

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 100

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	113	159	113	113	113	80	95
Tangential lines	113	134	113	113	95	80	80

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 420 No. 6629 and the 525 No. 6947 filters accompanying this 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>
1/125	7.50 ms = 1/135 s	80%
1/250	4.00 ms = 1/250 s	80%
1/500	2.00 ms = 1/500 s	80%
1/1000	1.00 ms = 1/1000 s	80%

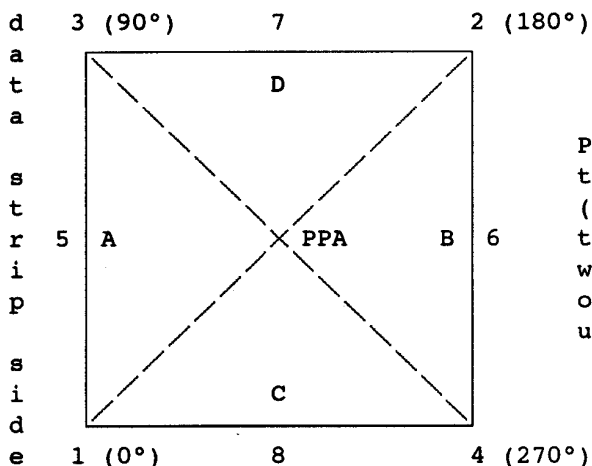
The effective exposure times were determined with the lens at aperture f/4. The method is considered accurate within 3 percent. The technique used is Method I described in American National Standard PH3.48-1972(R1978).

VI. Film Platen

The film platen mounted in Wild RC30 drive unit No. 5207-576 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 "576" 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	0.005 mm	0.013 mm
Indicated principal point, midside fiducials	0.007	0.011
Principal point of autocollimation (PPA)	0.0	0.0
Calibrated principal point (pt. of sym.) x_p, y_p	0.000	-0.006

Fiducial Marks

1	-105.995 mm	-105.985 mm
2	106.007	106.013
3	-105.994	106.005
4	106.008	-105.985
5	-111.998	0.008
6	112.011	0.013
7	0.007	112.011
8	0.007	-111.978

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 299.813 mm 3-4: 299.808 mm

Lines joining these markers intersect at an angle of 90° 00' 08"

Midside fiducials

5-6: 224.009 mm 7-8: 223.989 mm

Lines joining these markers intersect at an angle of 89° 59' 56"

Corner fiducials (perimeter)

1-3: 211.990 mm 2-3: 212.001 mm

1-4: 212.004 mm 2-4: 211.998 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 283 mm.

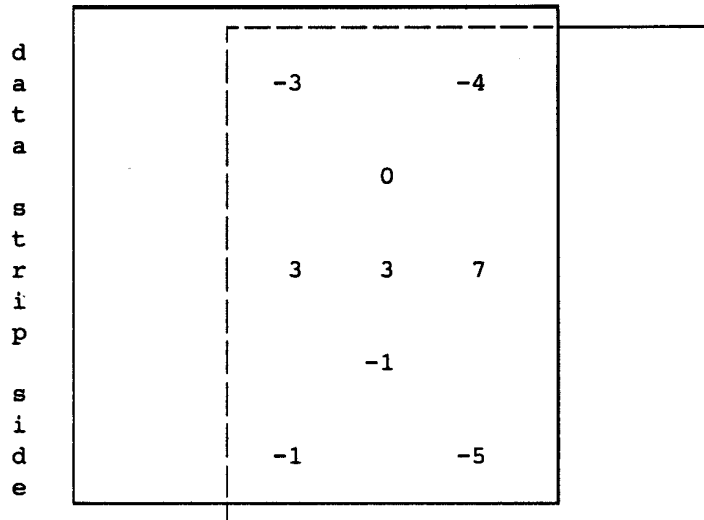
IX. Stereomodel Flatness

FMC Drive unit No.: 5207-576

Base/Height ratio: 0.6

Platen ID: 576

Maximum angle of field tested: 40°



Stereomodel
Test point array
(values in micrometers)

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: 45

Film: Type 2405

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	57	57	48	48	48	48	40
Tangential lines	57	57	48	40	48	40	34

LENS/FILM DISTORTION PARAMETERS

FMC Drive unit No.: 5207-576

Base/Height ratio: 0.6

Platen ID: 576

Maximum angle of field tested: 40°

XI. Calibrated Focal Length: 152.730 mmXII. Lens/Film Distortion

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

Symmetric radial distortion parametersDecentering distortion parametersCalibrated principal point

$$\begin{aligned} K_0 &= -0.7213 \times 10^{-4} \\ K_1 &= 0.6897 \times 10^{-8} \\ K_2 &= -0.7714 \times 10^{-13} \\ K_3 &= 0.0000 \\ K_4 &= 0.0000 \end{aligned}$$

$$\begin{aligned} P_1 &= 0.6068 \times 10^{-8} \\ P_2 &= 0.2878 \times 10^{-6} \\ P_3 &= 0.0000 \\ P_4 &= 0.0000 \end{aligned}$$

$$\begin{aligned} x_p &= 0.000 \text{ mm} \\ y_p &= -0.006 \text{ mm} \end{aligned}$$

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/2276, dated January 21, 1997.

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