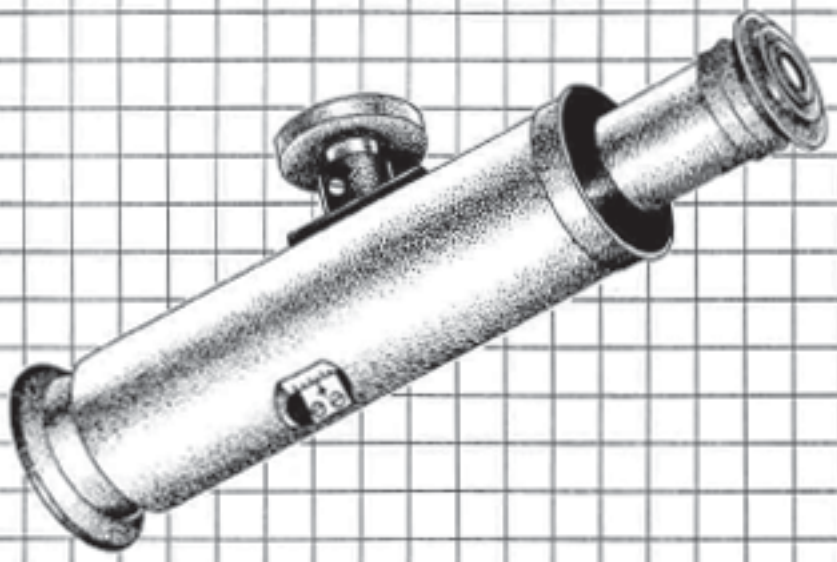
CUBIC. PRECISION

71 7105
EXIT PUPIL TESTER



INSTRUCTION MANUAL

APPLICATIONS

71 7105 Exit Pupil Tester is an instrument used to evaluate the performance of a telescope. It provides direct measurements of the exit pupil diameter of the telescope and the distance between the exit pupil and the eye lens (the "eye relief"). It also facilitates direct measurement of the clear aperture of the objective lens. Division of the diameter of the clear aperture by the diameter of the exit pupil gives the magnifying power of the telescope.

The instrument is a ten-power microscope which may be focused on a reticle calibrated in millimeters. This reticle in turn may be racked towards or away from the eye-lens of a telescope to the position of best focus to measure the diameter of the exit pupil directly from the instrument's reticle and to measure the eye relief distance directly off a scale on the side of the instrument.

The applications of the Exit Pupil Tester may be summarized as follows:

- Measuring the diameter of the exit pupil.
- Measuring eye relief distance.
- Can be used to examine interior optical elements, stops, etc. by manipulation of the focusing drawtube and eyepiece of the telescope.
- Centering a mirror on the optical axis of a fixed-focus instrument such as the auto-collimator. This is an especially important asset when the application is smaller than the objective aperture.
- Measuring the diameter of the entrance pupil (clear aperture of objective) within the range of the instrument reticle scale.
- Computing telescope magnifying power.

SPECIFICATIONS

Length (Closed)	127mm (5 inches)
Diameter	38mm (1.5 inches)
Reticle Calibration	8mm, in 0.1mm steps
Rack Calibration	50mm, in 1mm steps
Microscope Power	10X

TELESCOPE MAGNIFYING POWER

The magnifying power of a telescope can be calculated by dividing the diameter of the entrance pupil by the diameter of the exit pupil. The entrance pupil is the clear aperture of the objective of the telescope and the exit pupil is the diameter of the image of the objective lens produced by the eye-lens. These are shown in the illustration below.

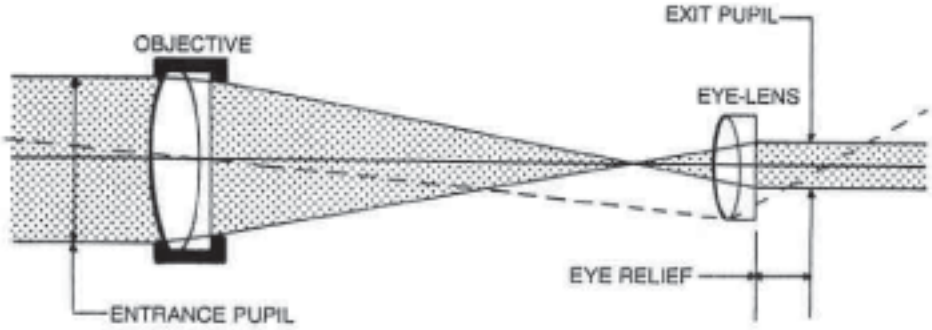


FIGURE 1

Exit Pupil and Eye Relief

The exit pupil diameter and the eye relief are measured during the same operation:

1. Place the Exit Pupil Tester between the eye and the eyepiece of the telescope as shown in Figure 2.

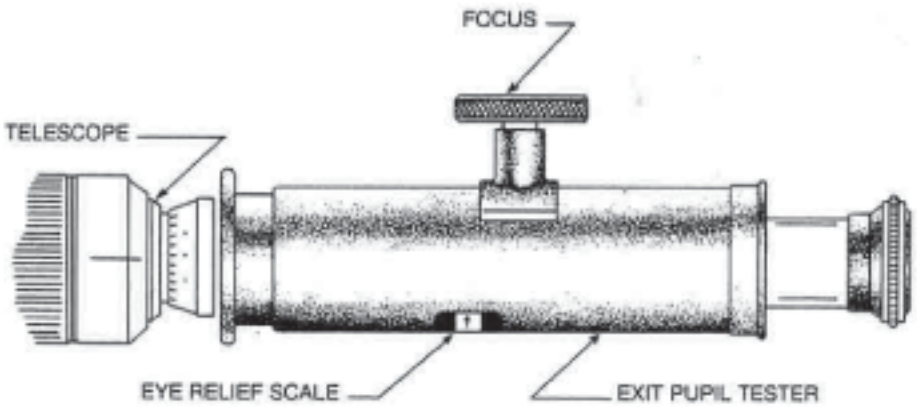


FIGURE 2

2. Focus the Exit Pupil Tester until you have the bright disk of the exit pupil sharply defined on the reticle of the tester.

3. Measure the diameter of the exit pupil from the scale on the tester reticle (Figure 3).

4. Read the eye relief distance from the scale on the side of the Exit Pupil Tester.

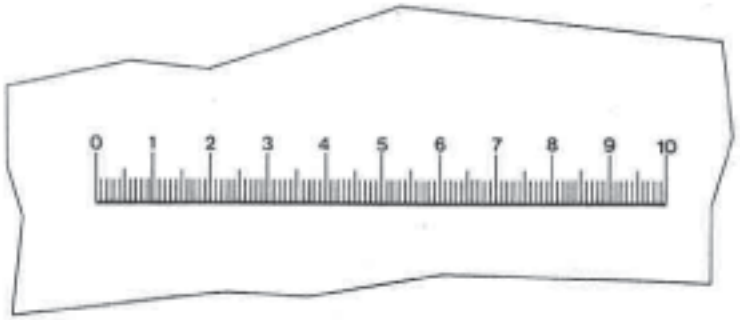


FIGURE 3

Entrance Pupil

If the diameter of the entrance pupil of the telescope is within the range of the reticle scale in the Exit Pupil Tester, the tester can be used to measure the entrance pupil by focusing on the clear aperture of the objective. Otherwise, calipers may be used to measure the entrance pupil.

Calculation of Telescope Magnifying Power

After measuring the diameters of the entrance and exit pupils of the telescope, the magnifying power of the telescope is determined simply by dividing the diameter of the entrance pupil by the diameter of the exit pupil.

$$\frac{\text{ENTRANCE PUPIL}}{\text{EXIT PUPIL}} = \text{MAGNIFYING POWER}$$

EXAMINE INTERIOR ELEMENTS

Another useful application of the Exit Pupil Tester is for an inspection tool. By manipulating the focusing drawtube of the tester and the eyepiece of the telescope, the interior optical elements and stops of the telescope can be brought into focus for inspection. This might be useful in determining if a stop has moved or checking for dirt and visual imperfections in the optical elements.

CENTER A MIRROR ON OPTICAL AXIS

The Exit Pupil Tester also provides a convenient scale for centering a mirror on the optical axis of a fixed-focus instrument, such as an auto-collimator. The reticle scale of the tester is first centered on the reticle of the instrument and then the mirror is centered, using the reticle scale of the Exit Pupil Tester.