RCD105 Calibration Certificate

	Camera Head	*Serial Number*	*Camera Controller*	*Serial Number*
This certificate is valid for	*CH39*	*021*	*CC105*	*021*

Calibration certificate issued on *07 15 2008*

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Inspector

Document code 764308

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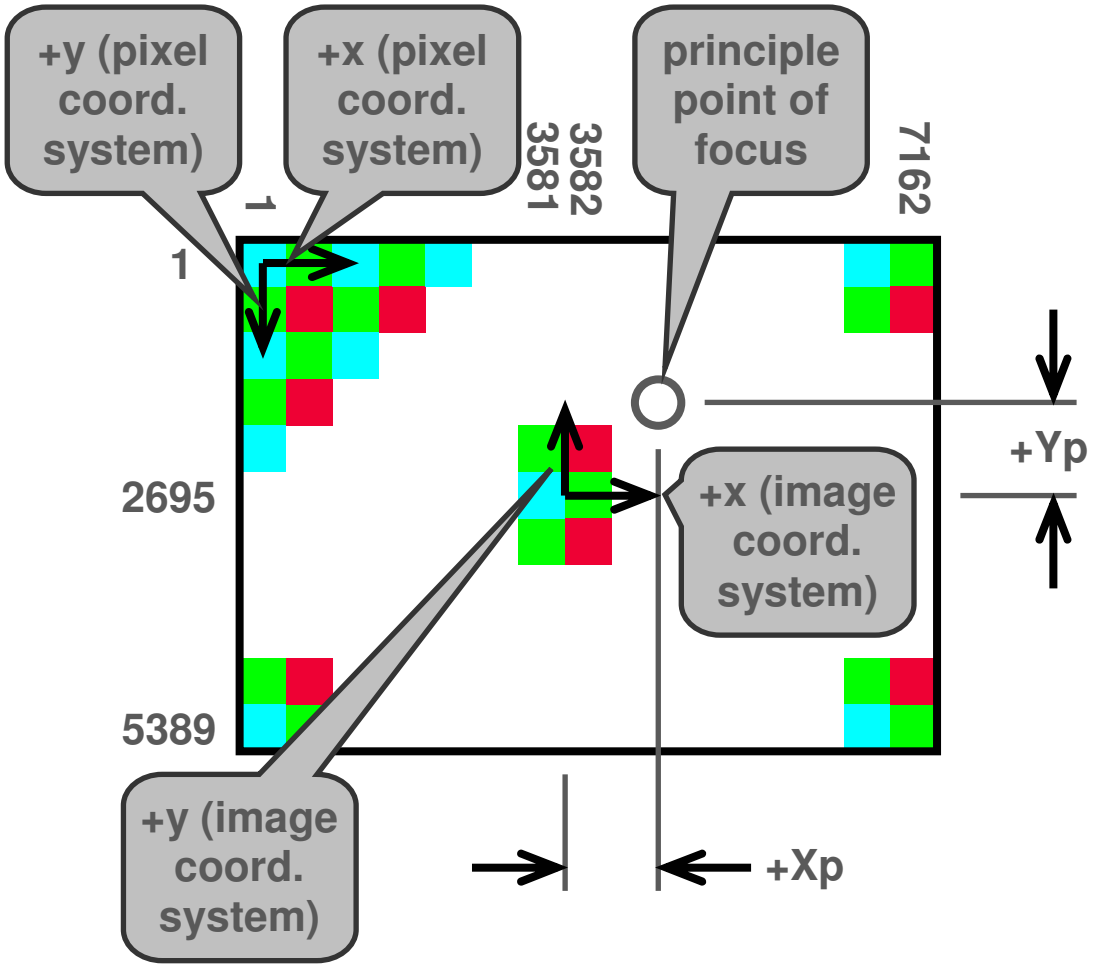
Components

Component	Type	Serial Number
Camera head	CH39	021
Lens focal length (mm)	F = 060 mm	19
Filter	RGB	24
Filter	CIR	
Camera Controller	CC105	021

Nominal focal plane layout and conventions

- The illustration below is of the developed image
- 7162 active columns, 5389 active rows
- Pixel coordinate system row and column coordinates are taken at the center of each pixel (see example for pixel 1, 1 below)
- Column 1, row 1 is at the upper left corner of the image
- Focal plane center is between columns 3581 and 3582, at row 2695
- Pixel coordinate system coordinates of focal plane center 3580.5, 2694.0
- Positive Xp or Yp places the principle point of focus closer to the 7162, 1 pixel
- Pixel coordinates of principle point of focus = (3580.5+Xp, 2694.0-Yp)



Calibration process

Adjustment of optical systems in optical laboratory

Process	Passed	Date	Inspector
Lens focus optimized and distance set and CCD plane distance and plane set	✓	2008.03.08	NAS
CCD plane and distance set	✓	2008.03.08	NAS
Functional test performed, final focus images archived and edge spread function measured at better than 4 pixels at 10%-90%	✓	2008.03.08	NAS

Radiometric calibration

Process	Passed	Date	Inspector
Radiometric calibration done	✓	2008.03.08	NAS
Dark signal (bias) files: CH39_serno_G3D.tif and CH39_serno_G4D.tif	✓	2008.03.08	NAS
Bright signal (pixel gain) files: CH39_serno_G3G.tif and CH39_serno_G4G.tif	✓	2008.03.08	NAS
Color calibration, Bayer placement and flaw map files: CH39_serno_G3P.txt and CH39_serno_G4P.txt	✓	2008.03.08	NAS
Static noise after calibration < 1% (pixel to pixel variation)	✓		
Static noise after calibration < 5% (across total image field)	✓		
Temporal noise < 2% (rms)	✓		

Geometric calibration standard

Process	Passed	Date	Inspector
Measurements performed on calibration cage HTR	✓	2008.07.15	NAS
Cage calibration filename: GSI_cage_scaled_release2.xyz	✓	2008.07.15	NAS

Sensor and lens data

Focal plane data

Parameter	Value
Pixel size	6.8 µm
Sensor size [Pixel]	7162 x 5389
Sensor size [mm]	48.7016 x 36.6452 (60.9485 diagonal)

Interior orientation parameters

Notes: Interior orientation coefficients follow the sign convention used in Leica Geosystems' Leica Photogrammetry Suite (LPS) software. Use of these coefficients, particularly the radial distortion coefficients, in other photogrammetry software may require changing the sign of the coefficients.

Interior orientation parameters below are determined using the Australis software package and reflect a static (i.e., laboratory) calibration. The parameters given reflect the so-called "balanced lens distortion" model.

Parameter	Symbol	Value	Std. dev.
Offset of principle point of focus [mm]	XP	0.3724	7.984E-04
	YP	-0.4564	7.102E-04
Focal length [mm]	Cb	59.827	0.002256096
Radial distortion	K0	8.38297E-03	1.49661E-05
	K1	-1.96324E-05	2.67456E-08
	K2	4.77732E-09	3.09881E-11
Decentring distortion	P1	0.0000	0.000e0
	P2	0.0000	0.000e0
In plane distortion	B1 (affinity, or pixel stretching / compression)	0.0000	0.000e0
	B2 (shear, or diagonal distortion)	0.0000	0.000e0

Lens distortion table

Note: This table is provided for users of photogrammetric software packages that do not allow direct input of the calibration coefficients provided in the preceding table. The table below is generated by plotting the distortion values using the coefficients in the preceding table and is therefore redundant information

r [mm]	***dr [µm]***
0.0	*0*
1.0	*8.4*
2.0	*16.6*
3.0	*24.6*
4.0	*32.3*
5.0	*39.5*
6.0	*46.1*
7.0	*52*
8.0	*57.2*
9.0	*61.4*
10.0	*64.7*
11.0	*66.9*
12.0	*67.9*
13.0	*67.6*
14.0	*66.1*
15.0	*63.1*
16.0	*58.7*
17.0	*52.8*
18.0	*45.4*
19.0	*36.4*
20.0	*25.9*
21.0	*13.7*
22.0	*0*
23.0	*-15.3*
24.0	*-32.2*
25.0	*-50.5*
26.0	*-70.3*
27.0	*-91.5*
28.0	*-114*
29.0	*-137.7*
30.0	*-162.5*
31.0	*-188.2*

Inspection

Process checks	***Passed***	***Date***	***Inspector***
Radiometric and geometric calibration files available, checked and archived	✓	*yymmdd*	*Leica emplyee name*
Test flight performed	✓	*yymmdd*	*Leica emplyee name*
Test flight image data archived	✓	*yymmdd*	*Leica emplyee name*

RCD105 calibration and inspection process specifications

Process	***Document***
RCD105 Radiometric calibration procedure	764309
RCD105 Geometric calibration procedure	764310
RCD105 Flight test procedure	764311