National Camera, Inc.
Technical Training
1315 South Clarkson
Denver, Colorado 80210
(303) 722-4603

OPTICS FOR THE CAMERA TECHNICIAN

Study Procedure and Practical Assignments

1. Review your lesson, "The Camera and its Variations." Pay particular attention to the section covering the Camera Obscura and the sections covering controls for exposure.

2. Read and study your lesson, "Optics for Camera Repair."

3. You should know:
   A. How white light may be dispersed into the seven colors of the color spectrum.
   B. The light principles of absorption, refraction, and reflection.
   C. How a pinhole and a simple lens form images.
   D. The difference between positive and negative lenses.
   E. The difference between real and virtual images.
   F. The causes and effects of the common lens aberrations.
   G. The causes and effects of diffraction and vignetting.
   H. How distance affects light intensity.
   I. What determines the speed of a lens.
   J. How to calculate exposures in the APEX system.
   K. How the focal length and the object distance determine image size.
   L. How a telephoto lens works.
   M. The different design techniques for changing the focal length.
   N. How a mirror forms an image.
   O. The optical principles of prisms.
   P. How to test resolving power and analyze the test results.

4. Your lesson text describes some experiments you can perform using a magnifying glass and a shoebox. These experiments aren't required. However, performing the experiments should help your understanding of the principles involved. Also, you'll find that optical theory becomes much more enjoyable when you put it into practice.

5. There is no required practical assignment for this lesson. Complete your quiz and return it for grading along with form #6611-01. Use the large envelope addressed to the Instruction Department.

To avoid delays, do not include correspondence to other departments with your returned lesson.

OPTIONAL: The practical assignment for this lesson is optional—it requires materials not supplied with your course. However, if you would like to test the lens of the K-1000 or other lens of your choice, you can perform the resolution test as described in your lesson. To analyze the test results, you must process the film you shoot. Or you may wish to have the film developed commercially.

Proper lighting is essential. Weather conditions permitting, shaded natural lighting would be best. If artificial lighting is used, make sure the charts are evenly illuminated across the field. Lights should also be positioned in such a way as to eliminate any possibility of glare or reflection off the charts.

Since exposure is quite critical in making the test, it is recommended you bracket the exposure for each aperture you test. This will insure at least one negative of proper reading density at each aperture tested. For example, if a meter reading off the charts indicates a speed setting of 1/125 sec. for a given aperture, you will want to make a minimum of two additional exposures on both sides of that setting—1/125 sec. plus 1/60 sec. and 1/250 sec. Follow the same procedure for each aperture tested.

In order to readily identify each exposure on your negatives, tape a card below the test charts indicating the aperture and speed setting for each individual frame as it is shot.

Evaluate your negatives in the manner described in your text. Select the best frame from each aperture tested. Then, indicate your readings on the Lens Resolution Test form on the second page of your Study Procedure and Practical Assignments. Your instructor will make a reading from one of your negatives. The reading will be for comparison only. You will not be graded on how much resolution you read, but rather on your attention to proper detail in making the set-up.

(Over)

NOTE: When returning negatives, either 35mm or roll film, please cut them into individual frames and put them in an appropriate size envelope. Do NOT send film in rolls, film cans or cassettes.

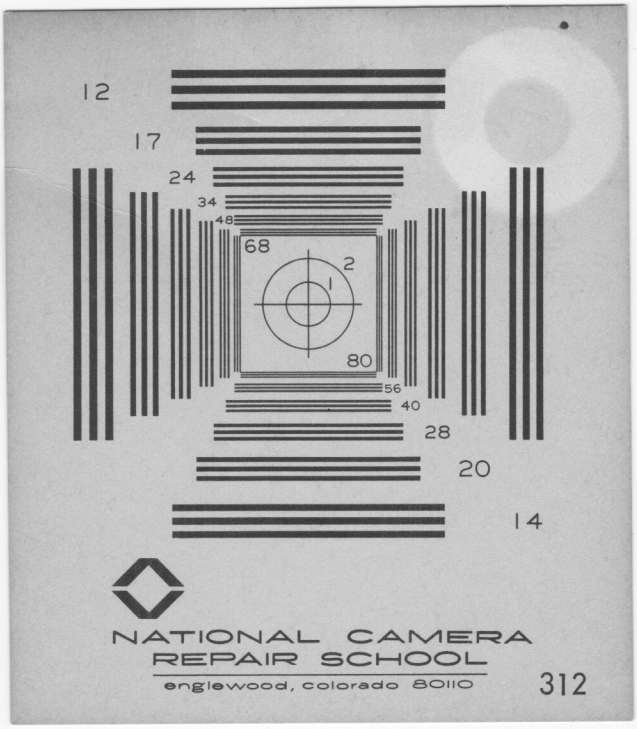
Place the negative envelope in the larger envelope with your completed lesson quiz. Be sure and check the optional assignment blocks on form #6611-091 and mark the outside of the envelope "Hand Stamp."

LENS RESOLUTION TEST

Lens model, speed & focal length _____

Film _____ Developer _____ Type & power of magnification _____

Relative Aperture (f-number)	Resolving Power In Lines Per Millimeter									
	TANGENTIAL					RADIAL				
	0°	5°	10°	15°	20°	0°	5°	10°	15°	20°


12
17
24
34
48
68
2
1
80
56
40
28
20
14
NATIONAL CAMERA
REPAIR SCHOOL
englewood, colorado 80110
312