How We Do What We Do!

BY THE EDITORS

Modern Photography has been testing photo equipment for nearly 35 years. To date we have published test data on 473 cameras and 768 accessory lenses alone. These figures don't include the equipment that failed, which would probably double or triple the figures. Our many tests of pre-production samples as well as tests carried out for manufacturers and importers are also extras. Our lab today occupies 2,320 square feet. It is a comprehensive state-of-the-art, computerized facility superior to any private, independent photographic test lab in the world, dedicated to providing our readers, as well as all levels of the photographic industry, with the most accurate, detailed, easy to assimilate but meaningful information possible. We have evolved a stringent but practical set of laboratory test standards covering the performance of optical, mechanical and electronic components and systems.

But cameras and lenses are designed to perform in the field, not just in the lab. The true test concerns the quality of pictures produced. So, all equipment, in addition to lab testing, is thoroughly field tested by a staff technician-photographer familiar with that particular line of equipment. These findings are printed in Modern's reports too.

Now let's press the right multi-digit combination on the lab's high security lock and swing the front door open wide. At first glance your eyes may become glazed by all the digitized high tech instrumentation as well as more conventional items such as monster tripods riding on tracks and complex-looking test chart arrays. The best way of making sense of it is to follow a lens and camera through.

The initial shakedown

We do not test specially selected samples. If we have any reason to suspect that a test item has been especially prepared for our benefit, we obtain a second sample from another source.

The name, technical specifications and serial numbers of all equipment is logged into our Hewlett-Packard 1000 computer. Not only do we keep physical track of it all, but also cross-reference specifications, test data, and compare our results instantly with our standards and with all other equipment on file.

In examining a newly arrived camera or lens, we first look for obvious physical defects such as loose screws and missing parts, and then subject each item to a simple functional examination. Obviously, when we discover a camera with a meter that won't turn on or a shutter that won't fire, or a lens that won't stop down properly or focus without binding, we reject it immediately and send it back whence it came with a polite notice explaining why. Ordinarily, we obtain a second sample of such rejected items unless we judge the fault to be a production line defect present on all samples. To separate sheep lenses from goat lenses quickly, we can mount lenses on our Pearl projector. Lenses which do especially poorly in this test can be weeded out immediately, a much quicker and simpler test than our elaborate, on-film testing.

Is it focusing on the film?

We use carefully calibrated "lab test" camera bodies for our "lens only" tests, which are recalibrated regularly. The first real lab test procedure is collimation—determining whether the lens is focusing properly on the film plane of the camera on which it's mounted, using our C-6800 Pearl Optical Collimator. After loading the camera (or putting the lens on a pre-checked test camera, if only the lens is to be tested), we set the lens and collimator to infinity, keeping the camera shutter open. If the focus is right we can see a sharp Siemens star reflected from the film surface through the lens to the collimator eyepiece. If the star is unsharp, we can adjust the collimator and read the focusing distance error in feet, or make necessary internal camera adjustments. The 300mm focal length and 40mm diameter of the collimator are sufficient to check a lens with an aperture as great as f/1.4. Larger lenses are collimated using our optical bench.

For practical purposes of comparing lens resolution on film, high-contrast lens test targets developed by the United States Air Force are highly satisfactory. Ours have been meticulously reproduced from a glass master target made for Modern by the E & L.E. Gurley Engineering and Scientific Corp., Troy, NY, using the diffusion transfer process. These targets mounted on metallic plates are placed on a large, flat magnetic board at the center, corners, edges and diagonals of the area representing each camera format. The board itself is painted a neutral gray using special Macbeth paint which precisely matches the "N5 patch" on the gray scale of the Macbeth ColorChecker. This makes exposure determination easy and provides a check on whether the test film has been properly developed. Lines have been drawn at the extreme edges of each testing camera format for measuring linear distortion directly off the test film at high magnification under the microscope. For shooting all lenses except those over 450mm, the camera is placed at a distance of 51 times the lens' focal length on a massive, vibration-resistant Linhof YSRP tripod that's firmly affixed to a custom-made carriage that rides on 25 in. wide double-track rails running the length of the longest dimension (72 ft.) of the lab. Since alignment of the camera and lens to the test target array is so critical, we do it by directing the beam from a metrologic neon laser through an optical flat clear glass plate fitted to the open camera body back to a centrally located mirror inset into the target board. Only when the laser beam winds up precisely in the center do we lock the camera in position and begin resolution testing on film.

In search of stability

How about building vibration? There's no vibration-free building, especially in New York City. However, Modern's decision to move into our present quarters was subject to extensive building-vibration tests. Using a very sensitive vibrometer, we found the projected lab area to have a very stable, low-vibration floor,

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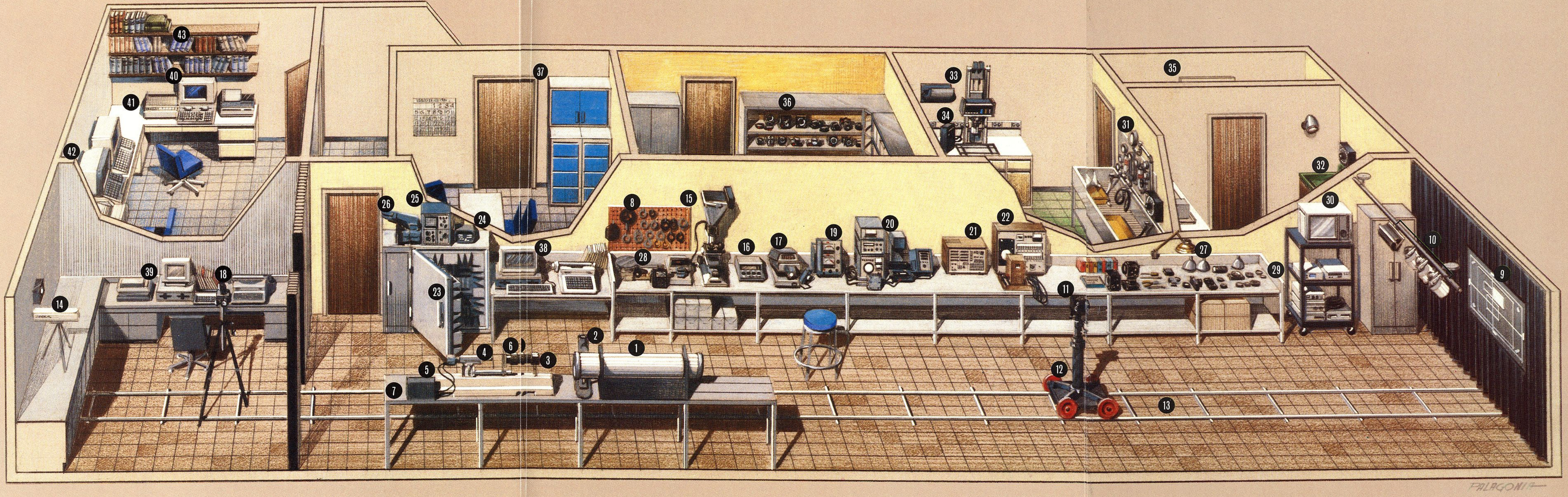
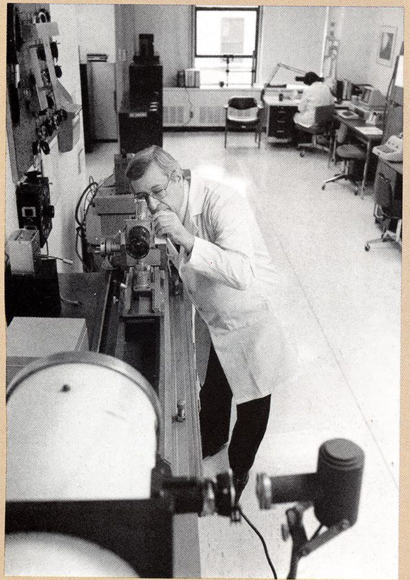


Inside Modern's Testing Laboratory

Dedicated technicians, highly sophisticated equipment provide readers and manufacturers with unbiased, valuable equipment reports

1. Cave Optical 8-in. collimator provides parallel rays for infinity focus lens checks to detect aberrations, measure focal lengths, true apertures, etc.
2. Light source illuminates interchangeable target slides including pinholes held in collimator.
3. Gaertner optical bench holds lens aligning mount with micrometer movements and vernier scales.
4. Microscope with Gaertner eyepiece allows image from lens to be inspected.
5. Eyepiece is interchangeable with this photomultiplier to analyze contrast transfer function of lens.
6. Lens under test held in custom jig.
7. Power supply and voltmeter for photo multiplier.
8. Custom-made mounts for lenses plus other optical test accessories.
9. USAF high contrast lens resolving power and linear distortion test targets on magnetic board.
10. Photofloods and halogen lamps to illuminate test target board evenly.
11. Checked master camera for testing accessory lenses.
12. Master camera test stand (interchangeable with tripod) and dolly.
13. Specially aligned and leveled 22 meter (72 ft.) resolution test track.
14. Laser for aligning camera before resolution test.
15. Olympus BH-2 microscope with 4 × 5 in. Polaroid film holder.
16. Auto-exposure control for Olympus microscope.
17. Macbeth TR-524 Densitometer for analyzing papers, negatives and slides.
18. Flash test tripod.
19. Kyoritsu IE-2A flash sync tester.
20. Kyoritsu EE-7D large-format shutter and EV tester with backup FL-4DM2.
21. Kyoritsu EF-600 computerized auto exposure multi-tester.
22. Kyoritsu multi-tester light source LB-2023 with tester head.
23. Custom-made anechoic soundproof test chamber for camera, motor winder noise measurement.
24. True-RMS logarithmic amplifier for sound measurement.
25. Tektronix oscilliscope for plotting sound measurement.
26. Oscilliscope camera with 4 × 5 Polaroid back for imaging sound measurement.
27. Work bench for disassembling cameras and lenses.
28. Ohaus Dial-a-gram balance for determining weight of equipment.
29. Master video recorder and test equipment.
30. Sony TV monitor.
31. Powers thermostatic darkroom solution temperature controls.
32. Test film processing room.
33. Super Chromega D-6 test enlarger.
34. Beseler PM3L color analyzer.
35. Finishing room.
36. Storage.
37. Laboratory office.
38. Hewlett-Packard 9816S desk top computer.
39. Hewlett-Packard 9816S desk top computer.
40. Hewlett-Packard 9836 desk top computer.
41. Hewlett-Packard 9872B plotter.
42. Hewlett-Packard HP-1000 computer system console.
43. Photo scientific and computer reference library.

MODERN's Laboratory technical staff, left to right: Lawrence R. White, Assoc. Technical Editor; Debra Seigel, Laboratory Asst.; Bennett Sherman, Consulting Editor; Robert Craige, Consulting Editor; Edna Smith, Editorial Coordinator; Tony Nagatomo, Chief Laboratory Technician.



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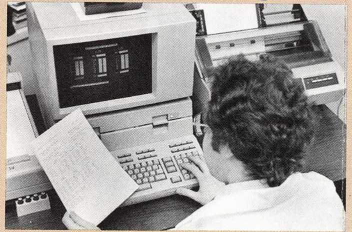

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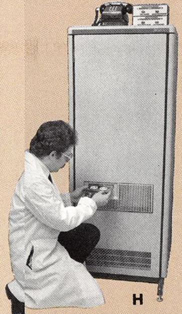

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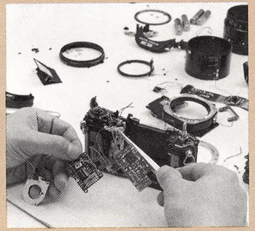

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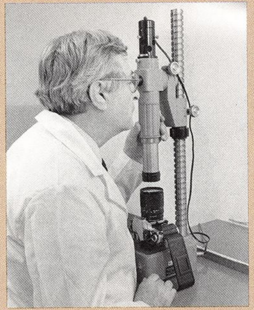

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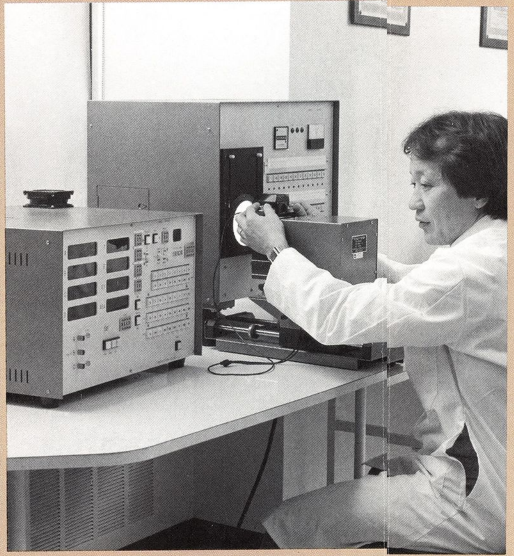

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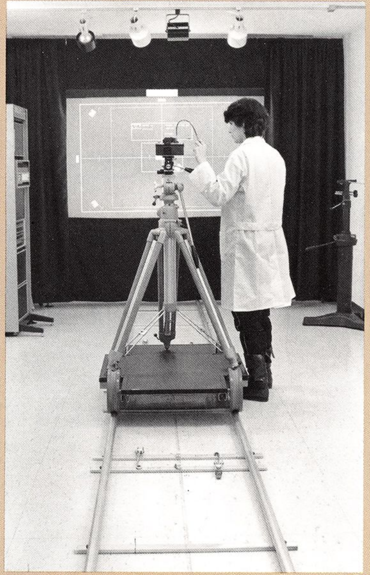

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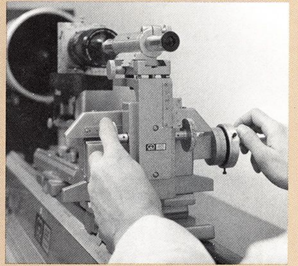

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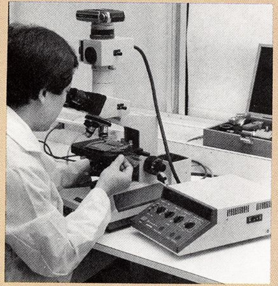

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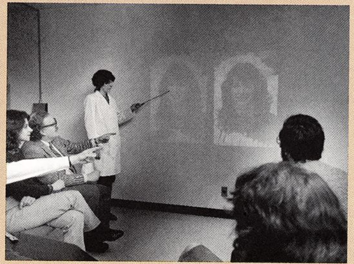

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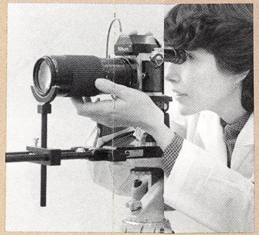

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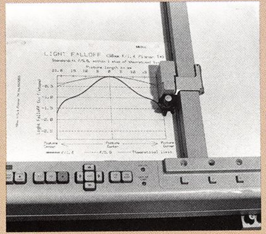

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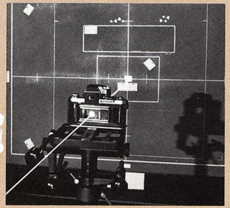

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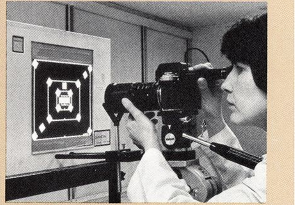

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Some highlights in Modern's Lab

A. Lens aberrations are identified and measured by observing infinity star image projected from 8 in. Cave Optical reflecting telescope through lens. Technician views through 6.7X Gaertner eyepiece on horizontal microscope.

B. Medium format cameras (2¼ in.) are checked on Kyoritsu EE-7D.

C. Entering data on HP9836 desktop computer. It checks data against specifications, sends data to main computer for storage.

D. Resolution and distortion amounts are read at 20X magnification using BH-2 Olympus microscope. Auto exposure electronic leaf-shutter Olympus camera back and controls plus full color balance controls allow vibration-free photographs to be made on 35mm or instant film for accurate checks of film grain structures.

E. So comparisons can be made with a known standard, practical group viewing evaluations of camera, lens, film, exposure quality, is carried out by two matched Kodak Carousel 600H projectors.

F. Lens contrast is measured using 30 lines/mm Contrast Transfer Function system with IP121 Photomultiplier tube observing revolving target. Hewlett Packard 9826 Computer and voltmeter round up needed equipment.

G. Quality of camera and lens construction including mechanics and electronics is analyzed during complete disassembly.

H. Specialized application computer programs for data analysis, storage, comparison are written within laboratory with aid of Hewlett-Packard HP1000 computer capable of storing 65 megabytes. HP1000 coordinates six desktop computers, plus terminals and remote systems.

I. Accuracy of focused camera and lens is insured by checking through 3.4X Tokyo Optical Co. Diopter-scope which also measures diopter magnification of entire finder system.

J. Correct infinity focus and proper lens-camera alignment are analyzed and measured with Pearl Optical Auto-Collimator.

K. Quality of field test slides made with each camera and lens is observed using Swiss Omag 26-50X microscope over Matrix Viewing Table.

L. Lens illumination is measured by synchrometer attached to Gaertner microscope. Computer collected result is automatically plotted on HP 9872B Plotter.

M. Accuracy of shutter speeds, auto exposure systems, including program and TTL are checked and measured with MODERN's specially modified Kyoritsu EE Multi-tester Type EF-600.

N. Quick quality check can be made by projecting resolution image through lens on Pearl RPT-1 optical projector.

O. Resolution figures for all lenses at all apertures and focal lengths are obtained by photographing U.S. Air Force line targets under rigidly controlled distance, lighting, exposure with lens on bench tested master camera mounted on Linhof Professional tripod traveling on rails. Rectangular lines on chart reveal linear distortion %.

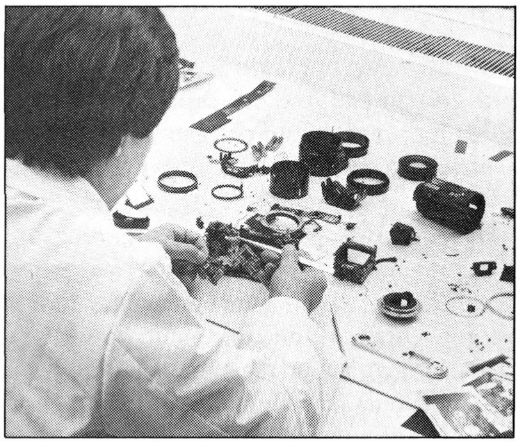
P. Proper camera-to-resolution target alignment is determined using Metrologic Neon laser beam shining through open camera and lens to mirror inset centrally on target board.

Q. Characteristic curves for processed black-and-white film and density analysis of color film can be plotted using Macbeth TR524 densitometer.

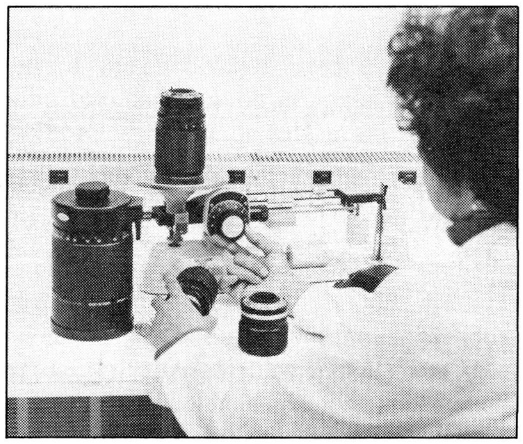
R. True f/stop of lens and focal length are compared to marked aperture and length by mounting lens on 1200mm solid iron block Gaertner Scientific Corp. optical bench. Measurement is made using micrometer controls and vernier scales which result in error less than 0.01%.

S. Sound level of camera mechanism plus motor or winder is measured by placing camera in custom-made IDE soundproof chamber connected to custom-made RMS logorithmic amplifier. Decibel level graph on oscilliscope can be photographed.

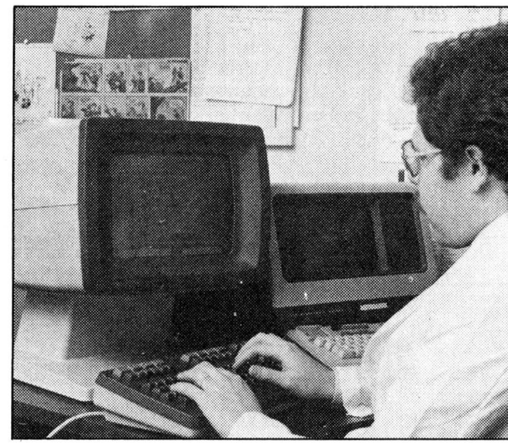
T. Macro focusing resolution is found for lenses by photographing special custom-made target created by Bennett Sherman.



Going to pieces: How well are cameras and lenses made? Expert technician Nagatomo disassembles each to find out.



Weighty problem: All equipment is weighed carefully in metric system using calibrated Dial-O-Gram balance scale.



For the record: HP 1000 computer keeps all equipment records; also stores and compares technical testing data.

essential not only for resolution tests, but for every other test as well.

Since we use a fixed target array and the maximum lab length is 72 ft. (22m), our lab is sufficient to test 800mm lenses at a distance of 26 times their focal length, 500mm lenses at 41X, and all other lenses from ultra-wides up to 450mm (on the 35mm format) at 51 times their focal length. We prefer testing lenses at 51 times because it falls within the range of "average" shooting distances and simplifies lines-per-millimeter calculations. This is because placing the camera at 51 times the lens focal length yields an on-film image magnification of 1:50.

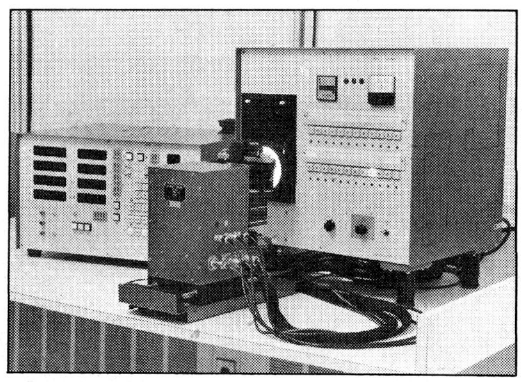
How can we make certain we have accurately focused on the targets? For critical test purposes, camera finders are not sufficient. Even with trained eyes, slight focusing errors occur. To avoid such and to measure the finder eyepiece in diopters (which tells us how great the apparent viewing distance is), we focus on the targets through a 3.4X Tokyo Optical Co. Diopter-scope.

Be it resolved?

When checking macro-focusing lenses, we obviously want to know not only how they perform at standard focusing distances, but also how good they are for close-up work. Technical Consultant Bennett Sherman created our macro test targets by printing the center of our USAF targets onto an 11×14 in. piece of thick, Estar-based lithographic film, incorporating distortion test lines. Although formats are available for 2X, 4X and 8X testing of 35mm negatives, we test at 4X.

All resolution testing is done under Tungsten Halogen lamps since they provide a controlled light source most closely approximating what our readers use outdoors. This illumination also yields a clear image on film for easier reading of resolving power and enables us to test daylight balanced color film.

If our field and resolving power tests indicate whether a lens is sick, you might say our examination of the lens on the optical bench tells us what disease it is suffering from. While a complete description of how the bench is used would take the length of a book, we can say that it involves examining a pin-point-light-source image through the lens by means of a low power microscope, and determining just how this perfect star is distorted by the lens. We can look at each aberration and photograph it.



Our pride and joy: State-of-the-art Kyoritsu EF-600 Multi Tester (left) hooked up to Kyoritsu LB-2034 Light Source (right) makes a formidable testing combo, capable of monitoring the performance of SLRs to the closest tolerances. While this setup only works with focal-plane-shutter 35s our complementary Kyoritsu system (see text) can do most of the same for leaf shutter, other cameras to 8×10.

Our Gaertner Scientific Corp. bench consists of a 1200mm-long, solid iron block with precision millimeter scales on the top rail. Traveling on the rail are a ruggedly-constructed, nodal-slide turntable to hold the lens and a microscope with a three-directional movement mechanism. The longitudinal movement has a 1/50mm vernier scale, and the radial movement has a 1/500mm vernier. If no other errors are included, we can determine a lens' focal length to 1/50mm precision using the nodal slide. Using an alternate magnification method we can measure focal lengths much more quickly. When using this method the lens' distortions are included in the results. Since the distortions can sometimes run up to as much as 2 percent in the zonal area where we measure the focal length, we prefer the nodal-slide method.

Our optical bench's microscope optics, which are usually used with a Gaertner 6.7X eyepiece, include a Gaertner numerical aperture (N.A.) 0.25 10X objective for up to f/2 lenses, and a 21X N.A. 0.5 objective for lenses to f/1.

The parallel light rays for our optical bench are supplied by an Astrola astronomical telescope made by Cave Optical. We use this reflecting telescope rather than a standard refractive collimator, because the huge Astrola provides an optical diameter of 8 in. (203mm), which is sufficient for examining long teles.

Constant calculations

While checking a lens' resolution power on film remains a time-honored procedure, it is far from an overall comprehensive test of a lens's ability. In recent years, most optical technicians have advocated some means of expressing a lens' contrast as a valid criterion. While such data still remains more useful to a lens designer than a lens user, we feel that its application to practical lens testing will continue to grow. Basically, an optical contrast test is a comparison, expressed in a percentage, between ideal image contrast and the contrast at a specific frequency as measured electronically from a linear target projected through the lens.

Perhaps we'd better explain our CTF system in slightly more detail for any optical technicians who may be interested.

Normally, a contrast test or so-called MTF (Modulated Transfer Function) measures the image contrast at continuously-variable frequencies from 0 lines per millimeter, and compares this difference with real subject contrast (which is set at 100 percent). These frequencies of MTF are all sine waves because, theoretically, all details of real subjects can be translated into sine waves.

Such a continuously-variable sine-wave target and its measurement are ideal in theory, but very difficult in practice. So, most MTF testing equipment requires some modification from the ideal. Some systems use single frequencies; some use single wave lengths; other use pulse inputs instead of sine waves, and so on. Of course, there are certain reasons and purposes for such modifications.

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MODERN'S CTF (Contrast Transfer Function) tester uses a single pulse wave of 30 lines/mm. The reason is fairly simple. We test the resolving power of lenses as well as their contrast; therefore, we have little need to measure how much detail a lens can resolve at the point of zero contrast. Our USAF resolution tests show essentially the same measurement information.

Why didn't we choose a lower frequency than 30 lines/mm? We felt that, at this particular point of frequency, the majority of lenses show their optical behavior most clearly. In our experiments we found the 30 lines/mm test point reveals the differences in optical quality between two lenses most dramatically.

Our contrast measuring system is also different in another way. It uses a revolving target located at a close distance rather than a stationary one placed at infinity. This modification was made to simplify the testing equipment yet retain measurement accuracy.

Stretching the bench

Our technical consultant, Bennett Sherman, thus chose a rotating target at 41 times the focal length of the test lens and readings comparing contrast at 1 and 30 lines/mm. The advantages of Sherman's system are the minimal chance of error when the optical condition changes within the light path, and the absence of any error caused by collimator aberrations (since we don't use ours for contrast measurement). By using two surface mirrors to bounce back the target signal, we halve the physical distance needed. Our 6m optical bench table can thus be "stretched" to 12m, thereby allowing us to measure lenses up to 1000mm, quite a range, if we do say so.

We are able to make contrast readings beyond f/22 with all lenses, thanks to low-noise circuitry designed by Bennett Sherman. The needle of the vacuum voltmeter furnishes very stable readings.

In contrast . . .

To further increase our testing range we've equipped our optical bench with an Extended Gaertner Nodal Slide, enabling us to find the nodal point of telephoto lenses. Rounding out our contrast testing apparatus are an RMS voltmeter, power supply and Photomultiplier tube which transform the contrast information coming from the microscope into a recordable electrical signal. In the near future we plan to feed these contrast signals directly into the Hewlett-Packard Computer, which presently controls only the bench's microscope stage movement.

The Olympus microscope camera mod-

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MODERN'S LAB

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el BH2 is a most important optical bench accessory. Using a special tube to fit it to our Gaertner bench, we use the camera to photograph the aberrations of star images as seen through test lenses.

When field-test slides (of subjects carefully selected specifically to show lens aberrations, distortion and general performance) are returned from the processor, we analyze them using an Omag microscope at 20-50X magnification on a Matrix light table illuminated with Duro-Test Vitalite Fluorescent tubes (described earlier). For a proper picture analysis of lens performance, we normally have to examine up to 60 or 70 Kodachrome 64 slides for each lens. We select about 16 critical test slides to save for future comparisons with other lenses.

Projected quality

For more detailed side-by-side comparisons of test transparencies we have two matched Carousel 600H projectors with almost perfectly-matched (in terms of brightness and color temperature) GE lamps. Two Ektanar 5-in. f/3.5 lenses have been closed down to f/5.6 to ensure sharpness and minimize film buckling. The film gates have been carefully adjusted so we won't have excessive unsharp-image problems in the corners.

These projectors are also used for comparing the characteristics of color films and the quality of projected images. While many camera body tests (e.g. assessing operational convenience, handling and general ergonomics) show up best in carefully-planned field tests, some areas can be examined completely only with proper lab equipment: exposure, shutter-speed and aperture accuracy (the last two being combined in programmed auto exposure cameras).

The shutter speed and exposure testers we now use are units modified specifically for our use by their maker, Kyoritsu Electric Co. Ltd. of Tokyo. The quality of these machines provides us with a very high level of accuracy.

Basically, we employ two complete and separate systems of Kyoritsu testing equipment. Our EF-600 Multi Tester is used in conjunction with a fully adjustable model LB-2023 Light Source for checking 35m focal-plane shutter cameras.

Based on a 3-point reading across the film-plane probe at speeds which may range as great as 8 sec. to 1/2000 sec., we can obtain three digital LED readouts of the shutter's mechanical motion in milliseconds—an "initial speed" reading, an "end speed" reading, and an "average exposure time" reading. In addition there is a fourth digital aperture readout which gives us the accuracy of the stop-down aperture to within 1/10 of an EV.

Basic EV (exposure value) accuracy determination from EV−4 to EV17 at ASA-ISO settings from 12-3200 is possible at the touch of appropriate buttons, but even more important with today's progammed and multi-mode cameras is the ability to pinpoint the precise reasons for exposure deviations.

Obviously, it is not possible to describe here in detail even a small percentage of the tests of which this system is capable. By pressing aperture buttons ranging from f/1.4 to f/22 we can check aperture accuracy using the light transmission method—a vital determination for our lens as well as camera-and-lens tests. Other test modes include: flash sync delay, shutter curtain running time, exposure accuracy with aperture- and shutter-preferred cameras, and an elaborate program mode for testing programmed-auto-exposure cameras. We can test the performance of virtually any present or future programmed SLR including those with multiple programs. In all cases, the light-source-to-sensor transmission is by fiber optics for optimum accuracy, and our custom film-plane-equivalent probe contains six light sensors—four in the corners and two in the center of the format field.

This system's light source can be set as precisely as 1/10 of an EV to accommodate different camera makers' test specs. There's also a "K factor" dial with settings from 1.04-1.64 to accommodate various meter sensitivity patterns, and the light source has a special daylight equivalent filter for those camera makers specifying this type of light source. As you might expect, all the test apparatus in this system incorporates interface capability for computerized operation and information transfer, and it's all recalibrated at regular intervals with the aid of a Kyoritsu BM-300 calibration meter.

Other formats

As excellent as our Kyoritsu EF-600 Multi Tester and LB-2023 Light Source are, we also require a system that can be used to test a wider variety of camera formats and shutter types. For these reasons, and also to serve as a backup unit, we use a modified Kyoritsu FL-4D M2 shutter tester in conjunction with a Kyoritsu EE-7D Auto-Exposure Camera Tester.

This system can test focal-plane shutters with any running direction (and leaf shutters as well) for single-frame, 35mm, 2¼×2¼ and up to 8×10 cameras.

Camera-format selection is done by changing light receptors. There are four receptors, 35mm, 2¼×2¼ (which also incorporates 35mm half frame), 2¼×1⅝ in., and 2¼×2¾ in. The leaf-shutter light receptor is an entirely different one, with an opal glass face to diffuse the light, and covers all leaf-shutter formats from pock-

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et size to 8×10. If in the future some entirely new focal-plane shutter is invented we can still use the Kyoritsu tester by fitting it with a new light receptor suitable to the new shutter.

Our (BM-300) Kyoritsu Luminance Meter uses a Silicon Blue Cell for its light receptor. An SBC is preferable to cells of other materials because of its extremely good response to light varying from extreme darkness to high brightness. With a range of EV 0.5 ~ EV 20 (ISO 100) it is used to calibrate the Kyoritsu.

As with our other system, the FL-4D M2 displays three exposure times—at the beginning of the focal-plane curtain run, at the run's midpoint, and near the end of the shutter movement. Comparing these three speeds at each position, we can determine the evenness of the exposure. If either curtain bounce-back (causing re-exposure of the film) or cutoff of one edge of the picture is detected, the FL-4D M2 automatically lights a red lamp, warning us to read the bottom counter in which the bounce exposure is shown. The unit also provides a check of FP, M and X sync delay times.

Digital readouts show the M and FP sync delay times in milliseconds, plus the total time in milliseconds from the moment of flash triggering to the shutter closing. From this we can easily calculate whether the flash tube's or bulb's illumination peak is properly adjusted to the shutter. When the tester is switched to X sync, the digital display windows indicate synchronization information for electronic flash photography.

Leaf-shutter tests

If we switch the test phase knob to leaf-shutter testing, our three-digital readout shows the total operational time of the shutter, the effective exposure time (normally just called exposure time), and the full opening time of the shutter. We can also hook up the FL-4D M2 to an oscilloscope to get a visual indication of shutter operation and accuracy. Since we can see the shutter operational pattern on our Telequipment type S 43 oscilloscope, we can then photograph the oscilloscope's face, using Polaroid film, to obtain a permanent record of the shutter's performance, as well as read the exposure times from the photographed patterns.

As with our 35mm focal-plane-shutter testing equipment, this more adaptable Kyoritsu setup also measures the amount of incoming light at the film plane in automatic-exposure cameras. MODERN's specially-modified Kyoritsu EE-7D automatic-exposure camera tester incorporates a light box that gives us totally-diffused light in five brightnesses, from very dark

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to very bright (EV 4, 7, 9, 12 and 15 at ASA 100). The light detector consists of a photomultiplier having visual spectral sensitivity correction plus a diffuser.

With the EE-7D, we can check f/numbers electronically. We can also check the true lens opening or the actual transmittance of a lens.

When a product fails to pass MODERN's test specifications, the manufacturer or importer, if he wishes, is furnished with a further analysis of why the equipment failed so that he can overcome the problem in the future. And, of course, if a manufacturer or importer wishes to resubmit improved products, we are always glad to recheck the equipment. In this way, MODERN's tests not only allow consumers to make intelligent choices, they also set strict but realistic performance standards for the entire photo industry.

How often do we upgrade our lab and field test procedures? Hardly a day goes by when we don't find some new way of improving a test, tightening procedures, making the results more readable and easier to assimilate. We may talk of this laboratory as *our* laboratory. In truth it is *your* laboratory, run by top technicians and using the finest equipment we can obtain to provide our readers with the best and most useful information possible.

—THE END