Mars Exploration Rover (MER) Project Engineering Camera Calibration Report

Approved:

Justin Maki, MER Imaging Scientist

Joy Crisp, MER Project Scientist

John Callas, MER Science Manager

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Author: Justin Maki

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Jet Propulsion Laboratory

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1 Introduction

1.1 **Document Scope**

This document describes the results of the Mars Exploration Rover (MER) Engineering Camera pre-launch calibration effort.

The pre-launch calibration of the MER Engineering Cameras focused primarily on the geometric calibration of the cameras at the system-level (i.e., flight cameras mounted on the rover prior to launch). These calibration data were used to derive a geometric "camera model" for each individual camera.

Although the calibration focused mainly on the geometric aspects of the cameras, effort was made to measure relative (flat field) and absolute responsivities. The results of this effort are described in sections 3.2 and 3.2.

1.2 Background

There are 14 Flight Model (FM) Engineering cameras (7 on Spirit and 7 on Opportunity). This report describes the analysis of the calibration data from the FM Engineering Cameras.

Camera Set	Rover	Mission	Vehicle Name
Designator	Number	Letter	
FM-1	2	A	Spirit
FM-2	1	В	Opportunity

Table 1.1. MER camera and venue nomenclature.

In addition to the FM cameras, there are also 14 (EM) Engineering Cameras in the MER Testbed (6 cameras in the Surface System Testbed (SSTB), 4 on the SSTB-lite, 2 in the Flight Software Testbed (FSWTB) 1 in the CETB, and 1 non-testbed camera. While a subset of the EM cameras has been geometrically calibrated, the analyses of those data are not included in this report.

1.3 References

For information on the MER Engineering Cameras (and the MER Imaging System in general), see the JGR paper by Maki et al., 2003

Maki, J. N., et al., Mars Exploration Rover Engineering Cameras, J. Geophys. Res., 108(E12), 8071,doi:10.1029/2003JE002077, 2003.)

Detailed information about the camera models can be found in the following:

Gennery, D. B., Least-squares camera calibration including lens distortion and automatic editing of calibration points, in Calibration and Orientation of Cameras in Computer

Vision, ch. 5, edited by A. Grun and T. Huang, pp. 123–136, Springer-Verlag, New York, 2001.

Yakimovsky, Y., and R. Cunningham, A system for extracting three-dimensional measurements from a stereo pair of TV cameras, January 7, 1977, Comput. Graph. Image Process., 7, 195–210, 1978.

2 Calibration Data

2.1 Deliverables

The Engineering Camera calibration effort focused on the following deliverables (listed in order of priority):

Item	Priority	Deliverable
Geometric calibration of all MER cameras at the	Highest	CAHVOR(E) Camera
system-level		Model files.
Relative responsivity (flat field) calibration of the	Medium	Flat field correction
Navcams and Hazcams		images.
Absolute responsivity of the Navcams and	Low	Responsivity
Hazcams		coefficients
Additional calibration data were gathered for	Lowest	None
purposes of characterizing detector dark current		
and detector read noise. Analysis of those data		
are not included in this report.		

Table 2.1. Calibration deliverables.

2.2 Data Set Description

The MER Engineering Camera calibration data are divided into two types: The subsystem calibration (also called "camera standalone") and the system-level calibration (in which the cameras were mounted on the rover and controlled through the rover avionics).

The types of data acquired for each camera are listed in table 2.2.

		MER A				MER B								
	LNAV	RNAV	FLHAZ	FRHAZ	RLHAZ	RRHAZ	DIMES	LNAV	RNAV	FLHAZ	FRHAZ	RLHAZ	RRHAZ	DIMES
Type of Measurement	112	113	107	109	106	108	118	102	117	120	122	119	121	123
Subsystem Calibration														
Dark Frames	Х	Х	Х	Х	Х	X	Х	Х	Х	X	X	Х	Х	X
Focus Target	Х	Х	Х	Х	Х	X	Х	Х	Х	Х	Х	Х	Х	X
Dot Target	X		Х	Х	Х	X	Х	Х	Х	Х	Х	Х	Х	X
White Board	Х		X	Х	X	Х				X		Х	X	X
Ambient Integrating Sphere	Х	Х	X	X	X	X	Х	Х	Х	X		Х	X	X
Stray Light Tests	Х		X				Х	X	Х	X				X
Light Transfer Tests (ambient)	Х		X	X	X	Х	Х	X	Х	X	X	X	X	X
Light Transfer Tests (-120 C)	Х	Х	Х	Х	Х	Х		Х	Х	Х	X	Х	Х	
Flat Field at -120 C	Х	Х	Х		Х	X		Х	Х	Х	X	Х	Х	
Flat Field at transitional temperatures	Х	Х	Х	Х	Х	X	Х	Х	Х	X	X	Х	Х	X
Subsystem Alignment	X	Х	Х	Х	Х	X		Х	Х	Х	X	Х	Х	
System-Level Calibration														
System Level Geometric Calibration	Х	Х	X	Х	Х	Х	X	Х	Х	Х	X	Х	X	X
Pointing Characterization	Х	Х						Х	Х					
Stereo Ranging Tests	Х	Х	Х	Х	Х	Х		Х	Х	Х	Х	Х	Х	
Rover Equipment Deck Imaging	Х	Х						Х	Х					
Thermal Stability Imaging	Х	Х	X	X	Х	X		X	Х	X	X	Х	X	

Table 2.2: MER Engineering Camera calibration data set at a glance.

2.3 Subsystem Calibration

The subsystem camera calibration was performed before the cameras were delivered to ATLO (Assembly Test and Launch Operations). Approximately 16,800 Engineering Camera images were collected during the subsystem calibration. These data are stored in the PDS "deep archive" and are organized by serial number according to the descriptors listed in table 2.3.

Descriptor	Camera	Number of
		Images
mer_camera_cal_sn_102_edr	MER B, Left Navcam	1009
mer_camera_cal_sn_106_edr	MER A Rear Left Hazcam	1168
mer_camera_cal_sn_107_edr	MER A Front Left Navcam	1171
mer_camera_cal_sn_108_edr	MER A Rear Right Hazcam	936
mer_camera_cal_sn_109_edr	MER A Front Right Hazcam	1026
mer_camera_cal_sn_112_edr	MER A Left Navcam	1058
mer_camera_cal_sn_113_edr	MER A Right Navcam	972
mer_camera_cal_sn_117_edr	MER B Right Navcam	996
mer_camera_cal_sn_118_edr	MER A DESCENT Imager	2501
mer_camera_cal_sn_119_edr	MER B Rear Left Hazcam	928
mer_camera_cal_sn_120_edr	MER B Front Left Hazcam	1013
mer_camera_cal_sn_121_edr	MER B Rear Right Hazcam	912
mer_camera_cal_sn_122_edr	MER B Front Left Hazcam	668
mer_camera_cal_sn_123_edr	MER B Descent Imager	2480

Table 2.3. List of MER subsystem-level Engineering Camera Calibration data. These data will be delivered to the PDS as a deep archive delivery.

Total Number of Images

16838

2.4 System-level calibration

The system-level calibration was performed while the cameras were on the flight vehicles. Approximately 5,800 image data products were collected as part of the ATLO calibration effort. These data are stored in the PDS deep archive and are organized by serial number according to the descriptors listed in table 2.4:

Descriptor	Camera	Number of Images
Mer_atlo1_descent_edr	MER B Descent Imager	148
Mer_atlo1_fcam_edr	MER B Front Hazcam	522
Mer_atlo1_ncam_edr	MER B Navcam	1965
Mer_atlo1_rcam_edr	MER B Rear Hazcam	338
Mer_atlo2_descent_edr	MER A Descent Imager	181
Mer_atlo2_fcam_edr	MER A Front Hazcam	453
Mer_atlo2_ncam_edr	MER A Navcam	1972
Mer_atlo2_rcam_edr	MER A Rear Hazcam	257

Total Number of Images 5836

Table 2.4. List of MER system-level Engineering Camera Calibration data. These data will be delivered to the PDS as a deep archive delivery.

3 Analysis

3.1 Geometric Calibration

All of the MER Engineering Cameras have been geometrically calibrated at the system level using the data listed in table 2.4. The derived results are stored in a CAHVOR(E) camera model file (see references in section 1.3 for more information regarding the CAHVOR(E) camera models). The entire set of CAVHOR(E) camera models for the MER flight cameras are provided in Appendix A.

The CAHVOR(E) camera model describes the relationship between the 2-dimensional detector frame and the 3-dimensional real-world frame. The camera models enable ray tracing, general image projection/reprojection, and the removal of geometric lens distortion. These projection techniques apply to the generation of epipolar aligned images for stereo processing, mosaic generation, and stereo ranging. For more information regarding the camera models used on MER, see the references listed in section 1.3

3.2 Relative Responsivity (flat fields)

All 14 of the flight MER Engineering camera flat field response patterns were measured during the subsystem calibration (table 2.1). These measurements were done at ambient temperatures (+20 C), at cold temperatures (-120), and at various transitional temperatures between -120 and +20 C. The derived flat field files are listed in table 3.1.

Flat Field Filename

MER_FLAT_SN_102.IMG MER_FLAT_SN_106.IMG MER_FLAT_SN_107.IMG MER_FLAT_SN_108.IMG MER_FLAT_SN_109.IMG MER_FLAT_SN_112.IMG MER_FLAT_SN_113.IMG MER_FLAT_SN_117.IMG MER_FLAT_SN_119.IMG MER_FLAT_SN_120.IMG MER_FLAT_SN_120.IMG MER_FLAT_SN_121.IMG MER_FLAT_SN_121.IMG

Table 3.1. Engineering Camera derived flat field files.

See Appendix B for a comparison of the actual derived flat field data to the modelled response. The files listed in table 3.1 will be delivered to the PDS deep archive.

3.3 Absolute Responsivity

Absolute responsivity measurements were made at the subsystem level (table 2.4). Due to the relatively low prioritization of this task during pre-launch data reduction, the responsivity measurements have not been derived from this data set. However, estimates of the absolute responsivity were derived by comparing Navcam/Hazcam images to Pancam images of the same target. The results of these "proxy" responsivity estimates are shown in table 3.2

Vehicle	Camera	Camera	R ₀ in units of	R ₁ in units of
		Serial	$(W/(m^2 st)$	$(W/(m^2 st)$
		Number	nm)/(DN/sec.)	nm)/(DN/sec.)
MER-A	Left Navcam	112	1.496E-05	1.437E-09
MER-A	Right Navcam	113	1.496E-05	1.437E-09
MER-A	Left Front Hazcam	107	1.496E-05	1.437E-09
MER-A	Right Front Hazcam	109	1.496E-05	1.437E-09
MER-A	Left Rear Hazcam	106	1.496E-05	1.437E-09
MER-A	Right Rear Hazcam	108	1.496E-05	1.437E-09
MER-B	Left Navcam	102	1.496E-05	1.437E-09
MER-B	Right Navcam	117	2.693E-05	1.437E-09
MER-B	Left Front Hazcam	120	1.496E-05	1.437E-09
MER-B	Right Front Hazcam	122	1.496E-05	1.437E-09
MER-B	Left Rear Hazcam	119	1.496E-05	1.437E-09
MER-B	Right Rear Hazcam	121	1.496E-05	1.437E-09

Table 3.2. Navcam/Hazcam absolute responsivity estimates. All of the Engineering Cameras have approximately identical responsivities, with the exception of Navcam SN 117, which is less sensitive than the average MER Engineering Camera by approximately a factor of 1.8. The responsivity as a function of temperature, $R(T) = R_0 + R_1 *T$, where T is the temperature in degrees C.

3.4 Dark Current

Engineering Camera dark current data have been collected for all cameras and have been verified to be similar to that of the Pancam and MI cameras. For more information on the MER camera dark current, see the Pancam and MI calibration reports. The dark current values from the MER Engineering Cameras are less than 1% of the total signal of a well-exposed pixel at typical Martian operating temperatures.

3.5 Pointing Characterization

The ability of the PMA to point to a target was characterized during ATLO. The PMA units on both rovers exhibited virtually identical pointing characteristics.

MER 2 PMA Pointing Summary	Measured Values (pixels)	Measured Values (degrees)	Requirement (degrees)
Left Navcam Repeatability			
Average Error (az), degrees	0.590	0.028	0.1
Average Error (el), degrees	2.115	0.099	0.1
Right Navcam Repeatability			
Average Error, in degrees (az)	0.525	0.025	0.1
Average Error, in degrees (el)	2.084	0.098	0.1
Left Pancam Repeatability			
Average Error, in degrees (az)	1.655	0.026	0.1
Average Error, in degrees (y)	4.692	0.075	0.1
Right Pancam Repeatability			
Average Error, in degrees (az)	1.281	0.020	0.1
Average Error, in degrees (el)	4.182	0.067	0.1

Table 3.2 Pointing performance for the Spirit PMA, as measured in ATLO.

Appendix A – Geometric Camera Models

```
MER A Camera Models
                                               MER B Camera Models
Filename:
                                               Filename:
/oss/mera/ops/ops/surface/tactical/staging/
                                               /oss/merb/flight/ops/lc/downlink/data_prods
ssw/products/./050/028/d0148-000-
                                               /staging/ssw/products/./050/028/p0001-001-
0006_001_0141097355-043.dat
                                               0028_001_0124528157-209.dat
Type: img_model - Camera Model Tables
                                               Type: img_model - Camera Model Tables
Spacecraft: MER A (SCID=254)
                                               Spacecraft: MER B (SCID=253)
DVT:2004-173T13:41:16.734 - 0141097355.043
                                               DVT:2003-346T19:09:17.816 - 0124528157.209
Packetized: 2004-174T18:49:51.415 -
                                               Packetized: 2003-350T02:32:24.377 -
0141202270.052
                                               0124814015.109
ERT:2004-174T19:25:12.107
                                               ERT:2003-350T03:08:42.308
APID=50 Subtype=28 Version=0
                                               APID=50 Subtype=28 Version=0
[Front Left Hazcam]
                                               [Front Left Hazcam]
Camera Model ID: 58
                                               Camera Model ID: 33
Camera Serial Number: 107
                                               Camera Serial Number: 120
Camera ID: Front Left Hazcam
                                               Camera ID: Front Left Hazcam
Filter Position: No filter/unknown
                                               Filter Position: No filter/unknown
Model Class: CAHVORE
                                               Model Class: CAHVORE
Model Type: 3
                                               Model Type: 3
Model Parameter: 0.370000
                                               Model Parameter: 0.370000
                                               Array Center Vector length 3
Array Center Vector length 3
Center Vector: 0.606185
                                               Center Vector: 0.609331
                                               [1]
Center Vector: -0.043367
                                               Center Vector: -0.041064
                                               [2]
Center Vector: -0.234891
                                               Center Vector: -0.233849
Array Axis Vector length 3
                                               Array Axis Vector length 3
Axis Vector: 0.712013
                                               Axis Vector: 0.703447
[1]
                                               [1]
Axis Vector: 0.037316
                                               Axis Vector: -0.005161
[2]
                                               [2]
Axis Vector: 0.701174
                                               Axis Vector: 0.710729
Array Horizontal Vector length 3
                                               Array Horizontal Vector length 3
Horizontal Vector: 353.340667
                                               Horizontal Vector: 351.361730
Horizontal Vector: 474.872862
                                               Horizontal Vector: 452.204294
Horizontal Vector: 350.820311
                                               Horizontal Vector: 353.494013
Array Vertical Vector length 3
                                               Array Vertical Vector length 3
Vertical Vector: 44.010163
                                               Vertical Vector: 35.806531
Vertical Vector: 16.904013
                                               Vertical Vector: -1.751429
                                               Vertical Vector: 682.704520
Vertical Vector: 683.916158
Array Optical Vector length 3
                                               Array Optical Vector length 3
                                               [0]
Optical Vector: 0.712953
                                               Optical Vector: 0.704402
Optical Vector: 0.038186
                                               Optical Vector: -0.006062
Optical Vector: 0.700171
                                               Optical Vector: 0.709775
Array Radial Distortion Terms length 3
                                               Array Radial Distortion Terms length 3
Radial Distortion Terms: 0.000003
                                               Radial Distortion Terms: 0.000003
Radial Distortion Terms: -0.013032
                                               Radial Distortion Terms: -0.012015
Radial Distortion Terms: -0.007540
                                               Radial Distortion Terms: -0.007525
Array Entrance Pupil Terms length 3
                                               Array Entrance Pupil Terms length 3
Entrance Pupil Terms: 0.000942
                                               Entrance Pupil Terms: 0.001442
```

MER A Camera Models	MED B Camera Models
[1]	MER B Camera Models [1]
Entrance Pupil Terms: 0.002280 [2]	Entrance Pupil Terms: 0.001522 [2]
Entrance Pupil Terms: 0.001613	Entrance Pupil Terms: 0.000483
Array Camera Reference Vector length 3	Array Camera Reference Vector length 3
[0] Camera Reference Vector: 0.000000	[0] Camera Reference Vector: 0.000000
[1] Camera Reference Vector: 0.000000	[1] Camera Reference Vector: 0.000000
[2] Camera Reference Vector: 0.000000	[2] Camera Reference Vector: 0.000000
Array Camera Reference Quaternion length 4 [0]	Array Camera Reference Quaternion length 4 [0]
Camera Reference Quaternion: 0.000000 [1]	Camera Reference Quaternion: 0.000000 [1]
Camera Reference Quaternion: 0.000000 [2]	Camera Reference Quaternion: 0.000000 [2]
Camera Reference Quaternion: 0.000000 [3]	Camera Reference Quaternion: 0.000000 [3]
Camera Reference Quaternion: 1.000000	Camera Reference Quaternion: 1.000000
Camera Temperature: 20.000000	Camera Temperature: 20.000000
[Front Right Hazcam]	[Front Right Hazcam]
Camera Model ID: 59	Camera Model ID: 34
Camera Serial Number: 109	Camera Serial Number: 122
Camera ID: Front Right Hazcam Filter Position: No filter/unknown	Camera ID: Front Right Hazcam Filter Position: No filter/unknown
Model Class: CAHVORE	Model Class: CAHVORE
Model Type: 3	Model Type: 3
Model Parameter: 0.370000	Model Type. 3 Model Parameter: 0.370000
Array Center Vector length 3	Array Center Vector length 3
[0]	[0]
Center Vector: 0.605777	Center Vector: 0.609774
[1]	[1]
Center Vector: 0.055065	Center Vector: 0.060081
[2]	[2]
Center Vector: -0.235306	Center Vector: -0.234332
Array Axis Vector length 3	Array Axis Vector length 3
[0]	[0]
Axis Vector: 0.702176	Axis Vector: 0.706252
Axis Vector: -0.007688	Axis Vector: 0.034860
Axis Vector: 0.711962	Axis Vector: 0.707102
Array Horizontal Vector length 3	Array Horizontal Vector length 3
[0]	[0]
Horizontal Vector: 347.882684	Horizontal Vector: 353.645269
Horizontal Vector: 451.204960 [2]	Horizontal Vector: 476.675400
Horizontal Vector: 357.288613	Horizontal Vector: 350.756881
Array Vertical Vector length 3	Array Vertical Vector length 3
[0] Vertical Vector: 39.944126	[0] Vertical Vector: 33.985059
[1] Vertical Vector: -7.191921	[1] Vertical Vector: 19.794709
[2]	[2]
Vertical Vector: 688.965306	Vertical Vector: 683.515455
Array Optical Vector length 3 [0]	Array Optical Vector length 3 [0]
Optical Vector: 0.701760	Optical Vector: 0.707943 [1]
Optical Vector: -0.012920 [2]	Optical Vector: 0.036219 [2]
Optical Vector: 0.712296	Optical Vector: 0.705340
Array Radial Distortion Terms length 3	Array Radial Distortion Terms length 3
[0]	[0]
Radial Distortion Terms: 0.000028	Radial Distortion Terms: 0.000008
[1] Radial Distortion Terms: -0.013534	[1] Radial Distortion Terms: -0.012790
Radial Distortion Terms: -0.013534 [2]	[2]

MED A Camora Modela	MED D Camera Modela
MER A Camera Models Radial Distortion Terms: -0.007456	MER B Camera Models Radial Distortion Terms: -0.007496
Array Entrance Pupil Terms length 3	Array Entrance Pupil Terms length 3
[0]	[0]
Entrance Pupil Terms: 0.000568	Entrance Pupil Terms: 0.001158
Entrance Pupil Terms: 0.001915	Entrance Pupil Terms: 0.001904
Entrance Pupil Terms: 0.002274	Entrance Pupil Terms: 0.000674
Array Camera Reference Vector length 3	Array Camera Reference Vector length 3
[0]	[0]
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.000000
[1] Camera Reference Vector: 0.000000	[1] Camera Reference Vector: 0.000000
[2]	[2]
Camera Reference Vector: 0.000000 Array Camera Reference Quaternion length 4	Camera Reference Vector: 0.000000 Array Camera Reference Quaternion length 4
[0]	[0]
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000 [2]
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
[3] Camera Reference Quaternion: 1.000000	[3] Camera Reference Quaternion: 1.000000
Camera Temperature: 20.000000	Camera Temperature: 20.000000
[Rear Left Hazcam]	[Rear Left Hazcam]
Camera Model ID: 60	Camera Model ID: 35
Camera Serial Number: 106	Camera Serial Number: 119
Camera ID: Rear Left Hazcam Filter Position: No filter/unknown	Camera ID: Rear Left Hazcam Filter Position: No filter/unknown
Model Class: CAHVORE	Model Class: CAHVORE
Model Type: 3	Model Type: 3
Model Parameter: 0.370000	Model Parameter: 0.370000
Array Center Vector length 3	Array Center Vector length 3
[0]	[0]
Center Vector: -0.352830	Center Vector: -0.352486
Center Vector: 0.027840	Center Vector: 0.029107
Center Vector: -0.220359	Center Vector: -0.219509
Array Axis Vector length 3	Array Axis Vector length 3
[0]	[0]
Axis Vector: -0.820494	Axis Vector: -0.817454
[1]	[1]
Axis Vector: -0.017232	Axis Vector: 0.003886 [2]
Axis Vector: 0.571396	Axis Vector: 0.575981
Array Horizontal Vector length 3	Array Horizontal Vector length 3
[0]	[0]
Horizontal Vector: -414.354735	Horizontal Vector: -412.111787
Horizontal Vector: -461.547168	Horizontal Vector: -454.507817
Horizontal Vector: 286.204206	Horizontal Vector: 294.672076
Array Vertical Vector length 3	Array Vertical Vector length 3
[0] Vertical Vector: -170.157896	[0] Vertical Vector: -153.453457
Vertical Vector: -1/0.15/896	[1]
Vertical Vector: -9.813575	Vertical Vector: 5.657748
[2]	[2]
Vertical Vector: 669.513537	Vertical Vector: 667.135065
Array Optical Vector length 3 [0]	Array Optical Vector length 3 [0]
Optical Vector: -0.818510	Optical Vector: -0.816478
[1]	[1]
Optical Vector: -0.020424 [2]	Optical Vector: 0.005312 [2]
Optical Vector: 0.574129	Optical Vector: 0.577352
Array Radial Distortion Terms length 3	Array Radial Distortion Terms length 3
[0]	[0]

MED A Camora Models	MED B Camora Modela
MER A Camera Models Radial Distortion Terms: 0.000022	MER B Camera Models Radial Distortion Terms: 0.000005
[1]	[1]
Radial Distortion Terms: -0.012974	Radial Distortion Terms: -0.013636
[2]	[2]
Radial Distortion Terms: -0.007563	Radial Distortion Terms: -0.007433
Array Entrance Pupil Terms length 3	Array Entrance Pupil Terms length 3
[0]	[0]
Entrance Pupil Terms: 0.000972	Entrance Pupil Terms: 0.002913
[1]	[1]
Entrance Pupil Terms: 0.001178	Entrance Pupil Terms: 0.002490
[2]	[2]
Entrance Pupil Terms: 0.001015 Array Camera Reference Vector length 3	Entrance Pupil Terms: 0.001988 Array Camera Reference Vector length 3
[0]	[0]
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.00000
[1]	[1]
Camera Reference Vector: 0.000000 [2]	Camera Reference Vector: 0.000000
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.000000
Array Camera Reference Quaternion length 4	Array Camera Reference Quaternion length 4
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000 [2]
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
Camera Reference Quaternion: 1.000000	Camera Reference Quaternion: 1.000000
Camera Temperature: 20.000000	Camera Temperature: 20.000000
[Rear Right Hazcam]	[Rear Right Hazcam]
Camera Model ID: 61	Camera Model ID: 36
Camera Serial Number: 108	Camera Serial Number: 121
Camera ID: Rear Right Hazcam	Camera ID: Rear Right Hazcam
Filter Position: No filter/unknown	Filter Position: No filter/unknown
Model Class: CAHVORE	Model Class: CAHVORE
Model Type: 3 Model Parameter: 0.370000	Model Type: 3 Model Parameter: 0.370000
Array Center Vector length 3	Array Center Vector length 3
[0]	[0]
Center Vector: -0.352856	Center Vector: -0.352347
[1]	[1]
Center Vector: -0.071599	Center Vector: -0.071376
[2]	[2]
Center Vector: -0.220484	Center Vector: -0.218263
Array Axis Vector length 3	Array Axis Vector length 3
[0]	[0]
Axis Vector: -0.817110 [1]	Axis Vector: -0.797769 [1]
Axis Vector: 0.006074	Axis Vector: -0.005895
[2]	[2]
Axis Vector: 0.576450	Axis Vector: 0.602934
Array Horizontal Vector length 3	Array Horizontal Vector length 3
[0]	[0]
Horizontal Vector: -413.667588	Horizontal Vector: -403.318552
[1]	[1]
Horizontal Vector: -448.794903	Horizontal Vector: -459.244833
[2] Horizontal Vector: 287.678977	[2]
Array Vertical Vector length 3	Horizontal Vector: 306.418265 Array Vertical Vector length 3
[0]	[0]
Vertical Vector: -170.387722	Vertical Vector: -142.127421
[1]	[1]
Vertical Vector: 1.125681	Vertical Vector: -1.605314
[2]	[2]
Vertical Vector: 673.049507	Vertical Vector: 680.026212
Array Optical Vector length 3	Array Optical Vector length 3
[0]	[0]
Optical Vector: -0.815498	Optical Vector: -0.798053
[1]	[1] Ontical Vector: -0.008088
Optical Vector: 0.004208	Optical Vector: -0.008088

MED A Comoro Modela	MED D Comovo Modela
MER A Camera Models [2]	MER B Camera Models [2]
Optical Vector: 0.578744	Optical Vector: 0.602532
Array Radial Distortion Terms length 3	Array Radial Distortion Terms length 3
	[0]
Radial Distortion Terms: 0.000011	Radial Distortion Terms: 0.000005
Radial Distortion Terms: -0.015912	Radial Distortion Terms: -0.012461
[2]	[2]
Radial Distortion Terms: -0.006998	Radial Distortion Terms: -0.007520
Array Entrance Pupil Terms length 3	Array Entrance Pupil Terms length 3
[0] Entrance Pupil Terms: 0.000920	[0] Entrance Pupil Terms: 0.003556
[1]	[1]
Entrance Pupil Terms: 0.001679	Entrance Pupil Terms: 0.003197
[2]	[2]
Entrance Pupil Terms: 0.002273 Array Camera Reference Vector length 3	Entrance Pupil Terms: 0.000849 Array Camera Reference Vector length 3
[0]	[0]
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.000000
	[1]
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.000000 [2]
Camera Reference Vector: 0.000000	Camera Reference Vector: 0.000000
Array Camera Reference Quaternion length 4	Array Camera Reference Quaternion length 4
[0]	[0]
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
Camera Reference Quaternion: 0.000000	Camera Reference Quaternion: 0.000000
<u> </u>	[2]
	Camera Reference Quaternion: 0.000000
Camera Reference Quaternion: 0.000000	[3] Camera Reference Quaternien: 1 000000
[3] Camera Reference Quaternion: 1.000000	Camera Reference Quaternion: 1.000000 Camera Temperature: 20.000000
Camera Temperature: 20.000000	[Left Navcam]
[Left Navcam]	Camera Model ID: 196
Camera Model ID: 174	Camera Serial Number: 102
Camera Serial Number: 112 Camera ID: Left Navcam	Camera ID: Left Navcam Filter Position: No filter/unknown
Filter Position: No filter/unknown	Model Class: CAHVOR
Model Class: CAHVOR	Model Type: 0
Model Type: 0	Model Parameter: 0.000000
Model Parameter: 0.000000 Array Center Vector length 3	Array Center Vector length 3 [0]
[0]	Center Vector: 0.411970
Center Vector: 0.427748	[1]
[1]	Center Vector: 0.105641
Center Vector: 0.114460 [2]	[2] Center Vector: -1.249215
Center Vector: -1.248564	Array Axis Vector length 3
Array Axis Vector length 3	[0]
[0]	Axis Vector: -0.972195
Axis Vector: -0.989991	[1] Axis Vector: -0.193555
Axis Vector: -0.011243	[2]
[2]	Axis Vector: 0.131811
Axis Vector: 0.140682	Array Horizontal Vector length 3
Array Horizontal Vector length 3 [0]	[0] Horizontal Vector: -247.726578
[0]	
Horizontal Vector: -450.458717	Horizontal Vector: -1296.609863
[1]	[2]
Horizontal Vector: -1193.412639	Horizontal Vector: 67.858466 Array Vertical Vector length 3
Horizontal Vector: 75.082092	[0]
Array Vertical Vector length 3	Vertical Vector: -331.070280
[0]	[1]
Vertical Vector: -344.660526	Vertical Vector: -63.484371
[1] Vertical Vector: 4.426849	[2] Vertical Vector: 1279.291928
[2]	Array Optical Vector length 3
	, <u>, , , , , , , , , , , , , , , , , , </u>

MER A Camera Models	MER B Camera Models
Vertical Vector: 1249.216269	[0]
Array Optical Vector length 3	Optical Vector: -0.964543
[0]	[1]
Optical Vector: -0.987140	Optical Vector: -0.215917
[1]	[2]
Optical Vector: 0.115434	Optical Vector: 0.151779
[2]	Array Radial Distortion Terms length 3
Optical Vector: 0.110584	[0]
-	1
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.000960
[0]	[1]
Radial Distortion Terms: 0.019876	Radial Distortion Terms: -0.002183
[1]	[2]
Radial Distortion Terms: -0.014281	Radial Distortion Terms: 0.018547
[2]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.020876	[0]
	1
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000
[0]	[1]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
	_
[1]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[2]	Array Camera Reference Vector length 3
	_
Entrance Pupil Terms: 0.000000	[0]
Array Camera Reference Vector length 3	Camera Reference Vector: 0.457290
[0]	[1]
Camera Reference Vector: 0.457810	Camera Reference Vector: 0.026050
[1]	[2]
Camera Reference Vector: 0.027790	Camera Reference Vector: -1.096200
[2]	Array Camera Reference Quaternion length 4
Camera Reference Vector: -1.096680	[0]
Array Camera Reference Quaternion length 4	Camera Reference Quaternion: 0.065924
[0]	[1]
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.006818
[1]	[2]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.992507
[2]	[3]
Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: -0.102653
[3]	Camera Temperature: 20.000000
	_
Camera Reference Quaternion: -0.016658	[Right Navcam]
Camera Temperature: 20.000000	Camera Model ID: 197
[Right Navcam]	Camera Serial Number: 117
Camera Model ID: 175	Camera ID: Right Navcam
Camera Serial Number: 113	Filter Position: No filter/unknown
Camera ID: Right Navcam	Model Class: CAHVOR
Filter Position: No filter/unknown	Model Type: 0
Model Class: CAHVOR	Model Parameter: 0.000000
Model Type: 0	Array Center Vector length 3
Model Parameter: 0.000000	[0]
Array Center Vector length 3	Center Vector: 0.452404
[0]	[1]
Center Vector: 0.435019	Center Vector: -0.090348
[1]	[2]
Center Vector: -0.085753	Center Vector: -1.248825
[2]	Array Axis Vector length 3
Center Vector: -1.249092	[0]
Array Axis Vector length 3	Axis Vector: -0.967006
[0]	[1]
Axis Vector: -0.988104	Axis Vector: -0.212014
[1]	[2]
Axis Vector: -0.049381	Axis Vector: 0.141240
[2]	Array Horizontal Vector length 3
Axis Vector: 0.145646	[0]
Array Horizontal Vector length 3	Horizontal Vector: -246.433204
[0]	[1]
Horizontal Vector: -452.075834	Horizontal Vector: -1294.549308
[1]	[2]
Horizontal Vector: -1233.255239	Horizontal Vector: 69.794922
[2]	Array Vertical Vector length 3
	-
Horizontal Vector: 79.557598	[0]
Array Vertical Vector length 3	Vertical Vector: -329.064749
[0]	[1]

MER A Camera Models	MER B Camera Models
Vertical Vector: -342.762187	Vertical Vector: -75.301543
[1]	[2]
Vertical Vector: -13.628939	Vertical Vector: 1273.320289
[2]	Array Optical Vector length 3
Vertical Vector: 1273.248298	[0]
Array Optical Vector length 3	Optical Vector: -0.959404
[0]	[1]
Optical Vector: -0.989044	Optical Vector: -0.246709
[1]	[2]
Optical Vector: -0.039669	Optical Vector: 0.136667
[2]	Array Radial Distortion Terms length 3
Optical Vector: 0.142189	[0]
1	
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.001281
[0]	[1]
Radial Distortion Terms: 0.000300	Radial Distortion Terms: -0.011721
[1]	[2]
Radial Distortion Terms: -0.004874	Radial Distortion Terms: 0.036593
[2]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.018766	[0]
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000
[0]	[1]
	1
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[2]	Array Camera Reference Vector length 3
	-
Entrance Pupil Terms: 0.000000	[0]
Array Camera Reference Vector length 3	Camera Reference Vector: 0.457290
[0]	[1]
Camera Reference Vector: 0.457810	Camera Reference Vector: 0.026050
[1]	[2]
Camera Reference Vector: 0.027790	Camera Reference Vector: -1.096200
[2]	Array Camera Reference Quaternion length 4
Camera Reference Vector: -1.096680	[0]
Array Camera Reference Quaternion length 4	Camera Reference Quaternion: 0.065924
	[1]
[0]	
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.006818
[1]	[2]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.992507
[2]	[3]
	1
Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: -0.102653
[3]	Camera Temperature: 20.000000
Camera Reference Quaternion: -0.016658	[Left Pancam, filter L1]
Camera Temperature: 20.000000	Camera Model ID: 198
[Left Pancam, filter L1]	Camera Serial Number: 115
, · · · · · · · · · · · · · · · · · · ·	
Camera Model ID: 176	Camera ID: Left Pancam
Camera Serial Number: 104	Filter Position: Pancam Left-Eye Filter L1:
Camera ID: Left Pancam	empty
Filter Position: Pancam Left-Eye Filter L1:	Model Class: CAHVOR
empty	Model Type: 0
Model Class: CAHVOR	Model Parameter: 0.000000
Model Type: 0	Array Center Vector length 3
Model Parameter: 0.000000	[0]
Array Center Vector length 3	Center Vector: 0.382152
[0]	[1]
Center Vector: 0.401265	Center Vector: 0.149178
[1]	[2]
Center Vector: 0.163027	Center Vector: -1.246381
[2]	Array Axis Vector length 3
Center Vector: -1.245082	[0]
Array Axis Vector length 3	Axis Vector: -0.965675
[0]	[1]
Axis Vector: -0.989679	Axis Vector: -0.224240
[1]	[2]
Axis Vector: -0.046318	Axis Vector: 0.131104
[2]	Array Horizontal Vector length 3
Axis Vector: 0.135607	[0]
Array Horizontal Vector length 3	Horizontal Vector: 315.089938
[0]	[1]
Horizontal Vector: -349.960356	Horizontal Vector: -3647.728413
[1]	[2]

MED & Company Model a	MED D Comore Models
MER A Camera Models Horizontal Vector: -3576.595824	MER B Camera Models Horizontal Vector: 47.302857
[2]	Array Vertical Vector length 3
Horizontal Vector: 44.320764	[0]
Array Vertical Vector length 3	Vertical Vector: -20.801368
[0]	
Vertical Vector: -10.046627	[1]
[1]	Vertical Vector: -26.864694
Vertical Vector: -28.461764	[2]
[2]	Vertical Vector: 3660.536632
Vertical Vector: 3591.399075	Array Optical Vector length 3
Array Optical Vector length 3	[0]
[0] Optical Vector: -0.991056	Optical Vector: -0.962756
[1]	Optical Vector: -0.233389
Optical Vector: -0.047812	[2]
[2]	Optical Vector: 0.136490
Optical Vector: 0.124591	Array Radial Distortion Terms length 3
Array Radial Distortion Terms length 3	[0]
[0]	Radial Distortion Terms: 0.000998
Radial Distortion Terms: 0.022997	[1]
[1]	Radial Distortion Terms: 0.003762
Radial Distortion Terms: 0.024872	[2]
[2]	Radial Distortion Terms: -0.057232
Radial Distortion Terms: -0.407146	Array Entrance Pupil Terms length 3
Array Entrance Pupil Terms length 3 [0]	[0] Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[1]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[2]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
Array Camera Reference Vector length 3	[0]
[0]	Camera Reference Vector: 0.457290
Camera Reference Vector: 0.457810	[1]
[1]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.027790	[2]
[2]	Camera Reference Vector: -1.096200
Camera Reference Vector: -1.096680	Array Camera Reference Quaternion length 4
Array Camera Reference Quaternion length 4	[0]
[0] Camera Reference Ouaternion: 0.070093	Camera Reference Quaternion: 0.065924
[1]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.001171	[2]
[2]	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.997401	[3]
[3]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: -0.016658	Camera Temperature: 20.000000
Camera Temperature: 20.000000	[Left Pancam, filter L2]
[Left Pancam, filter L2]	Camera Model ID: 199
Camera Model ID: 177	Camera Serial Number: 115
Camera Serial Number: 104	Camera ID: Left Pancam
Camera ID: Left Pancam	Filter Position: Pancam Left-Eye Filter L2:
Filter Position: Pancam Left-Eye Filter L2: 750 nm	750 nm Model Class: CAHVOR
Model Class: CAHVOR	Model Class: CAHVOR Model Type: 0
Model Type: 0	Model Type: 0 Model Parameter: 0.000000
Model Parameter: 0.000000	Array Center Vector length 3
Array Center Vector length 3	[0]
[0]	Center Vector: 0.382152
Center Vector: 0.401265	[1]
[1]	Center Vector: 0.149178
Center Vector: 0.163027	[2]
[2]	Center Vector: -1.246381
Center Vector: -1.245082	Array Axis Vector length 3
Array Axis Vector length 3	[0]
[0]	Axis Vector: -0.965675
Axis Vector: -0.989679	[1] Axis Vector: -0.224240
Axis Vector: -0.046318	[2]
[2]	Axis Vector: 0.131104
r=1	INTED ACCORT. O'THITA

MED A Comerce Model o	MED D Comovo Modela
MER A Camera Models Axis Vector: 0.135607	MER B Camera Models Array Horizontal Vector length 3
Array Horizontal Vector length 3	[0]
[0]	Horizontal Vector: 315.089938
Horizontal Vector: -349.960356	[1]
[1] Horizontal Vector: -3576.595824	Horizontal Vector: -3647.728413
[2]	Horizontal Vector: 47.302857
Horizontal Vector: 44.320764	Array Vertical Vector length 3
Array Vertical Vector length 3	[0]
[0] Vertical Vector: -10.046627	Vertical Vector: -20.801368
[1]	[11]
Vertical Vector: -28.461764	Vertical Vector: -26.864694
[2]	[2]
Vertical Vector: 3591.399075 Array Optical Vector length 3	Vertical Vector: 3660.536632 Array Optical Vector length 3
[0]	[0]
Optical Vector: -0.991056	Optical Vector: -0.962756
[1]	[1]
Optical Vector: -0.047812	Optical Vector: -0.233389
Optical Vector: 0.124591	Optical Vector: 0.136490
Array Radial Distortion Terms length 3	Array Radial Distortion Terms length 3
[0]	[0]
Radial Distortion Terms: 0.022997	Radial Distortion Terms: 0.000998
Radial Distortion Terms: 0.024872	Radial Distortion Terms: 0.003762
[2]	[2]
Radial Distortion Terms: -0.407146	Radial Distortion Terms: -0.057232
Array Entrance Pupil Terms length 3	Array Entrance Pupil Terms length 3
[0] Entrance Pupil Terms: 0.000000	[0] Entrance Pupil Terms: 0.000000
[1]	[1]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[2]	[2]
Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3	Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3
[0]	[0]
Camera Reference Vector: 0.457810	Camera Reference Vector: 0.457290
[1]	[1]
Camera Reference Vector: 0.027790 [2]	Camera Reference Vector: 0.026050 [2]
Camera Reference Vector: -1.096680	Camera Reference Vector: -1.096200
Array Camera Reference Quaternion length 4	Array Camera Reference Quaternion length 4
[0]	[0]
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.065924 [1]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.006818
[2]	[2]
Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: 0.992507
[3] Camera Reference Ouaternion: -0.016658	[3] Camera Reference Quaternion: -0.102653
Camera Temperature: 20.000000	Camera Temperature: 20.000000
[Left Pancam, filter L3]	[Left Pancam, filter L3]
Camera Model ID: 178	Camera Model ID: 200
Camera Serial Number: 104 Camera ID: Left Pancam	Camera Serial Number: 115 Camera ID: Left Pancam
Filter Position: Pancam Left-Eye Filter L3:	Filter Position: Pancam Left-Eye Filter L3:
670 nm	670 nm
Model Class: CAHVOR	Model Class: CAHVOR
Model Type: 0 Model Parameter: 0.000000	Model Type: 0 Model Parameter: 0.000000
Array Center Vector length 3	Array Center Vector length 3
[0]	[0]
Center Vector: 0.401265	Center Vector: 0.382152
[1] Contar Wester: 0 163027	[1]
Center Vector: 0.163027	Center Vector: 0.149178
Center Vector: -1.245082	Center Vector: -1.246381
Array Axis Vector length 3	Array Axis Vector length 3

MER A Camera Models	MED B Camera Models
[0]	MER B Camera Models [0]
Axis Vector: -0.989679	Axis Vector: -0.965675
Axis Vector: -0.046318	Axis Vector: -0.224240
Axis Vector: 0.135607	Axis Vector: 0.131104
Array Horizontal Vector length 3	Array Horizontal Vector length 3
[0]	[0]
Horizontal Vector: -349.960356 [1]	Horizontal Vector: 315.089938
Horizontal Vector: -3576.595824 [2]	Horizontal Vector: -3647.728413
Horizontal Vector: 44.320764 Array Vertical Vector length 3 [0]	Horizontal Vector: 47.302857 Array Vertical Vector length 3 [0]
Vertical Vector: -10.046627	Vertical Vector: -20.801368
Vertical Vector: -28.461764	Vertical Vector: -26.864694
Vertical Vector: 3591.399075	Vertical Vector: 3660.536632
Array Optical Vector length 3	Array Optical Vector length 3
[0]	[0]
Optical Vector: -0.991056 [1]	Optical Vector: -0.962756 [1]
Optical Vector: -0.047812 [2]	Optical Vector: -0.233389 [2]
Optical Vector: 0.124591	Optical Vector: 0.136490
Array Radial Distortion Terms length 3	Array Radial Distortion Terms length 3
[0] Radial Distortion Terms: 0.022997 [1]	[0] Radial Distortion Terms: 0.000998 [1]
Radial Distortion Terms: 0.024872	Radial Distortion Terms: 0.003762
Radial Distortion Terms: -0.407146	Radial Distortion Terms: -0.057232
Array Entrance Pupil Terms length 3	Array Entrance Pupil Terms length 3
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
Array Camera Reference Vector length 3	Array Camera Reference Vector length 3
[0] Camera Reference Vector: 0.457810	[0] Camera Reference Vector: 0.457290
[1] Camera Reference Vector: 0.027790	[1] Camera Reference Vector: 0.026050
[2]	[2]
Camera Reference Vector: -1.096680 Array Camera Reference Quaternion length 4 [0]	Camera Reference Vector: -1.096200 Array Camera Reference Quaternion length 4 [0]
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.065924
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: -0.016658	Camera Reference Quaternion: -0.102653
Camera Temperature: 20.000000 [Left Pancam, filter L4]	Camera Temperature: 20.000000 [Left Pancam, filter L4]
Camera Model ID: 179	Camera Model ID: 201
Camera Serial Number: 104	Camera Serial Number: 115
Camera ID: Left Pancam	Camera ID: Left Pancam
Filter Position: Pancam Left-Eye Filter L4:	Filter Position: Pancam Left-Eye Filter L4: 600 nm
Model Class: CAHVOR	Model Class: CAHVOR
Model Type: 0	Model Type: 0
Model Parameter: 0.000000	Model Parameter: 0.000000
Array Center Vector length 3 [0]	Array Center Vector length 3 [0]
Center Vector: 0.401265	Center Vector: 0.382152
	1

MER A Camera Models	MER B Camera Models
[1]	[1]
Center Vector: 0.163027	Center Vector: 0.149178 [2]
Center Vector: -1.245082	Center Vector: -1.246381
Array Axis Vector length 3 [0]	Array Axis Vector length 3 [0]
Axis Vector: -0.989679	Axis Vector: -0.965675
[1] Axis Vector: -0.046318	[1] Axis Vector: -0.224240
[2] Axis Vector: 0.135607	[2] Axis Vector: 0.131104
Array Horizontal Vector length 3	Array Horizontal Vector length 3
Horizontal Vector: -349.960356	Horizontal Vector: 315.089938
Horizontal Vector: -3576.595824	Horizontal Vector: -3647.728413
[2]	Horizontal Vector: 47.302857
Horizontal Vector: 44.320764	Array Vertical Vector length 3
Array Vertical Vector length 3 [0]	[0] Vertical Vector: -20.801368
Vertical Vector: -10.046627	[1]
[1]	Vertical Vector: -26.864694
Vertical Vector: -28.461764	[2] Vertical Vector: 3660.536632
Vertical Vector: 3591.399075	Array Optical Vector length 3
Array Optical Vector length 3	[0]
[0] Optical Vector: -0.991056	Optical Vector: -0.962756
[1]	Optical Vector: -0.233389
Optical Vector: -0.047812	[2] Optical Vector: 0.136490
Optical Vector: 0.124591	Array Radial Distortion Terms length 3
Array Radial Distortion Terms length 3	[0]
[0] Radial Distortion Terms: 0.022997	Radial Distortion Terms: 0.000998 [1]
[1] Radial Distortion Terms: 0.024872	Radial Distortion Terms: 0.003762
[2] Radial Distortion Terms: -0.407146	Radial Distortion Terms: -0.057232 Array Entrance Pupil Terms length 3
Array Entrance Pupil Terms length 3	[0]
[0] Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000 [1]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000 [2]	[2] Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
Array Camera Reference Vector length 3	[0] Camera Reference Vector: 0.457290
Camera Reference Vector: 0.457810	[1]
[1] Camera Reference Vector: 0.027790	Camera Reference Vector: 0.026050
[2]	Camera Reference Vector: -1.096200
Camera Reference Vector: -1.096680 Array Camera Reference Quaternion length 4	Array Camera Reference Quaternion length 4 [0]
[0] Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.065924 [1]
[1] Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.006818
[2] Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: 0.992507
[3]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: -0.016658 Camera Temperature: 20.000000	Camera Temperature: 20.000000 [Left Pancam, filter L5]
[Left Pancam, filter L5]	Camera Model ID: 202
Camera Model ID: 180	Camera Serial Number: 115
Camera Serial Number: 104 Camera ID: Left Pancam	Camera ID: Left Pancam Filter Position: Pancam Left-Eye Filter L5:
Filter Position: Pancam Left-Eye Filter L5:	530 nm
530 nm	Model Class: CAHVOR

MER A Camera Models	
Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.401265 [1] [1] Center Vector: 0.149178 Center Vector: 0.163027 [2] [2] Center Vector: -1.246381 Center Vector: -1.245082 Array Axis Vector length 3 [0] Axis Vector: -0.965675 Axis Vector: -0.989679 [1] [1] Axis Vector: -0.224240 Axis Vector: -0.046318 [2] [2] Axis Vector: 0.131104 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 Horizontal Vector: 315.089938 [1] Horizontal Vector: -3647.728413 [2] Horizontal Vector: 47.302857 Array Vertical Vector length 3 [0] Horizontal Vector: 44.320764 Horizontal Vector: -20.801368	
Model Parameter: 0.000000	
Array Center Vector length 3 [0] Center Vector: 0.401265 [1] Center Vector: 0.163027 [2] Center Vector: -1.245082 Array Axis Vector length 3 [0] Axis Vector: -0.989679 [1] Axis Vector: -0.046318 [2] Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 Array Vertical Vector: length 3 [0] Horizontal Vector: 44.320764 Array Vertical Vector: -20.801368	
Center Vector: 0.401265	
[1] Center Vector: 0.163027 [2] Center Vector: -1.245082 Array Axis Vector length 3 [0] Axis Vector: -0.989679 [1] Axis Vector: -0.046318 [2] Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: length 3 [0] Vertical Vector: -20.801368	
Center Vector: 0.163027 [2] Center Vector: -1.245082 Array Axis Vector length 3 [0] Axis Vector: -0.989679 [1] Axis Vector: -0.046318 [2] Axis Vector: -0.046318 [2] Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: length 3 [0] Vertical Vector: -20.801368	
[2] Center Vector: -1.245082 Array Axis Vector length 3 [0] Axis Vector: -0.989679 [1] Axis Vector: -0.046318 [2] Axis Vector: -0.046318 [2] Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: -20.801368	
Center Vector: -1.245082	
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[1] Axis Vector: -0.224240 [2] Axis Vector: 0.131104 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: -20.801368	
Axis Vector: -0.046318 [2] Axis Vector: 0.131104 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: -20.801368 [2] Axis Vector: 0.131104 Array Horizontal Vector: 315.089938 [0] Horizontal Vector: -3647.728413 [2] Horizontal Vector: -3647.728413 [2] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 47.302857 Array Vertical Vector length 3	
Axis Vector: 0.131104	
Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: -20.801368 Array Horizontal Vector: 315.089938 [1] Horizontal Vector: -3647.728413 [2] Horizontal Vector: 47.302857 Array Vertical Vector length 3	
Axis Vector: 0.135607 Array Horizontal Vector length 3 [0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector: 420.801368 [0] Horizontal Vector: -20.801368	
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[1] Horizontal Vector: -3576.595824 Horizontal Vector: 47.302857 Array Vertical Vector length 3 Horizontal Vector length 3 Vertical Vector: -20.801368	
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[2] Array Vertical Vector length 3 Horizontal Vector: 44.320764 [0] Array Vertical Vector: -20.801368	
Horizontal Vector: 44.320764 [0] Array Vertical Vector length 3 Vertical Vector: -20.801368	
Vertical Vector: -10.046627 Vertical Vector: -26.864694	
[1]	
Vertical Vector: -28.461764 Vertical Vector: 3660.536632	
[2] Array Optical Vector length 3	
[0]	
Vertical Vector: 3591.399075 Optical Vector: -0.962756	
Array Optical Vector length 3 [1]	
[0] Optical Vector: -0.233389	
Optical Vector: -0.991056 [2]	
[1] Optical Vector: 0.136490	- 2
Optical Vector: -0.047812 Array Radial Distortion Terms length	1 3
[2] [0] Optical Vector: 0.124591 [0] Radial Distortion Terms: 0.000998	
Array Radial Distortion Terms length 3 [1]	
[0] Radial Distortion Terms: 0.003762	
Radial Distortion Terms: 0.022997 [2]	
[1] Radial Distortion Terms: -0.057232	
Radial Distortion Terms: 0.024872 Array Entrance Pupil Terms length 3	
[2]	
Radial Distortion Terms: -0.407146 Entrance Pupil Terms: 0.000000	
Array Entrance Pupil Terms length 3 [1]	
[0] Entrance Pupil Terms: 0.000000	
Entrance Pupil Terms: 0.000000 [2]	
[1] Entrance Pupil Terms: 0.000000	
Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length	1 3
Entrance Pupil Terms: 0.000000 Camera Reference Vector: 0.457290	
Array Camera Reference Vector length 3 [1]	
[0] Camera Reference Vector: 0.026050	
Camera Reference Vector: 0.457810 [2] Camera Reference Vector: -1.096200	
Camera Reference Vector: -1.096200 Camera Reference Vector: -1.096200 Array Camera Reference Quaternion le	enath 4
[2] [0]	-119 C11 T
Camera Reference Vector: -1.096680 Camera Reference Quaternion: 0.06592	24
Array Camera Reference Quaternion length 4 [1]	
[0] Camera Reference Quaternion: 0.00683	L8
Camera Reference Quaternion: 0.070093 [2]	
[1] Camera Reference Quaternion: 0.99250)7
Camera Reference Quaternion: 0.001171 [3]	
[2] Camera Reference Quaternion: -0.1026	553
Camera Reference Quaternion: 0.997401	
[3] [Left Pancam, filter L6]	
Camera Reference Quaternion: -0.016658	

MER A Camera Models	MER B Camera Models
Camera Temperature: 20.000000	Camera Serial Number: 115
[Left Pancam, filter L6]	Camera ID: Left Pancam
Camera Model ID: 181	Filter Position: Pancam Left-Eye Filter L6:
Camera Serial Number: 104	480 nm
Camera ID: Left Pancam	Model Class: CAHVOR
Filter Position: Pancam Left-Eye Filter L6:	Model Type: 0
480 nm	Model Parameter: 0.000000
Model Class: CAHVOR	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.382152
Array Center Vector length 3	[1]
[0]	Center Vector: 0.149178
Center Vector: 0.401265	[2]
[1]	Center Vector: -1.246381
Center Vector: 0.163027	Array Axis Vector length 3
[2]	[0]
Center Vector: -1.245082	Axis Vector: -0.965675
Array Axis Vector length 3	[1]
[0]	Axis Vector: -0.224240
Axis Vector: -0.989679	[2]
[1]	Axis Vector: 0.131104
Axis Vector: -0.046318	Array Horizontal Vector length 3
[2]	[0]
Axis Vector: 0.135607	Horizontal Vector: 315.089938
Array Horizontal Vector length 3	[1]
[0]	Horizontal Vector: -3647.728413
Horizontal Vector: -349.960356	[2]
[1]	Horizontal Vector: 47.302857
Horizontal Vector: -3576.595824	Array Vertical Vector length 3
[2]	[0]
Horizontal Vector: 44.320764	Vertical Vector: -20.801368
Array Vertical Vector length 3	[1]
[0]	Vertical Vector: -26.864694
Vertical Vector: -10.046627	[2]
[1]	Vertical Vector: 3660.536632
Vertical Vector: -28.461764	Array Optical Vector length 3
[2]	[0]
Vertical Vector: 3591.399075	Optical Vector: -0.962756
Array Optical Vector length 3	[1]
[0]	Optical Vector: -0.233389
Optical Vector: -0.991056	[2]
[1]	Optical Vector: 0.136490
Optical Vector: -0.047812	Array Radial Distortion Terms length 3
[2]	[0]
Optical Vector: 0.124591	Radial Distortion Terms: 0.000998
Array Radial Distortion Terms length 3	
	Radial Distortion Terms: 0.003762
Radial Distortion Terms: 0.022997	[2]
[1] Radial Distortion Terms: 0.024872	Radial Distortion Terms: -0.057232
Radial Distortion Terms: 0.024872	Array Entrance Pupil Terms length 3 [0]
Radial Distortion Terms: -0.407146	Entrance Pupil Terms: 0.000000
Array Entrance Pupil Terms length 3	[1]
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
[2]	[0]
Entrance Pupil Terms: 0.000000	Camera Reference Vector: 0.457290
Array Camera Reference Vector length 3	[1]
[0]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.457810	[2]
[1]	Camera Reference Vector: -1.096200
Camera Reference Vector: 0.027790	Array Camera Reference Quaternion length 4
[2]	[0]
Camera Reference Vector: -1.096680	Camera Reference Quaternion: 0.065924
Array Camera Reference Quaternion length 4	[1]
[0]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.070093	[2]
[1]	Camera Reference Quaternion: 0.992507

MER A Camera Models	MER B Camera Models
	[3]
Camera Reference Quaternion: 0.001171	
[2]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: 0.997401	Camera Temperature: 20.000000
[3]	[Left Pancam, filter L7]
Camera Reference Quaternion: -0.016658	Camera Model ID: 204
Camera Temperature: 20.000000	Camera Serial Number: 115
[Left Pancam, filter L7]	Camera ID: Left Pancam
Camera Model ID: 182	Filter Position: Pancam Left-Eye Filter L7:
Camera Serial Number: 104	450 nm
Camera ID: Left Pancam	Model Class: CAHVOR
Filter Position: Pancam Left-Eye Filter L7:	Model Type: 0
450 nm	Model Parameter: 0.000000
Model Class: CAHVOR	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.382152
Array Center Vector length 3	[1]
[0]	Center Vector: 0.149178
Center Vector: 0.401265	[2]
[1]	Center Vector: -1.246381
1	
Center Vector: 0.163027	Array Axis Vector length 3
[2]	
Center Vector: -1.245082	Axis Vector: -0.965675
Array Axis Vector length 3	[1]
[0]	Axis Vector: -0.224240
Axis Vector: -0.989679	[2]
[1]	Axis Vector: 0.131104
Axis Vector: -0.046318	Array Horizontal Vector length 3
[2]	[0]
Axis Vector: 0.135607	Horizontal Vector: 315.089938
Array Horizontal Vector length 3	[1]
[0]	Horizontal Vector: -3647.728413
Horizontal Vector: -349.960356	[2]
[1]	Horizontal Vector: 47.302857
Horizontal Vector: -3576.595824	Array Vertical Vector length 3
[2]	[0]
Horizontal Vector: 44.320764	Vertical Vector: -20.801368
Array Vertical Vector length 3	[1]
[0]	Vertical Vector: -26.864694
Vertical Vector: -10.046627	[2]
[1]	Vertical Vector: 3660.536632
Vertical Vector: -28.461764	Array Optical Vector length 3
[2]	[0]
Vertical Vector: 3591.399075	Optical Vector: -0.962756
Array Optical Vector length 3	[1]
[0]	Optical Vector: -0.233389
Optical Vector: -0.991056	[2]
[1]	Optical Vector: 0.136490
Optical Vector: -0.047812	Array Radial Distortion Terms length 3
[2]	[0]
Optical Vector: 0.124591	Radial Distortion Terms: 0.000998
	[1]
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.003762
[0]	[2]
Radial Distortion Terms: 0.022997	Radial Distortion Terms: -0.057232
[1]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.024872	[0]
[2]	Entrance Pupil Terms: 0.000000
Radial Distortion Terms: -0.407146	[1]
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000
[0]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	Array Camera Reference Vector length 3
Entrance Pupil Terms: 0.000000	[0]
[2]	Camera Reference Vector: 0.457290
	[1]
Entrance Pupil Terms: 0.000000	
Array Camera Reference Vector length 3	Camera Reference Vector: 0.026050
[0]	[2]
Camera Reference Vector: 0.457810	Camera Reference Vector: -1.096200
[1]	Array Camera Reference Quaternion length 4
Camera Reference Vector: 0.027790	[0]

Camera Reference Vector: -1.096680 Array Camera Reference Quaternion: 0.005818 101 Camera Reference Quaternion: 0.070093 121 Camera Reference Quaternion: 0.070093 131 Camera Reference Quaternion: 0.00171 Camera Reference Quaternion: 0.097401 131 Camera Reference Quaternion: 0.992507 131 Camera Reference Quaternion: 0.992507 131 Camera Reference Quaternion: 0.992507 131 Camera Reference Quaternion: 0.0902507 131 Camera Reference Quaternion: 0.000000 151 Camera Reference Quaternion: 0.000000 151 Camera Reference Quaternion: 0.000000 152 Camera Reference Quaternion: 0.000000 152 Camera Reference Quaternion: 0.000000 153 Camera Reference Quaternion: 0.000000 152 Camera Reference Quaternion: 0.000000 153 Camera Reference Quaternion:	MER A Camera Models	MER B Camera Models
Camera Reference Vector: -1.096680		
Array Camera Reference Quaternion: 0.070093 11 1 12 12 12 13 13 13		
Camera Reference Quaternion: 0.070093 111 Camera Reference Quaternion: 0.001171 121 Camera Reference Quaternion: 0.091701 131 Camera Reference Quaternion: 0.097401 131 Camera Reference Quaternion: 0.016658 Camera Reference Quaternion: 0.010265 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Serial Number: 115 Camera Godel ID: 205 Camera Godel ID: 205 Camera Serial Number: 115 Camera Godel ID: 205 Camera Godel		Camera Reference Ouaternion: 0.006818
13 Camera Reference Quaternion: 0.001171 121 121 122 123 123 124 125	-	
Camera Reference Quaternion: 0.001171 Camera Reference Quaternion: 0.997401 Camera Reference Quaternion: 0.997401 Camera Reference Quaternion: 0.997401 Camera Reference Quaternion: 0.097401 Camera Reference Quaternion: 0.097401 Camera Reference Quaternion: 0.097401 Camera Reference Quaternion: 0.097401 Camera Model ID: 283 Camera Model ID: 283 Camera Serial Number: 105 Camera Model ID: 283 Camera Serial Number: 105 Camera Model ID: 283 Camera Serial Number: 105 Camera Model Type: 0 Model	Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.997401 Camera Reference Quaternion: 0.097401 Camera Reference Quaternion: -0.016658 Camera Temperature: 20.000000 Camera Serial Number: 115 Camera Model ID: 205	[1]	[3]
Camera Reference Quaternion: 0.997401 Camera Reference Quaternion: -0.016658 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Serial Number: 115 Camera Serial Number: 124 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Serial Number: 115 Camera Model ID: 205 Camera Model ID: 205	Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: -0.102653
Gamera Reference Quaternions: -0.016658 Camera Temperature: 20.000000 Left Pancam, filter L8 Camera Serial Number: 104 Camera Serial Number: 105 Model Pipe: 0 Model Pipe: 0	[2]	Camera Temperature: 20.000000
Camera Reference Quaternion: -0.016658 Camera Temperature: 20.000000 Camera Model ID: 183 Camera Serial Number: 104 Camera Model ID: 183 Camera Serial Number: 104 Camera Model ID: 183 Camera Serial Number: 104 Camera ID: 16ft Pancam Filter Position: Pancam Left-Eye Filter L8: 40 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Class: CAHVOR Model Parameter: 0.00000 Center Vector: 0.401265 Center Vector: 0.401265 Center Vector: 0.163027 Center Vector: -1.245082 Array Axis Vector: -0.986679 Axis Vector: -0.986679 Axis Vector: -0.046318 Color Model Vector: 0.13507 Axis Vector: -376.595824 Color Model Vector: -3876.595824 Color Model Parameter: 0.00000 Center Vector: 1.245082 Axis Vector: -0.244240 Color Model Parameter: 0.00000 Center Vector: 1.24681 Array Axis Vector: -0.246318 Color Model Parameter: 0.00687 Center Vector: 0.139178 Center Vector: 1.24681 Array Axis Vector: -0.24638 Color Model Parameter: 0.00687 Center Vector: 0.199178 Color Model Parameter: 0.00600 Model Parameter: 0.000000 Model Parameter: 0.000000 Model Parameter: 0.000000 Model Class: CAHVOR Model Type: 0.000000 Center Vector: 0.382152 Conter Vector: 0.382152 Conter Vector: 0.46381 Conter Vector: 0.46567 Conter Vector: 0.45657 Conter Vector: 0.45657 Conter Vector: 0.45647 Conter Vector: 0.46627 Conter Vector: 0.46627	Camera Reference Quaternion: 0.997401	[Left Pancam, filter L8]
Camera Temperature: 20.000000	[3]	Camera Model ID: 205
Left Pancam, filter L8 Camera Model ID: 183 Camera Serial Number: 104 Camera ID: Left Pancam Filter Position: Pancam Left-Eye Filter L8:	Camera Reference Quaternion: -0.016658	Camera Serial Number: 115
Camera Model ID: 183	Camera Temperature: 20.000000	Camera ID: Left Pancam
Camera Serial Number: 104		-
Camera ID: Left Pancam Filter Position: Panciam Left-Eye Filter L8:		
Filter Position: Pancam Left-Eye Filter L8: Model Class: CAHVOR Model Class: CAHVOR Model Parameter: 0.000000 Array Center Vector length 3 (0) Center Vector: 0.382152 (1) Center Vector: 0.149178 (2) Center Vector: 0.149178 (2) Center Vector: 0.149178 (2) Center Vector: 0.163027 (2) Center Vector: 0.163027 (2) Center Vector: 0.163027 (2) Axis Vector length 3 (0) Axis Vector: 0.989679 Axis Vector: 0.046318 (1) Axis Vector: 0.046318 (1) Axis Vector: 0.135607 Array Horizontal Vector: 0.349.960356 (1) Axis Vector: 0.3560.59384 (1) Horizontal Vector: -3576.595824 (1) Array Vertical Vector: -10.046627 (1) Array Vertical Vector: -10.046627 (1) Array Optical Vector: -28.461764 (2) Vertical Vector: -2.84.61764 (2) Vertical Vector: -0.991056 (1) Array Optical Vector: 0.124591 Array Radial Distortion Terms: 0.02297 (1) Array Radial Distortion Terms: 0.02297 (1) Array Radial Distortion Terms: 0.04872 (2) Camera Reference Vector: 0.457290 Array Center Vector: 1.24531 Array Array Center Vector: 0.149178 (2) Array Array Radial Distortion Terms: 0.000000 Array Center Vector: 0.124591 Array Radial Distortion Terms: 0.000000 Array Center Vector: 0.457290 Array Center Vector: 0.1457290 Arr		
A40 m - Solar ND Model Class: CAHVOR Model Type: 0 Center Vector: 0.382152 Center Vector: 0.000000 Center Vector: 0.000000 Center Vector: 0.401265 Center Vector: 0.149178 Center Vector: 0.163027 Center Vector: -1.245381 Center Vector: -1.245082 Center Vector: -0.988679 Axis Vector: -0.988679 Axis Vector: -0.046318 Center Vector: 0.13104 Center Vector: 0.13104 Center Vector: -1.245082 Center Vector: -1.245082 Center Vector: -0.046318 Center Vector: -0.046318 Center Vector: -0.046318 Center Vector: -0.046318 Center Vector: -0.13104 Center Vector: -0.24240 Center Vector: -0.24241 Center Vector: -0.24241 Center Vector: -0.24241 Center Vector: -0.24272 Center Vector: -0.24240 C		
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Model Type: 0 Center Vector: 0.382152 Model Parameter: 0.000000 Taray Center Vector length 3 Center Vector: 0.401265 Center Vector: 0.149178 Center Vector: 0.163027 Center Vector: 0.163027 Center Vector: -1.245082 Array Axis Vector length 3 Conter Vector: -0.989679 Axis Vector: -0.046318 Conter Vector: 0.135607 Axis Vector: -0.046318 Conter Vector: -0.155607 Axis Vector: -0.135607 Axis Vector: -0.135607 Array Horizontal Vector: -349.960356 Conter Vector: -3647.728413 Conter Vector: -3647.728413 Conter Vector: -3646.728413 Conter Vector: -364		-
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Center Vector: 0.401265		
11		
Center Vector: 0.163027		
Center Vector: -1.245082		
Array Axis Vector length 3 (0)		
[0]	Center Vector: -1.245082	[1]
Axis Vector: -0.989679	Array Axis Vector length 3	Axis Vector: -0.224240
Axis Vector: -0.046318 [0]	[0]	[2]
Axis Vector: -0.046318 [0]	Axis Vector: -0.989679	Axis Vector: 0.131104
(2)		
Axis Vector: 0.135607		
Array Horizontal Vector length 3 10 12 12 13 13 10 12 13 10 12 13 10 10 12 13 10 10 10 10 10 10 10		
[0] Horizontal Vector: -349.960356 [1] Horizontal Vector: -3576.595824 [2] Horizontal Vector: 44.320764 Array Vertical Vector length 3 [0] Vertical Vector: -20.801368 [1] Vertical Vector: -26.864694 [0] Vertical Vector: -26.864694 [1] Vertical Vector: -26.864694 [2] Vertical Vector: -3591.399075 Array Optical Vector length 3 [0] Vertical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		
Horizontal Vector: -349.960356 Horizontal Vector: 47.302857 Array Vertical Vector length 3 Horizontal Vector: -3576.595824 [0] Vertical Vector: -20.801368 Horizontal Vector: 44.320764 [1] Vertical Vector: -20.801368 Horizontal Vector:		
State		
Horizontal Vector: -3576.595824 [0] Vertical Vector: -20.801368 [1] Vertical Vector: -20.801368 [1] Vertical Vector: -20.801368 [1] Vertical Vector: -26.864694 [2] Vertical Vector: -26.864694 [2] Vertical Vector: -26.864694 [2] Vertical Vector: -3660.536632 Array Optical Vector: -28.461764 [2] Optical Vector: -0.962756 [1] Optical Vector: -0.962756 [1] Optical Vector: -0.991056 Optical Vector: -0.233389 [2] Optical Vector: -0.047812 [0] Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.000998 [1] Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.022997 Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 Camera Reference Vector: 0.457290 Camera Vector: 0.45		
Horizontal Vector: 44.320764 [1] Vertical Vector: -26.864694 [2] Vertical Vector: -10.046627 Vertical Vector: 3660.536632 [1] Vertical Vector: -28.461764 [2] Optical Vector: -0.962756 [1] Optical Vector: 3591.399075 [1] Optical Vector: -0.962756 [1] Optical Vector: -0.962756 [1] Optical Vector: -0.233389 [0] Optical Vector: -0.991056 Optical Vector: -0.136490 Array Radial Distortion Terms length 3 [0] Optical Vector: 0.124591 Array Radial Distortion Terms: 0.000998 [1] Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.022997 Radial Distortion Terms: 0.057232 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 Entrance Pupil Terms: 0.000000 Camera Reference Vector: 0.457290 Camera Reference Vector: 0.4572	Horizontal Vector: -3576.595824	
Array Vertical Vector length 3 [0] Vertical Vector: -10.046627 [1] Vertical Vector: -28.461764 [2] Vertical Vector: -28.461764 [2] Vertical Vector: 3591.399075 Array Optical Vector length 3 [0] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290	[2]	Vertical Vector: -20.801368
[0] Vertical Vector: -10.046627	Horizontal Vector: 44.320764	[1]
Vertical Vector: -10.046627 [1] Vertical Vector: -28.461764 [2] Vertical Vector: 3591.399075 Array Optical Vector length 3 [0] Optical Vector: -0.991056 [1] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: -0.047812 [2] Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		
Camera Reference Vector: 0.457290 Camera Reference Vector: 0.000000 Camera Reference Vector: 0.000000 Camera Reference Vector: 0.000000 Camera Reference Vector: 0.000000 Camera Reference Vector: 0.0457290 Camera Reference Vector: 0.457290 Camera Reference Vector: 0.		
Vertical Vector: -28.461764 [0]		
Vertical Vector: 3591.399075 Array Optical Vector length 3 [0] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.0024872 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		
Vertical Vector: 3591.399075 Array Optical Vector length 3 [0] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.233389 [2] Optical Vector: -0.233389 [2] Optical Vector: 0.136490 Array Radial Distortion Terms: 0.000998 [1] Optical Vector: -0.233389 [2] Optical Vector: 0.136490 Array Fadial Distortion Terms: 0.000098 [1] Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.003762 [2] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.457290		
Array Optical Vector length 3 [0] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.003762 [1] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.0407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		-
[0] Optical Vector: -0.991056 [1] Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms: 0.000998 [1] Array Radial Distortion Terms: 0.003762 [0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		
Array Radial Distortion Terms length 3 Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms: 0.000998 [1] Array Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		_
Optical Vector: -0.047812 [2] Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290	Optical Vector: -0.991056	Optical Vector: 0.136490
[2] Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.003762 [2] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [3] Entrance Pupil Terms: 0.000000 [4] Entrance Pupil Terms: 0.000000 [5] Camera Reference Vector: 0.457290		-
Optical Vector: 0.124591 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [3] Entrance Pupil Terms: 0.000000 [4] Entrance Pupil Terms: 0.000000 [5] Camera Reference Vector: 0.457290	-	
Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [3] Entrance Pupil Terms: 0.000000 [4] Camera Reference Vector: 0.457290		
[0] Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.457290	_	
Radial Distortion Terms: 0.022997 [1] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: 0.004872 [2] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.457290	-	
[1] Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.457290		
Radial Distortion Terms: 0.024872 [2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.457290		
[2] Radial Distortion Terms: -0.407146 Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [3] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.457290		
Array Entrance Pupil Terms length 3 [0] Entrance Pupil Terms: 0.0000000 [1] Entrance Pupil Terms: 0.0000000 [1] Entrance Pupil Terms: 0.0000000 Array Camera Reference Vector length 3 [0] [2] Camera Reference Vector: 0.457290		
[0] [2] Entrance Pupil Terms: 0.000000 Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3 [0] Camera Reference Vector: 0.457290	Radial Distortion Terms: -0.407146	[1]
Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3 [0] [2] Camera Reference Vector: 0.457290		_
[1] Array Camera Reference Vector length 3 Entrance Pupil Terms: 0.000000 [0] Camera Reference Vector: 0.457290		
Entrance Pupil Terms: 0.000000 [0] Camera Reference Vector: 0.457290	_	_
[2] Camera Reference Vector: 0.457290		-
	_	
	Entrance Pupil Terms: 0.000000	[1]

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MER A Camera Models	MER B Camera Models
Array Camera Reference Vector length 3	Camera Reference Vector: 0.026050
[0]	[2]
Camera Reference Vector: 0.457810	Camera Reference Vector: -1.096200
[1]	Array Camera Reference Quaternion length 4
	-
Camera Reference Vector: 0.027790	[0]
[2]	Camera Reference Quaternion: 0.065924
Camera Reference Vector: -1.096680	[1]
Array Camera Reference Quaternion length 4	Camera Reference Quaternion: 0.006818
[0]	[2]
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.992507
~	·-
[1]	[3]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: -0.102653
[2]	Camera Temperature: 20.00000
	_
Camera Reference Quaternion: 0.997401	[Right Pancam, filter R1]
[3]	
Camera Reference Quaternion: -0.016658	Camera Model ID: 206
Camera Temperature: 20.000000	Camera Serial Number: 114
[Right Pancam, filter R1]	Camera ID: Right Pancam
Camera Model ID: 184	Filter Position: Pancam Right-Eye Filter
Camera Serial Number: 103	R1: 450 nm
Camera ID: Right Pancam	Model Class: CAHVOR
_	
Filter Position: Pancam Right-Eye Filter	Model Type: 0
R1: 450 nm	Model Parameter: 0.000000
Model Class: CAHVOR	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.443429
Array Center Vector length 3	[1]
[0]	Center Vector: -0.142099
Center Vector: 0.413705	[2]
[1]	Center Vector: -1.246638
Center Vector: -0.135215	Array Axis Vector length 3
[2]	[0]
Center Vector: -1.246372	Axis Vector: -0.974596
Center Vector: -1.240372	
	[1]
Array Axis Vector length 3	Axis Vector: -0.180627
[0]	[2]
Axis Vector: -0.990622	Axis Vector: 0.132429
[1]	Array Horizontal Vector length 3
Axis Vector: -0.007005	[0]
[2]	Horizontal Vector: 176.690830
Axis Vector: 0.136451	[1]
Array Horizontal Vector length 3	Horizontal Vector: -3612.502474
-	
[0]	[2]
Horizontal Vector: -474.046354	Horizontal Vector: 64.120658
[1]	Array Vertical Vector length 3
	-
Horizontal Vector: -3554.067848	[0]
[2]	Vertical Vector: -34.618632
Horizontal Vector: 56.808555	[1]
Array Vertical Vector length 3	Vertical Vector: -6.528287
[0]	[2]
Vertical Vector: -4.611697	Vertical Vector: 3620.840003
[1]	Array Optical Vector length 3
	1 1
Vertical Vector: -13.887297	[0]
[2]	Optical Vector: -0.973043
	=
Vertical Vector: 3586.811043	[1]
Array Optical Vector length 3	Optical Vector: -0.185358
[0]	[2]
Optical Vector: -0.993079	Optical Vector: 0.137249
[1]	Array Radial Distortion Terms length 3
Optical Vector: 0.017077	[0]
-	
[2]	Radial Distortion Terms: 0.013087
Optical Vector: 0.116202	[1]
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.023504
_	
[0]	[2]
Radial Distortion Terms: 0.022082	Radial Distortion Terms: -0.374157
[1]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: -0.033675	[0]
[2]	Entrance Pupil Terms: 0.000000
Radial Distortion Terms: 0.611672	[1]
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000

MER A Camera Models	MER B Camera Models
[0]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	Array Camera Reference Vector length 3
Entrance Pupil Terms: 0.000000	[0]
-	
	Camera Reference Vector: 0.457290
Entrance Pupil Terms: 0.000000	[1]
Array Camera Reference Vector length 3	Camera Reference Vector: 0.026050
[0]	[2]
Camera Reference Vector: 0.457810	Camera Reference Vector: -1.096200
[1]	Array Camera Reference Quaternion length 4
Camera Reference Vector: 0.027790	[0]
[2]	Camera Reference Quaternion: 0.065924
Camera Reference Vector: -1.096680	
Array Camera Reference Quaternion length 4	Camera Reference Quaternion: 0.006818
[0]	[2]
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.992507
[1]	[3]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: -0.102653
[2]	Camera Temperature: 20.00000
Camera Reference Quaternion: 0.997401	[Right Pancam, filter R2]
[3]	Camera Model ID: 207
Camera Reference Quaternion: -0.016658	Camera Serial Number: 114
Camera Temperature: 20.00000	Camera ID: Right Pancam
[Right Pancam, filter R2]	Filter Position: Pancam Right-Eye Filter
Camera Model ID: 185	R2: 750 nm
Camera Serial Number: 103	Model Class: CAHVOR
Camera ID: Right Pancam	Model Type: 0
Filter Position: Pancam Right-Eye Filter	Model Parameter: 0.000000
R2: 750 nm	Troder rarameter 0.00000
Model Class: CAHVOR	Boundary Company Marchany James 2
	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.443429
Array Center Vector length 3	[1]
[0]	Center Vector: -0.142099
Center Vector: 0.413705	[2]
[1]	Center Vector: -1.246638
Center Vector: -0.135215	Array Axis Vector length 3
[2]	[0]
Center Vector: -1.246372	Axis Vector: -0.974596
Array Axis Vector length 3	[1]
[0]	Axis Vector: -0.180627
Axis Vector: -0.990622	[2]
	Axis Vector: 0.132429
Axis Vector: -0.007005	Array Horizontal Vector length 3
[2]	[0]
Axis Vector: 0.136451	Horizontal Vector: 176.690830
Array Horizontal Vector length 3	[1]
[0]	Horizontal Vector: -3612.502474
Horizontal Vector: -474.046354	[2]
[1]	Horizontal Vector: 64.120658
Horizontal Vector: -3554.067848	Array Vertical Vector length 3
[2]	[0]
Horizontal Vector: 56.808555	Vertical Vector: -34.618632
Array Vertical Vector length 3	[1]
[0]	Vertical Vector: -6.528287
Vertical Vector: -4.611697	[2]
[1]	Vertical Vector: 3620.840003
Vertical Vector: -13.887297	Array Optical Vector length 3
[2]	[0]
Vertical Vector: 3586.811043	Optical Vector: -0.973043
Array Optical Vector length 3	[1]
[0]	Optical Vector: -0.185358
Optical Vector: -0.993079	[2]
[1]	Optical Vector: 0.137249
	Array Radial Distortion Terms length 3
Optical Vector: 0.017077	-
[2]	
Optical Vector: 0.116202	Radial Distortion Terms: 0.013087
Array Radial Distortion Terms length 3	[1]
[0]	Radial Distortion Terms: 0.023504
Radial Distortion Terms: 0.022082	[2]

MER A Camera Models	MER B Camera Models
[1]	Radial Distortion Terms: -0.374157
Radial Distortion Terms: -0.033675	Array Entrance Pupil Terms length 3
[2]	[0]
Radial Distortion Terms: 0.611672	Entrance Pupil Terms: 0.000000
Array Entrance Pupil Terms length 3	[1]
	1
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[1]	Entrance Pupil Terms: 0.000000
	<u> </u>
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
[2]	[0]
Entrance Pupil Terms: 0.000000	Camera Reference Vector: 0.457290
Array Camera Reference Vector length 3	[1]
_	1
[0]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.457810	[2]
[1]	Camera Reference Vector: -1.096200
Camera Reference Vector: 0.027790	Array Camora Reference Ouaternien length /
	Array Camera Reference Quaternion length 4
[2]	[0]
Camera Reference Vector: -1.096680	Camera Reference Quaternion: 0.065924
Array Camera Reference Quaternion length 4	[1]
_	1
[0]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.070093	[2]
[1]	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.001171	[3]
	1
[2]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: 0.997401	Camera Temperature: 20.000000
[3]	[Right Pancam, filter R3]
	I
Camera Reference Quaternion: -0.016658	Camera Model ID: 208
Camera Temperature: 20.000000	Camera Serial Number: 114
[Right Pancam, filter R3]	Camera ID: Right Pancam
Camera Model ID: 186	_
	Filter Position: Pancam Right-Eye Filter
Camera Serial Number: 103	R3: 800 nm
Camera ID: Right Pancam	Model Class: CAHVOR
Filter Position: Pancam Right-Eye Filter	Model Type: 0
R3: 800 nm	Model Parameter: 0.000000
Model Class: CAHVOR	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.443429
Array Center Vector length 3	[1]
[0]	Center Vector: -0.142099
Center Vector: 0.413705	[2]
[1]	Center Vector: -1.246638
Center Vector: -0.135215	Array Axis Vector length 3
[2]	[0]
Center Vector: -1.246372	Axis Vector: -0.974596
Array Axis Vector length 3	[1]
[0]	Axis Vector: -0.180627
Axis Vector: -0.990622	[2]
[1]	
	Axis Vector: 0.132429
Axis Vector: -0.007005	Array Horizontal Vector length 3
[2]	[0]
Axis Vector: 0.136451	Horizontal Vector: 176.690830
Array Horizontal Vector length 3	
[0]	Horizontal Vector: -3612.502474
Horizontal Vector: -474.046354	[2]
[1]	Horizontal Vector: 64.120658
Horizontal Vector: -3554.067848	Array Vertical Vector length 3
[2]	[0]
Horizontal Vector: 56.808555	Vertical Vector: -34.618632
	[1]
Array Vertical Vector length 3	1
[0]	Vertical Vector: -6.528287
Vertical Vector: -4.611697	[2]
[1]	Vertical Vector: 3620.840003
Vertical Vector: -13.887297	Array Optical Vector length 3
[2]	[0]
Vertical Vector: 3586.811043	Optical Vector: -0.973043
Array Optical Vector length 3	[1]
	1
[0]	Optical Vector: -0.185358
Optical Vector: -0.993079	[2]
[1]	Optical Vector: 0.137249
	-
Optical Vector: 0.017077	Array Radial Distortion Terms length 3

MER A Camera Models	MER B Camera Models
[2]	[0]
Optical Vector: 0.116202	Radial Distortion Terms: 0.013087
Array Radial Distortion Terms length 3	[1]
[0]	Radial Distortion Terms: 0.023504
Radial Distortion Terms: 0.022082	[2]
[1]	Radial Distortion Terms: -0.374157
Radial Distortion Terms: -0.033675	Array Entrance Pupil Terms length 3
[2]	[0]
Radial Distortion Terms: 0.611672	Entrance Pupil Terms: 0.000000
Array Entrance Pupil Terms length 3	[1]
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
[2]	[0]
Entrance Pupil Terms: 0.000000	Camera Reference Vector: 0.457290
Array Camera Reference Vector length 3	[1]
[0]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.457810	[2]
[1]	Camera Reference Vector: -1.096200
Camera Reference Vector: 0.027790	Array Camera Reference Quaternion length 4
[2]	[0]
Camera Reference Vector: -1.096680	Camera Reference Quaternion: 0.065924
Array Camera Reference Quaternion length 4	[1]
[0]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.070093	[2]
[1]	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.001171	[3]
[2]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: 0.997401	Camera Temperature: 20.000000
[3]	[Right Pancam, filter R4]
Camera Reference Quaternion: -0.016658	Camera Model ID: 209
Camera Temperature: 20.000000	Camera Serial Number: 114
[Right Pancam, filter R4]	Camera ID: Right Pancam
Camera Model ID: 187	Filter Position: Pancam Right-Eye Filter
Camera Serial Number: 103	R4: 860 nm
Camera ID: Right Pancam	Model Class: CAHVOR
Filter Position: Pancam Right-Eye Filter	Model Type: 0
R4: 860 nm	Model Parameter: 0.000000
Model Class: CAHVOR	Array Center Vector length 3
Model Type: 0	[0]
Model Parameter: 0.000000	Center Vector: 0.443429
Array Center Vector length 3	[1]
[0]	Center Vector: -0.142099
Center Vector: 0.413705	[2]
[1]	Center Vector: -1.246638
Center Vector: -0.135215	Array Axis Vector length 3
[2]	[0]
Center Vector: -1.246372	Axis Vector: -0.974596
Array Axis Vector length 3	[1]
	Axis Vector: -0.180627
Axis Vector: -0.990622	[2]
[1]	Axis Vector: 0.132429
Axis Vector: -0.007005	Array Horizontal Vector length 3
[2]	[0]
Axis Vector: 0.136451	Horizontal Vector: 176.690830
Array Horizontal Vector length 3	[1] Horizontal Vector: -3612.502474
[0] Horizontal Vector: -474.046354	
Horizontal Vector: -4/4.046354	[2] Horizontal Vector: 64.120658
Horizontal Vector: -3554.067848	Array Vertical Vector length 3
[2]	[0]
Horizontal Vector: 56.808555	[0]
Array Vertical Vector length 3	Vertical Vector: -34.618632
[0]	[1]
Vertical Vector: -4.611697	Vertical Vector: -6.528287
[1]	[2]
Vertical Vector: -13.887297	[2] Vertical Vector: 3620.840003
[2]	Array Optical Vector length 3
Vertical Vector: 3586.811043	[0]
	r

MER A Camera Models	MER B Camera Models
Array Optical Vector length 3	Optical Vector: -0.973043
[0]	[1]
Optical Vector: -0.993079	Optical Vector: -0.185358
[1]	[2]
Optical Vector: 0.017077	Optical Vector: 0.137249
[2]	Array Radial Distortion Terms length 3
Optical Vector: 0.116202	[0]
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.013087
Radial Distortion Terms: 0.022082	Radial Distortion Terms: 0.023504
[1] Radial Distortion Terms: -0.033675	[2] Radial Distortion Terms: -0.374157
[2]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.611672	[0]
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000
[0]	[1]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[2]	Array Camera Reference Vector length 3
Entrance Pupil Terms: 0.000000	[0]
Array Camera Reference Vector length 3	Camera Reference Vector: 0.457290
[0]	[1]
Camera Reference Vector: 0.457810	Camera Reference Vector: 0.026050
	[2]
Camera Reference Vector: 0.027790	Camera Reference Vector: -1.096200
[2]	Array Camera Reference Quaternion length 4
Camera Reference Vector: -1.096680	[0]
Array Camera Reference Quaternion length 4 [0]	Camera Reference Quaternion: 0.065924
Camera Reference Quaternion: 0.070093	Camera Reference Quaternion: 0.006818
[1]	[2]
Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.992507
[2]	[3]
Camera Reference Quaternion: 0.997401	Camera Reference Quaternion: -0.102653
[3]	Camera Temperature: 20.000000
Camera Reference Quaternion: -0.016658	[Right Pancam, filter R5]
Camera Temperature: 20.000000	Camera Model ID: 210
[Right Pancam, filter R5]	Camera Serial Number: 114
Camera Model ID: 188	Camera ID: Right Pancam
Camera Serial Number: 103	Filter Position: Pancam Right-Eye Filter
Camera ID: Right Pancam	R5: 900 nm
Filter Position: Pancam Right-Eye Filter	Model Class: CAHVOR
R5: 900 nm	Model Type: 0
Model Class: CAHVOR	Model Parameter: 0.000000
Model Type: 0	Array Center Vector length 3
Model Parameter: 0.000000 Array Center Vector length 3	Center Vector: 0.443429
[0]	[1]
Center Vector: 0.413705	Center Vector: -0.142099
[1]	[2]
Center Vector: -0.135215	Center Vector: -1.246638
[2]	Array Axis Vector length 3
Center Vector: -1.246372	[0]
Array Axis Vector length 3	Axis Vector: -0.974596
[0]	[1]
Axis Vector: -0.990622	Axis Vector: -0.180627
[1]	[2]
Axis Vector: -0.007005	Axis Vector: 0.132429
[2]	Array Horizontal Vector length 3
Axis Vector: 0.136451	[0]
Array Horizontal Vector length 3	Horizontal Vector: 176.690830
[0] Horizontal Vector: -474.046354	[1] Horizontal Vector: -3612.502474
Horizontal Vector: -4/4.046354	Horizontal Vector: -3612.5024/4
Horizontal Vector: -3554.067848	Horizontal Vector: 64.120658
[2]	Array Vertical Vector length 3
Horizontal Vector: 56.808555	[0]
Array Vertical Vector length 3	Vertical Vector: -34.618632
[0]	[1]

MER A Camera Models	MER B Camera Models
Vertical Vector: -4.611697	Vertical Vector: -6.528287
[1]	[2]
Vertical Vector: -13.887297	Vertical Vector: 3620.840003
[2]	Array Optical Vector length 3
Vertical Vector: 3586.811043	[0]
Array Optical Vector length 3	Optical Vector: -0.973043
	1 =
Optical Vector: -0.993079	Optical Vector: -0.185358
[1]	[2]
Optical Vector: 0.017077	Optical Vector: 0.137249
[2]	Array Radial Distortion Terms length 3
Optical Vector: 0.116202	[0]
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.013087
_	
[0]	
Radial Distortion Terms: 0.022082	Radial Distortion Terms: 0.023504
[1]	[2]
Radial Distortion Terms: -0.033675	Radial Distortion Terms: -0.374157
[2]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.611672	[0]
Array Entrance Pupil Terms length 3	
	Backson Bouris Bouris 0 000000
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[1]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[2]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
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Array Camera Reference Vector length 3	
[0]	Camera Reference Vector: 0.457290
Camera Reference Vector: 0.457810	[1]
[1]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.027790	[2]
[2]	Camera Reference Vector: -1.096200
Camera Reference Vector: -1.096680	Array Camera Reference Quaternion length 4
Array Camera Reference Quaternion length 4	[0]
[0]	Camera Reference Quaternion: 0.065924
Camera Reference Quaternion: 0.070093	[1]
[1]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.001171	[2]
[2]	Camera Reference Quaternion: 0.992507
	[3]
Camera Reference Quaternion: 0.997401	1
[3]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: -0.016658	Camera Temperature: 20.000000
Camera Temperature: 20.000000	[Right Pancam, filter R6]
[Right Pancam, filter R6]	Camera Model ID: 211
Camera Model ID: 189	Camera Serial Number: 114
Camera Serial Number: 103	Camera ID: Right Pancam
	Filter Position: Pancam Right-Eye Filter
Camera ID: Right Pancam	
Filter Position: Pancam Right-Eye Filter	R6: 930 nm
R6: 930 nm	Model Class: CAHVOR
Model Class: CAHVOR	Model Type: 0
Model Type: 0	Model Parameter: 0.000000
Model Parameter: 0.000000	Array Center Vector length 3
Array Center Vector length 3	[0]
[0]	Center Vector: 0.443429
Center Vector: 0.413705	[1]
[1]	Center Vector: -0.142099
Center Vector: -0.135215	[2]
[2]	Center Vector: -1.246638
Center Vector: -1.246372	Array Axis Vector length 3
Array Axis Vector length 3	[0]
[0]	Axis Vector: -0.974596
Axis Vector: -0.990622	
	[1]
[1]	Axis Vector: -0.180627
Axis Vector: -0.007005	[2]
[2]	Axis Vector: 0.132429
Axis Vector: 0.136451	Array Horizontal Vector length 3
Array Horizontal Vector length 3	[0]
[0]	Horizontal Vector: 176.690830
Horizontal Vector: -474.046354	[1]
[1]	Horizontal Vector: -3612.502474

MER A Camera Models	MER B Camera Models
Horizontal Vector: -3554.067848	[2]
[2]	Horizontal Vector: 64.120658
Horizontal Vector: 56.808555	Array Vertical Vector length 3
Array Vertical Vector length 3	[0]
[0]	Vertical Vector: -34.618632
Vertical Vector: -4.611697	[1]
[1] Vertical Vector: -13.887297	Vertical Vector: -6.528287 [2]
[2]	Vertical Vector: 3620.840003
Vertical Vector: 3586.811043	Array Optical Vector length 3
Array Optical Vector length 3	[0]
[0]	Optical Vector: -0.973043
Optical Vector: -0.993079	[1]
[1] Optical Vector: 0.017077	Optical Vector: -0.185358 [2]
[2]	Optical Vector: 0.137249
Optical Vector: 0.116202	Array Radial Distortion Terms length 3
Array Radial Distortion Terms length 3	[0]
[0]	Radial Distortion Terms: 0.013087
Radial Distortion Terms: 0.022082	[1]
[1]	Radial Distortion Terms: 0.023504
Radial Distortion Terms: -0.033675	[2] Radial Distortion Terms: -0.374157
Radial Distortion Terms: 0.611672	Array Entrance Pupil Terms length 3
Array Entrance Pupil Terms length 3	[0]
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[1]
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[2] Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3
Array Camera Reference Vector length 3	[0]
[0]	Camera Reference Vector: 0.457290
Camera Reference Vector: 0.457810	[1]
[1]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.027790	[2]
[2] Camera Reference Vector: -1.096680	Camera Reference Vector: -1.096200
Array Camera Reference Quaternion length 4	Array Camera Reference Quaternion length 4 [0]
[0]	Camera Reference Quaternion: 0.065924
Camera Reference Quaternion: 0.070093	[1]
[1]	Camera Reference Quaternion: 0.006818
Camera Reference Quaternion: 0.001171	[2]
[2]	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.997401	[3]
Camera Reference Quaternion: -0.016658	Camera Reference Quaternion: -0.102653 Camera Temperature: 20.000000
Camera Temperature: 20.000000	[Right Pancam, filter R7]
[Right Pancam, filter R7]	Camera Model ID: 212
Camera Model ID: 190	Camera Serial Number: 114
Camera Serial Number: 103	Camera ID: Right Pancam
Camera ID: Right Pancam	Filter Position: Pancam Right-Eye Filter
Filter Position: Pancam Right-Eye Filter R7: 985 nm	R7: 985 nm Model Class: CAHVOR
Model Class: CAHVOR	Model Type: 0
Model Type: 0	Model Parameter: 0.000000
Model Parameter: 0.000000	Array Center Vector length 3
Array Center Vector length 3	[0]
[0]	Center Vector: 0.443429
Center Vector: 0.413705 [1]	[1] Center Vector: -0.142099
Center Vector: -0.135215	[2]
[2]	Center Vector: -1.246638
Center Vector: -1.246372	Array Axis Vector length 3
Array Axis Vector length 3	[0]
[0]	Axis Vector: -0.974596
Axis Vector: -0.990622	[1]
[1] Axis Vector: -0.007005	Axis Vector: -0.180627 [2]
Axis vector: -0.00/005	Axis Vector: 0.132429
[4]	1MID *CCCOI. 0.132127

Array Horizontal Vector length 3 10 Horizontal Vector: -1.954.067848 11 Horizontal Vector: -3554.067848 12 Horizontal Vector: -3554.067848 12 Horizontal Vector: -36.80855 Array Vertical Vector: -6.80855 Array Vertical Vector: -4.611697 Vertical Vector: -3.61.867297 12 Vertical Vector: -3.68.81043 Array Optical Vector: -3.68.81043 Array Optical Vector: -9.93079 12 Vertical Vector: -0.93079 Optical Vector: -0.93079 Optical Vector: 0.116020 Array Radial Distortion Terms: 0.022082 13 Radial Distortion Terms: 0.022082 14 Radial Distortion Terms: 0.03875 10 Radial Distortion Terms: 0.03875 10 Radial Distortion Terms: 0.000000 Array Camera Reference Vector: -1.096680 Array Camera Reference Vector: -1.096680 Array Camera Reference Quaternion: 0.07093 13 Camera Reference Quaternion: 0.07093 14 Camera Reference Quaternion: 0.07093 15 Camera Reference Quaternion: 0.070	MER A Camera Models	MER B Camera Models
10		
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Morizontal Vector: -3554.087848 12 Morizontal Vector: 56.808555 Array Vertical Vector length 3 10 Vertical Vector: -4.611697 11 Vertical Vector: -3.887297 12 Vertical Vector: -3.887297 12 Vertical Vector: -3.886.811043 Array Optical Vector length 3 Vertical Vector: -0.993079 11 Optical Vector: 0.017077 12 Optical Vector: 0.017077 12 Optical Vector: 0.017077 12 Optical Vector: 0.017077 12 Optical Vector: 0.018620 Array Radial Distortion Terms: 0.02282 Tarray Radial Distortion Terms: 0.038675 Tarray Entrance Pupil Terms: 0.011672 Radial Distortion Terms: 0.038675 Tarray Entrance Pupil Terms: 0.000000 Tarray Camera Reference Vector: 0.457810 Tarray Camera Reference Vector: 0.027990 Tarray Camera Reference Vector: 0.07799 Tarray Camera Reference Vector: 0.07799 Tarray Camera Reference Vector: 0.07790 Tarray Camera Nodel Type: 0.000000 Tarray Camera Nod		1
Morizontal Vector: 56.80855 Array Vertical Vector length 3 10 Vertical Vector: -4.611697 11 Vertical Vector: -13.887297 12 Vertical Vector: -13.887297 12 Vertical Vector: -13.887297 12 Vertical Vector: -13.887297 12 Vertical Vector: -6.528287 12 Vertical Vector: -9.993079 13 Optical Vector: -0.993079 13 Optical Vector: -0.993079 13 Optical Vector: -0.186202 Optical Vector: -0.186202 Optical Vector: -0.186202 Optical Vector: -0.185258 Optical Vector: -0.185258 Optical Vector: -0.193587 Optical Vector: -0.973043 Optical Vector: -0.973049 Optical Vector: -0.973043 Optical Vector: -0.973049 Optical Vector: -0.973043 Optical		
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Narray Vertical Vector length 3 10 Vertical Vector: -4.611697 11 Vertical Vector: -3.887297 12 Vertical Vector: -3566.811043 Array Optical Vector: -3566.811043 Array Optical Vector: -0.993079 13 Optical Vector: 0.017077 12 Optical Vector: 0.017077 12 Optical Vector: 0.116202 Array Radial Distortion Terms: 0.02282 The Radial Distortion Terms: 0.02282 The Radial Distortion Terms: 0.033675 The Radial Distortion Terms: 0.00000 The Radial Distortion Terms: 0.03675 The Radial Distortion Terms: 0.03675 The Radial Distortion Terms: 0.03877 The Radial Disto		
Contervence Vector -4.611697 Camera Reference Vector 0.000000 Camera Reference Vector 0.000000 Camera Reference Vector 0.000000 Camera Reference Quaternion 0.00171 Camera Reference Quaternion 0.00618 Camera Reference Q		_
Vertical Vector: -4.611697 11	Array Vertical Vector length 3	
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Vertical Vector: 3586.81043 Array Optical Vector length 3 [0] Optical Vector: 0.993079 [1] Optical Vector: 0.017077 [2] Optical Vector: 0.16202 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022082 [1] Radial Distortion Terms: 0.033675 [2] Radial Distortion Terms: 0.033675 [2] Radial Distortion Terms: 0.01672 Radial Distortion Terms: 0.01672 Radial Distortion Terms: 0.033675 [2] Radial Distortion Terms: 0.033675 [2] Radial Distortion Terms: 0.000000 [3] Ratrance Pupil Terms: 0.000000 [3] Rutrance Pupil Terms: 0.000000 [3] Rutrance Pupil Terms: 0.000000 [3] Rutrance Pupil Terms: 0.000000 [4] Rutrance Pupil Terms: 0.000000 [5] Rutrance Pupil Terms: 0.000000 [6] Rutrance Pupil Terms: 0.000000 [7] Rutrance Pupil Terms: 0.000000 [8] Rutrance Pupil Terms: 0.000000 [8] Rutrance Pupil Terms: 0.000000 [9] Rutrance Pupil Terms: 0.000000 [10] Rutrance Pupil Terms: 0.000000 [11] Rutrance Pupil Terms: 0.000000 [12] Rutrance Pupil Terms: 0.000000 [13] Rutrance Pupil Terms: 0.000000 [14] Rutrance Pupil Terms: 0.000000 [15] Rutrance Pupil Terms: 0.000000 [16] Rutrance Pupil Terms: 0.000000 [17] Rutrance Pupil Terms: 0.000000 [18] Rutrance Pupil Terms: 0.000000 [19] Rutrance Pupil Terms: 0.000000 [10] Rutrance Pupil Terms: 0.000000 [11] Rutrance Pupil Terms: 0.000000 [12] Radial Distortion Terms: 0.023504 [13] [10] Radial Distortion Terms: 0.023504 [12] R	Vertical Vector: -4.611697	[1]
12 Vertical Vector: 3586.811043 Array Optical Vector length 3 (0) Optical Vector: -0.993079 (1) Optical Vector: -0.993079 (1) Optical Vector: 0.017077 (2) Optical Vector: 0.116202 Array Radial Distortion Terms: 0.022082 (1) Optical Vector: 0.116202 Array Radial Distortion Terms: -0.033675 (2) Radial Distortion Terms: -0.033675 (2) Radial Distortion Terms: 0.611672 Array Entrance Pupil Terms: 0.611672 Array Entrance Pupil Terms: 0.000000 (1) Entrance Pupil Terms: 0.000000	[1]	Vertical Vector: -6.528287
Array Optical Vector length 3 [10] Optical Vector: -0.993079 [11] Optical Vector: 0.017077 [12] Optical Vector: 0.16202 Array Radial Distortion Terms length 3 [10] Radial Distortion Terms: 0.022082 [11] Radial Distortion Terms: -0.033675 [12] Radial Distortion Terms: -0.033675 [13] Radial Distortion Terms: 0.611672 Array Entrance Pupil Terms length 3 [10] Entrance Pupil Terms: 0.000000 Array Camera Reference Vector: 0.457290 [10] Camera Reference Vector: 0.00000 Array Camera Reference Vector: 0.00000 Entrance Pupil Terms: 0.000000 Array Camera Reference Vector: 0.000000 Array Camera Reference Vector: 0.000000 Entrance Pupil Terms: 0.000000 Array Camera Reference Vector: 0.000000 Array Camera Reference Vector: 0.000000 Array Camera Reference Quaternion: 0.00171 [2] Camera Reference Quater	Vertical Vector: -13.887297	[2]
Array Optical Vector: ength 3 10 Optical Vector: -0.993079 11 Optical Vector: 0.017077 12 Optical Vector: 0.115202 12 Optical Vector: 0.115203 12 Optical Vector: 0.115203 12 Optical Vector: 0.137249 Optical Vector: 0.00000 Optical Vector: 0.137249 Optical Vector: 0.1000000 Optical Vector: 0.137249 Optical Vector: 0.100000 Optical Ve	[2]	Vertical Vector: 3620.840003
Array Optical Vector: ength 3 10 Optical Vector: -0.993079 11 Optical Vector: 0.017077 12 Optical Vector: 0.115202 12 Optical Vector: 0.115203 12 Optical Vector: 0.115203 12 Optical Vector: 0.137249 Optical Vector: 0.00000 Optical Vector: 0.137249 Optical Vector: 0.1000000 Optical Vector: 0.137249 Optical Vector: 0.100000 Optical Ve	Vertical Vector: 3586.811043	Array Optical Vector length 3
Optical Vector: -0.993079 [1] Optical Vector: -0.993079 [1] Optical Vector: 0.017077 [2] Optical Vector: 0.116202 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022082 [1] Radial Distortion Terms: -0.033675 [2] Radial Distortion Terms: 0.611672 Array Radial Distortion Terms: 0.611672 Array Ratrance Pupil Terms: 0.000000 Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 Array Camera Reference Vector 1 ength 3 [0] Entrance Pupil Terms: 0.000000 Array Camera Reference Vector -1.096680 Array Camera Reference Vector: -1.096680 Array Camera Reference Quaternion: 0.070093 [1] Camera Reference Quaternion: 0.001171 [2] Camera Reference Quaternion: 0.0018688 Camera Reference Quaternion: 0.0018688 Camera Temperature: 20.000000 [Right Pancam, filter R8] Camera Serial Number: 103 Camera ID: Right Pancam Right-Eye Filter R8: 880 mn - Solar ND Model Class: CAHVOR Model Type: 0 Model Type: 0 Model Parameter: 0.000000 Array Center Vector: 0.413705 [1] Center Vector: -1.246372 Optical Vector: -0.185358 [2] Optical Vector: -0.185358 [2] Optical Vector: 0.135258 [0] Optical Vector: 0.135255 [1] Optical Vector: 0.135		
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Optical Vector: -0.185358 Optical Vector: 0.110707 [2] Optical Vector: 0.116202 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.022082 [1] Radial Distortion Terms: -0.033675 [2] Radial Distortion Terms: -0.033675 [2] Radial Distortion Terms: 0.611672 Array Entrance Pupil Terms: 0.00000 Entrance Pupil Terms: 0.00000 [1] Entrance Pupil Terms: 0.00000 [1] Entrance Pupil Terms: 0.00000 [2] Entrance Pupil Terms: 0.00000 Array Camera Reference Vector: 0.457810 [1] [1] Camera Reference Vector: -1.096680 Array Camera Reference Quaternion: 0.07093 [1] [2] Camera Reference Quaternion: 0.001171 [2] Camera Reference Quaternion: 0.001071 [3] Camera Reference Quaternion: 0.001171 [2] Camera Reference Quaternion: 0.001071 [3] Camera Reference Quaternion: 0.097401 [3] Camera Reference Quaternion: 0.00000 [Right Pancam, filter R8] Camera Model ID: 191 Camera Reference Quaternion: 0.016658 Camera Temperature: 20.000000 [Right Pancam, filter R8] Camera Reference Quaternion: 0.070000 [Right Pancam, filter R		
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Agray Radial Distortion Terms length 3 10 10 Radial Distortion Terms length 3 10 10 Radial Distortion Terms: 0.022082 11 Radial Distortion Terms: 0.023675 12 Radial Distortion Terms: 0.033675 12 Radial Distortion Terms: 0.013087 13 Radial Distortion Terms: 0.023504 12 Radial Distortion Ter		
Array Radial Distortion Terms: 0.022082 13 16 18 18 17 18 17 18 18 18		
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Camera Reference Quaternion: -0.016658 Camera Temperature: 20.000000 [Right Pancam, filter R8] Camera Model ID: 191 Camera Serial Number: 103 Camera ID: Right Pancam Camera ID: Right Pancam Filter Position: Pancam Right-Eye Filter R8: 880 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Parameter: 0.000000 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.413705 [1] Center Vector: -0.135215 [2] Center Vector: -1.246372 Camera Temperature: 20.000000 [Right Pancam, filter R8] Camera Model ID: 213 Camera Model ID: 213 Camera Model ID: 213 Camera Model ID: 213 Camera Model ID: 216 Camera Model ID: 218 Ca	~	
Camera Temperature: 20.000000 [Right Pancam, filter R8] Camera Model ID: 191 Camera Serial Number: 103 Camera ID: Right Pancam Camera ID: Right Pancam Filter Position: Pancam Right-Eye Filter R8: 880 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.413705 [1] Center Vector: -0.135215 [2] Center Vector: -1.246372 [Right Pancam, filter R8] Camera Model ID: 213 Camera Model ID: 214 Camera Model		~
[Right Pancam, filter R8] Camera Model ID: 191 Camera Serial Number: 103 Camera ID: Right Pancam Camera ID: Right Pancam Filter Position: Pancam Right-Eye Filter R8: 880 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.413705 [1] Center Vector: -0.135215 [2] Center Vector: -1.246372 Camera Model ID: 213 Camera Serial Number: 114 Camera ID: Right Pancam Filter Position: Pancam Right-Eye Filter R8: 880 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.443429 [1] Center Vector: -0.142099 [2] Center Vector: -1.246638 Array Axis Vector length 3		
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R8: 880 nm - Solar ND Model Class: CAHVOR Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.413705 [1] Center Vector: -0.135215 [2] Center Vector: -1.246372 Model Class: CAHVOR Model Type: 0 Model Parameter: 0.000000 Array Center Vector length 3 [0] Center Vector: 0.443429 [1] Center Vector: -0.142099 [2] Center Vector: -1.246638 Array Axis Vector length 3	I = = = = = = = = = = = = = = = = = = =	
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[1] Center Vector: -0.142099 Center Vector: -0.135215 [2] Center Vector: -1.246638 Center Vector: -1.246372 Array Axis Vector length 3	[0]	
Center Vector: -0.135215	Center Vector: 0.413705	[1]
[2] Center Vector: -1.246638 Center Vector: -1.246372 Array Axis Vector length 3	[1]	Center Vector: -0.142099
[2] Center Vector: -1.246338 Center Vector: -1.246372 Array Axis Vector length 3	Center Vector: -0.135215	[2]
Center Vector: -1.246372 Array Axis Vector length 3		Center Vector: -1.246638
1		
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MER A Camera Models	MER B Camera Models
[0]	Axis Vector: -0.974596
Axis Vector: -0.990622	[1]
[1]	Axis Vector: -0.180627
Axis Vector: -0.007005 [2]	[2] Axis Vector: 0.132429
Axis Vector: 0.136451	Array Horizontal Vector length 3
Array Horizontal Vector length 3	[0]
[0]	Horizontal Vector: 176.690830
Horizontal Vector: -474.046354	[1] Horizontal Vector: -3612.502474
Horizontal Vector: -3554.067848	[2]
[2]	Horizontal Vector: 64.120658
Horizontal Vector: 56.808555	Array Vertical Vector length 3
Array Vertical Vector length 3	[0] Vertical Vector: -34.618632
[0] Vertical Vector: -4.611697	[1]
[1]	Vertical Vector: -6.528287
Vertical Vector: -13.887297	[2]
[2]	Vertical Vector: 3620.840003
Vertical Vector: 3586.811043 Array Optical Vector length 3	Array Optical Vector length 3 [0]
[0]	Optical Vector: -0.973043
Optical Vector: -0.993079	[1]
[1]	Optical Vector: -0.185358
Optical Vector: 0.017077	[2] Optical Vector: 0.137249
Optical Vector: 0.116202	Array Radial Distortion Terms length 3
Array Radial Distortion Terms length 3	[0]
[0]	Radial Distortion Terms: 0.013087
Radial Distortion Terms: 0.022082	[1]
[1] Radial Distortion Terms: -0.033675	Radial Distortion Terms: 0.023504
[2]	Radial Distortion Terms: -0.374157
Radial Distortion Terms: 0.611672	Array Entrance Pupil Terms length 3
Array Entrance Pupil Terms length 3	[0]
[0] Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	[2]
[2]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000 Array Camera Reference Vector length 3	Array Camera Reference Vector length 3 [0]
[0]	Camera Reference Vector: 0.457290
Camera Reference Vector: 0.457810	[1]
[1]	Camera Reference Vector: 0.026050
Camera Reference Vector: 0.027790	[2]
[2] Camera Reference Vector: -1.096680	Camera Reference Vector: -1.096200 Array Camera Reference Quaternion length 4
Array Camera Reference Quaternion length 4	[0]
[0]	Camera Reference Quaternion: 0.065924
Camera Reference Quaternion: 0.070093	[1]
[1] Camera Reference Quaternion: 0.001171	Camera Reference Quaternion: 0.006818 [2]
[2]	Camera Reference Quaternion: 0.992507
Camera Reference Quaternion: 0.997401	[3]
[3]	Camera Reference Quaternion: -0.102653
Camera Reference Quaternion: -0.016658	Camera Temperature: 20.000000 [EDL Descent Imager]
Camera Temperature: 20.000000 [EDL Descent Imager]	Camera Model ID: 169
Camera Model ID: 171	Camera Serial Number: 123
Camera Serial Number: 118	Camera ID: EDL Descent Imager
Camera ID: EDL Descent Imager	Filter Position: No filter/unknown
Filter Position: No filter/unknown Model Class: CAHVOR	Model Class: CAHVOR Model Type: 0
Model Type: 0	Model Parameter: 0.000000
Model Parameter: 0.000000	Array Center Vector length 3
Array Center Vector length 3	[0]
[0] Center Vector: -0.000954	Center Vector: -0.000318
Center Vector: -0.000954	[1] Center Vector: -0.864737
L-1	COMMON VOCCOL. U.UUT/J/

Center Vector: -0.084925 Center Vector: 0.004438 Array Axis Vector length 3 101 Axis Vector: 0.003038 111 Axis Vector: -0.0334895 12] Axis Vector: -0.334895 12] Axis Vector: -0.334895 12] Axis Vector: -0.334609 12] Axis Vector: -0.334609 12] Axis Vector: -0.334609 12] Axis Vector: -0.344609 12] Axis Vector: -0.318626 12] Axi	MER A Camera Models	MER B Camera Models
Center vector: 0.006423		
Center Vector: 0.006423		1
Axis Vector: 0.003038 10		
01		
Axis Vector: 0.003038		
13		
Axis Vector: -0.334895 12 Axis Vector: 0.942251 Axis Vector: 0.942251 Axis Vector: 0.942251 Axis Vector: 0.942251 Axis Vector: -0.817862 10 Horizontal Vector: -1.727939 11 Horizontal Vector: -1.727939 11 Horizontal Vector: -1.729.587622 12 Horizontal Vector: 78.976148 Array Vertical Vector: 1927.942274 10 Vectical Vector: 1727.942274 11 Vectical Vector: -1.71.11650 12 Vectical Vector: -1.71.11650 Vectical Vector: -1.71.11650 Vectical Vector: -0.035227 11 Optical Vector: 0.035227 12 Optical Vector: 0.035227 13 Optical Vector: 0.035227 13 Optical Vector: 0.035227 14 Optical Vector: 0.035227 15 Optical Vector: 0.035227 16 Optical Vector: 0.035227 17 Optical Vector: 0.035227 18 Optical Vector: 0.035227 18 Optical Vector: 0.035227 19 Optical Vector: 0.05600 Array Radial Distortion Terms: 0.00160 Radial Distortion Terms: 0.00160 Radial Distortion Terms: 0.00218 Radial Distortion Terms: 0.00218 Radial Distortion Terms: 0.00000 Radial Distortion Terms: 0.000000 Radial Distortio		1
Axis Vector: 0.942251 Axray Horizontal Vector length 3 (0) Horizontal Vector: -2.77399 (1) Horizontal Vector: -3.29.587622 (2) Horizontal Vector: 78.976148 Array Norizontal Vector: Pength 3 (0) Horizontal Vector: Pength 3 (0) Vertical Vector length 3 (0) Vertical Vector: 1227.942274 (1) Vertical Vector: 1217.311650 (2) Vertical Vector: -0.35227 (1) Vertical Vector: 0.035227 (1) Optical Vector: 0.035227 (1) Optical Vector: 0.34036 (2) Optical Vector: 0.344036 (2) Optical Vector: 0.945389 Array Radial Distortion Terms: 0.00160 (1) Radial Distortion Terms: 0.00160 (1) Radial Distortion Terms: 0.021769 Array Entrance Pupil Terms: 0.000000 (1) Camera Reference Vector: 0.000000 (1) Camera Reference Vector: 0.000000 (2) Camera Reference Vector: 0.000000 (1) Camera Reference Quaternion: 0.000000 (1) Camera Reference Quaternion: 0.000000 (2) Camera Reference Quaternion: 0.000000 (3) Cam		
Axis Vector: 0.942251 (10) Horizontal Vector: -2.773939 (11) Horizontal Vector: -2.773939 (12) Horizontal Vector: 73.976148 Array Vertical Vector length 3 (10) Vertical Vector: 1227.942274 (11) Vertical Vector: -171.111650 (12) Vertical Vector: -171.111650 (12) Vertical Vector: -171.111650 (12) Vertical Vector: -171.111650 (12) Vertical Vector: -171.111650 (13) Array Optical Vector length 3 (10) Optical Vector: 0.035227 (11) Optical Vector: 0.035227 (12) Optical Vector: 0.035227 (13) Optical Vector: 0.035227 (14) Optical Vector: 0.094389 Array Radial Distortion Terms length 3 (10) Optical Vector: 0.945389 Array Radial Distortion Terms: 0.001160 (11) Radial Distortion Terms: 0.00160 (12) Entrance Pupil Terms: 0.000000 (13) Camera Reference Vector: 0.000000 (14) Camera Reference Vector: 0.000000 (15) Camera Reference Vector: 0.000000 (16) Camera Reference Quaternion: 0.000000 (17) Camera Reference Quaternion: 0.000000 (18) Camera Reference Quaternion: 0.000000 (19) Camera Reference Quaternion: 0.000000 (10) Camera Reference Quaternion: 0.000000 (13) Camera Reference Quaternion: 0.000000 (Microscopic Imager, Cover Closed) Camera Model ID: 173 Array Horizontal Vector: -0.817862 (11) Horizontal Vector: -1319.884526 (12) Horizontal Vector: -1319.884526 (12) Horizontal Vector: -1319.884526 (12) Horizontal Vector: -1719.584526 (12) Horizontal Vector: -1719.584526 (12) Horizontal Vector: -1719.884526 (12) Horizontal Vector: -1719.584526 (12) Horizontal Vector: -171.51026 (11) Horizontal Vector: -1719.584526 (12) Horizontal Vector: -1719.584526 (12) Horizontal Vector: -171.51026 (12) Horizontal Vector: -171.51028 (12) Horizontal V		1
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Horizontal Vector: -0.817862 Horizontal Vector: -0.817862 Horizontal Vector: -1329.587622 Horizontal Vector: 73.976148 Horizontal Vector: 1227.942274 Horizontal Vector: 1227.942274 Horizontal Vector: -171.111650 Usertical Vector: -171.111		_
Interior		1
Horizontal Vector: -1329.587622 [2] Horizontal Vector: 78.976148 Array Vertical Vector length 3 [0] Vertical Vector: 1227.942274 [1] Vertical Vector: -171.111650 [2] Vertical Vector: -171.111650 [2] Vertical Vector: -171.111650 [2] Vertical Vector: -174.152524 [2] Vertical Vector: -0.08482 [0] Optical Vector: -0.324036 [1] Optical Vector: -0.324036 [1] Optical Vector: -0.324036 [1] Optical Vector: -0.267211 Optical Vector: -0.267211 Optical Vector: -0.267211 Optical Vector: -0.267211 Optical Vector: -0.963601 Array Radial Distortion Terms: 0.00160 [1] Radial Distortion Terms: 0.002118 [2] Radial Distortion Terms: 0.005004 [1] Radial Distortion Terms: 0.00000 [1] Ratirance Pupil Terms: 0.000000 [2] Radial Distortion Terms: 0.000000	Horizontal Vector: -2.773939	[1]
Aprizontal Vector: 78.976148 Array Vertical Vector length 3 101 Vertical Vector length 3 102 Vertical Vector: 1227.942274 11 Vertical Vector: -171.111650 121 Vertical Vector: -171.111650 121 Vertical Vector: -174.152524 121 Vertical Vector: -0.08482 121 Optical Vector: 0.035227 131 Optical Vector: -0.324036 122 Optical Vector: -0.324036 123 Optical Vector: -0.324036 123 Optical Vector: -0.267211 Optical Vector: -0.963601 Array Radial Distortion Terms: 0.001160 131 Radial Distortion Terms: 0.00218 123 Radial Distortion Terms: 0.00218 124 Radial Distortion Terms: 0.00218 125 Radial Distortion Terms: 0.00000 127 Radial Distortion Terms: 0.00000 128 Radial Distortion Terms: 0.00000 129 Radial Distortion Terms: 0.00000 129 Radial Distortion Terms: 0.00000 120 Radial Distortion Terms: 0.00000 121 Radial Distortion Terms: 0.00000 122 Radial Distortion Terms: 0.00000 123 Radial Distortion Terms: 0.00000 124 Radial Distortion Terms: 0.00000 125 Radial Distortion Terms: 0.000000 127 Radial Distortion Terms: 0.000000 128 Radial Distortion Terms: 0.000000 129 Radial Distortion Terms: 0.000000 129 Radial Distortion Terms: 0.000000 120 Radial Distortion Terms: 0.000000 121 Radial Distortion Terms: 0.000000 122 Radial Distortion Terms: 0.000000 123 Radial Distortion Terms	[1]	Horizontal Vector: -1319.884526
Horizontal Vector: 18.976148	Horizontal Vector: -1329.587622	[2]
Horizontal Vector: 18.976148	[2]	Horizontal Vector: 77.557951
O Vertical Vector: 1227.942274 [1] Vertical Vector: -174.152524 [1] Vertical Vector: -174.152524 [2] Vertical Vector: -174.152524 [2] Vertical Vector: 468.829410 Array Optical Vector length 3 [0] Optical Vector: 0.035227 [1] Optical Vector: -0.324036 [2] Optical Vector: 0.945389 Array Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: 0.00218 [2] Radial Distortion Terms: 0.021769 Array Entrance Pupil Terms length 3 [0] Radial Distortion Terms: 0.00000 [1] Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.000000 [2] Camera Reference Quaternion: 0.000000 [2] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [4] Camera Reference Quaternion: 0.000000 [5] Camera Reference Quaternion: 0.000000 [6] Camera Reference Quaternion: 0.000000 [7] Camera Reference Quaternion: 0.000000	Horizontal Vector: 78.976148	
Vertical Vector: 1227.942274	Array Vertical Vector length 3	[0]
1	[0]	Vertical Vector: 1217.312286
Vertical Vector: -171.111650 [2] Vertical Vector: 468.829410 Array Optical Vector length 3 [0] Optical Vector: 0.035227 [1] Optical Vector: -0.324036 [2] Optical Vector: -0.324036 [2] Optical Vector: -0.267211 [2] Optical Vector: 0.945389 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: -0.002318 [2] Radial Distortion Terms: -0.002318 [2] Radial Distortion Terms: 0.021769 Array Entrance Pupil Terms length 3 [0] Radial Distortion Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.000000 [2] Camera Reference Vector: 0.000000 [2] Camera Reference Quaternion: 0.000000 [2] Camer	Vertical Vector: 1227.942274	[1]
Vertical Vector: 468.829410	[1]	Vertical Vector: -174.152524
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Array Optical Vector length 3 (0)		Vertical Vector: 490.582537
Optical Vector: -0.035227 [1] Optical Vector: -0.324036 [2] Optical Vector: 0.945389 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: -0.002318 [2] Radial Distortion Terms: 0.02318 [2] Radial Distortion Terms: 0.021769 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 [2] Camera Reference Vector: 0.000000 [2] Camera Reference Quaternion: 0.000000 [1] Camera Reference Quaternion: 0.000000 [2] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [4] Camera Reference Quaternion: 0.000000 [5] Camera Reference Quaternion: 0.000000 [6] Camera Reference Quaternion: 0.000000 [7] Camera Reference Quaternion: 0.000000 [8] Camera Reference Quaternion: 0.000000 [8] Camera Model ID: 173	Vertical Vector: 468.829410	Array Optical Vector length 3
Optical Vector: 0.035227 [1]	Array Optical Vector length 3	[0]
Optical Vector: -0.324036 [2] Optical Vector: 0.945389 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: -0.002318 [2] Radial Distortion Terms: 0.0221769 Array Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [1] Entrance Pupil Terms: 0.000000 [2] Entrance Pupil Terms: 0.000000 Array Camera Reference Vector: 0.000000 [1] Camera Reference Vector: 0.000000 [1] Camera Reference Vector: 0.000000 [1] Camera Reference Quaternion: 0.000000 [2] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 1.000000	[0]	Optical Vector: -0.008482
Optical Vector: -0.324036 [2] Optical Vector: 0.945389 Array Radial Distortion Terms length 3 [0] Radial Distortion Terms: 0.001160 [1] Radial Distortion Terms: -0.002318 [2] Radial Distortion Terms: 0.021769 Array Entrance Pupil Terms: 0.000000 [1] Camera Reference Vector: 0.000000 [1] Camera Reference Vector: 0.000000 [1] Camera Reference Vector: 0.000000 [2] Camera Reference Quaternion: 0.000000 [1] Camera Reference Quaternion: 0.000000 [3] Camera Reference Quaternion: 1.000000 Camera Temperature: 20.000000 [Microscopic Imager, Cover Closed] Camera Model ID: 173	Optical Vector: 0.035227	[1]
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Camera Model ID: 173 Camera Serial Number: 110	_	
l Camera Serial Number: 105	Camera Serial Number: 105	Camera ID: Microscopic Imager
Camera ID: Microscopic Imager Camera ID: Microscopic Imager Filter Position: Microscopic Imager Cover		
Filter Position: Microscopic Imager Cover Closed		
Closed Model Class: CAHVOR		
Model Class: CAHVOR Model Type: 0		
Model Type: 0 Model Parameter: 0.000000		

MER A Camera Models	MER B Camera Models
Model Parameter: 0.000000	Array Center Vector length 3
Array Center Vector length 3	[0]
[0]	Center Vector: 1.120980
Center Vector: 1.058880	[1]
[1]	Center Vector: 0.084947
Center Vector: -0.054903	Center Vector: 0.105077
Center Vector: 0.275421	Array Axis Vector length 3
Array Axis Vector length 3	[0]
[0]	Axis Vector: 0.025729
Axis Vector: -0.005821	[1]
[1]	Axis Vector: -0.014067
Axis Vector: 0.058380	[2] Axis Vector: 0.999570
Axis Vector: 0.998277	Array Horizontal Vector length 3
Array Horizontal Vector length 3	[0]
[0]	Horizontal Vector: -605.098814
Horizontal Vector: 26.031857	[1]
[1]	Horizontal Vector: 2279.629747
Horizontal Vector: -2337.838852	[2] Horizontal Vector: 576.574483
Horizontal Vector: 631.369970	Array Vertical Vector length 3
Array Vertical Vector length 3	[0]
[0]	Vertical Vector: -2269.908949
Vertical Vector: 2365.204651	[1]
[1]	Vertical Vector: -629.901082
Vertical Vector: 57.405196	[2] Vertical Vector: 571.473228
Vertical Vector: 525.651774	Array Optical Vector length 3
Array Optical Vector length 3	[0]
[0]	Optical Vector: -0.003143
Optical Vector: -0.061672	[1]
	Optical Vector: -0.044770
Optical Vector: 0.126116	[2] Optical Vector: 0.998992
Optical Vector: 0.990097	Array Radial Distortion Terms length 3
Array Radial Distortion Terms length 3	[0]
[0]	Radial Distortion Terms: 0.001715
Radial Distortion Terms: 0.007629	[1]
[1]	Radial Distortion Terms: 0.070042
Radial Distortion Terms: -0.104219	[2] Radial Distortion Terms: -0.724357
Radial Distortion Terms: 0.624037	Array Entrance Pupil Terms length 3
Array Entrance Pupil Terms length 3	[0]
[0]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	
[1] Entrance Dunil Terms: 0 000000	Entrance Pupil Terms: 0.000000 [2]
Entrance Pupil Terms: 0.000000 [2]	Entrance Pupil Terms: 0.000000
Entrance Pupil Terms: 0.000000	Array Camera Reference Vector length 3
Array Camera Reference Vector length 3	[0]
[0]	Camera Reference Vector: 1.121830
Camera Reference Vector: 1.048823	[1]
[1] Camera Reference Vector: -0.053605	Camera Reference Vector: 0.083616
[2]	Camera Reference Vector: 0.160306
Camera Reference Vector: 0.328496	Array Camera Reference Quaternion length 4
Array Camera Reference Quaternion length 4	[0]
[0]	Camera Reference Quaternion: -0.004108
Camera Reference Quaternion: -0.027773	[1]
[1] Camera Reference Quaternion: 0.011828	Camera Reference Quaternion: 0.010736
[2]	Camera Reference Quaternion: -0.612627
Camera Reference Quaternion: 0.707667	[3]
[3]	Camera Reference Quaternion: 0.790289
Camera Reference Quaternion: 0.705901	Camera Temperature: 20.00000
Camera Temperature: 20.000000	[Microscopic Imager, Cover Open]
[Microscopic Imager, Cover Open] Camera Model ID: 172	Camera Model ID: 194 Camera Serial Number: 110
Camera Model 1D. 172 Camera Serial Number: 105	Camera ID: Microscopic Imager
Camera Derrar Mamber. 100	camera in. Micropeopie imagei

MER A Camera Models	MER B Camera Models
Camera ID: Microscopic Imager	Filter Position: Microscopic Imager Cover
Filter Position: Microscopic Imager Cover	Open
Open	Model Class: CAHVOR
	Model Type: 0
Model Class: CAHVOR	Model Parameter: 0.000000
Model Type: 0	Array Center Vector length 3
Model Parameter: 0.000000	[0]
Array Center Vector length 3	Center Vector: 1.120980
[0]	[1]
Center Vector: 1.058880	Center Vector: 0.084947
[1]	[2]
Center Vector: -0.054903	Center Vector: 0.105077
[2]	Array Axis Vector length 3
Center Vector: 0.275421	[0]
Array Axis Vector length 3	Axis Vector: 0.025729
[0]	[1]
Axis Vector: -0.005821	Axis Vector: -0.014067
[1]	[2]
Axis Vector: 0.058380	Axis Vector: 0.999570
Axis Vector: 0.998277	Array Horizontal Vector length 3
	Horizontal Vector: -605.098814
Array Horizontal Vector length 3	[1]
Horizontal Vector: 26.031857	Horizontal Vector: 2279.629747
[1]	[2]
Horizontal Vector: -2337.838852	Horizontal Vector: 576.574483
[2]	Array Vertical Vector length 3
Horizontal Vector: 631.369970	[0]
Array Vertical Vector length 3	Vertical Vector: -2269.908949
[0]	[1]
Vertical Vector: 2365.204651	Vertical Vector: -629.901082
[1]	[2]
Vertical Vector: 57.405196	Vertical Vector: 571.473228
[2]	Array Optical Vector length 3
Vertical Vector: 525.651774	[0]
Array Optical Vector length 3	Optical Vector: -0.003143
[0]	[1]
Optical Vector: -0.061672	Optical Vector: -0.044770
[1]	[2]
Optical Vector: 0.126116	Optical Vector: 0.998992
[2]	Array Radial Distortion Terms length 3
Optical Vector: 0.990097	[0]
Array Radial Distortion Terms length 3	Radial Distortion Terms: 0.001715
	[1]
Radial Distortion Terms: 0.007629	Radial Distortion Terms: 0.070042
[1] Radial Distortion Terms: -0.104219	Radial Distortion Terms: -0.724357
[2]	Array Entrance Pupil Terms length 3
Radial Distortion Terms: 0.624037	[0]
Array Entrance Pupil Terms length 3	Entrance Pupil Terms: 0.000000
[0]	[1]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[1]	[2]
Entrance Pupil Terms: 0.000000	Entrance Pupil Terms: 0.000000
[2]	Array Camera Reference Vector length 3
Entrance Pupil Terms: 0.000000	[0]
Array Camera Reference Vector length 3	Camera Reference Vector: 1.121830
[0]	[1]
Camera Reference Vector: 1.048823	Camera Reference Vector: 0.083616
[1]	[2]
Camera Reference Vector: -0.053605	Camera Reference Vector: 0.160306
[2]	Array Camera Reference Quaternion length 4
Camera Reference Vector: 0.328496	[0]
Array Camera Reference Quaternion length 4	Camera Reference Quaternion: -0.004108
Camera Reference Quaternion: -0.027773	Camera Reference Quaternion: 0.010736
[1]	[2]
Camera Reference Quaternion: 0.011828	Camera Reference Quaternion: -0.612627
[2]	[3]
Camera Reference Quaternion: 0.707667	Camera Reference Quaternion: 0.790289

MER A Camera Models	MER B Camera Models
[3] Camera Reference Quaternion: 0.705901 Camera Temperature: 20.000000	Camera Temperature: 20.000000

Appendix B. MER flat fields

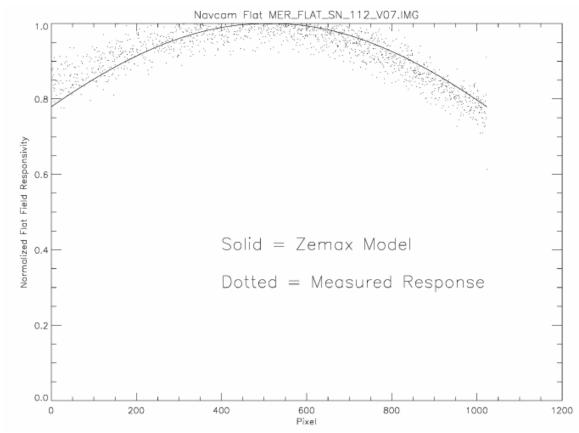


Figure A.1 Measured MER A Left Navcam Flat Field Response

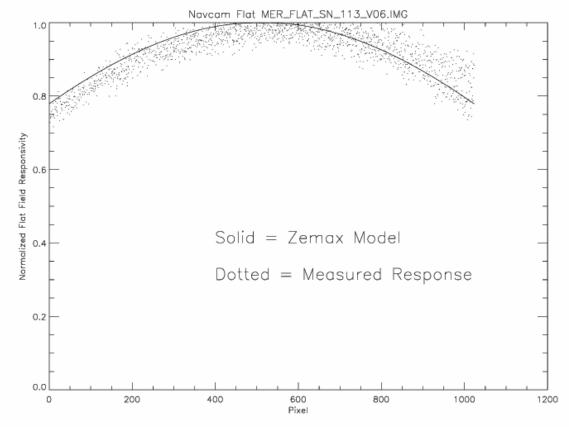


Figure A.2 Measured MER A Right Navcam Flat Field Response

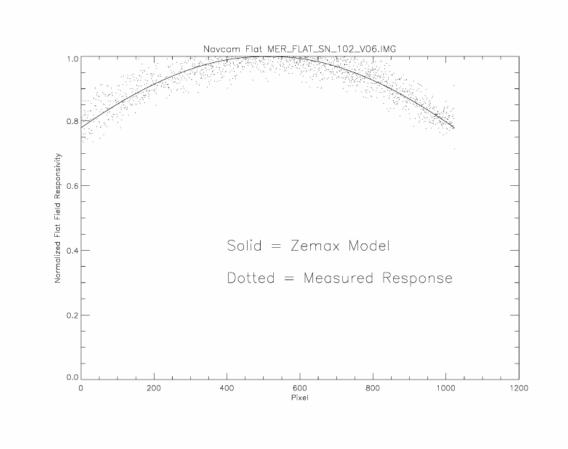


Figure A.3. Measured MER B Left Navcam Flat Field Response

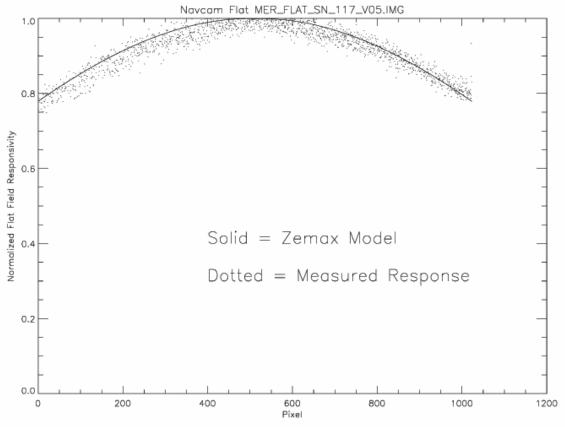


Figure A.4 Measured MER B Right Navcam Flat Field Response