eyepiece apart. If you have an objectionable amount of dust on the interior lenses of an eyepiece, a trip back to the factory is your best bet. Al Nagler tells me that one of the main reasons an eyepiece is returned for servicing is because its owner took it apart and couldn't put it back together properly.

Cleaning optics is just part of the package when you become a telescope owner. Although the process can seem intimidating at first, eventually it will become routine. And this is when you have to exercise the greatest care. Don't become complacent, and make sure you take all the necessary precautions when cleaning your optics. And don't start cleaning them more frequently than necessary because you've become comfortable with the process. If you use the methods described here, and only do so when you really have to, your telescopes and eyepieces should last a lifetime.

Contributing editor **Gary Seronik** has been building and cleaning scopes for more than three decades. He authors this magazine's Telescope Workshop column and can be contacted through his website: **www.garyseronik.com**.