Online Lensometry Class

By

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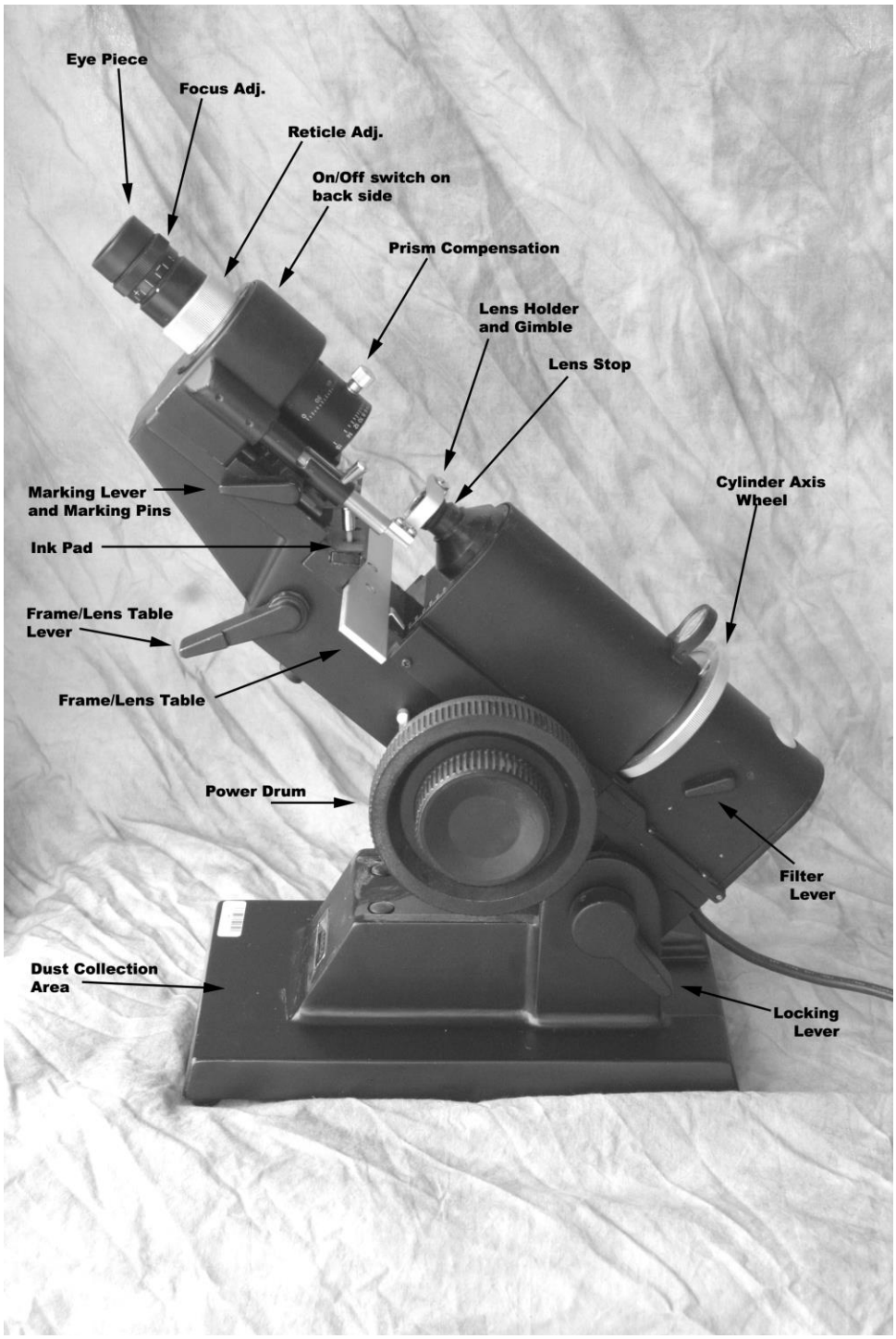
Introduction

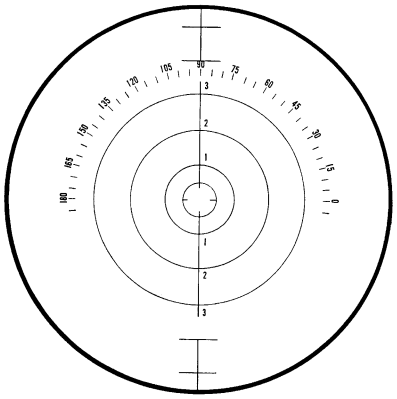
This course covers the basics of the lensometer and shows how to neutralize lenses and glasses in single vision, multifocals and progressives. It also covers prism in all these lenses.

Parts and Setup

Below is a photo of a Marco 101 lensometer with the parts named. If the lensometer you use is not the same brand this is not an issue. Most lensometers are built in a similar manner and their operation is very comparable.



Now that you are familiar with the parts of the lensometer you should learn the basic setup of the instrument. The first thing to look at is the focus of the eyepiece. This is done by taking a white piece of paper and placing it between the prism ring and the lens stop, at an angle to shine ambient light into the instrument. Looking into the lensometer look at the reticle and make sure these lines are in focus. Change the focus with the ring on the eyepiece.



The Reticle

Next turn on the instrument and make sure the power drum is at zero. You should see the target which is set of lighted lines, three narrow and three wide. Now look at the target and make sure it is centered and in focus. If the target is not centered, then the prism ring may not be zeroed out also. If at this point the target is not in focus or not centered, having checked the prism ring and power drum, your instrument may need some adjustments by a qualified technician. Contact the instrument vendor or call your local lab for help or recommendations for repair.

As mentioned before the target is made up of six lighted lines. The three narrow lines are for focusing the sphere power of a lens and the three wide lines are for the cylinder in a lens.

Using the lensometer – Single Vision

After the initial setup the lensometer should be checked each time it is used, by zeroing out the power drum and making sure the target is centered and in focus.

This video series is based on reading in minus cylinder but there is a video explaining how to work in plus cylinder. Any optician should be able to use either equally well and all the principles discussed in this series are the same for the operation of the lensometer in either plus or minus cylinder. In general, when reading any lens, the power drum should be moved to the plus range and brought back toward the minus range. Then, if there is cylinder, the power drum will be moved more minus again.

Reading a lens on the instrument remember to try not to move the power drum back and forth to focus the lines. Moving the drum and stopping when the lines come into focus is the recommended procedure. When reading sphere powers, the lines all come into focus at the same time so this is the easiest lens to read.

A compound lens has a second power ground into it to correct astigmatism. When reading a compound lens there will be the sphere power, the cylinder power and the axis. A typical prescription looks like this: -4.00 -2.00 X 47. The RX is a relationship of the sphere and cylinder powers. The sphere power is read first, and the drum will read a -4.00 which makes sense. The cylinder power is now -2.00 more than the sphere. So as the power drum is moved, it is moved -2.00 more to a -6.00 on the drum.

When reading a compound lens, remember the sphere power is read with the narrow lines and the cylinder power is denoted by the wide lines. So, when reading the power move the power drum until any part of any of the lines come into focus and stop. Now move the axis wheel so the sphere lines are close or in focus and in alignment. When the sphere lines are in focus then we can read the power of the sphere and our axis should now be close. Now move the power drum more minus until the wide (cylinder) lines come into focus and figure the difference from the sphere and the cylinder powers and note that this is the power for the cylinder. Then double check the axis by making sure the lines are straight. If you turn the axis wheel you will notice the lines become crooked at certain points, so moving the wheel back a forth a little will help to get an accurate reading on the axis.

Checking glasses is a little different than just checking a stock lens. In general, most opticians check the right lens and then the left lens but to be technically correct the most powerful lens should be checked first then the other lens. Also, it is very important that once the first lens is checked the table, which is used to stabilize and position the pair of glasses, should not be moved when checking the other lens.

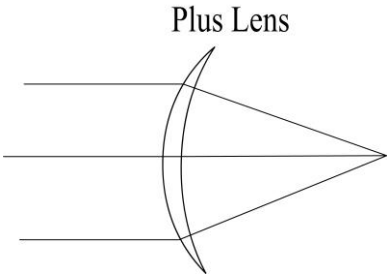
Plus Cylinder

Reading in plus cylinder is very simple but it is also very important since it may be necessary to read and analyze an RX in plus cylinder. The difference between minus cylinder and plus cylinder is whether you read the most plus power first, and move the power drum to the more minus side (minus cyl) or the most minus power first, and move the power drum to the more plus side(plus cyl).

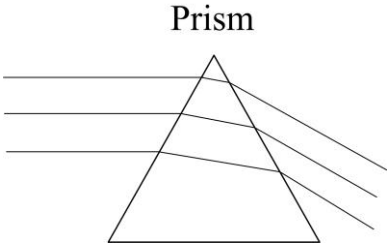
Prism

A conventional prism is a three-sided transparent material that will diffract light. The amount of prism is indicated by diopters just like power. The position of a prism is noted by the position of the base of the prism.

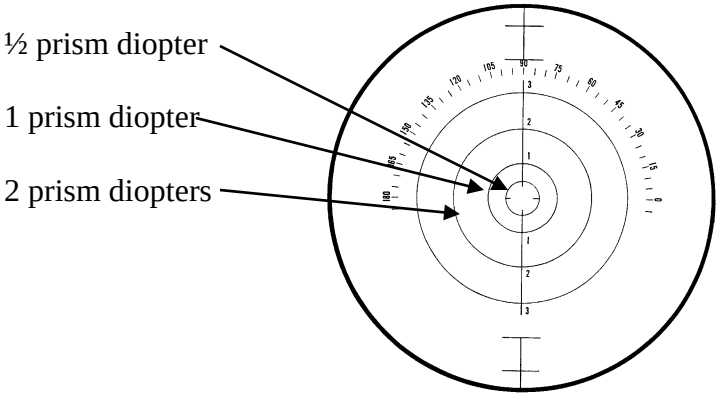
Prism is not the same as power in a lens. Power will either converge light or diverge light from a point. Prism diffracts light which is another way of saying it changes the direction of the light. If parallel light passes through a plus lens then the light would be converged to a point.



If a parallel light goes through a prism it changes direction but would stay in parallel.



Prism is read on the lensometer by using the reticle and the concentric circles.



Prism is usually prescribed by a doctor in four directions, up, down, in and out. This can coincide with the target being placed above the center of the reticle for up prism and below the center of the reticle for down prism. In and out prism is a little different because there needs to be a reference to the pair of glasses. This reference point if the nasal side of the lens or the bridge of the frame the lens is placed in. If the base of the prism is toward the nasal edge it is base in and if the base is toward the temporal edge it is base out. When reading in and out prism you will need to note which lens, right or left, is being analyzed.

When reading a pair of glasses with up and down prism remember, not to move the table after the first lens is read. The other concept to realize here it that up and down prism is a relationship between the lenses, where the reference point of one lens to the other determines the prism.

In most cases prism being prescribed by a doctor or found in a pair of glasses is usually split between the eyes equally. If 2 BU is found in the right eye, then it would be indicated by 1BU in the right and 1BD in the left. Base in and out prism is a little different when being split. When there is base up and down prism these are opposite prisms but when it is base in and out prism, then if there is base in in one eye then the opposite prism is base in on the other eye. The same is true of base out prism.

As mentioned earlier that base up and down is determined by the position of the lenses, when base in or out is found it is based on the PD of the patient.

Compound Prism

Some patients will have compound prism prescribed by the doctor. This is when the prism is up and out in one eye and down and out in the other eye. These can be hard to read but just remember that the prism is referenced from where the circles of the reticle intersect the horizontal or vertical lines of the reticle. This is better explained in the video than here in the manual.

Large prisms

The prism compensation ring is very important in finding larger amounts of prism. It can induce up to 15 diopters of prism in one direction. It can adjust for all four directions by turning the knob and/or turning the ring to the right or left.
In other types of lensometers, inducing more prism is done by placing an individual prism in front of the viewing tube to bring the target into the field of view.

The sample lens being used is a left lens, so the prism is out on the right side.

Prism can also be indicated by angle. This is very uncommon, and you may never see it. In our sample lens -3.50 -.75 X 103 5 ½ D @ 45. This is prism using polar coordinates.

To read this position the lens and analyze as normal then move the reticle center line to intersect the center of the target. Read the prism and angle off the reticle. Another way to read this would be to center the target with the prism ring and then read the prism and angle from the prism ring.

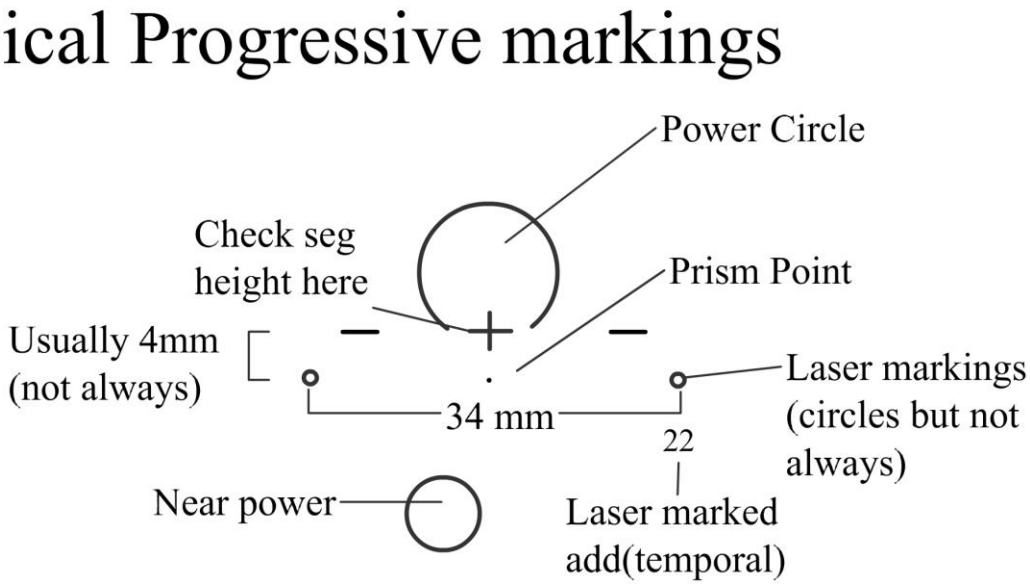
Multifocal lenses

Bifocals and trifocals are checked in the distance like single vision lenses. After the distance is checked for power, prism and pd, go back and check the add power. If you do the right lens first, get the power in the distance dialed in and then shift the lens down to the bifocal. Now turn the power drum to the more plus side, since this will be a more plus power, and focus the sphere lines. The add will be the difference from the distance sphere power to the power now indicated on the power drum.

One other technique to checking an add is also used. If the power or thickness of a lens starts to increase, then you may need to turn the lens over and read the add from the back to get an accurate reading. This is due to the vertex distance when reading the front of the bifocal. The thickness of the lens will change the power read by the lensometer. When you turn a lens over it will also change the axis of the lens. The change is 180 minus the axis of the lens. Our example is 45 so if we take 180 – 135 we get 45. Another example would be an axis of 170 on the lens. 180 -170 = 10. So, the lens, when turned over, is now at an axis of 10 so just dial in the new axis and read the add.

Progressive lenses

Progressive lenses have three areas to check. The power, the prism point and the add. Most lenses from the lab should be marked or have a clear plastic template on the lens.



This diagram shows the basics of progressive markings that you will see. These will be different from manufacturer to manufacturer and some measurements will be slightly different. The plus at the bottom of the circle will always be the seg height. The prism point in most lenses will be 4 mm below the seg height but can vary from 2 to 6 mm. The laser markings are semi transparent marks produced in the lens. These may be difficult to find due to their transparency, most of the time they are small circles but can be several different indicators from pluses to the company logo. In all the progressives I have seen the laser markings are always 34 mm apart.

The lens is checked for power in the power circle. When the power is checked there may be prism indicated and this is normal. Then the prism point should be checked for any prism that may be prescribed or, if no prism has been prescribed then look for equal prism in each lens. This could be down or up depending on the power of the lens and the prism thinning used by the lab but should be equal. Prism thinning is referenced in the video and is very common. I don't check the near power but depend on the lens markings. The near power can be checked but you need to be pretty precise to find an accurate power.

To summarize the progressive is checked in a certain order.

- The power
- Prism
- Near power if you want to
- The PD is checked by ruler using the prism point or the plus above the prism point.
- Segment height is checked using the plus above the prism point