

RCD105 Calibration Certificate



	<i>Camera Head</i>	<i>Serial Number</i>	<i>Camera Controller</i>	<i>Serial Number</i>
<i>This certificate is valid for</i>	CH39	021	CC105	021

Calibration certificate issued on **2010 02 02**

Gert Ferrano

Inspector

Document code **764308**

Leica Geosystems AG
Heinrich-Wild-Strasse
9435 Heerbrugg
Switzerland

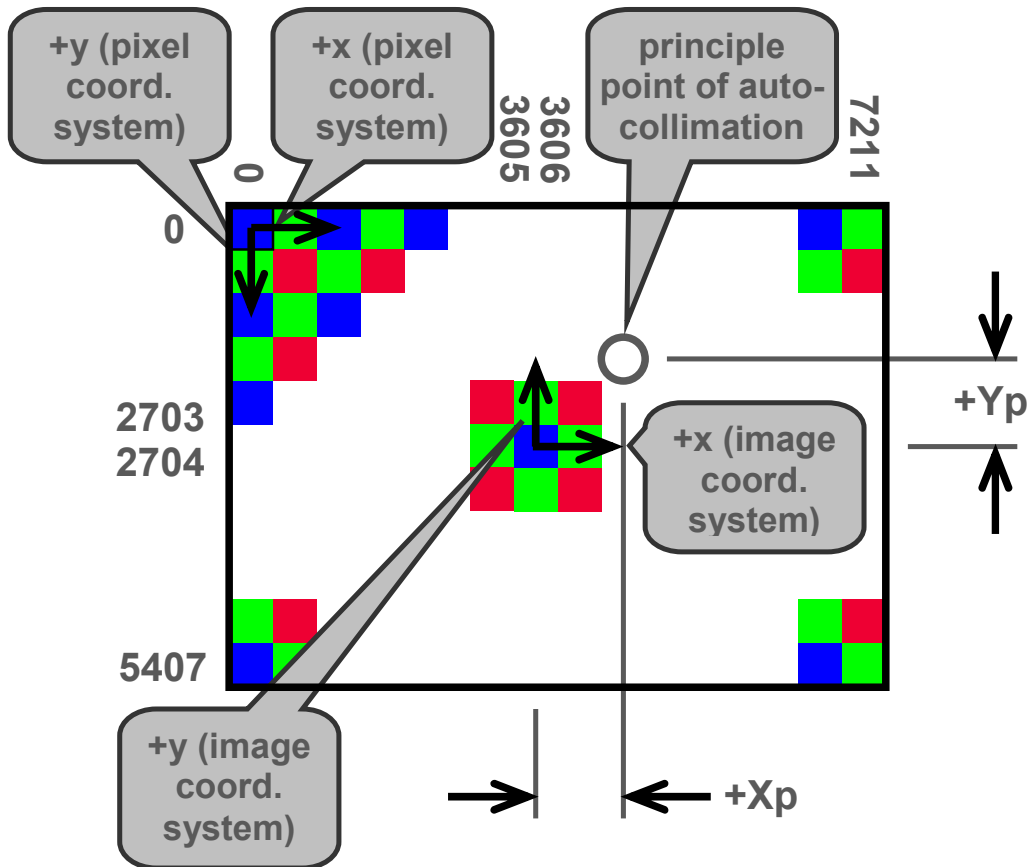


Components

Component	Type	Serial Number
Camera head	CH39	21
Lens focal length (mm)	F = 60 mm	19
Filter	RGB	24
Filter	CIR	-
Camera Controller	CC105	21

Nominal focal plane layout and conventions

- The illustration below is of the radiometric processed tif-image
- 7212 active columns, 5408 active rows
- Pixel coordinate system row and column coordinates are taken at the center of each pixel (see example for pixel 0, 0 below)
- Column 0, row 0 is at the upper left corner of the image
- Image center is between columns 3605 and 3606, and between rows 2703 and 2704
- Pixel coordinate system coordinates of image center 3605.5 and 2703.5
- Positive Xp or Yp places the principle point of auto-collimation closer to the 7211, 0 pixel
- Pixel coordinates of principle point of auto-collimation = $(3605.5+X_p, 2703.5-Y_p)$



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	✓	01/08/10	NAS
CCD plane and distance set	✓	01/08/10	NAS
Functional test performed, final focus images archived and edge spread function measured at better than 4 pixels at 10%-90%	✓	01/08/10	NAS

Radiometric calibration

Process	Passed	Date	Inspector
Radiometric calibration done	✓	01/08/10	NAS
Dark signal (bias) files: CH39_serno_G3D.tif and CH39_serno_G4D.tif	✓	01/08/10	NAS
Bright signal (pixel gain) files: CH39_serno_G3G.tif and CH39_serno_G4G.tif	✓	01/08/10	NAS
Color calibration, Bayer placement and flaw map files: CH39_serno_G3P.txt and CH39_serno_G4P.txt	✓	01/08/10	NAS
Static noise after calibration < 1% (pixel to pixel variation)	✓	01/08/10	NAS
Static noise after calibration < 5% (across total image field)	✓	01/08/10	NAS
Temporal noise < 2% (rms)	✓	01/08/10	NAS

Geometric calibration standard

Process	Passed	Date	Inspector
Measurements performed on calibration cage HTR	✓	01/08/10	NAS
Cage calibration filename: htr_cagemodel_112807_final.xyz	✓	01/08/10	NAS

Sensor and lens data

Focal plane data

Parameter	Value
Pixel size	6.8 μm
Sensor size [Pixel]	7212 x 5408
Sensor size [mm]	49.0416 x 36.7744 (61.2979 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	-0.0025	1.0430E-03
	YP	-0.3247	9.3550E-04
Focal length [mm]	Cb	59.799	2.90861E-03
	K0	8.57325E-03	1.94331E-05
Radial distortion	K1	-2.01969E-05	3.47319E-08
	K2	5.13135E-09	4.01926E-11
Decentering 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

<i>r [mm]</i>	<i>dr [μm]</i>
0.0	0
1.0	8.6
2.0	17
3.0	25.2
4.0	33
5.0	40.4
6.0	47.1
7.0	53.2
8.0	58.4
9.0	62.7
10.0	66
11.0	68.3
12.0	69.3
13.0	69
14.0	67.4
15.0	64.3
16.0	59.8
17.0	53.8
18.0	46.2
19.0	37.1
20.0	26.3
21.0	14
22.0	0
23.0	-15.5
24.0	-32.6
25.0	-51.1
26.0	-71.1
27.0	-92.4
28.0	-115
29.0	-138.7
30.0	-163.4
31.0	-189

Inspection

Process checks	Passed	Date	Inspector
<i>Radiometric and geometric calibration files available, checked and archived</i>	✓	100201	<i>FERG</i>
<i>Test flight performed</i>	✓	100127	<i>Phung</i>
<i>Test flight image data archived</i>	✓	100127	<i>Phung</i>

RCD105 calibration and inspection process specifications

Process	Document
<i>RCD105 Radiometric calibration procedure</i>	764309
<i>RCD105 Geometric calibration procedure</i>	764310
<i>RCD105 Flight test procedure</i>	764311