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Figure 4-10  Break. The retinal reflex is discontinuous with the intercept when the streak is off the correct axis (dashed lines). (Illustration by C. H. Wooley.)

Figure 4-11  Width, or thickness, of the retinal reflex. The examiner locates the axis where the reflex is thinnest (dashed lines). (Illustration by C. H. Wooley.)

Figure 4-12  Skew. The arrows indicate that movements of the reflex (single arrow) and intercept (2 arrows) are not parallel. The reflex and intercept do not move in the same direction but are skewed when the streak is off axis. Dashed lines indicate the on-axis line. (Illustration by C. H. Wooley.)

Figure 4-13  Locating axis on the protractor. A, First, determine the astigmatic axis. B, Second, adjust the sleeve to enhance the intercept until the filament is observed as a fine line pinpointing the axis. (Illustration by C. H. Wooley.)
This axis can be confirmed through a technique known as *straddling*, which is performed with the estimated correcting cylinder in place (Fig 4-14). The retinoscope streak is turned 45° off-axis in both directions, and if the axis is correct, the width of the reflex should be equal in both off-axis positions. If the axis is not correct, the widths are unequal in these 2 positions. The axis of the correcting plus cylinder should be moved toward the narrower reflex and the straddling repeated until the widths are equal.

**Finding the cylinder power**

After the 2 principal meridians are identified, the previously explained spherical techniques are applied to each axis:

- **With 2 spheres.** Neutralize 1 axis with a spherical lens; then neutralize the axis 90° away. The difference between these readings is the cylinder power. For example, if the 90° axis is neutralized with a +1.50 sphere and the 180° axis is neutralized with a +2.25 sphere, the gross retinoscopy is +1.50 +0.75 × 180. The examiner’s working distance (ie, +1.50) is subtracted from the sphere to obtain the final refractive correction: plano +0.75 × 180.

- **With a sphere and cylinder.** Neutralize 1 axis with a spherical lens. To enable the use of with reflexes, neutralize the less plus axis first. Then, with this spherical lens in place, neutralize the axis 90° away by adding a plus cylindrical lens. The spherocylindrical gross retinoscopy is read directly from the trial lens apparatus.

It is also possible to use 2 cylinders at right angles to each other for this gross retinoscopy. Video 4-2 demonstrates the plus cylinder technique, and Video 4-3 demonstrates the minus cylinder technique.

**VIDEO 4-2** Retinoscopy: plus cylinder technique.  
*Animation developed by Thomas F. Mauger, MD.*

**VIDEO 4-3** Retinoscopy: minus cylinder technique.  
*Animation developed by Thomas F. Mauger, MD.*