

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 86

Field Angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	95	95	113	95	95	95	48
Tangential lines	95	95	80	80	95	80	67

The resolving power is obtained by photographing a series of test bars and examining the resultant image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 5 to 268 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

IV. Filter Parallelism

The two surfaces of the Wild 525 No. 6274 filter accompanying the camera are within 10 seconds of being parallel. The 525 filter was used for the calibration.

V. Shutter Calibration

<u>Indicated exposure time</u>	<u>Effective exposure time</u>	<u>Efficiency</u>
1/200	5.25 ms = 1/190 s	79%
1/400	2.88 ms = 1/350 s	79%
1/600	1.83 ms = 1/545 s	79%
1/800	1.38 ms = 1/725 s	79%
1/1000	1.10 ms = 1/910 s	79%

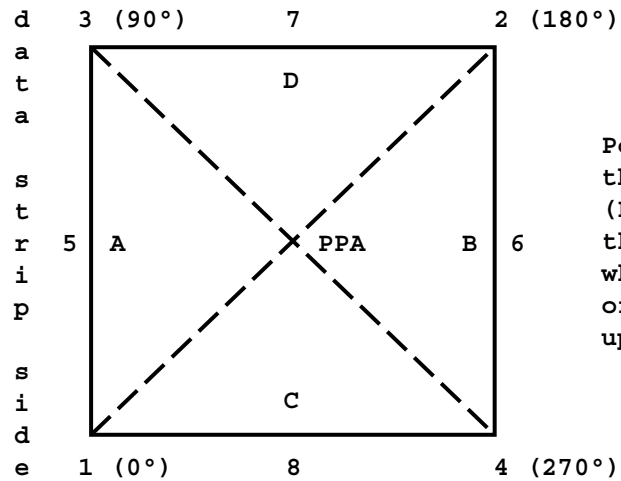
The effective exposure times were determined with the lens at aperture f/4. The method is considered accurate within 3 percent. The technique used is Method I described in American National Standard PH3.48-1972 (R1978).

VI. Film Platen

The film platen mounted in Wild RC10 drive unit No. 3653-387 does not depart from a true plane by more than 13 μ m (0.0005 in).

This camera is equipped with a platen identification marker that will register "387" in the data strip area for each exposure.

VII. Principal Points and Fiducial Coordinates



Positions of all points are referenced to the principal point of autocollimation (PPA) as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The data strip is to the left.

	<u>x coordinate</u>	<u>y coordinate</u>
Indicated principal point, corner fiducials	0.007 mm	0.010 mm
Indicated principal point, midside fiducials	0.009	0.008
Principal point of autocollimation (PPA)	0.0	0.0
Calibrated principal point (pt. of sym.) x_p, y_p	0.002	0.000

Fiducial Marks

1	-105.996 mm	-105.992 mm
2	106.012	106.012
3	-105.987	106.007
4	106.005	-105.992
5	-109.994	0.008
6	110.019	0.008
7	0.010	110.005
8	0.008	-109.985

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 299.821 mm 3-4: 299.807 mm

Lines joining these markers intersect at an angle of 89° 59' 59"

Midside fiducials

5-6: 220.013 mm 7-8: 219.990 mm

Lines joining these markers intersect at an angle of 89° 59' 57"

Corner fiducials (perimeter)

1-3: 211.999 mm 2-3: 211.999 mm

1-4: 212.001 mm 2-4: 212.003 mm

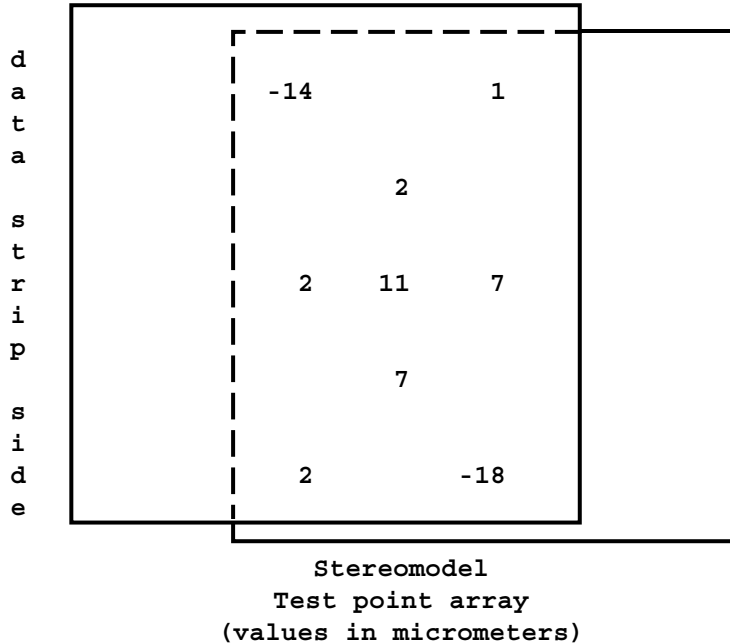
The method of measuring these distances is considered accurate within 0.003 mm

Note: For GPS applications, the nominal entrance pupil distance from the focal plane is 282 mm.

IX. Stereomodel Flatness

FMC Drive Unit No.: 3563-387
 Platen ID: 387

Base/Height ratio: 0.6
 Maximum angle of field tested: 40°



The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereo models. The values are based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements can vary by as much as $\pm 5 \mu\text{m}$ from model to model.

X. System Resolving Power on film in cycles/mm

Area-weighted average resolution: 43 Film: Type 2405

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	48	48	48	48	48	48	40
Tangential lines	48	40	40	40	40	40	34

LENS/FILM DISTORTION PARAMETERS

Drive unit No.: 3563-387

Base/Height ratio: 0.6

Platen ID: 387

Maximum angle of field tested: 40°

XI. Calibrated Focal Length: 153.039 mm

XIII. Lens/Film Distortion

Field angle:	7.5°	15°	22.7°	30°	35°	40°
Symmetric radial (um)	2	3	5	4	2	-4
Decentering (um)	0	0	1	2	3	4

Symmetric radial distortion parameters

$$\begin{aligned}
 K_0 &= -0.8741 \times 10^{-4} \\
 K_1 &= -0.2917 \times 10^{-8} \\
 K_2 &= 0.2631 \times 10^{-12} \\
 K_3 &= 0.0000 \\
 K_4 &= 0.0000
 \end{aligned}$$

Decentering distortion parameters

$$\begin{aligned}
 P_1 &= 0.4602 \times 10^{-7} \\
 P_2 &= -0.2228 \times 10^{-6} \\
 P_3 &= 0.0000 \\
 P_4 &= 0.0000
 \end{aligned}$$

Calibrated principal point

$$\begin{aligned}
 x_p &= 0.002 \text{ mm} \\
 y_p &= 0.000 \text{ mm}
 \end{aligned}$$

The above measurements were computed from contact glass positives made from Kodak 2405 film exposed in the magazine.

The values and parameters for Calibrated Focal Length (CFL), Symmetric Radial Distortion (K_0, K_1, K_2, K_3, K_4), Decentering Distortion (P_1, P_2, P_3, P_4), and Calibrated Principal point (point of symmetry) (x_p, y_p) were determined through a least-squares Simultaneous Multiframe Analytical Calibration (SMAC) adjustment. The x and y-coordinate measurements utilized in the adjustment of the above parameters have a standard deviation (σ) of ± 3 microns.

This aerial mapping camera calibration report supersedes the previously issued USGS Report No. OSL/2290, dated February 28, 1997.

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