Rosetta – ÇIVA

To Planetary Science Archive Interface Control Document

RLGS-SPEC-SONC_DPS-SCIE-9037-CNES
LCI-SP-0026-3270-IAS

Issue 1 revision 2

05 October 2016

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CHANGE RECORD SHEET

Date	Sections Changed	Reasons for Change
23/12/2010	Creation of Issue 1 Revision 0	Delivery of Issue 1.0 to PSA after peer review
01/07/2015	Updated: 2.5.5 In-Flight data products 2.5.8 Ancillary Data Usage 3.1.4 Filenaming conventions 4.2 Datasets, Definition and Content Added: 3.2.2.2.5 Spacecraft Clock Count in PDS Labels Deleted: 3.4.3.4.2 Geometric Index File 3.4.3.6 Geometry Directory	Delivery of Issue 1.1 updated for the Comet phase
05/10/2016	Updated: 2.5.6 Documentation Typo correction: p33, 35, 38 (Rrolis) 4.3.1.3 Instrument and Detector Descriptive Data Elements information added for INST_CMPRS_RATE keyword	

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1 Introduction

1.1 Purpose and Scope

The purpose of this EAICD (Experimenter to Planetary Science Archive Interface Control Document) is twofold. First it provides users of the ÇIVA instrument with detailed description of the product and a description of how it was generated, including data sources and destinations. Secondly, the EAICD describes the interface to the Planetary Science Archive (PSA) of ESA and is the official document between each experimenter team and the PSA.

1.2 Archiving Authorities

The *Planetary Data System* Standard is used as archiving standard by:

- NASA for U.S. planetary missions, implemented by PDS
- ESA for European planetary missions, implemented by the Research and Scientific Support Department (RSSD) of ESA

ESA's *Planetary Science Archive* (PSA)
ESA implements an online science archive, the PSA

- to support and ease data ingestion
- to offer additional services to the scientific user community and science operations teams as e.g.:
    - search queries that allow searches across instruments, missions and scientific disciplines
    - several data delivery options as:
        - direct download of data products, linked files and data sets
        - ftp download of data products, linked files and data sets

  The PSA aims for online ingestion of logical archive volumes and offers the creation of physical archive volumes on request.

1.3 Contents

This document describes the data flow of the ÇIVA instrument on Rosetta from the s/c until the insertion into the PSA for ESA. It includes information on how data were processed, formatted, labeled and uniquely identified. The document discusses general naming schemes for data volumes, data sets, data and label files. Standards used to generate the product are explained.

The design of the data set structure and the data product is given. Examples of these are given in the appendix.

1.4 Intended Readership

The staff of the archiving authority (Planetary Science Archive, ESA, RSSD, Lander team, design team) and any potential user of the ÇIVA data.

1.5 Applicable Documents

[AD1] Planetary Data System Data Preparation Workbook, February 17, 1995, Version 3.1, JPL, D-7669, Part1

[AD2] Planetary Data System Standards Reference, August 1, 2003, Version 3.6, JPL, D-7669, Part 2

[AD3] ROSETTA Archive Conventions RO-EST-TN-3372 Issue 5, Rev. 6, 25 March 2010

[AD4] ÇIVA Flight User Manual: LCI-IE-0023-3274-IAS

[AD5] Civa/Rolis IME FM Acceptance Data Package RO-LRS-ADP-3304 Issue 1 / Revision 5 (LCI-RP-0025-3115-IAS)

[AD6] CDMS Command and Data Management System - Subsystem Specification RO-LCD-SP-3101 29/08/2001, Issue 3, Rev. 5

[AD7] CDMS Command and Data Management System - Operation Manual RO-LCD-SW-3402 12/02/2001, Issue 1, Rev. 2

[AD8] Rosetta Time handling RO-EST-TN-3165, issue 1 rev 0, February 9, 2004

[AD9] Report of the IAU/IAG working group on cartographic coordinates and rotational elements of the planets and satellite: 2000, P.K. Seidelman, et al., Celestial Mechanics and Dynamical Astronomy, in Press, 2002.

[AD10] DDID- Data Delivery Interface Document RO-ESC-IF-5003 Issue B6 23/10/2003

[AD11] ROSETTA Archive Conventions RO-EST-TN-3372 Issue 7, Rev. 9, 06 April 2015

1.6 Relationships to Other Interfaces

No products, software and documents would be affected by a change in this EAICD.

1.7 Acronyms and Abbreviations

AD	Applicable Document
APID	Application Process IDentifier.
CDMS	Command and Data Management System
CIVA	Cometary Infrared and Visible Analyser
CNES	Centre National d’Etudes Spatiales
CODMAC	Committee On Data Management, Archiving, and Computation
COSAC	Cometary Sampling And Composition
DN	Digital Number
DDS	Data Delivery System (ESOC server)
DECW	Data Error Control Word
EAICD	Experiment Archive Interface Control Document
ESA	European Space Agency
ESOC	European Space Operation Center
ESS	Electrical Support System
ESTEC	European Space Research and Technology Center
FOV	Field of View
GRM	Ground Reference Model
HK	Housekeeping
IAS	Institut d’Astrophysique Spatiale
IFOV	Instantaneous Field of View
ISIS	Integrated Software for Imaging Spectrometers
IR	Infrared
MJT	Modified Julian Time
OBDH	On Board Data Handling
OBT	On Board Time
NAIF	Navigation Ancillary Information Facility

PDS	Planetary Data System
PECW	Packet Error Control Word
PI	Principal Investigator
PID	Process Identifier
PSA	Planetary Science Archive
PVV	PSA Volume Verifier
RD	Reference Document
RF	Radio Frequency
ROM	Read-Only Memory
S/C	Spacecraft
SCET	Spacecraft Elapsed Time
SFDU	Standard Formatted Data Unit
SONC	Science Operations and Navigation Center
SWIR	Short Wavelength Infrared channel
TBC	To Be Confirmed
TBD	To Be Defined
TC	Telecomand
VNIR	Visible and Near Infrared channel
WRT	With Respect To

1.8 Contact Names and Addresses

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2 Overview of Scientific Objectives, Instrument Design, Data Handling Process and Product Generation

2.1 Scientific Objectives

The origin and history of a comet is recorded both in microscopic and macroscopic properties of its surface: sizes, shapes, molecular/mineralogical composition of constitutive material, from micron-sized individual grains and matrix component, up to meter size or larger crust features and boulders. The combined imaging of the Rosetta Lander landing site, up to the horizon, and analyses of surface and drilled samples can reveal unique information about the composition of the primordial molecular protosolar cloud, the initial states of formation of planetesimals in the solar nebula and their subsequent processing. This record of the physical and chemical processes of aggregation, accretion and evolution is available nowhere else in the solar system. It provides key information on how interstellar nebula constituents, molecules, condensates and grains, grew into the present planetary system. In the following, we briefly indicate the background for combined macroscopic in-situ imaging, sample textural and compositional measurements, with an emphasis on the benefits obtained when molecular compositional information can be tied to microscopic measurements. It is shown that key structural features occur in the size range probed by the instrument. We then describe spectra for candidate cometary materials, illustrating the highly diagnostic capabilities of our spectral range and resolution for determining molecular and mineralogical composition.

ÇIVA is an integrated set of imaging instruments, designed to characterize the landing and sampling site, the 360° panorama as seen from the Rosetta Lander, all samples collected and delivered by the Drill Sample and Distribution System. It is constituted by a panoramic stereo camera (ÇIVA-P), and a microscope coupled to an IR spectrometer (ÇIVA-M). ÇIVA is sharing a common Imaging Main Electronics (ÇIVA/ROLIS/IME) with ROLIS. This IME includes a ÇIVA dedicated Command and Data Processing Unit, and a 16 Mbytes mass memory.

ÇIVA-P characterizes the landing site, from the landing legs to the local horizon. The camera is composed of 6 identical micro-cameras, mounted of the Lander sides, with their optical axes separated by 60°. Each of the micro-camera field is imaged, through a 6 elements objective, onto a 1024x1024 frame transfer CCD detector, providing an IFOV close to 1.1 mrad: each pixel images a 1 mm size feature at the distance of the landing legs, and centimeters features at the local horizon. In addition, stereoscopic capability is provided by one additional micro-camera, identical to and co-aligned with one of the panoramic micro-camera, with its optical axis 10 cm apart. Thus, the panoramic camera characterizes the surface topography and provide an albedo mapping of the landing site, with the aim of describing the interfaces between dark mantle materials and brighter surface ices at all scales; it identifies structures (microcracks, vents, faults) and erosion features linked to cometary processes; it reconstructs the local 3-dimensional structure of the surface, in at least one FOV including a landing leg, the penetration of which indicates the tensile strength of the cometary material. In case the Lander would rotate, the stereoscopic reconstruction is obtained for the full panorama. In addition, if operations of ÇIVA-P are repeated several times along the cometary activity, manifestations of cometary activity (microjets and faint dust emissions) and resulting surface changes are detected at scales not achievable from the Orbiter.
The seven cameras are operated sequentially. The electronics driving each CCD has adequate intelligence to optimize the exposure time. All images are compressed and stored before being transmitted.

ÇIVA-M combines in separated boxes, two ultra-compact and miniaturized channels, one visible microscope ÇIVA-M/V and one IR spectrometer ÇIVA-M/I, to characterize, by non-destructive analyses, the texture, albedo, mineralogical and molecular composition of each of the samples collected and distributed by the Drill Sample and Distribution System.
The visible microscope images the samples at a distance of a few (13) millimeters onto a 1024x1024 CCD detector, at a resolution of 7 µm and with a large depth of focus (up to ± 0.1 mm); the sample(s) are illuminated sequentially with 3 LEDs of different colors (green/blue: 525nm, red: 640nm, and infrared: 880nm). Following the microscope imaging, 128x96 pixels IR spectral images are obtained, with a spatial resolution of 40 µm, by means of a 128 x 128 IR HgCdTe array operating at temperatures 120 to 140 K. The

samples are illuminated by a monochromator operating between 1 and 4.0 µm at a resolution of 7 to 10 nm, using a rotating grating. The spectrometer should allow identifying the major organic chemical functions of the volatiles and organic refractories. The entire process takes less than 20 minutes, to get all spectra with SNR > 100, assuming IR albedos of 0.05. Then the sample could be transferred to a subsequent experiment (PTOLEMY and/or COSAC). The process would be repeated for each sample obtained at different depths and/or location.

All detector heads, both visible (for ÇIVA-P and the optical part of ÇIVA-M/V) and IR (for the spectrometer within ÇIVA-M/I), are mounted directly onto miniaturized electronic packages, a few cm^3 in volume and less than 100 g each. A central CDPU processes and transfers all data to a common mass memory controlled by the ROLIS-DPU of the ÇIVA/ROLIS/IME which insures their transmission to the CDMS.

Scientific sequences.
CIVA-P is operated to take one stereo image of the Orbiter just after release of Philae, to be used as calibration for the on-comet images. Then, immediately after touch-down, a full panorama of the landing site, with a partial stereoscopic coverage, is taken by CIVA-P, and immediately transmitted to the Earth for quick look data reduction. This first panorama is key to assess the landing conditions, and to declare secure the planned Philae sequence of operations. Follow-ons partial or global panoramas could be acquired either to monitor changes with solar illumination and/or cometary activity, to increase the stereoscopic coverage, and to image after their deployment Philae systems and sensors.
CIVA-M is turned on after all samplings (surface and subsurface) by SD2. It consists in sequences of calibration (by imaging an oven with a calibration target), imaging of ovens prior to be filled, and after being filled by SD2 with cometary samples. CIVA-M/V images each oven in three colors, while CIVA-M/I acquires a complete 3D (x,y,lamda) imagecube of them. After compression and storage in the IME mass memory, the data are transferred to CDMS for downlink.

2.2 Instrument Design

ÇIVA is made of four sub-systems :

- the Panoramic cameras (ÇIVA-P);
- the integrated Microscope (ÇIVA-M/V);
- the integrated IR Spectrometer (ÇIVA-M/I);
- the ÇIVA Central Electronics (ÇIVA-CE) distributed on two boards are part of the Imaging Main Electronics (IME), one board named ÇIVA-MID (ÇIVA-M Infrared Detector Electronics), the other ÇIVA-DPU.

ÇIVA-P is constituted of 7 identical cameras, implemented as 5 single cameras and one stereoscopic pair of two co-aligned ones, thus filling the 360° panoramic field of view by six overlapping FOV of 70° each, 60° apart one from the next (Figure 1). All cameras are mounted at the top of the side panels of the Lander. For the five panels covered with solar cells, one part is removed to give clearance for the camera FOV.

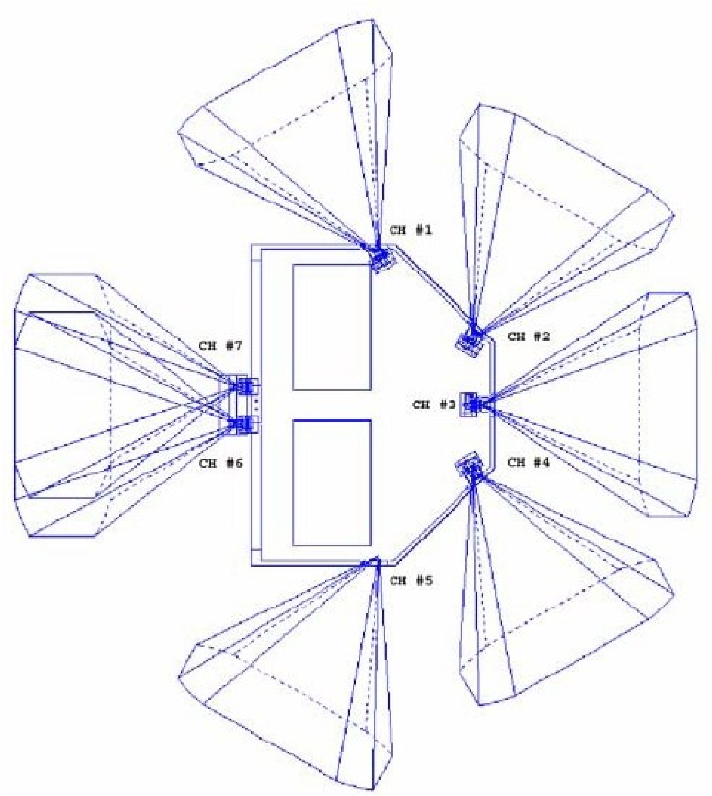

Figure 1 Location of the 7 CIVA-P cameras and sketch of their field of view.

Figure 2 and Figure 3 show the CIVA-P flight model before implementation on the Lander.

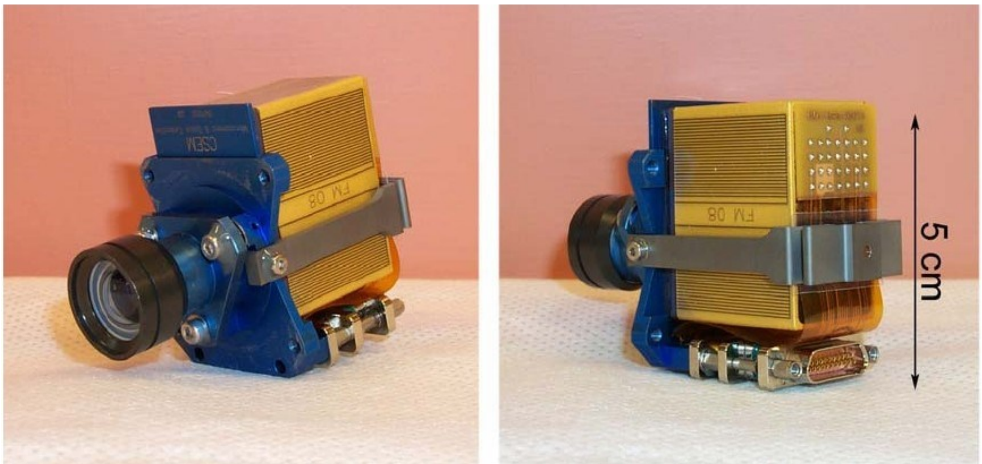

Figure 2 One CIVA-P FM cameras before implementation on Philae

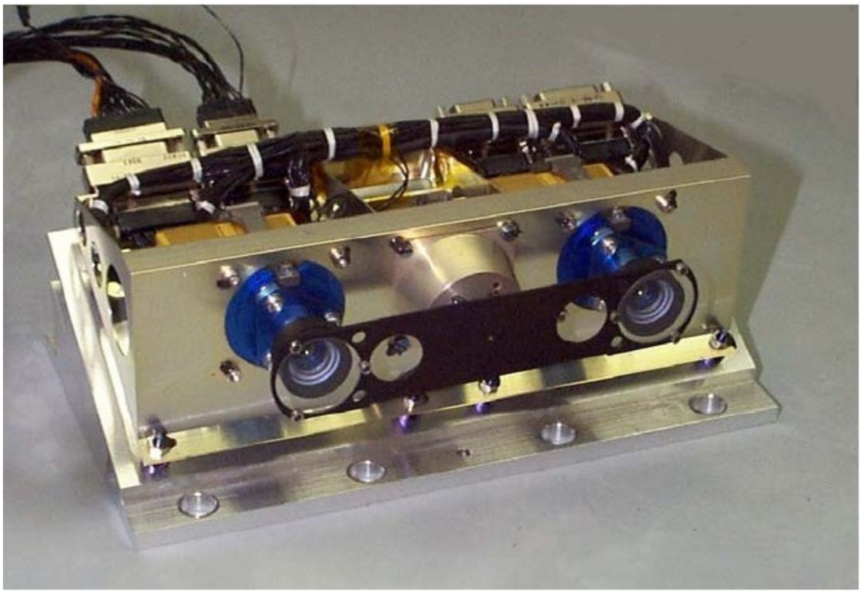

Figure 3 The CIVA-P stereo camera.

ÇIVA-M/V and ÇIVA-M/I are mounted on the base-plate (« balcony »), close to the drill and sample distribution system (SD2). They image and analyze the samples whenever they are brought at a designed location, within containers closed by a window transparent in both the Visible and the IR. The ÇIVA-M electronics board, which is the control and acquisition unit for the IR detector, is placed inside the CEB (Central Electronics Box). Figure 4 and Figure 5 show the CIVA M flight model before implementation on the Lander.

Figure 4 CIVA-M/V FM prior to implementation on Philae

Figure 5 CIVA-M/I FM prior to implementation on Philae

The ÇIVA dedicated electronics (ÇIVA-CE) forms, together with the ROLIS-DPU, MEM (Mass memory) and Lander I/F board, the Imaging Main Electronics (ÇIVA/ROLIS/IME). There is no direct electrical interface between the ÇIVA electronics and the Lander. The block diagram of the CIVA instrument is given in Figure 6.

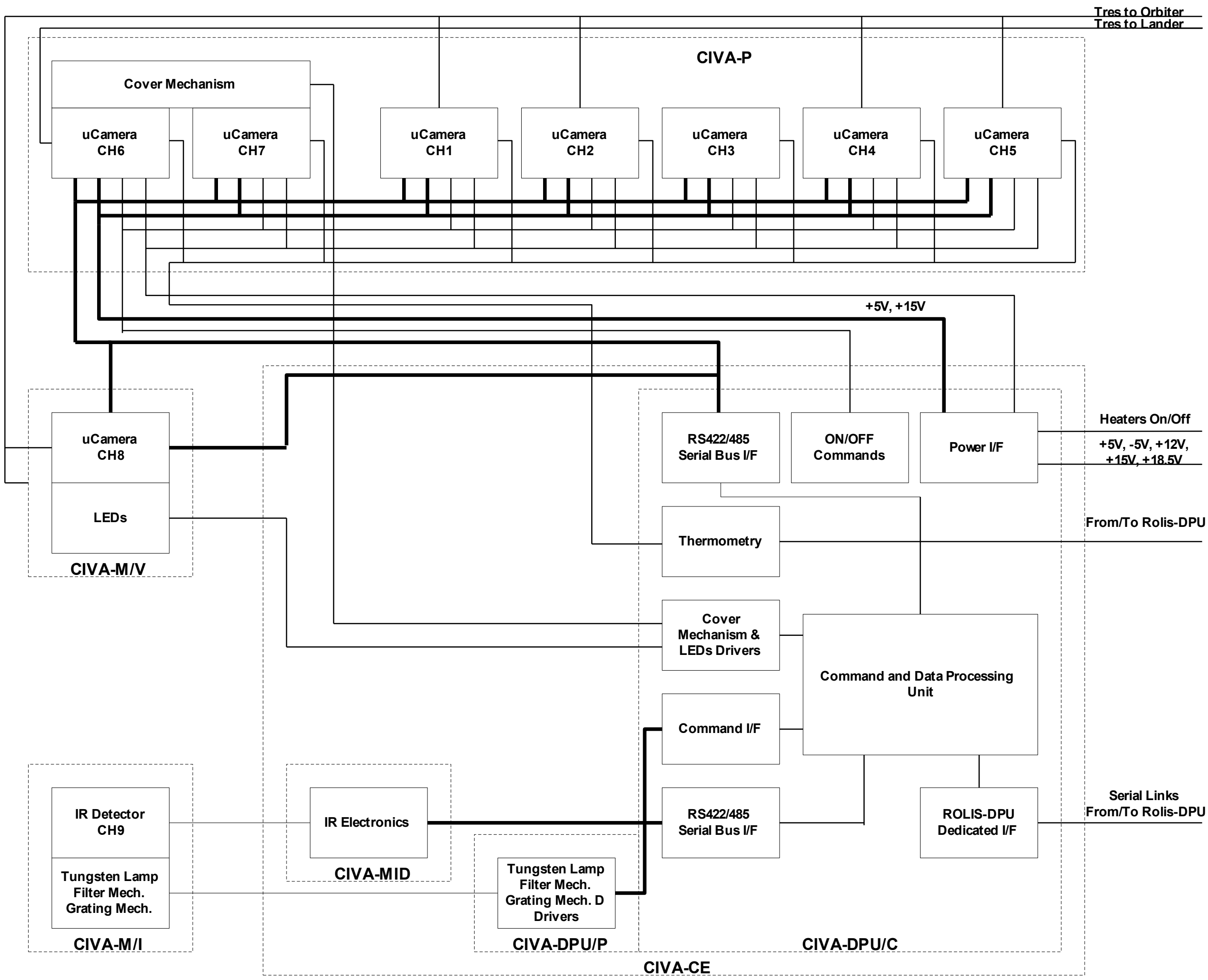

Figure 6 Civa general block diagram

The Imaging Main Electronics (IME) is a facility, developed under the co-responsibility of IWP/DLR and IAS, for both ROLIS and CIVA: they share a common I/F with the Lander, for both the power subsystem and the Central Data Management System (CDMS). Thus the IME includes the CIVA-Central Electronics (CIVA-CE), mainly based on a dedicated CDPU (Command and Data Processing Unit); it is equipped with a 16 Mbytes mass memory.
The CIVA-CDPU (Command and Data Processing Unit), developed by IAS, has the following functions: on/off power control; camera program uploading; camera heads check out; command reception (from ROLIS-DPU) and management; CIVA payload sequencing; status monitoring; image acquisition; integration time optimization; image compression (using wavelet based software); error encoding and data formatting.
It consists of a TEMIC TSC21020 processor, 2 Kword PROMs for boot sequence, 512 Kbyte EEPROM for application program and parameters storage, 128 KWord Fast SRAM for application program, 128 KWord Fast SRAM for application data and 6 Mbyte SRAM for 2 images data (1024x1024 pixels) storage/processing. The CDPU electronics is integrated into a 3D-packaged cube which is implemented into the IME (Figure 7).
The CIVA-CE includes two more electrical boards: one is dedicated to the IR detector, and the second to the CIVA peripheral devices.

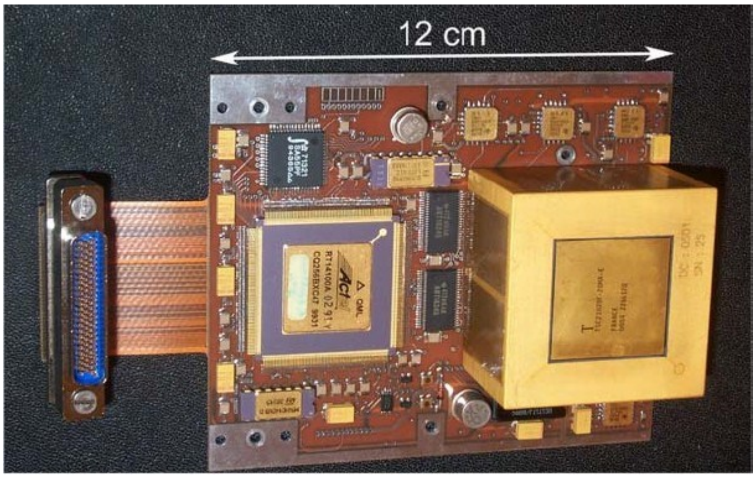

Figure 7 CIVA C-DPU integrated on its board.

2.3 Relationship with other interfaces

ÇIVA is in relation with the ROLIS, SD2 and PTOLEMY instruments.
Together with ROLIS and its down-looking camera, it is part of the PHILAE imaging package. Technically speaking, one common Imaging Main Electronics (IME) gathers both the ÇIVA Central Electronics (ÇIVA-CE) and the ROLIS electronics which is in charge of the power, telemetry and telecommand interfacing with the Lander CDMS, PSS and TCU sub-systems. That configuration implies an imperative switching-on of the ROLIS electronics before any ÇIVA activation. One thermal sensor only dedicated to the temperature measurement of the ÇIVA stereo camera is directly linked to the Orbiter until the Lander is released.
ÇIVA-M/V and ÇIVA-M/I are physically and optically interfaced to the SD2 system. SD2 is sequentially in charge of presenting in front of both instruments one of the ten mid temperature ovens (one equipped with a calibration target and the others being imaged empty first and then after being filled up with a cometary sample by SD2).
The interface with PTOLEMY is not direct but the activation or not of the tapping station by this instrument has to be known.

2.4 Data Handling Process

SONC is responsible for data preparation and Institut d'Astrophysique Spatiale is responsible for the distribution to CoI's. The relevant contact information is provided in section 1.8.
The SONC is responsible for PDS CIVA data sets generation and delivery to the PSA.

The CIVA telemetry data is provided by the ESA DDS (Data Distribution Server). Following the operations plan the SONC pulls out archived packets (SC and HK) by direct request to the DDS via FTP and stores them into SONC database.
As soon they are received, the SC raw packets are passed through the IAS data processing software (integrated in SONC) for decommutation, and decompression (raw images). The raw images are converted to JPG and PNG formats and stored into SONC database.
In the same way, the HK raw packets are passed through the SONC data processing software for decommutation and calibration.

Thus, the following data are immediately available through W3-SONC server (http://soncv2-rosetta.cnes.fr) and the authorized[1] users can get them for a selected time interval:
- Science (SC) and Housekeeping (HK) raw packets as binary files with .rolbin extension.
- Raw images (P, MI, MV) as files with .raw extension.
- Calibrated HK data as ASCII files with .csv extension (directly readable).

Moreover, the W3-SONC provides interactive plots of CIVA images (P, MI, MV) which can be downloaded as images formats such as JPG, PNG.

SONC also handles Auxiliary data (Attitude and Orbit files) pushed by the ESA DDS server.

Just after the proprietary period (six month as a minimum), the SONC team provides the raw data, raw images and plots to the PSA.
At this stage, raw images can be converted into Calibrated SC data with calibration files (provided also to PSA), but these files change several times before their stabilization.
Once the calibration files stabilized, calibrated SC data files are generated at SONC and provided to PSA.
Still later, Reduced data from SC and auxiliary, are generated and delivered to PSA.

The delivery format is described in this document.

Two periods must be distinguished in the CIVA data handling process:
1- the in-flight activity after the launch including the Commissioning phase, the Earth and the Mars swing-bys. Data produced during this period are not scientifically relevant.
2- the in-flight scientific mission including the two Asteroid fly-bys and the on-comet activity (starting from the SDL phase). Only this period produces scientific data.

SONC handles the whole data produced by CIVA experiment (all flight data as well as GRM data), as well as auxiliary data.
All data are delivered to PSA, but only the in-flight data produced during the period 2 are made public by PSA.

And two periods must be distinguished in the PDS CIVA data delivery to PSA:
A- just after the proprietary period, first step of delivery with data already available at SONC (see above). Raw images go with calibration files.
B- when ready, calibrated SC data and reduced data are generated and distributed to PSA.

2.5 Overview of Data Products

2.5.1 Pre-Flight Data Products

The following pre-flight data products are archived:
CIVA-P : rolbin file containing a panorama of integration room which can help for flight data calibration and panorama reconstruction.
CIVA-M/I : rolbin file containing a calibration sequence (images of an oven)
CIVA-M/V : no pre-flight data are provided

2.5.2 Sub-System Tests

[1] The authorization is controlled by PI (IAS). At his request, SONC delivers a login/password to the authorized user.

The only relevant sub-system test for this purpose is performed if an anomaly is observed in the data packets. A fixed test data set can be generated by a specific command so as to check the integrity of the downlink chain.

2.5.3 Instrument Calibrations

The following information should be used to calibrate and correct the science data *:*

- Spectral: table giving for ÇIVA-M/I the wavelength position of each spectral channel
- Geometric: Table giving for each pixel of the ÇIVA-P image the angular viewing direction
- Radiometric: reference images of calibrated targets for Civa-P; the transfer function for CIVA-M/I and CIVA-M/V will be derived from the spectral images of the calibration target made in flight.

The ÇIVA team provides and update relevant information so that the processing pipeline is up to date with the current understanding of the characteristics of ÇIVA.

The calibration files are available at IAS and SONC. A release is provided to PSA whenever they are refined. The delivery format is described in 3.4.3.2 (calibration directory).

2.5.4 Other Files written during Calibration

All calibration files obtained during ground and flight sequences, stored at IAS, will be made available through a direct collaboration with the PI team.

2.5.5 In-Flight Data Products

In-flight data are constituted by the data acquired during the on-comet operations. The ÇIVA-P Images nominally acquired during asteroids fly-bys should also be archived .

In flight data products cover 4 levels :

- Raw data (CODMAC level 1) : HK and SC CIVA/ROLIS packets as received from DDS.

These data are available at ESOC, SONC, IAS (periods 1 and 2) and PSA (period 2). **No delivery to PSA.**

- Raw images (CODMAC level 2) : One file for each decompressed image (up to seven for CIVA-P, three for CIVA-M/V and from one to eleven for CIVA-M/I).

Available at IAS, SONC (periods 1 and 2) and PSA (period 2). **Delivery to PSA in period A (after the proprietary period).**

- Calibrated SC data (CODMAC level 3) : Calibrated and corrected images (1 step for geometric and photometric corrections by SONC, 2 steps: (A) for linearity correction, (B) for geometric and photometric correction by IAS)

Available at IAS, SONC (periods 1 and 2) and PSA (period 2). **Delivery to PSA in period B (when ready).**

- Reduced (or derived) data (CODMAC level 5) : (see 2.5.7).

Available at IAS, SONC (periods 1 and 2) and PSA (period 2). **Selected subsets delivered to PSA in period B (when ready).**

The level 2 and 3 images contain, in addition HK parameters tables.

In flight data can be produced during following mission phases:

MISSION_PHASE_NAME	**Abbre viation**	**Start Date** (dd/mm/yyyy)	**End Date** (dd/mm/yyyy)	**CIVA data** (1)		
				MI	**MV**	**P**

Commissioning (part 1)	CVP1	05/03/2004	06/06/2004	X
Cruise 1	CR1	07/06/2004	05/09/2004	
Commissioning (part 2)	CVP2	06/09/2004	16/10/2004	X
Earth Swing-by 1 (including PC#0)	EAR1	17/10/2004	04/04/2005	X
Cruise 2 (including PC#1,2)	CR2	05/04/2005	28/07/2006	X
Mars Swing-by (including PC#3,4,5)	MARS	29/07/2006	28/05/2007	X
Cruise 3	CR3	29/05/2007	12/09/2007	
Earth Swing-by 2 (including PC#6,7)	EAR2	13/09/2007	27/01/2008	X
Cruise 4-1 (including PC#8)	CR4A	28/01/2008	03/08/2008	X
Steins Flyby	AST1	04/08/2008	05/10/2008	
Cruise 4-2 (including PC#9)	CR4B	06/10/2008	13/09/2009	X
Earth Swing-by 3 (including PC#10)	EAR3	14/09/2009	13/12/2009	X
Cruise 5 (including PC#12)	CR5	14/12/2009	06/06/2010	X
Lutetia Flyby	AST2	07/06/2010	10/09/2010	
RV Manoeuver 1 (including PC#13)	RVM1	11/09/2010	13/07/2011	X
Cruise 6	CR6	14/07/2011	22/01/2014	
Post Hibernation Commissionning	PHC	09/04/2014	24/04/2014	X
Pre-delivery calibration Science	PDCS	25/04/2014	11/11/2014	X

(1) The last column indicates if CIVA data are available.

After the release of the Lander, we distinguish four phases, characterized by:

- The Start and Stop dates need to be expressed in seconds
- The Lander has its own Auxiliary data

Separation/Descent/Landing	SDL	2014/11/12 08:35:02	2014/11/12 15:34:04	X
Rebounds	RBD	2014/11/12 15:34:05	2014/11/12 17:30:20	
First Science Sequence	FSS	2014/11/12 17:30:21	2014/11/15 01:00:00	X
Long Term Science	LTS	tbd	tbd	tbc

Table 2-1 Mission phases

2.5.6 Documentation

The documentation directory contains the following documents:

- Civa/Rolis IME FM Acceptance Data Package RO-LRS-ADP-3304 Issue 2 / Revision 0
- EAICD (This document)
- CIVA_CALIBRATION_DESC.ASC, description of calibration of CIVA images
- Figures referenced in CIVA_CALIBRATION_DESC.ASC
  - FIG1.PNG - The position and orientation of CIVA-P cameras in the Lander system, +Y view)

- FIG2.PNG - The position and orientation of CIVA-P cameras in the Lander system, +Z view)

- FIG3.PNG - The position and orientation of CIVA-P cameras in the Lander system, global view)

- TIMELINE_ph.TXT, timeline ASCII file for phase ph. The SDL, RBD and FSS mission phases are grouped in a single file, TIMELINE_SDL_RBD_FSS.TXT.
- TIMELINE_ph_DESC.TXT, description of the timeline file for phase ph. For SDL, RBD and FSS mission phases ph is SDL_RBD_FSS
- TIMELINE_ph.PNG, timeline Image file for phase ph. For SDL, RBD and FSS mission phases there are two image files:
  - TIMELINE_SDL_RBD_FSS_1.PNG - Timeline of Philae activities for mission phases SDL, RBD, FSS
  - TIMELINE_SDL_RBD_FSS_2.PNG - Timeline of Philae instrument data for mission phases SDL, RBD, FSS

2.5.7 Derived and other Data Products

A few derived (level 5) products, built at IAS, are delivered for archiving

- Reconstructed panorama of the landing site
- Partial stereoscopic viewing of the landing site
- Reconstructed microscopic images in each visible color for each sample **TBC**
- 3D spectral cube of each sample **TBC**

2.5.8 Ancillary Data Usage

The Lander Auxiliary Data on the comet (Position/Orientation/Illumination at any time + Comet models + Ancillary Data from the instruments) will be available in an ANCDR (Ancillary Data Record) whose definition is in progress, pending the Lander auxiliary data reconstruction.

The ancillary data needed by CIVA are Lander orientation, localisation in space, light source origin, day / night cycle, solar angle for CIVA-P, all relevant information from SD2 for CIVA-M.

.

3 Archive Format and Content

3.1 Format and Conventions

Data processing level number used in CIVA naming scheme conforms to CODMAC norm :

Raw Data (codmac1) : telemetry data with data embedded.
Edited Data (codmac2) : corrected data for telemetry errors and split or decommutated into a data set for a given instrument. Sometimes called Experimental Data Record. Data are also tagged with time and location of acquisition. Corresponds to NASA Level 0 data.
Calibrated Data (codmac 3) : edited data that are still in units produced by instrument, but that have been corrected so that values are expressed in or are proportional to some physical unit such as radiance. No resampling, so edited data can be reconstructed. NASA Level 1A.
Derived Data (codmac 5) : Derived results, as maps, reports, graphics, etc. NASA Levels 2 through 5.

3.1.1 Deliveries and Archive Volume Format

A data set is delivered for each **simple mission phase.** Each data set contains **only one level data processing**.

The list of simple mission phases is given in [AD11].

A data set is level-stamped as below :

- Level 2 when it contains :
  - Raw CIVA-P, CIVA-MI, CIVA-MV Images in .IMG and .QUB files (CODMAC level 2)
  - Browse Images in .jpg files (CODMAC level 2)

- Level 3 when it contains :
  - Calibrated Images (CODMAC level 3)

- Level 5 when it contains :
  - Derived files (CODMAC level 5)

In addition a data set contains :

- Documents (see chapter 3.4.3.6)

A new version is provided when :
- calibration information refining
- new data processing
- higher levels production.

3.1.2 Data Set ID Formation

The following naming formation scheme is used for the data sets :

DATA_SET_ID = <INSTRUMENT_HOST_ID>-<target id>-<INSTRUMENT_ID>-<data processing level number>-<mission phase abbreviation>-<version>

DATA_SET_NAME = <INSTRUMENT_HOST_NAME> <target name> <INSTRUMENT_ID> <data processing level number> <mission phase abbreviation> <version>

See appendix F (16.1.1, 16.1.2) of Archive Plan Issue 2/2.

Examples of DATA_SET_ID and DATA_SET_NAME for CIVA level 3 data obtained from the Comet phase :

DATA_SET_ID = "RL-C-CIVA-3-COM-V1.0"

DATA_SET_NAME= "ROSETTA-LANDER 67P CIVA 3 COM V1.0"

3.1.3 Data Directory Naming Convention

See § 3.4.3

3.1.4 File naming Convention

The following file naming scheme is used :

{**exp**}_{**datatype**}_{**begin of observation**}_{**unit**}_{**sub-unit**}.{**ext**}

- **exp** (4 character) = CIVA
- **datatype** (3 character) = XYZ
  - X = **G** for Ground, **F** for Flight
  - Y = **S** for Science Data,
  - Z = CODMAC level : **2** for raw images, **3** for data calibrated by SONC (from CVP1 to PDCS), **3A** for data calibrated by IAS (stpe1), **3B** for data calibrated by IAS (stpe2), **5** for derived data,
  - **P** for Plots
- **begin of observation** (12 characters) = time of test or working session yymmddhhmnss:
  - yy = year
  - mm = month
  - dd = day
  - hh = hour
  - mn = minute
  - ss = second
- **unit** (decimal number, 1 character)
  - units 1 to 5 = panoramic (mono) cameras
  - units 6, 7 = stereoscopic cameras
  - unit 8 = infrared microscope (M/I)
  - unit 9 = visible microscope (M/V)

- **sub-unit** (hexadecimal number,1 character)
  - for CIVA-P sub-unit is 0
  - for CIVA-M/V sub-unit can be 0, 1 or 2
  - for CIVA-M/I sub-unit can be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C

  See AD5 for details on CIVA sub-units

- **ext** = extension of file. For CIVA the files can be:
  - .IMG raw image data (CODMAC level 2, 3)
  - .QUB raw spectral data (CODMAC level 2, 3)
  - .PNG browse image

Examples:

CIVA-P: CIVA_FS**2**_040414143522_1_0.IMG

This file begins at 2004/04/14 14:35:22 and contains a raw CIVA-P image from mono camera number 1 (unit 1 sub-unit 0)

CIVA-P: CIVA_FS**2P**_040414143522_1_0.PNG
This file is the corresponding browse

CIVA-P: CIVA_FS**3A**_040414143522_1_0.IMG
This file contains the corresponding calibrated (step1) image

CIVA-P: CIVA_FS**3P**_040414143522_1_0.PNG
This file contains the corresponding calibrated (step1) browse image

CIVA-P: CIVA_FS**3B**_040414143522_1_0.IMG
This file contains the corresponding calibrated (step2) image

CIVA-P: CIVA_FS**3P**_040414143522_1_0.PNG
This file contains the corresponding calibrated (step1) browse image

Note that the step (1 or 2) of Level 3 browse images is noted in the label

CIVA-M/V: CIVA_FS2_041110120143_9_0.IMG
This file begins at 2004/11/10 12:01:43 and contains a raw CIVA-MV image from visible microscope (unit 9 sub-unit 0)

CIVA-M/I: CIVA_FS2_041207170536_8_B.QUB
The core of the cube contains the units 1 to B; the dark references 8_0 and 8_C and the HK parameters are contained in the backplane

3.2 Standards Used in Data Product Generation

3.2.1 PDS Standards

The PDS standard for the cubes is that of PDS version 3.6 as described in the document [AD2] (JPL D-7669 part 2)

3.2.2 Time Standards

3.2.2.1 Generalities

This paragraph gives a summary of the different existing formats in the Rosetta Ground segment, from their generation by the instruments to their availability at SONC :

- The Lander CDMS requires the scientific instruments to transmit the data by bursts of 8 or 64 bytes (4 or 32 16-bit words)

- When sufficient data are received, the CDMS builds packets containing 256 bytes of instrument data. The CDMS adds 18 bytes header (unit PID, sequence count, OOBT : Orbiter OBT, data type) and a 2 bytes checksum (DECW) and creates packets with a fixed length of 276 bytes[2]. For transmission

[2] The Lander CDMS header and the headers of the telemetry source packets from the Orbiter instruments are quite similar. There is a difference in the data field header. The byte containing PUS version, checksum flag and spare fields

between Lander and Orbiter, a 4 bytes synchro header and a 2 bytes trailing checksum (PECW) are added, increasing the packet size to 282 bytes. The extra bytes are removed by the ESS.

To comply with ESA requirements, the time registered in the CDMS packets is the **OOBT**. It is reconstituted from the LOBT, as follows shown in Figure 8 :

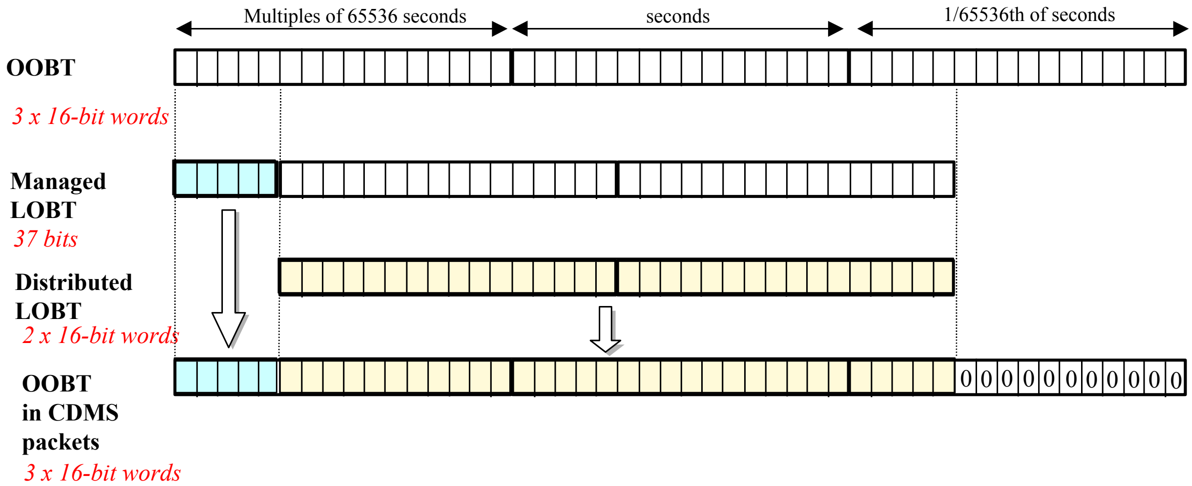

Figure 8 Reconstruction of the on board time in CDMS packets

- The ESS groups together several packets and passes them to the Orbiter OBDH, which transmits them according to the Space/Ground interface. This part is transparent for the Lander ground segment.
- The data are delivered by the Rosetta Data Distribution System (DDS) to the SONC in SFDU format. A SFDU file is basically a collection of 276-byte packets interspersed with auxiliary information records. An 18 bytes SFDU header is added to the CDMS 276-byte packets. This header contains information added at the ground station (time correlated OBT, ground station id, virtual channel id, service channel, type of data, time quality)
- SONC processes the SFDU files to retrieve the 276-byte packets. This format is available in the SONC database.

is set to zero in the CDMS header. Besides the last byte of the OOBT is set to zero in th e CDMS header. The CDMS header has an additional word (2 bytes) after the data field header named "FORMAT ID". This word is mainly used for HK data and it contains the HK scanning period and the SID (structure identification).

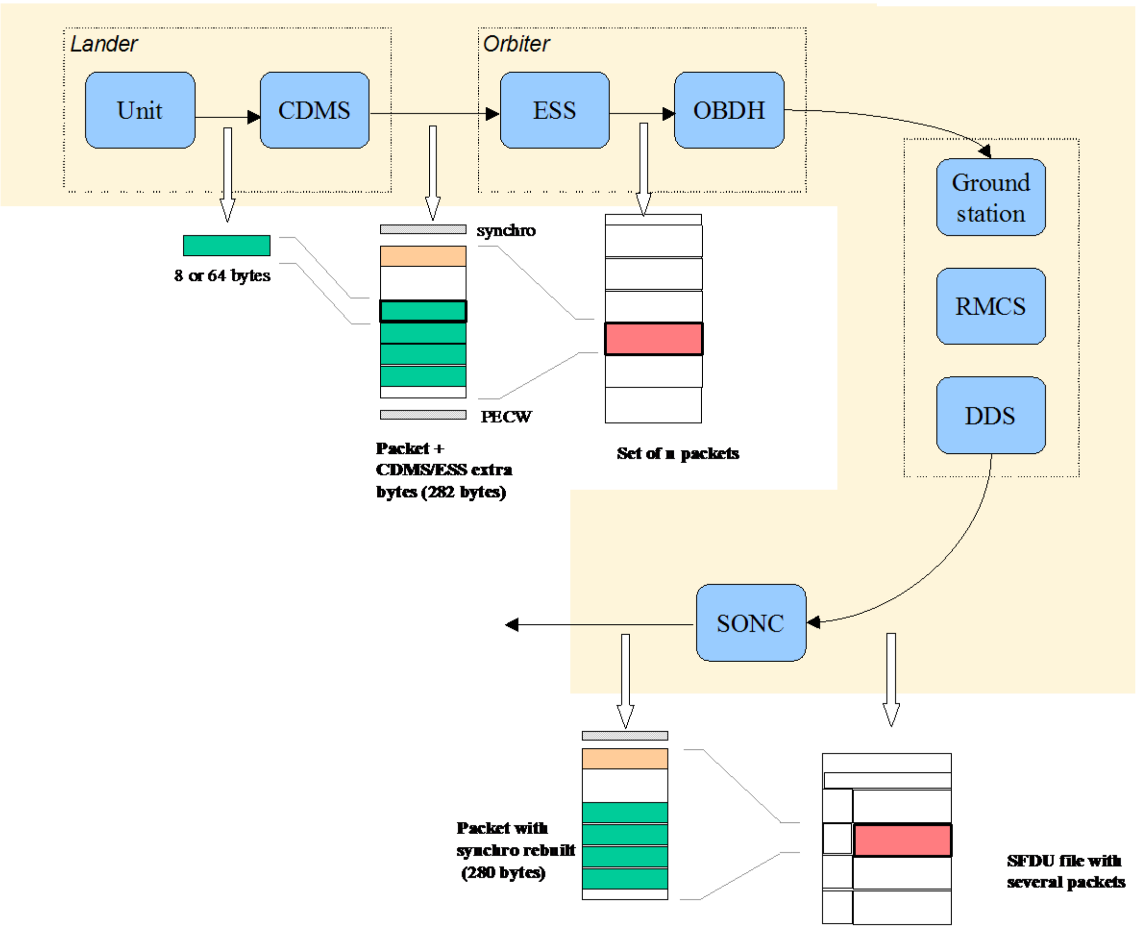

Figure 9 On board data flow

- Afterwards, SONC processes science raw packets in order to recompose the science measurement (e.g. an image, a spectrum, ...).

Figure 9 gives an overview of this data flow.

The following principles are applied :

- the packet wrapping is removed, and science frames that had to be split into several raw data packets are rebuilt. Basic error detection controls are applied, to recover from possible problems in the transmission chain.

- the Lander On-Board time (LOBT) (synchronised with OOBT) extracted from the packet, and corresponding UTC time coming from the SFDU header, are added.

- UTC time is calculated from the On-Board time taking into account the On-Board clock drift as following :
UTC (seconds since 01/01/1970) = LOBT(seconds) * Gradient + Offset (these coefficients are extracted from TCP packets delivered by DDS).
LOBT is either the LOBTextracted from CDMS header or the Experiment internal clock when it exists (CIVA, COSAC, PTOLEMY, ROMAP, ROLIS, SESAME). In the last case, it must be taken into account that the Internal clock (32 bits) resets all 4 years, 4 months, 3 days (first reset : 03/04/2007 10 :42 :07).

UTC time-stamped Science and HK data are available in the SONC database and used to generate PDS format.

3.2.2.2 CIVA Time standards

The time standards used in the CIVA data products are :
- the CIVA on-board time,
- the Lander on-board time,
- the DDS header time correlated,
- the UTC.

3.2.2.2.1 The CIVA On-Board Time

The On-Board time (seconds and fractions of seconds since last switch-on of the spacecraft, nominally after launch) is the only time available to the instrument during operation. It is reset each time a “time” TC is received by ÇIVA. ÇIVA uses a timer to update this time between two successive time TC. The on-board time at generation is written by ÇIVA within each generated data packet

3.2.2.2.2 The Lander On-Board Time (LOBT)

The instruments on board the spacecraft (Orbiter) generate telemetry source packets with an OOBT (orbiter on board time) time stamp in the header.
The OOBT written into the packet header specifies the time, when CDMS can complete a packet.

In terms of HK packets this is the time of the last HK word. Using the HK scanning rate, which is given in word #9 of the packet, one can calculate the OBT of every individual word in this packet. Note that this is only valid if packets with SID (word #9) 1 or 2 are generated. Packets with SID 4 and 5 are "snapshots", which means you can apply the packet OOBT for every word in this packet. SID 3 packets have to be analysed case by case.

In terms of SC packets this is the receiption of the last 32 word block by CDMS, which also completes the SC packet. How often 32 word blocks are created (and sent) by the unit, and corresponding to this the delta time between each block, might be different for each unit. So, re-calculation of OOBT for SC words depends on this unit feature.

The Orbiter On-Board Time (OOBT) is a linear binary counter having a resolution of 1/65536 sec stored in 3 16-bit words.

The Lander On-Board Time (LOBT) is a linear binary counter having a resolution of 1/32 sec, kept in 37 bits. Only the 32 least significant bits are distributed to the instruments, in 2 16-bit words. The 5 most significant bits are supposed constant during most of the mission, they are available through a specific service.
The LOBT is derived from the Orbiter On-Board Time (OOBT) : the 11 least significant bits of the OOBT are discarded to obtain the LOBT, hence the reduced resolution. A re-synchronization between OOBT and LOBT is performed regularly (see [AD6]).
The Lander is synchronized prior to Separation and during every RF link after landing. So, during descent and the First Science Sequence this should not be a problem, since LOBT is kept synchronized as long as the Lander is powered.

Technical details about synchronisation of Lander On-board Time can be found in § 2.3.2.6 [AD6].

For a description of time handling in the Rosetta project see [AD8].
For a description of Lander on board time handling see [AD6] :
§ 2.3.2.6 Synchronisation and Adjustment of Lander On-board Time
§ 2.3.2.6.1 Absolute vs. relative time references
§ 2.3.2.6.2 On-board Time Failure Modes and Recovery Procedures
and [AD7] (§ 6 About Lander On-board Time).

3.2.2.2.3 The DDS header time correlated

The OOBT is converted to UTC (Coordinated Universal Time) by means of time correlation and included in the additional DDS packet header when the packets are distributed via the DDS server.
The **DDS header time correlated** (SCET field in the DDS header) is the UTC of the start of measurement derived from the OOBT by time correlation.

Its format is the Sun Modified Julian Time (MJT) i.e. two 32 bit integers. The first (MSB) contains the number of seconds since 00:00:00 on 1st January 1970 and the second (LSB) integer the number of micro-seconds from seconds in the first field.

Time correlation is described in [AD10] (Appendix 18 § 18.1.2.1).

3.2.2.2.4 The UTC

The **UTC** used as time stamp for SC and HK CIVA data products (from level 2 to level 5) is calculated from the experiment on-board time taking into account the drift and reset clock.

3.2.2.2.5 Spacecraft Clock Count in PDS Labels

The PDS keywords SPACECRAFT_CLOCK_START_COUNT and SPACECRAFT_CLOCK_STOP_COUNT refer to LOBT.
The LOBT is represented in the following format:
SPACECRAFT_CLOCK_START/STOP_COUNT = "<reset number>/<unit seconds>.<fractional seconds>"
The unit seconds and the fractional seconds are separated by the full stop character. **Note that this is not a decimal point.** The fractional seconds are expressed as multiples of 2^{-5} = 0,03125. seconds and count from 0 to 2^{5} -1 = 31. E.g. in SPACECRAFT_CLOCK_START_COUNT = "3/356281394.21" the 21 fractional seconds correspond to 21 × 2^{-5} = 0.65625 decimal seconds.
The reset number is an integer starting at 1, i.e. "1/" means LOBT = 0 at 2003-01-01T00:00:00 UTC.

3.2.3 Cartographic Standards (Reference systems)

TBD

3.3 Data Validation

The CIVA data products are delivered to PSA by SONC. All the levels SC and HK data produced by SONC are validated by CIVA PI. These data are also distributed via the W3-SONC server and used by all the experiment teams.

3.3.1 DATA_QUALITY_ID

The definition of the data quality id is based on the number of corrupted sub-images that appear either in one ÇIVA-P or ÇIVA-M/V image or in one ÇIVA-M/I slice (see [AD5] for definition of sub-image and slice), according to the next criteria :

Number of corrupted sub images	DATA_QUALITY_ID
0	0
1 to 4	1

5 to 16	2
17 to 32	3
33 to 64	4

However, this definition of the DATA_QUALITY_ID is not applicable to the M/I images during the cruise phase since the M/I detectors were not cold enough, all images being thus saturated with dark current. These images are therefore not "scientifically" usable although there are no corrupted sub images.

3.4 Content

3.4.1 Volume Set

One volume corresponds to one data set. The possible values of VOLUME keywords can be found in [AD3]. The volume keyword values for the Mars mission phase are given in the following example.

```
DESCRIPTION          = “This volume contains  CIVA
                        level 2 data products and
                        supporting documentation from the
                        Mars swing by phase of Rosetta
                        mission”
VOLUME_ID            = "RLCIV2_1010"
VOLUME_NAME          = "CIVA RAW DATA FOR THE MARS SWING BY PHASE"
VOLUME_SERIES_NAME   = "ROSETTA SCIENCE ARCHIVE"
VOLUME_SET_ID        = "FR_CNRS_IAS_ROCIV_10XX"
VOLUME_SET_NAME      = "ROSETTA CIVA DATA"
VOLUME_VERSION_ID    = "VERSION 1"
VOLUMES              = "UNK"
VOLUME_FORMAT        = "ISO-9660"
MEDIUM_TYPE          = "ONLINE"
PUBLICATION_DATE     = 2010-01-15
```

3.4.2 Data Set

The CIVA data is archived in as many Data Sets as simple mission phase and level data processing.

Name element	**Data Set ID**	**Data Set Name**
INSTRUMENT_HOST_ID / INSTRUMENT_HOST_NAME	RL (Rosetta Lander)	ROSETTA-LANDER
Target id / target name	See [AD11]	in [AD11]
INSTRUMENT_NAME	CIVA – COMETARY INFRARED AND VISIBLE ANALYSER	
INSTRUMENT_ID	CIVA	
Data processing level number	* Level 2 is delivered directly after the end of the proprietary period and contains level 2 SC and level 3 HK. * Level 3 is delivered after the stabilization of the calibration and contains level 3 SC. * Level 5 is delivered even later and contains the reduced or derived data products.	

mission phase abbreviation	See Table 2-1 Mission phases	
description	N/A	No description.
version	The first version of a data set is V1.0	

3.4.3 Directories

The CIVA archive have the following directory structure :

```
                        |-AAREADME.TXT
                        |-BROWSE-
                        |-CATALOG-
                        |
                        |-DATA---------------- |-CIVAP
                        |                      |               |- MI
                        |                      |-CIVAM--------|
                        |                                      |- MV
|-root directory------ |
                        |
                        |- CALIB-------------- |-CIVAP
                        |
                        |-DOCUMENT-
                        |-INDEX-
                        |-VOLDESC.CAT
```

3.4.3.1 Root Directory

Files in the Root Directory include an overview of the archive, a description of the volume for the PDS Catalog, and a list of errata or comments about the archive. The following files are contained in the Root Directory.

File Name	File Contents
AAREADME.TXT	Volume content and format information
VOLDESC.CAT	A description of the contents of this volume in a PDS format readable by both humans and computers

3.4.3.2 Calibration Directory

Calibration information can be found in the file CIVA_CALIBRATION_DESC.TXT located in the DOCUMENT directory. For CIVAP instrument, calibration parameters described in §2.5.3 are stored in ASCII files in CALIB directory with specific instrument sub-directory (see § 3.4.3).
To be noted that the Calibration made by SONC (for CIVA-P images before landing on the comet) and the one made by IAS (for images on the comet) are different, so the content of the file CIVA_CALIBRATION_DESC.TXT in both cases is different.

3.4.3.3 Catalog Directory

The files in the Catalog Directory provide a top-level understanding of the mission, spacecraft, instruments, and data sets. The files in this directory are coordinated with the PSA team, who is responsible for loading them into the PDS catalog. The following files are found in the Catalog Directory.

File Name	File Contents
CATINFO.TXT	A description of the contents of this directory
DATASET.CAT	Data set information for the PDS catalog
INSTHOST.CAT	Instrument host (spacecraft-lander) information for the PDS catalog
INST.CAT	Instrument information for the PDS catalog
MISSION.CAT	Mission information for the PDS catalog
PERSON.CAT	PDS personnel catalog information about the instrument team responsible for generating the data products. There is one file for each instrument team providing data to this data set.
REF.CAT	Full citations for references mentioned in any and all of the catalog files, or in any associated label files.
SOFTWARE.CAT	Information about the software included in the SOFTWARE directory

3.4.3.4 Index Directory

Files in the Index Directory are provided to help the user locate products on this archive volume and on previously released volumes in the archive.
The following files are contained in the Index Directory:

3.4.3.4.1 Dataset Index File

File Name	File Contents
BROWSE_INDEX.LBL	PDS label for the BROWSE index file BROWSE_INDEX.TAB
BROWSE_INDEX.TAB	Index of the BROWSE directory
INDXINFO.TXT	A description of the contents of this directory
INDEX.TAB	A table listing all data products on this volume
INDEX.LBL	A PDS detached label that describes INDEX.TAB

3.4.3.5 Browse Directory and Browse Files

The browse directory contains plots (JPEG files) that are one to one mapping of the corresponding raw images (.IMG) in the DATA directory.
However during the cruise phase only browse images from the Mars fly-by are archived.
For file naming convention see 3.1.4.
The browse directory contains also the file BROWINFO.TXT which describes the contents of the browse directory.

3.4.3.6 Document Directory

The Document Directory contains documentation to help the user understand and use the archive data. The following files are contained in the Document Directory.

File Name	File Contents
DOCINFO.TXT	A description of the contents of this directory
EAICD_CIVA.PDF	The CIVA Experiment Archive Interface Control Document (this document) as a PDF file.
EAICD_CIVA.LBL	PDS label for EAICD_CIVA.PDF .
CIVAROLIS_IME_ADP.PDF	Civa/Rolis IME Flight Model Acceptance Data Package
CIVAROLIS_IME_ADP.LBL	PDS label for Civa/Rolis IME Flight Model Acceptance Data Package
CIVA_CALIBRATION_DESC.TXT	Description of calibration of civa images
CIVA_CALIBRATION_DESC.LBL	PDS label for CIVA_CALIBRATION_DESC.TXT
FIGx.PNG	Figures used to describe CIVA calibration (x=1,2,3)
TIMELINE_*ph*.TXT	Timeline Ascii file with the PDS label attached for phase *ph*
TIMELINE_*ph*_DESC.TXT	Description of the timeline file for phase *ph*
TIMELINE_*ph_obty*.PNG	Timeline Image file for phase *ph* and observation type *obty*
TIMELINE_*ph_obty*.LBL	PDS label for image TIMELINE_*ph_obty*.PNG

3.4.3.7 Data Directory

The structure and naming scheme of the data directory is described in section 3.4.3.

4 Detailed Interface Specifications

4.1 Structure and Organization Overview

The CIVA data are archived in a data set on the basis of instrument (P, M/V, M/I) and mission phase relative to the production of the data. The DATA directory contains subdirectories corresponding to CIVA P, M/I and M/V instruments. The subdirectories contain:

- raw images (P and M/V file extension IMG) or raw cube (M/I, file extension QUB).
- calibrated images (P and M/V, file extension IMG) or calibrated cube (M/I, file extension QUB).

4.2 Data Sets, Definition and Content

The following table gives the definition of the name and id of the foreseen data sets :

Data Set ID	Data Set Name
RL-CAL-CIVA-2-GRND-V1.0	ROSETTA-LANDER CAL CIVA 2 GRND V1.0
RL-CAL-CIVA-2-CVP-V1.0	ROSETTA-LANDER CAL CIVA 2 CVP V1.0
RL-CAL-CIVA-2-CR2-V1.0	ROSETTA-LANDER CAL CIVA 2 CR2 V1.0
RL-CAL-CIVA-2-CR4A-V1.0	ROSETTA-LANDER CAL CIVA 2 CR4A V1.0
RL-CAL-CIVA-2-CR4B-V1.0	ROSETTA-LANDER CAL CIVA 2 CR4B V1.0
RL-CAL-CIVA-2-CR5-V1.0	ROSETTA-LANDER CAL CIVA 2 CR5 V1.0
RL-CAL-CIVA-2-EAR1-V1.0	ROSETTA-LANDER CAL CIVA 2 EAR1 V1.0
RL-CAL-CIVA-2-EAR2-V1.0	ROSETTA-LANDER CAL CIVA 2 EAR2 V1.0
RL-CAL-CIVA-2-EAR3-V1.0	ROSETTA-LANDER CAL CIVA 2 EAR3 V1.0
RL-M-CIVA-2-MARS-V1.0	ROSETTA-LANDER MARS CIVA 2 MARS V1.0
RL-M-CIVA-3-MARS-V1.0	ROSETTA-LANDER MARS CIVA 3 MARS V1.0
RL-CAL-CIVA-2-RVM1-V1.0	ROSETTA-LANDER CAL CIVA 2 RVM1 V1.0
RL-CAL-CIVA-1-PHC-V1.0	ROSETTA-LANDER 67P CIVA 1 PHC V1.0
RL-CAL-CIVA-1-PDCS-V1.0	ROSETTA-LANDER 67P CIVA 1 PDCS V1.0
RL-C-CIVA-1-SDL-V1.0	ROSETTA-LANDER 67P CIVA 1 SDL V1.0
RL-C-CIVA-1-FSS-V1.0	ROSETTA-LANDER 67P CIVA 1 FSS V1.0
RL-CAL-CIVA-2-PHC-V1.0	ROSETTA-LANDER 67P CIVA 2 PHC V1.0
RL-CAL-CIVA-2-PDCS-V1.0	ROSETTA-LANDER 67P CIVA 2 PDCS V1.0
RL-C-CIVA-2-SDL-V1.0	ROSETTA-LANDER 67P CIVA 2 SDL V1.0
RL-C-CIVA-2-FSS-V1.0	ROSETTA-LANDER 67P CIVA 2 FSS V1.0
RL-CAL-CIVA-3-PHC-V1.0	ROSETTA-LANDER 67P CIVA 3 PHC V1.0
RL-CAL-CIVA-3-PDCS-V1.0	ROSETTA-LANDER 67P CIVA 3 PDCS V1.0
RL-C-CIVA-3-SDL-V1.0	ROSETTA-LANDER 67P CIVA 3 SDL V1.0
RL-C-CIVA-3-FSS-V1.0	ROSETTA-LANDER 67P CIVA 3 FSS V1.0

4.3 Data Product Design

A series of level 2 PDS files is generated for each sub-session and each instrument of ÇIVA, i.e. a series of images performed in the same operational mode as described in section 2. These PDS files contain all the scientific data and auxiliary (housekeeping) data produced by ÇIVA. The PDS label is always included in the file (attached label).

4.3.1 Science level 2 and level 3 data product design

Level 2 contains raw (uncalibrated) CIVA-P, CIVA-M/V images and raw CIVA-M/I spectral cubes. The level 2 products have PDS attached labels. Each image and spectral cube have associated calibrated HK data (embedded table object). The HK parameters with the closest time to the time of the image or spectral cube are selected.

Level 3 contains calibrated and corrected CIVA-P, CIVA-M/V images and calibrated CIVA-M/I spectral cubes. The level 3 PDS labels are similar to level 2 labels. The calibration is described in § 2.5.3

4.3.1.1 File Characteristics Data Elements

PDS data product labels contain data element information that describes important attributes of the physical structure of a data product file. The PDS file characteristic data elements for CIVA science level 2 and 3 data are:

```
RECORD_TYPE
RECORD_BYTES
FILE_RECORDS
LABEL_RECORDS
```

The RECORD_TYPE data element identifies the record characteristics of the data product file. Physical records are always fixed-length. The RECORD_BYTES data element identifies the number of bytes in each physical record in the data product file. Records length is always equal to 512 bytes for CIVA-M/I and 2048 bytes for CIVA-P and CIVA-M/V. The FILE_RECORDS data element identifies the number of physical records in the file. The LABEL_RECORDS data element identifies the number of physical records that make up the PDS product label.

4.3.1.2 Data Object Pointers Identification Data Elements

The CIVA labels refer to two different data objects: IMAGE (file extension IMG) for P and M/V and QUBE (file extension QUB) for M/I. The beginning of the data object is specified by pointers. The data object pointer takes the following form:

> `^IMAGE = n` for the CIVA-P and CIVA-M/V images
> `^QUBE = n` for the CIVA-M/I spectral cubes
> `^TABLE = n` for the housekeeping parameters table associated to CIVA-P and CIVA-M/I images and to CIVA-M/I cubes

where n represents the starting record number (of image or qube) within the file (first record is numbered 1),

4.3.1.3 Instrument and Detector Descriptive Data Elements

The following data identification elements provide additional information about the ÇIVA data products.

```
INSTRUMENT_HOST_NAME             = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID               = RL
INSTRUMENT_ID                    = CIVA
INSTRUMENT_NAME                  = "CIVA - COMETARY INFRARED AND VISIBLE ANALYSER"
INSTRUMENT_TYPE                  = {"IMAGING CAMERA", "IMAGING SPECTROMETER",
                                    "INFRARED SPECTROMETER"}
^INSTRUMENT_CALIBRATION_DESC     = "CIVA_CALIBRATION_DESC.TXT"
```

The following data elements contain information on the operating mode of CIVA.

```
COMMAND_NAME
COMMAND_DESC
```

`COMMAND_DESC` indicates the series of hexadecimal commands which were sent to CIVA for this particular data product. They control the operational modes given by the following keywords:

```
INSTRUMENT_MODE_ID
EXPOSURE_DURATION
INST_CMPRS_NAME
INST_CMPRS_RATE
GAIN_NUMBER
FOCAL_PLANE_TEMPERATURE
```

The `INSTRUMENT_MODE_ID` is

- for CIVA-P a list of 7 integer values corresponding to 5 mono cameras (1 to 5) and 1 stereo camera (6 and 7) with the following meaning for each element: 0, instrument off, 1, fixed exposure time, 2, automatic exposure time
- for CIVA-M/V a list of 3 integer values corresponding to the infra red, green and red cameras (in that order) with the following meaning for each element: 1, fixed exposure time, 2, automatic exposure time
- for CIVA-M/I a list of 11 integer values for 11 CIVA-MI sub-cycles with the following meaning for each element: 0, instrument is off, 64 or 89 number of spectral positions.

The `GAIN_NUMBER` is a list of integers containing 3 elements for CIVA-M/V, 7 elements for CIVA-M/P and 11 elements for CIVA-M/I. The GAIN_NUMBER parameter is controlled by telecommand and determines the analog gain G of the analog to digital converter associated to each camera according to the following formula: G = 4/(1+3*(15-GAIN_NUMBER)/15. It takes values from 0 to 15.

The `EXPOSURE_DURATION` is a list of integer values representing the exposure time for each CIVA-P and CIVA-M/V image or CIVA-M/I sub-unit.
For CIVA-P and CIVA-M/V the exposure time is given in milliseconds. For CIVA-M/I, 15 integer element list with 4 times corresponding to the calibration images and 11 times corresponding to the CIVA-M/I sub-units.

The `FOCAL_PLANE_TEMPERATURE` is a list of real values defined as follows:

- For CIVA-P list of 11 elements corresponding to the following
  - 5 for the mono cameras (P1 to P5) and 1 for the stereo camera (P6) present in the CIVA HK TM packets
  - 4 temperatures from the Thermal Control Unit for the P1 and P4 camera cubes (TCU main data) and for the P2 and P5 camera cubes (TCU Redundant data)
- For CIVA-M/V
  - 2 CIVA-M/V camera temperatures (CCD detector within the CIVA HK TM packets and camera cube within the TCU Main data)
- For CIVA-M/I
  - 2 CIVA-M/I detector temperatures sampled during the calibration sub-units, e.g. 8_0 for the first one and 8_2 up to 8_C for the last one depending on the number of spectral sub-cycles (both data are part of the CIVA HK TM packets)

`INST_CMPRS_NAME` indicates which of the 3 types of compression was used for the data: NONE (N/A or bit-packing), REVERSIBLE or WAVELET. The INST_CMPRS_RATE indicates the compression factor with respect to the 10 bits (ÇIVA-P and ÇIVA-M/V) or 12 bits (ÇIVA-M/I) resolutions. It is a list of 7 real values for CIVA-P, 3 real values for CIVA-M/V and one real value for CIVA-M/I. The REVERSIBLE type means a compression without data loss (Huffman type). The compression rate is not known a priori and is set to "N/A" (although it can be computed a posteriori). The WAVELET type is compression with data loss. The compression rate is known a priori since it is an input parameter to the compression algorithm.
The possible values should be the following:

CIVA-P

```
INST_CMPRS_NAME      = "N/A"
INST_CMPRS_RATE      = "1"
```
or
```
INST_CMPRS_NAME      = "REVERSIBLE"
INST_CMPRS_RATE      = "N/A"
```
or
```
INST_CMPRS_NAME      = "WAVELET"
INST_CMPRS_RATE      = (cmprsP1,cmprsP2,cmprsP3,cmprsP4,cmprsP5,cmprsP6,cmprsP7)with
                       cmprsPx expressed as multiples of 0.01
```

CIVA-MV

```
INST_CMPRS_NAME     = "N/A"
INST_CMPRS_RATE     = "1"
```
or
```
INST_CMPRS_NAME     = "REVERSIBLE"
INST_CMPRS_RATE     = "N/A"
```
or
```
INST_CMPRS_NAME     = "WAVELET"
INST_CMPRS_RATE     = (cmprsMVIR,cmprsMVGreen,cmprsMVRed) with cmprsMVx expressed as
                      multiples of 0.01
```

CIVA-MI

```
INST_CMPRS_NAME     = "N/A"
INST_CMPRS_RATE     = "1"
```
or
```
INST_CMPRS_NAME     = "REVERSIBLE"
INST_CMPRS_RATE     = "N/A"
```
or
```
INST_CMPRS_NAME     = "WAVELET"
INST_CMPRS_RATE= (cmprsMI) with cmprsMI expressed as multiple of 0.01
```

4.3.1.4 Data Object Definition

Eleven types of scientific files can be generated by ÇIVA, seven for the ÇIVA-P images, three for the ÇIVA-M/V images, one for ÇIVA-M/I spectral and calibration images. The data product has three different PDS labels. Examples of PDS files are given in annex B for each type of label.

4.3.1.4.1 ÇIVA-P Data object definition

The data object for ÇIVA-P is IMAGE which gathers 1024x1024 pixels, 16 bits/pixel (Figure 4.1) associated to an engineering table (TABLE object) with the accounted Housekeeping data.

The following characteristics specific to ÇIVA-P are included in the label:

- the observation period
- the Lander attitude
- the set of hexadecimal commands which control the observation parameters of the camera:
    - number of cleanings or exposure number
    - exposure time
    - compression mode
    - gain setting or gain number
- the representative temperatures of the camera

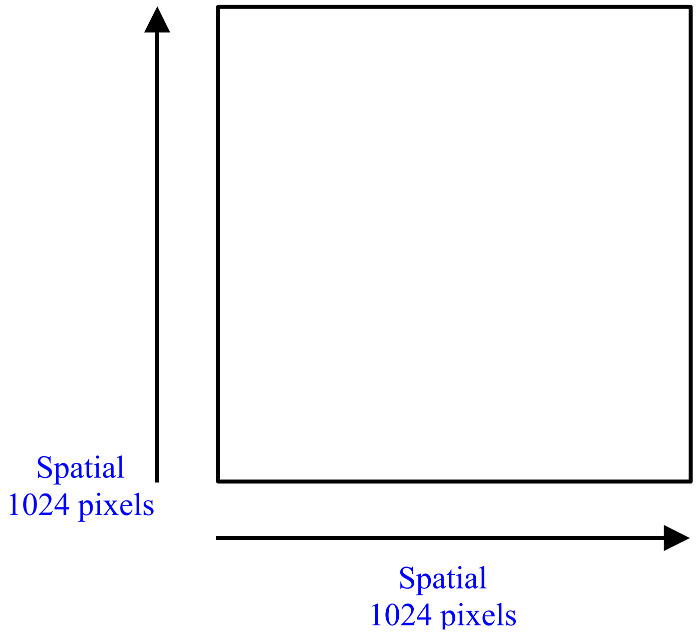

Figure 4-1: Conceptual view of the ÇIVA-P and ÇIVA-M/V science data

The engineering table (TABLE object) associated to each ÇIVA-P image contains the following data:

- temperatures are expressed in Kelvin
- voltages are expressed in Volt
- currents are expressed in Ampere

The ÇIVA-P housekeeping data are monitored by four different sub-systems, both ÇIVA and ROLIS (ÇIVA/ROLIS), the Main Thermal Control Unit (TCU-M), the Redundant Thermal Control Unit (TCU-R) and the Orbiter (APID20). The following table lists the corresponding parameters, their origin and their initial source. Note that the temperature measurements are made by fully independent thermal sensors which are located at different places, e.g. at the back of the CCD detectors for camera sensors 1 and inside the electronics cube for cameras sensors 2.

Description of HK parameter	Origin (type of TM)	Source
Temperature of ÇIVA-P1	ÇIVA/ROLIS, HK#1, TSC1	Camera thermal sensor 1
Temperature of ÇIVA-P2	ÇIVA/ROLIS, HK#2, TSC2	Camera thermal sensor 1
Temperature of ÇIVA-P3	ÇIVA/ROLIS, HK#3, TSC3	Camera thermal sensor 1
Temperature of ÇIVA-P4	ÇIVA/ROLIS, HK#4, TSC4	Camera thermal sensor 1
Temperature of ÇIVA-P5	ÇIVA/ROLIS, HK#5, TSC5	Camera thermal sensor 1
Temperature of ÇIVA-P6	ÇIVA/ROLIS, HK#6, TSC6	Camera thermal sensor 1
Current of +5.2V power line	ÇIVA/ROLIS, HK#14, HKI+5.2V	Current on the PSS +5.2V line
Voltage of A+5V power line	ÇIVA/ROLIS, HK#15, U5P_A	Voltage on the +5.2V line (Civa and Rolis)
Temperature of ÇIVA-P1	TCU-M, TCM_Civa_P1	Camera thermal sensor 2
Temperature of ÇIVA-P2	TCU-R, TCR_Civa_P2	Camera thermal sensor 2
Temperature of ÇIVA-P4	TCU-M, TCM_Civa_P4	Camera thermal sensor 2
Temperature of ÇIVA-P5	TCU-R, TCR_Civa_P5	Camera thermal sensor 2
Temperature of ÇIVA-P Stereo	APID20, ORB_Civa_St_Temperature	Camera support thermal sensor

Start time of the ÇIVA-P6	ÇIVA/ROLIS	ÇIVA-CE status (CIVA central electronics inside IME)
Number of interrupts for ÇIVA-P6	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P6	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P7	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P7	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P7	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P1	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P1	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P1	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P2	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P2	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P2	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P3	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P3	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P3	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P4	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P4	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P4	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-P5	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-P5	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-P5	ÇIVA/ROLIS	ÇIVA-CE status

4.3.1.4.2 ÇIVA-M/V Data object definition

The data object for ÇIVA-M/V is an IMAGE which gathers 1024x1024 pixels (same as ÇIVA-P), see Figure 1) associated to an engineering table (TABLE object) with the accounted Housekeeping data. The images are coded as 16 bits integers (MSB signed).

The following characteristics specific to ÇIVA-M/V are included in the label:

- the observation period
- the SD2 Oven number aligned to ÇIVA-M/V, the drilling depth and the volume of the sample
- the set of hexadecimal commands which control the observation parameters of the camera:
    - number of cleanings or exposure number
    - exposure time
    - compression mode
    - gain setting or gain number
- the representative temperatures of the camera
- the temperatures of the optics

The engineering table associated to each ÇIVA-M/V image contains the following data listed in the next table (all analog values are expressed as a 32 bits signed integer):

- temperatures are expressed in Kelvin
- voltages are expressed in Volt.
- currents are expressed in Ampere.

The ÇIVA-M/V housekeeping data are monitored by four different sub-systems, both ÇIVA and ROLIS (ÇIVA/ROLIS), the Main Thermal Control Unit (TCU-M), the Redundant Thermal Control Unit (TCU-R) and the Orbiter (APID20). The following table lists the corresponding parameters, their origin and their initial source. Note that the temperature measurements are made by fully independent thermal sensors which are located at different places, e.g. at the back of the CCD detectors for camera sensor 1 and inside the electronics cube for camera sensor 2.

Description of HK parameter	Origin (type of TM)	Source
Temperature of ÇIVA-M/V detector	ÇIVA/ROLIS, HK#7, TSC8	Camera thermal sensor 1
Temperature of ÇIVA-M/V optics	ÇIVA/ROLIS, HK#11, TSC11	Optics thermal sensor 1
Current of +5.2V power line	ÇIVA/ROLIS, HK#14, HKI+5.2V	Current on the PSS +5.2V line
Voltage of A+5V power line	ÇIVA/ROLIS, HK#15, U5P_A	Voltage on the +5.2V line (Civa and Rolis)
Temperature of ÇIVA-M/V detector	TCU-M, TCM_Civa_M	Camera thermal sensor 2
Temperature of ÇIVA-M/V optics	TCU-R, TCR_Civa_M	Optics thermal sensor 2
Start time of the ÇIVA-M/V IR	ÇIVA/ROLIS	ÇIVA-CE status (CIVA central electronics inside IME)
Number of interrupts for ÇIVA-M/V IR	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-M/V IR	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-M/V Green	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-M/V Green	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-M/V Green	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-M/V Red	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-M/V Red	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-M/V Red	ÇIVA/ROLIS	ÇIVA-CE status

4.3.1.4.3 ÇIVA-M/I Data object definition

The data object for ÇIVA-M/I is a QUBE with the following basic format:

- X dimension: spatial sample (128 pixels)
- Y dimension: spatial sample (96 pixels)
- Z dimension: spectral (rank of the spectral band from 64 to 752)

The following characteristics specific to ÇIVA-M/I are included in the label:

- the observation period
- the SD2 Oven number aligned to ÇIVA-M/I, the drilling depth and the volume of the sample
- the set of hexadecimal commands which control the observation parameters of the camera:
  - exposure time for each sub-cycle
  - compression mode
  - measurement settings for the ÇIVA-M/I detector
  - power level for the ÇIVA-M/I light source
  - number of spectral scans for ÇIVA-M/I
- the representative temperatures of the camera
- the temperatures of the optics

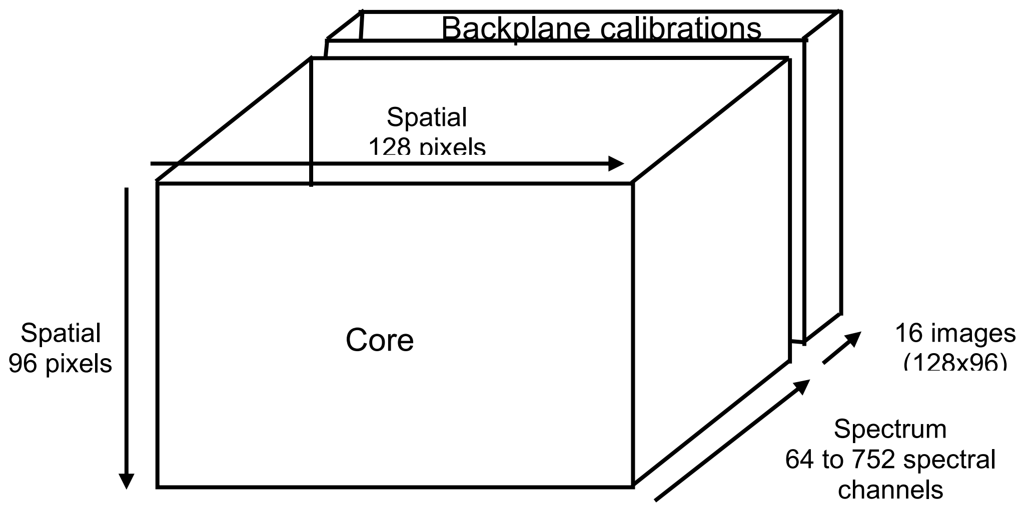

Figure 4-2: Conceptual view of the ÇIVA-M/I spectral and calibration data

The data QUBE for ÇIVA-M/I does not fulfill ISIS standards. The binary data is constituted of one cube of up to 752 images of 128x96 pixels, one image corresponding to one specific spectral channel plus 16 back planes with 128x96 pixels calibration images. The cube core data are coded as 16 bits signed integers (LSB_INTEGER) and the 16 back planes are coded as 32 signed bits integers (LSB_INTEGER)

Keyword	Definition	Typical value
AXES	Dimension of the qube	3
AXIS_NAME	Names of axes	(SAMPLE,LINE,BAND)
CORE_ITEMS	Core dimensions of axes	(128,96,752*) * maximum
CORE_NAME	Name of value stored in core	RAW_DATA_NUMBER
CORE_ITEM_BYTES	Core element size	2
CORE_ITEM_TYPE	Core element type	LSB_INTEGER
CORE_BASE	Base value item scaling*	0.0
CORE_MULTIPLIER	Multiplier for core item scaling*	1.0
CORE_UNIT	Unit of core values	DIMENSIONLESS
CORE_NULL	Special value indicating 'invalid' data	"NULL"
CORE_VALID_MINIMUM	Minimum valid core value	"NULL"
CORE_LOW_REPR_SATURATION	Special value indicating representation saturation at low end**	-32768
CORE_LOW_INSTR_SATURATION	Special value indicating instrument saturation at low end**	-32768
CORE_HIGH_REPR_SATURATION	Special value indicating representation saturation at high end**	32767
CORE_HIGH_INSTR_SATURATION	Special value indicating instrument saturation at high end**	32767
SUFFIX_BYTES	Storage allocation for suffix elements	4
SUFFIX_ITEMS	Suffix dimensions of axes	(1,0,0)

* *true* value = base + multiplier * *stored* value
** These keywords are required but not applicable in the case of the geometry data qube

Table 4-1: Data Qube Keywords Definition.

Four calibration images are made to measure the dark current with the lamp off, then with the lamp on and the filter off (eight images 128 x 96 in total) for each of the four selected integration times (tmin * 1,2,5,12), before the scan begins. After the return scan, the filter is off, and four acquisitions are performed with the lamp on, then with the lamp off, for each of the four selected integration times (tmin * 1,2,5,12). The image corresponding to "lamp-on, filter off" with the same integration time before the beginning of the scan is substracted from each image of the sub-scan if dark current substraction is requested (sub_flag field in word 26). That process induces a total of 16 images, 8 images before and 8 images after the spectral scan. They are numbered from #1 to #8 and the corresponding data are put in the following manner in the 16 back planes.

1st back plane: Calibration begin, image #1
2nd back plane: Calibration begin, image #2
3rd back plane: Calibration begin, image #3
4th back plane: Calibration begin, image #4

5th back plane: Calibration begin, image #5
6th back plane: Calibration begin, image #6
7th back plane: Calibration begin, image #7
8th back plane: Calibration begin, image #8

9th back plane: Calibration end, image #1
10th back plane: Calibration end, image #2
11th back plane: Calibration end, image #3
12th back plane: Calibration end, image #4
13th back plane: Calibration end, image #5
14th back plane: Calibration end, image #6
15th back plane: Calibration end, image #7
16th back plane: Calibration end, image #8

The definition of BAND_SUFFIX keywords is given in table .

Keyword	Definition	Typical value
BAND_SUFFIX_NAME	Band suffix name	“CALIBRATION IMAGES”
BAND_SUFFIX_UNIT	Names of axes	"N/A"
BAND_SUFFIX_ITEM_BYTES	Suffix item size	4
BAND_SUFFIX_ITEM_TYPE	Suffix item type	LSB_INTEGER
BAND_SUFFIX_BASE	Base value of suffix item scaling	0.0
BAND_SUFFIX_MULTIPLIER	Multiplier for suffix item scaling	1.0
BAND_SUFFIX_VALID_MINIMUM	Minimum valid suffix value	"N/A"
BAND_SUFFIX_NULL	Null value of the suffix items (indicates missing data)	"N/A"
BAND_SUFFIX_LOW_REPR_SAT	Low representation saturation values of the suffix items (indicates the true value cannot be represented in the chosen data type and length, in this case being below the allowable range)	-32768
BAND_SUFFIX_LOW_INSTR_SAT	Low instrument saturation values (indicates the measuring instrument was saturated at the low end)	-32768
BAND_SUFFIX_HIGH_REPR_SAT	High representation saturation of the suffix items values (indicates the true value cannot be represented in the chosen data type and length, in this case being above the allowable range)	32767
BAND_SUFFIX_HIGH_INSTR_SAT	high instrument saturation values of the suffix items (indicates the measuring instrument was saturated at the high end)	32767

The HK TABLE associated to the ÇIVA-M/I cube contents the data listed in the next table:

- temperatures are expressed in Kelvin
- voltages are expressed in Volt.
- currents are expressed in Ampere.

The ÇIVA-M/I housekeeping data are monitored by four different sub-systems, both ÇIVA and ROLIS (ÇIVA/ROLIS), the Main Thermal Control Unit (TCU-M), the Redundant Thermal Control Unit (TCU-R) and the Orbiter (APID20). The following table lists the corresponding parameters, their origin and their initial source. Note that the MID card is associated to the infrared detector.

Description of HK parameter	Origin (type of TM)	Source
UTC_TIME	ÇIVA/ROLIS, HK CDMS header	OOBT, origin 01/01/2003 00h
Temperature of ÇIVA-M/I mechanism	ÇIVA/ROLIS, HK#9, TSC9	Grating Mechanism thermal sensor
Temperature of ÇIVA-M/I optics	ÇIVA/ROLIS, HK#9, TSC10	Optics thermal sensor
Current of +5.2V power line	ÇIVA/ROLIS, HK#14, HKI+5.2V	Current on the PSS +5.2V line
Voltage of A+5V power line	ÇIVA/ROLIS, HK#15, U5P_A	Voltage on the +5.2V line (Civa and Rolis)
Lamp level	ÇIVA/ROLIS	ÇIVA-CE (CIVA central electronics inside IME) command status
ÇIVA-M/I detector gain parameter	ÇIVA/ROLIS	ÇIVA-CE command status
Start time of the ÇIVA-M/I Calibration begin	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-M/I Calibration begin	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-M/I Calibration begin 1	ÇIVA/ROLIS	ÇIVA-CE status
TestB parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID TestB	ÇIVA-CE status (MID - Microscope Infrared detector card)
DeadPot parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID DeadPot	ÇIVA-CE status (MID card)
ABAMPHI parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID ABAMPHI	ÇIVA-CE status (MID card)
Vref parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID Vref	ÇIVA-CE status (MID card)
Temperature of the ÇIVA-M/I FPA	ÇIVA/ROLIS, ÇIVA-MID Temp	ÇIVA-CE status (MID card)
DIGATE parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID DIGATE	ÇIVA-CE status (MID card)
Number of steps in the reference search	ÇIVA/ROLIS	ÇIVA-CE status
Number of steps in the reference search after retry	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the second ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the second ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the second ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the third ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the third ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the third ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the fourth ÇIVA-M/I	ÇIVA/ROLIS	ÇIVA-CE status

sub-cycle		
Number of interrupts for the fourth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the fourth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the fifth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the fifth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the fifth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the sixth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the sixth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the sixth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the seventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the seventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the seventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the eighth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the eighth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the eighth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ninth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the ninth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the ninth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the tenth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the tenth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the tenth ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the eleventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for the eleventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for the eleventh ÇIVA-M/I sub-cycle	ÇIVA/ROLIS	ÇIVA-CE status
Start time of the ÇIVA-M/I Calibration end	ÇIVA/ROLIS	ÇIVA-CE status
Number of interrupts for ÇIVA-M/I Calibration end	ÇIVA/ROLIS	ÇIVA-CE status
Exposure time for ÇIVA-M/I Calibration end	ÇIVA/ROLIS	ÇIVA-CE status
TestB parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID TestB	ÇIVA-CE status (MID card)
DeadPot parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID DeadPot	ÇIVA-CE status (MID card)
ABAMPHI parameter for ÇIVA-	ÇIVA/ROLIS, ÇIVA-MID	ÇIVA-CE status (MID card)

M/I	ABAMPHI	
Vref parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID Vref	ÇIVA-CE status (MID card)
Temperature of the ÇIVA-M/I FPA	ÇIVA/ROLIS, ÇIVA-MID Temp	ÇIVA-CE status (MID card)
DIGATE parameter for ÇIVA-M/I	ÇIVA/ROLIS, ÇIVA-MID DIGATE	ÇIVA-CE status (MID card)
Number of steps in the last reference search	ÇIVA/ROLIS	ÇIVA-CE status
Number of steps in the last reference search after retry	ÇIVA/ROLIS	ÇIVA-CE status

4.3.1.5 Description of Instrument

The description of the instrument is done in [AD5] and as a brief overview in the INST.CAT catalog file.

4.3.1.6 Mission Specific Keywords

4.3.1.6.1 Instrument Specific Keywords

ROSETTA : CIVA_CLEANING_NUMBER
- **Type** : integer from 0 to 10
- **Standard values** : from 0 to 2
- **Description** : number of images that are taken with the ÇIVA-P and ÇIVA-M/V cameras in order to clean-up the CCD detectors before the transmission of the effective one

ROSETTA:SPECTROMETER_TEMPERATURE

- **Type** : list of 2 real values
- **Standard values** : N/A
- **Description** : The SPECTROMETER_TEMPERATURE is a list of real values representing applicable to CIVA-M:

- For CIVA-M/V: 2 temperatures (unit K) of the optical box, one within the CIVA HK packets and one within the TCU Redundant data
- For CIVA-M/I: 2 temperatures (unit K), the one of the grating mechanism within the CIVA HK packets and the one of the optical box within the TCU Redundant data

4.3.1.6.2 Sample Tracking Specific Keywords

These keywords have been defined to track the cometary material drilled and distributed by SD2 system. They are N/A during the cruise. They are encountered in case of CIVA-M :

ROSETTA : SD2_OVEN_FILLING
- **Type:** character
- **Standard values:** "YES" or "NO"
- **Description:** filling conditions of the pictured oven as deduced from the SD2 data

ROSETTA : SD2_DRILL_DEPTH
- **Type**: real, unit mm
- **Standard values**: refer to SD2 data (or missing value)
- **Description:** depth of the drilling process as deduced from the SD2 data

ROSETTA : SD2_OVEN_NUMBER
- **Type:** integer
- **Standard values:** 1 to 26

- **Description:** number of the oven filled by the SD2 system

ROSETTA : SD2_OVEN_TYPE
- **Type:** character
- **Standard values**: "MTO" or "HTO"
- **Description:** type of the oven filled by the SD2 system (Medium Temperature Oven or High Temperature Oven)

ROSETTA : SAMPLE_TAPPING
- **Type:** character
- **Standard values:** "YES" or "NO" or “N/A”
- **Description:** tapping conditions of the pictured oven as deduced from the PTOLEMY or COSAC data

ROSETTA : SAMPLE_NUMBER
- **Type:** integer
- **Standard values**: 1, 2,…or missing value
- **Description:** number of number of sample (1 for the first sample of the mission and n+1 for the following ones)

ROSETTA : SAMPLE_VOLUME
- **Type:** real, mm3
- **Standard values**: from Volume Checker
- **Description:** amount of sample discharged into the oven from the Volume Checker data

4.3.2 Science level 5 data product design

See § 2.5.7

5 Appendix A: Available Software to read PDS files

Housekeeping and science PDS files can be read with the PDS table verifier tool “tbtool” and readpds (Small Bodies Node tool). Furthermore, “NasaView” software is used to read images.

6 Appendix B: Example of PDS attached label of a ÇIVA-P level 2 data product

```
PDS_VERSION_ID               = PDS3
LABEL_REVISION_NOTE  = "2007-07-16, SONC, Version 1.0"
/* PVV version 3.6 */

/*              Raw Images (Level 2)               */

/* IDENTIFICATION & DESCRIPTIVE DATA ELEMENTS */
/* FILE CHARACTERISTIC DATA ELEMENTS */

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 2048
FILE_RECORDS         = 1035
LABEL_RECORDS        = 10


/* DATA OBJECT POINTERS  */

^TABLE = 11
^IMAGE = 12


DATA_SET_ID     = "RL-M-CIVA-2-MARS-V1.0"
DATA_SET_NAME   = "ROSETTA-LANDER MARS CIVA 2 MARS V1.0"
PI_PDS_USER_ID   = BIBRING
PRODUCT_ID      = "CIVA_FS2_061208013011_1_0"
PRODUCT_CREATION_TIME  = 2011-01-11T18:27:07
PROCESSING_LEVEL_ID = "2"

MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME     = "MARS SWING-BY"
MISSION_ID             = ROSETTA
INSTRUMENT_HOST_NAME   = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID     = RL
OBSERVATION_TYPE    = "ACTIVE CHECKOUT 4"

PRODUCT_TYPE         = EDR
START_TIME           = 2006-12-08T01:30:11.287
STOP_TIME            = 2006-12-08T01:30:11.287
SPACECRAFT_CLOCK_START_COUNT = "1/124162183.17"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/124162183.17"

PRODUCER_ID          = "SONC"
PRODUCER_FULL_NAME   = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID        = CIVA
INSTRUMENT_NAME      = "CIVA - COMETARY INFRARED AND VISIBLE ANALYSER"
INSTRUMENT_TYPE      = {"IMAGING CAMERA", "IMAGING SPECTROMETER",
                        "INFRARED SPECTROMETER"}
TARGET_NAME          = "MARS"
TARGET_TYPE          = "PLANET"

^INSTRUMENT_CALIBRATION_DESC = "CIVA_CALIBRATION_DESC.TXT"

DATA_QUALITY_ID   = "-1"
DATA_QUALITY_DESC = "-1 : NOT QUALIFIED"
```

```
/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = (  126809671.7,  99784274.9,  47043004.6)
/* TARGET PARAMETERS: Position <km>, Velocity <km/s> */
SC_TARGET_POSITION_VECTOR = (  -15400833.6, -67324857.4, -25763220.3)
SC_TARGET_VELOCITY_VECTOR = (          5.4,        12.9,         5.3)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =    73709327.4 <km>
SUB_SPACECRAFT_LATITUDE =     0.04 <deg>
SUB_SPACECRAFT_LONGITUDE =    43.50 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the EMEJ2000 reference frame.
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <km/s>, Angles in <deg>"




/* DATA OBJECT DEFINITION  */

INSTRUMENT_MODE_ID = ("1","1","1","1","1","1","1")

INSTRUMENT_MODE_DESC = "For CIVA-P the INSTRUMENT_MODE_ID is a list of
                        integers representing the operating
                        conditions of each of the 7 cameras, i.e.
                        0=off, 1=fixed exposure time, 2=automatic
                        exposure time"

/* set of commands */
COMMAND_NAME = "CIVA_NOMINAL"
COMMAND_DESC = "0000CF4D 07070001 001FFFFF 1098CC4A 1098CC4A
                1098CC4A 1098CC4A 1098CC4A 1098CC4A 1098CC4A
                3E18CC4A FF18CC4A 3E18CC4A 226066D7 B9FE402B
                012AAA55"

/* instrument status */
CHANNEL_ID              = "P"
EXPOSURE_DURATION = (512,512,512,512,512,512,512)
/* EXPOSURE_DURATION_DESC = "list of exposure times :  */
/*                             CIVA-P1,CIVA-P2,CIVA-P3,CIVA-P4,CIVA-P5,*/
/*                             CIVA-P6,CIVA-P7"*/

EXPOSURE_COUNT  = 7
IMAGE_TIME      = 2006-12-08T01:30:11.287
INST_CMPRS_NAME = "WAVELET"
INST_CMPRS_RATE = (1.50,1.50,1.50,1.50,1.50,1.50,1.50)
GAIN_NUMBER = (10,10,10,10,10,10,10)
ROSETTA:CIVA_CLEANING_NUMBER    = 0
FOCAL_PLANE_TEMPERATURE = (197.63,999.99,191.44,187.28,191.83,191.51,
                          999.99,195.13,191.18,187.11,185.88)
/*FOCAL_PLANE_TEMPERATURE_DESC = "list of temperatures:  */
/*                                   TSC1,TCM_Civa_P1,TSC2,TCR_Civa_P2,*/
/*                                   TSC3,TSC4,TCM_Civa_P4,TSC5,*/
/*                                   TCR_Civa_P5,TSC6,*/
/*                                   ORB_Civa_Stereo_Temp"*/
```

```
/* DESCRIPTION OF OBJECTS CONTAINED IN FILE */

OBJECT                   = TABLE
   NAME                  = "HK_TABLE"
   INTERCHANGE_FORMAT    = ASCII
   ROWS                  = 1
   COLUMNS               = 35
   ROW_BYTES             = 345

OBJECT                  = COLUMN
   NAME                  = "UTC_TIME"
   DATA_TYPE             = TIME
   START_BYTE            = 1
   BYTES                 = 23
   DESCRIPTION           = "This column represents the UTC Time"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC1"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 25
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P1 camera detector"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC2"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 32
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P2 camera detector"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC3"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 39
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P3 camera detector"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC4"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 46
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P4 camera detector"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC5"
```

```
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 53
   BYTES                  = 6
   UNIT                   = "KELVIN"
   FORMAT                 = "F6.2"
   DESCRIPTION            = "Temperature of the CIVA-P5 camera detector"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "TSC6"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 60
   BYTES                  = 6
   UNIT                   = "KELVIN"
   FORMAT                 = "F6.2"
   DESCRIPTION            = "Temperature of the CIVA-P6 camera detector"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "HKI+5.2V"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 67
   BYTES                  = 5
   UNIT                   = "AMPERE"
   FORMAT                 = "F5.3"
   DESCRIPTION            = "Current of the +5.2V power line"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "U5P_A"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 73
   BYTES                  = 5
   UNIT                   = "VOLT"
   FORMAT                 = "F5.3"
   DESCRIPTION            = "CIVA_MV_detector_tre"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "TCM_CIVA_P1"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 79
   BYTES                  = 6
   UNIT                   = "KELVIN"
   FORMAT                 = "F6.2"
   DESCRIPTION            = "Temperature of the CIVA-P1 camera cube"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "TCR_CIVA_P2"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 86
   BYTES                  = 6
   UNIT                   = "KELVIN"
   FORMAT                 = "F6.2"
   DESCRIPTION            = "Temperature of the CIVA-P2 camera cube"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "TCM_CIVA_P4"
   DATA_TYPE              = ASCII_REAL
```

```
   START_BYTE            = 93
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P4 camera cube"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TCR_CIVA_P5"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 100
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-P5 camera cube"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "ORB_CIVA_STEREO_TRE"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 107
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the mechanical support of
                            the CIVA-P stereo"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P6_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 115
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the CIVA-P6 imaging,
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P6_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 131
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            CIVA-P6 imaging process"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P6_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 141
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the CIVA-P6 imaging"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
```

```
   NAME                   = "CIVA_P7_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 148
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the CIVA-P7 imaging,
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_P7_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 164
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             CIVA-P7 imaging process"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_P7_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 174
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the CIVA-P7 imaging"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_P1_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 181
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the CIVA-P1 imaging,
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_P1_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 197
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             CIVA-P1 imaging process"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_P1_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 207
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the CIVA-P1 imaging"
```

```
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P2_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 214
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the CIVA-P2 imaging,
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P2_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 230
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            CIVA-P2 imaging process"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P2_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 240
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the CIVA-P2 imaging"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P3_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 247
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the CIVA-P3 imaging,
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P3_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 263
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            CIVA-P3 imaging process"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_P3_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 273
```

```
   BYTES                = 5
   UNIT                 = "MILLISECOND"
   DESCRIPTION          = "Exposure time of the CIVA-P3 imaging"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_P4_START_TIME"
   DATA_TYPE            = CHARACTER
   START_BYTE           = 280
   BYTES                = 14
   UNIT                 = "N/A"
   DESCRIPTION          = "Start time of the CIVA-P4 imaging,
                           Lander On Board Time represented as :
                           Reset number (integer starting at 1) / seconds.
                           Reset number 1 starts at 2003-01-01T00:00:00 UTC
                           The time resolution is 0.03125 s"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_P4_INTERRUPTS_NUMBER"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 296
   BYTES                = 9
   UNIT                 = "N/A"
   DESCRIPTION          = "Number of interrupts during the
                           CIVA-P4 imaging process"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_P4_EXPOSURE_TIME"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 306
   BYTES                = 5
   UNIT                 = "MILLISECOND"
   DESCRIPTION          = "Exposure time of the CIVA-P4 imaging"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_P5_START_TIME"
   DATA_TYPE            = CHARACTER
   START_BYTE           = 313
   BYTES                = 14
   UNIT                 = "N/A"
   DESCRIPTION          = "Start time of the CIVA-P5 imaging,
                           Lander On Board Time represented as :
                           Reset number (integer starting at 1) / seconds.
                           Reset number 1 starts at 2003-01-01T00:00:00 UTC
                           The time resolution is 0.03125 s"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_P5_INTERRUPTS_NUMBER"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 329
   BYTES                = 9
   UNIT                 = "N/A"
   DESCRIPTION          = "Number of interrupts during the
                           CIVA-P5 imaging process"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
```

```
   NAME                    = "CIVA_P5_EXPOSURE_TIME"
   DATA_TYPE               = ASCII_INTEGER
   START_BYTE              = 339
   BYTES                   = 5
   UNIT                    = "MILLISECOND"
   DESCRIPTION             = "Exposure time of the CIVA-P5 imaging"
 END_OBJECT                = COLUMN

 END_OBJECT                = TABLE

OBJECT                    = IMAGE
   INTERCHANGE_FORMAT     = BINARY
   LINES                  = 1024
   LINE_SAMPLES         = 1024
   SAMPLE_TYPE          = MSB_UNSIGNED_INTEGER
   SAMPLE_BITS          = 16
   SAMPLE_BIT_MASK        = 2#1111111111111111#
 END_OBJECT                = IMAGE

END
```

7 Appendix C: Example of PDS attached label for ÇIVA-M/V level 2 data product

```
PDS_VERSION_ID                = PDS3
LABEL_REVISION_NOTE  = "2007-07-16, SONC, Version 1.0"
/* PVV version 3.6 */

/*              Raw Images (Level 2)               */

/* IDENTIFICATION & DESCRIPTIVE DATA ELEMENTS */
/* FILE CHARACTERISTIC DATA ELEMENTS */

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 2048
FILE_RECORDS         = 1031
LABEL_RECORDS        = 6


/* DATA OBJECT POINTERS  */

^TABLE = 7
^IMAGE = 8


DATA_SET_ID     = "RL-M-CIVA-2-MARS-V1.0"
DATA_SET_NAME   = "ROSETTA-LANDER MARS CIVA 2 MARS V1.0"
PI_PDS_USER_ID   = BIBRING
PRODUCT_ID      = "CIVA_FS2_061206121127_9_1"
PRODUCT_CREATION_TIME  = 2011-01-11T18:21:29
PROCESSING_LEVEL_ID = "2"

MISSION_NAME            = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME      = "MARS SWING-BY"
MISSION_ID              = ROSETTA
INSTRUMENT_HOST_NAME    = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID      = RL
OBSERVATION_TYPE    = "ACTIVE CHECKOUT 4"
```

```
PRODUCT_TYPE         = EDR
START_TIME           = 2006-12-06T12:11:27.669
STOP_TIME            = 2006-12-06T12:11:27.669
SPACECRAFT_CLOCK_START_COUNT = "1/124027859.30"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/124027859.30"

PRODUCER_ID          = "SONC"
PRODUCER_FULL_NAME   = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID        = CIVA
INSTRUMENT_NAME      = "CIVA - COMETARY INFRARED AND VISIBLE ANALYSER"
INSTRUMENT_TYPE      = {"IMAGING CAMERA", "IMAGING SPECTROMETER",
                        "INFRARED SPECTROMETER"}
TARGET_NAME          = "MARS"
TARGET_TYPE          = "PLANET"

^INSTRUMENT_CALIBRATION_DESC = "CIVA_CALIBRATION_DESC.TXT"

DATA_QUALITY_ID   = "-1"
DATA_QUALITY_DESC = "-1 : NOT QUALIFIED"

/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = (  128743983.2,  96489018.7,  45535256.7)
/* TARGET PARAMETERS: Position <km>, Velocity <km/s> */
SC_TARGET_POSITION_VECTOR = (  -16141202.0, -69063295.7, -26484633.7)
SC_TARGET_VELOCITY_VECTOR = (          5.7,        13.0,         5.4)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =    75704681.5 <km>
SUB_SPACECRAFT_LATITUDE =     0.19 <deg>
SUB_SPACECRAFT_LONGITUDE =   228.85 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the EMEJ2000 reference frame.
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <km/s>, Angles in <deg>"

/* SD2 PARAMETERS */
ROSETTA:SD2_OVEN_FILLING = "N/A"
ROSETTA:SD2_DRILL_DEPTH  = 999.99
ROSETTA:SD2_OVEN_NUMBER  = 99
ROSETTA:SD2_OVEN_TYPE    = "N/A"
ROSETTA:SAMPLE_NUMBER    = 99
ROSETTA:SAMPLE_TAPPING   = "N/A"
ROSETTA:SAMPLE_VOLUME    = 999.99

/* DATA OBJECT DEFINITION  */

INSTRUMENT_MODE_ID = ("0","0","0")

INSTRUMENT_MODE_DESC = "For CIVA-M/V the INSTRUMENT_MODE_ID is a list of
                        integers representing the operating
                        conditions for each of the 3 colors, IR,
                        GREEN and RED, i.e. 0=off, 1=fixed exposure
                        time, 2=automatic exposure time"
```

```
/* set of commands */
COMMAND_NAME = "CIVA_NOMINAL"
COMMAND_DESC = "0000CF3D 07070001 20E00000 1018CC4C 1018CC4C
                1018CC4C 1018CC4E 1018CC4C 1018CC4C 1018CC4E
                3E18CC4C FF18CC4C 3E18CC4C 226066D7 B9FE402B
                012AAA55"

/* instrument status */
CHANNEL_ID              = "MV"
EXPOSURE_DURATION = (1984,8160,1984)
/* EXPOSURE_DURATION_DESC = "list of exposure times :  */
/*                              CIVA-M/V_IR, CIVA_M/V_GREEN,*/
/*                               CIVA-MV/V_RED"*/

EXPOSURE_COUNT  = 3
IMAGE_TIME      = 2006-12-06T12:11:27.669
INST_CMPRS_NAME = "WAVELET"
INST_CMPRS_RATE = (1.50,1.50,1.50)
GAIN_NUMBER = (12,12,12)
ROSETTA:CIVA_CLEANING_NUMBER    = 0
FOCAL_PLANE_TEMPERATURE = (209.61,999.99)
/*FOCAL_PLANE_TEMPERATURE_DESC = "list of temperatures:  */
/*                                    TSC8(detector), TCM_CIVA_M(cube)"*/

ROSETTA:SPECTROMETER_TEMPERATURE     = (190.71,186.17)
/*SPECTROMETER_TEMPERATURE_DESC = "list of temperatures:  */
/*                                  TSC11, TCR_CIVA_M"*/


/* DESCRIPTION OF OBJECTS CONTAINED IN FILE */

OBJECT                  = TABLE
   NAME                 = "HK_TABLE"
   INTERCHANGE_FORMAT   = ASCII
   ROWS                 = 1
   COLUMNS              = 16
   ROW_BYTES            = 164

OBJECT                 = COLUMN
   NAME                 = "UTC_TIME"
   DATA_TYPE            = TIME
   START_BYTE           = 1
   BYTES                = 23
   DESCRIPTION          = "This column represents the UTC Time"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "TSC8"
   DATA_TYPE            = ASCII_REAL
   START_BYTE           = 25
   BYTES                = 6
   UNIT                 = "KELVIN"
   FORMAT               = "F6.2"
   DESCRIPTION          = "Temperature the CIVA-M/V camera detector"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "TSC11"
   DATA_TYPE            = ASCII_REAL
   START_BYTE           = 32
   BYTES                = 6
```

```
   UNIT                    = "KELVIN"
   FORMAT                  = "F6.2"
   DESCRIPTION             = "Temperature of the CIVA-M/V optics 1"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "HKI+5.2V"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 39
   BYTES                   = 5
   UNIT                    = "AMPERE"
   FORMAT                  = "F5.3"
   DESCRIPTION             = "Current of the +5.2V power line"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "U5P_A"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 45
   BYTES                   = 5
   UNIT                    = "VOLT"
   FORMAT                  = "F5.3"
   DESCRIPTION             = "Voltage of the A+5V power line"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "TCM_CIVA_M"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 51
   BYTES                   = 6
   UNIT                    = "KELVIN"
   FORMAT                  = "F6.2"
   DESCRIPTION             = "Temperature of the CIVA-M/V camera cube"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "TCR_CIVA_M"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 58
   BYTES                   = 6
   UNIT                    = "KELVIN"
   FORMAT                  = "F6.2"
   DESCRIPTION             = "Temperature of the CIVA-M/V optical box"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "START_TIME_IR_CIVA_MV"
   DATA_TYPE               = CHARACTER
   START_BYTE              = 66
   BYTES                   = 14
   UNIT                    = "N/A"
   DESCRIPTION             = "Start time of the CIVA-M/V IR imaging,
                              Lander On Board Time represented as :
                              Reset number (integer starting at 1) / seconds.
                              Reset number 1 starts at 2003-01-01T00:00:00 UTC
                              The time resolution is 0.03125 s"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MV_IR_INTERRUPTS_NUMBER"
   DATA_TYPE               = ASCII_INTEGER
```

```
   START_BYTE             = 82
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             CIVA-M/V IR colour imaging process"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MV_IR_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 92
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the CIVA-M/V IR colour imaging"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MV_GREEN_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 99
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the CIVA-M/V Green colour imaging,
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MV_GREEN_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 115
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             CIVA-M/V Green colour imaging process"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MV_GREEN_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 125
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the CIVA-M/V Green colour imaging"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MV_RED_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 132
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the CIVA-M/V Red colour imaging,
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
 END_OBJECT               = COLUMN
```

```
OBJECT                     = COLUMN
   NAME                     = "CIVA_MV_RED_INTERRUPTS_NUMBER"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 148
   BYTES                    = 9
   UNIT                     = "N/A"
   DESCRIPTION              = "Number of interrupts during the
                               CIVA-M/V Red colour imaging process"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MV_RED_EXPOSURE_TIME"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 158
   BYTES                    = 5
   UNIT                     = "MILLISECOND"
   DESCRIPTION              = "Exposure time of the CIVA-M/V Red colour imaging"
 END_OBJECT                 = COLUMN

 END_OBJECT                 = TABLE

OBJECT                     = IMAGE
   INTERCHANGE_FORMAT      = BINARY
   LINES                   = 1024
   LINE_SAMPLES            = 1024
   SAMPLE_TYPE             = MSB_UNSIGNED_INTEGER
   SAMPLE_BITS             = 16
   SAMPLE_BIT_MASK         = 2#1111111111111111#
 END_OBJECT                = IMAGE

END
```

8 Appendix D: Example of PDS attached label for ÇIVA-M/I level 2 data product

```
PRODUCT_CREATION_TIME  = 2011-01-11T18:21:14
PROCESSING_LEVEL_ID = "2"

MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME     = "MARS SWING-BY"
MISSION_ID             = ROSETTA
INSTRUMENT_HOST_NAME   = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID     = RL
OBSERVATION_TYPE    = "ACTIVE CHECKOUT 4"

PRODUCT_TYPE          = EDR
START_TIME            = 2006-12-06T11:11:17.481
STOP_TIME             = 2006-12-06T11:19:44.856
SPACECRAFT_CLOCK_START_COUNT = "1/124024249.24"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/124024757.04"

PRODUCER_ID           = "SONC"
PRODUCER_FULL_NAME    = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID         = CIVA
INSTRUMENT_NAME       = "CIVA - COMETARY INFRARED AND VISIBLE ANALYSER"
INSTRUMENT_TYPE       = {"IMAGING CAMERA", "IMAGING SPECTROMETER",
                         "INFRARED SPECTROMETER"}
TARGET_NAME           = "MARS"
TARGET_TYPE           = "PLANET"

^INSTRUMENT_CALIBRATION_DESC = "CIVA_CALIBRATION_DESC.TXT"

DATA_QUALITY_ID   = "-1"
DATA_QUALITY_DESC = "-1 : NOT QUALIFIED"

/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = (  128795070.2,  96399766.7,  45494409.6)
/* TARGET PARAMETERS: Position <km>, Velocity <km/s> */
SC_TARGET_POSITION_VECTOR = (  -16161617.6, -69110262.5, -26504153.9)
SC_TARGET_VELOCITY_VECTOR = (          5.7,        13.0,         5.4)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =    75758708.1 <km>
SUB_SPACECRAFT_LATITUDE =     0.20 <deg>
SUB_SPACECRAFT_LONGITUDE =   243.50 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the EMEJ2000 reference frame.
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <km/s>, Angles in <deg>"

/* SD2 PARAMETERS */
ROSETTA:SD2_OVEN_FILLING = "N/A"
ROSETTA:SD2_DRILL_DEPTH  = 999.99
ROSETTA:SD2_OVEN_NUMBER  = 99
ROSETTA:SD2_OVEN_TYPE    = "N/A"
ROSETTA:SAMPLE_NUMBER    = 99
ROSETTA:SAMPLE_TAPPING   = "N/A"
ROSETTA:SAMPLE_VOLUME    = 999.99
```

```
/* DATA OBJECT DEFINITION  */

INSTRUMENT_MODE_ID = ("64","64","64","64","64","64","64","64","64",
                     "64","64")

INSTRUMENT_MODE_DESC = "For CIVA-M/I the INSTRUMENT_MODE_ID is a list of
                        integers representing the operating
                        conditions for each of the 11 cycles,i.e.
                        0=off, 64 or 80=number of spectral positions"

/* set of commands */
COMMAND_NAME = "CIVA_NOMINAL"
COMMAND_DESC = "0000CF7D 07070001 07000000 1018CC4C 1018CC4C
                1018CC4C 1018CC4E 1018CC4C 1018CC4C 1018CC4E
                3E18CC4A FF18CC4A 3E18CC4A 22606615 B9FE40C3
                012AAA55"

/* instrument status */
CHANNEL_ID             = "MI"
EXPOSURE_DURATION = (108,216,216,216,216,540,540,540,540,540,540,540,
                    108)
/* EXPOSURE_DURATION_DESC = "list of exposure times :  */
/*                              Sub_unit 8_0 (first calibration,*/
/*                              first exposure time),Sub_unit 8_1,*/
/*                              Sub_unit 8_2,Sub_unit 8_3,Sub_unit 8_4,*/
/*                              Sub_unit 8_5,Sub_unit 8_6,Sub_unit 8_7,*/
/*                              Sub_unit 8_8,Sub_unit 8_9,Sub_unit 8_A,*/
/*                              Sub_unit 8_B,*/
/*                              Last Sub_unit (last calibration,*/
/*                               last exposure time)"*/

EXPOSURE_COUNT  = 13
IMAGE_TIME      = 2006-12-06T11:18:13.075
INST_CMPRS_NAME = "WAVELET"
INST_CMPRS_RATE = (2.00,2.00,2.00,2.00,2.00,2.00,2.00,2.00,2.00,2.00,
                  2.00,2.00,2.00)
GAIN_NUMBER = (1,1,1,1,1,1,1,1,1,1,1,1,1,1)
FOCAL_PLANE_TEMPERATURE = (420,09,420,09)
/*FOCAL_PLANE_TEMPERATURE_DESC = "list of temperatures:  */
/*                                    CIVA_MID_temp1(calibration begin),*/
/*                                    CIVA_MID_temp2(calibration end)"*/

ROSETTA:SPECTROMETER_TEMPERATURE     = (186.32,187.17)
/*SPECTROMETER_TEMPERATURE_DESC = "list of temperatures:  */
/*                                  TSC9, TSC10"*/


/* DESCRIPTION OF OBJECTS CONTAINED IN FILE */

OBJECT                  = TABLE
   NAME                 = "HK_TABLE"
   INTERCHANGE_FORMAT   = ASCII
   ROWS                 = 1
   COLUMNS              = 62
   ROW_BYTES            = 564

OBJECT                 = COLUMN
   NAME                 = "UTC_TIME"
   DATA_TYPE            = TIME
   START_BYTE           = 1
   BYTES                = 23
   DESCRIPTION          = "This column represents the UTC Time"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "TSC9"
   DATA_TYPE            = ASCII_REAL
```

```
   START_BYTE            = 25
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-M/I granting mechanism"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "TSC10"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 32
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "Temperature of the CIVA-M/I optics"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "HKI+5.2V"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 39
   BYTES                 = 5
   UNIT                  = "AMPERE"
   FORMAT                = "F5.3"
   DESCRIPTION           = "Current of the +5.2V power line"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "U5P_A"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 45
   BYTES                 = 5
   UNIT                  = "VOLT"
   FORMAT                = "F5.3"
   DESCRIPTION           = "Voltage of the A+5V power line"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "LAMP_LEVEL"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 51
   BYTES                 = 1
   UNIT                  = "N/A"
   DESCRIPTION           = "Lamp supply voltage level
                             0 : lamp is off
                             1 : low level
                             2 : typical
                             3 : maximum level"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MID_CAP"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 53
   BYTES                 = 1
   UNIT                  = "N/A"
   DESCRIPTION           = "CIVA-M/I detector gain
                             0 : minimum
                             1 : low
                             2 : typical
                             3 : maximum"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_CAL1_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 56
   BYTES                 = 14
```

```
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the first calibration,
                              Lander On Board Time represented as :
                              Reset number (integer starting at 1) / seconds.
                              Reset number 1 starts at 2003-01-01T00:00:00 UTC
                              The time resolution is 0.03125 s"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_CAL1_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 72
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                              first CIVA-M/I imaging process"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_CAL1_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 82
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the CIVA-M/I imaging"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MID_TESTB1"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 88
   BYTES                  = 4
   UNIT                   = "VOLT"
   FORMAT                 = "F4.2"
   DESCRIPTION            = "CIVA_M/I detector video signal simulation
                              voltage level sampled during the first calibration"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MID_DEADPOT1"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 93
   BYTES                  = 4
   UNIT                   = "VOLT"
   FORMAT                 = "F4.2"
   DESCRIPTION            = "CIVA_M/I detector reference and dead pixels
                              level tuning sampled during the first calibration"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MID_ABAMPHI1"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 98
   BYTES                  = 4
   UNIT                   = "VOLT"
   FORMAT                 = "F4.2"
   DESCRIPTION            = "CIVA_M/I detector reference voltage
                              sampled during the first calibration"
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MID_VREF1"
   DATA_TYPE              = ASCII_REAL
   START_BYTE             = 103
   BYTES                  = 4
   UNIT                   = "VOLT"
   FORMAT                 = "F4.2"
   DESCRIPTION            = "CIVA_M/I detector, video signal offset
```

```
                               tuning level sampled during the first calibration"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MID_TEMP1"
   DATA_TYPE                 = ASCII_REAL
   START_BYTE                = 108
   BYTES                     = 6
   UNIT                      = "KELVIN"
   FORMAT                    = "F6.2"
   DESCRIPTION               = "CIVA_M/I detector temperature sampled
                               during the first calibration"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MID_DIGATE1"
   DATA_TYPE                 = ASCII_REAL
   START_BYTE                = 115
   BYTES                     = 4
   UNIT                      = "VOLT"
   FORMAT                    = "F4.2"
   DESCRIPTION               = "CIVA_M/I detector, polarisation voltage
                               during the first calibration"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MI_STEPS1"
   DATA_TYPE                 = ASCII_INTEGER
   START_BYTE                = 120
   BYTES                     = 2
   UNIT                      = "N/A"
   DESCRIPTION               = "Number of steps of the grating mechanism
                               in the reference search during the first calibration
                               Possible values are: 0, 64 or 80"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MI_STEPS_RETRY1"
   DATA_TYPE                 = ASCII_INTEGER
   START_BYTE                = 123
   BYTES                     = 4
   UNIT                      = "N/A"
   DESCRIPTION               = "Number of steps of the grating mechanism in
                               the reference search after retry during
                               the first calibration"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MI_SUBCYC1_START_TIME"
   DATA_TYPE                 = CHARACTER
   START_BYTE                = 129
   BYTES                     = 14
   UNIT                      = "N/A"
   DESCRIPTION               = "Start time of the first spectral subcycle
                                Lander On Board Time represented as :
                                Reset number (integer starting at 1) / seconds.
                                Reset number 1 starts at 2003-01-01T00:00:00 UTC
                                The time resolution is 0.03125 s"
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
   NAME                      = "CIVA_MI_SUBCYC1_INTERRUPTS_NUMBER"
   DATA_TYPE                 = ASCII_INTEGER
   START_BYTE                = 145
   BYTES                     = 9
   UNIT                      = "N/A"
   DESCRIPTION               = "Number of interrupts during the first
                                spectral subcycle"
```

```
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC1_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 155
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the first spectral subcycle"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC2_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 162
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the second spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC2_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 178
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            second spectral subcycle"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC2_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 188
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the second spectral subcycle"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC3_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 195
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the third spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC3_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 211
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the third
                            spectral subcycle"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC3_EXPOSURE_TIME"
```

```
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 221
   BYTES                = 5
   UNIT                 = "MILLISECOND"
   DESCRIPTION          = "Exposure time of the third subcycle"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC4_START_TIME"
   DATA_TYPE            = CHARACTER
   START_BYTE           = 228
   BYTES                = 14
   UNIT                 = "N/A"
   DESCRIPTION          = "Start time of the fourth spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC4_INTERRUPTS_NUMBER"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 244
   BYTES                = 9
   UNIT                 = "N/A"
   DESCRIPTION          = "Number of interrupts during the
                             fourth spectral subcycle"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC4_EXPOSURE_TIME"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 254
   BYTES                = 5
   UNIT                 = "MILLISECOND"
   DESCRIPTION          = "Exposure time of the fourth subcycle"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC5_START_TIME"
   DATA_TYPE            = CHARACTER
   START_BYTE           = 261
   BYTES                = 14
   UNIT                 = "N/A"
   DESCRIPTION          = "Start time of the fifth spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC5_INTERRUPTS_NUMBER"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 277
   BYTES                = 9
   UNIT                 = "N/A"
   DESCRIPTION          = "Number of interrupts during the
                            fifth spectral subcycle"
 END_OBJECT             = COLUMN

OBJECT                 = COLUMN
   NAME                 = "CIVA_MI_SUBCYC5_EXPOSURE_TIME"
   DATA_TYPE            = ASCII_INTEGER
   START_BYTE           = 287
   BYTES                = 5
   UNIT                 = "MILLISECOND"
```

```
   DESCRIPTION           = "Exposure time of the fifth subcycle"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC6_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 294
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the sixth spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC6_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 310
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            sixth spectral subcycle"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC6_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 320
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the sixth subcycle"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC7_START_TIME"
   DATA_TYPE             = CHARACTER
   START_BYTE            = 327
   BYTES                 = 14
   UNIT                  = "N/A"
   DESCRIPTION           = "Start time of the seventh spectral subcycle
                            Lander On Board Time represented as :
                            Reset number (integer starting at 1) / seconds.
                            Reset number 1 starts at 2003-01-01T00:00:00 UTC
                            The time resolution is 0.03125 s"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC7_INTERRUPTS_NUMBER"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 343
   BYTES                 = 9
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of interrupts during the
                            seventh spectral subcycle"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_SUBCYC7_EXPOSURE_TIME"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 353
   BYTES                 = 5
   UNIT                  = "MILLISECOND"
   DESCRIPTION           = "Exposure time of the seventh subcycle"
  END_OBJECT             = COLUMN

OBJECT                  = COLUMN
```

```
   NAME                   = "CIVA_MI_SUBCYC8_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 360
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the eighth spectral subcycle
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYC8_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 376
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             eighth spectral subcycle"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYC8_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 386
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the eighth subcycle"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYC9_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 393
   BYTES                  = 14
   UNIT                   = "N/A"
   DESCRIPTION            = "Start time of the ninth spectral subcycle
                             Lander On Board Time represented as :
                             Reset number (integer starting at 1) / seconds.
                             Reset number 1 starts at 2003-01-01T00:00:00 UTC
                             The time resolution is 0.03125 s"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYC9_INTERRUPTS_NUMBER"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 409
   BYTES                  = 9
   UNIT                   = "N/A"
   DESCRIPTION            = "Number of interrupts during the
                             ninth spectral subcycle"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYC9_EXPOSURE_TIME"
   DATA_TYPE              = ASCII_INTEGER
   START_BYTE             = 419
   BYTES                  = 5
   UNIT                   = "MILLISECOND"
   DESCRIPTION            = "Exposure time of the ninth first subcycle"
  END_OBJECT              = COLUMN

OBJECT                   = COLUMN
   NAME                   = "CIVA_MI_SUBCYCA_START_TIME"
   DATA_TYPE              = CHARACTER
   START_BYTE             = 426
   BYTES                  = 14
```

```
   UNIT                     = "N/A"
   DESCRIPTION              = "Start time of the tenth spectral subcycle
                               Lander On Board Time represented as :
                               Reset number (integer starting at 1) / seconds.
                               Reset number 1 starts at 2003-01-01T00:00:00 UTC
                               The time resolution is 0.03125 s"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_SUBCYCA_INTERRUPTS_NUMBER"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 442
   BYTES                    = 9
   UNIT                     = "N/A"
   DESCRIPTION              = "Number of interrupts during the
                               tenth spectral subcycle"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_SUBCYCA_EXPOSURE_TIME"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 452
   BYTES                    = 5
   UNIT                     = "MILLISECOND"
   DESCRIPTION              = "Exposure time of the tenth subcycle"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_SUBCYCB_START_TIME"
   DATA_TYPE                = CHARACTER
   START_BYTE               = 459
   BYTES                    = 14
   UNIT                     = "N/A"
   DESCRIPTION              = "Start time of the eleventh spectral subcycle
                               Lander On Board Time represented as :
                               Reset number (integer starting at 1) / seconds.
                               Reset number 1 starts at 2003-01-01T00:00:00 UTC
                               The time resolution is 0.03125 s"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_SUBCYCB_INTERRUPTS_NUMBER"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 475
   BYTES                    = 9
   UNIT                     = "N/A"
   DESCRIPTION              = "Number of interrupts during the
                               eleventh spectral subcycle"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_SUBCYCB_EXPOSURE_TIME"
   DATA_TYPE                = ASCII_INTEGER
   START_BYTE               = 485
   BYTES                    = 5
   UNIT                     = "MILLISECOND"
   DESCRIPTION              = "Exposure time of the eleventh subcycle"
 END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
   NAME                     = "CIVA_MI_CAL2_START_TIME"
   DATA_TYPE                = CHARACTER
   START_BYTE               = 492
   BYTES                    = 14
   UNIT                     = "N/A"
   DESCRIPTION              = "Start time of the last spectral calibration
                               Lander On Board Time represented as :
                               Reset number (integer starting at 1) / seconds.
```

```
                              Reset number 1 starts at 2003-01-01T00:00:00 UTC
                              The time resolution is 0.03125 s"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MI_CAL2_INTERRUPTS_NUMBER"
   DATA_TYPE               = ASCII_INTEGER
   START_BYTE              = 508
   BYTES                   = 9
   UNIT                    = "N/A"
   DESCRIPTION             = "Number of interrupts during the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MI_CAL2_EXPOSURE_TIME"
   DATA_TYPE               = ASCII_INTEGER
   START_BYTE              = 518
   BYTES                   = 5
   UNIT                    = "MILLISECOND"
   DESCRIPTION             = "Exposure time of the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MID_TESTB2"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 524
   BYTES                   = 4
   UNIT                    = "VOLT"
   FORMAT                  = "F4.2"
   DESCRIPTION             = "CIVA_M/I detector video signal simulation
                              voltage level sampled during the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MID_DEADPOT2"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 529
   BYTES                   = 4
   UNIT                    = "VOLT"
   FORMAT                  = "F4.2"
   DESCRIPTION             = "CIVA_M/I detector reference and dead pixels
                              level tuning sampled during the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MID_ABAMPHI2"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 534
   BYTES                   = 4
   UNIT                    = "VOLT"
   FORMAT                  = "F4.2"
   DESCRIPTION             = "CIVA_M/I detector reference voltage
                              sampled during the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MID_VREF2"
   DATA_TYPE               = ASCII_REAL
   START_BYTE              = 539
   BYTES                   = 4
   UNIT                    = "VOLT"
   FORMAT                  = "F4.2"
   DESCRIPTION             = "CIVA_M/I detector, video signal offset
                             tuning level sampled during the last calibration"
 END_OBJECT                = COLUMN

OBJECT                    = COLUMN
   NAME                    = "CIVA_MID_TEMP2"
```

```
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 544
   BYTES                 = 6
   UNIT                  = "KELVIN"
   FORMAT                = "F6.2"
   DESCRIPTION           = "CIVA_M/I detector temperature sampled
                           during the last calibration"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MID_DIGATE2"
   DATA_TYPE             = ASCII_REAL
   START_BYTE            = 551
   BYTES                 = 4
   UNIT                  = "VOLT"
   FORMAT                = "F4.2"
   DESCRIPTION           = "CIVA_M/I detector, polarisation voltage during
                           the last calibration"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_STEPS2"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 556
   BYTES                 = 2
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of steps of the grating mechanism
                           in the reference search during the last calibration
                           Possible values are: 0, 64 or 80"
 END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   NAME                  = "CIVA_MI_STEPS_RETRY2"
   DATA_TYPE             = ASCII_INTEGER
   START_BYTE            = 559
   BYTES                 = 4
   UNIT                  = "N/A"
   DESCRIPTION           = "Number of steps of the grating mechanism in
                           the reference search after retry during
                           the last calibration"
 END_OBJECT              = COLUMN

 END_OBJECT              = TABLE

OBJECT                  = QUBE

/* spectral cube with non-standard backplanes */
   AXES                        = 3
   AXIS_NAME                   = (SAMPLE,LINE,BAND)

   /* Core description */
   CORE_ITEMS                  = (128,96,704)
   CORE_NAME                   = RAW_DATA_NUMBER
   CORE_ITEM_BYTES             = 2
   CORE_ITEM_TYPE              = LSB_INTEGER
   CORE_BASE                   = 0.0
   CORE_MULTIPLIER             = 1.0
   CORE_UNIT                   = DIMENSIONLESS
   CORE_NULL                   = 32767
   CORE_VALID_MINIMUM          = 0
   CORE_LOW_REPR_SATURATION    = -32768
   CORE_LOW_INSTR_SATURATION   = -32768
   CORE_HIGH_REPR_SATURATION   = 32767
   CORE_HIGH_INSTR_SATURATION = 32767

   /* suffix definitions for CIVA */
   /* 16 backplanes containing 16 images */
```

```
   SUFFIX_ITEMS               = (0,0,16)
   SUFFIX_BYTES               = 4

        BAND_SUFFIX_NAME            = "CALIBRATION IMAGES"
        BAND_SUFFIX_UNIT            = "N/A"
        BAND_SUFFIX_ITEM_BYTES      = 4
        BAND_SUFFIX_ITEM_TYPE       = LSB_INTEGER
        BAND_SUFFIX_BASE            = 0.0
        BAND_SUFFIX_MULTIPLIER      = 1.0
        BAND_SUFFIX_VALID_MINIMUM   = 0
        BAND_SUFFIX_NULL            = 32767
        BAND_SUFFIX_LOW_REPR_SAT    = -32768
        BAND_SUFFIX_LOW_INSTR_SAT   = -32768
        BAND_SUFFIX_HIGH_REPR_SAT   = 32767
        BAND_SUFFIX_HIGH_INSTR_SAT  = 32767

 END_OBJECT              = QUBE

END
```

9 Appendix E: Example of Directory Listing of Data Set RL-M-CIVA-2-MARS-V1.0

```
|-AAREADME.TXT
|
|              |-BROWINFO.TXT
|              |-CIVA_FSP_070225015019_1_0.JPG
|              |-CIVA_FSP_070225015019_1_0.LBL
|              |-CIVA_FSP_070225015349_1_0.JPG
|              |-CIVA_FSP_070225015349_1_0.LBL
|              |-CIVA_FSP_070225015358_2_0.JPG
|              |-CIVA_FSP_070225015358_2_0.LBL
|              |-CIVA_FSP_070225015529_1_0.JPG
|              |-CIVA_FSP_070225015529_1_0.LBL
|              |-CIVA_FSP_070225015538_2_0.JPG
|              |-CIVA_FSP_070225015538_2_0.LBL
|              |-CIVA_FSP_070225015738_1_0.JPG
|              |-CIVA_FSP_070225015738_1_0.LBL
|-BROWSE------|-CIVA_FSP_070225015746_2_0.JPG
|              |-CIVA_FSP_070225015746_2_0.LBL
|              |-CIVA_FSP_070225015917_1_0.JPG
|              |-CIVA_FSP_070225015917_1_0.LBL
|              |-CIVA_FSP_070522154950_6_0.JPG
|              |-CIVA_FSP_070522154950_6_0.LBL
|              |-CIVA_FSP_070522154959_7_0.JPG
|              |-CIVA_FSP_070522154959_7_0.LBL
|              |-CIVA_FSP_070522155007_1_0.JPG
|              |-CIVA_FSP_070522155007_1_0.LBL
|              |-CIVA_FSP_070522155016_2_0.JPG
|              |-CIVA_FSP_070522155016_2_0.LBL
|              |-CIVA_FSP_070522155025_3_0.JPG
|              |-CIVA_FSP_070522155025_3_0.LBL
|              |-CIVA_FSP_070522155034_4_0.JPG
|              |-CIVA_FSP_070522155034_4_0.LBL
|              |-CIVA_FSP_070522155042_5_0.JPG
|              |-CIVA_FSP_070522155042_5_0.LBL
|
|              |-CALINFO.TXT
|              |
|              |          |-COEFF_GEOM_EXT_STEREO.LBL
|              |          |-COEFF_GEOM_EXT_STEREO.TXT
|              |          |-COEFF_GEOM_UNIT_1.LBL
|              |          |-COEFF_GEOM_UNIT_1.TXT
|              |          |-COEFF_GEOM_UNIT_2.LBL
|              |          |-COEFF_GEOM_UNIT_2.TXT
|              |          |-COEFF_GEOM_UNIT_3.LBL
|              |          |-COEFF_GEOM_UNIT_3.TXT
|              |          |-COEFF_GEOM_UNIT_4.LBL
|              |          |-COEFF_GEOM_UNIT_4.TXT
|              |          |-COEFF_GEOM_UNIT_5.LBL
|              |          |-COEFF_GEOM_UNIT_5.TXT
|              |          |-COEFF_GEOM_UNIT_6.LBL
|              |          |-COEFF_GEOM_UNIT_6.TXT
|              |          |-COEFF_GEOM_UNIT_7.LBL
|              |          |-COEFF_GEOM_UNIT_7.TXT
|              |          |-COEFF_PHOTO_UNIT_1.LBL
|              |          |-COEFF_PHOTO_UNIT_1.TXT
|              |          |-COEFF_PHOTO_UNIT_2.LBL
|-CALIB-------|-CIVAP---|-COEFF_PHOTO_UNIT_2.TXT
|                         |-COEFF_PHOTO_UNIT_3.LBL
|                         |-COEFF_PHOTO_UNIT_3.TXT
|                         |-COEFF_PHOTO_UNIT_4.LBL
|                         |-COEFF_PHOTO_UNIT_4.TXT
```

```
|                       |-COEFF_PHOTO_UNIT_5.LBL
|                       |-COEFF_PHOTO_UNIT_5.TXT
|                       |-COEFF_PHOTO_UNIT_6.LBL
|                       |-COEFF_PHOTO_UNIT_6.TXT
|                       |-COEFF_PHOTO_UNIT_7.LBL
|                       |-COEFF_PHOTO_UNIT_7.TXT
|
|             |-CATINFO.TXT
|             |-DATASET.CAT
|-CATALOG-----|-INST.CAT
|             |-INSTHOST.CAT
|             |-MISSION.CAT
|             |-PERSON.CAT
|             |-REF.CAT
|             |-SOFTWARE.CAT
|
|             |         |-CIVA_FS2_060829191015_6_0.IMG
|             |         |-CIVA_FS2_060829191024_7_0.IMG
|             |         |-CIVA_FS2_060829191032_1_0.IMG
|             |         |-CIVA_FS2_060829191042_2_0.IMG
|             |         |-CIVA_FS2_060829191050_3_0.IMG
|             |         |-CIVA_FS2_060829191059_4_0.IMG
|             |         |-CIVA_FS2_060829191108_5_0.IMG
|             |         |-CIVA_FS2_061128171617_6_0.IMG
|             |         |-CIVA_FS2_061128171626_7_0.IMG
|             |         |-CIVA_FS2_061128171634_1_0.IMG
|             |         |-CIVA_FS2_061128171643_2_0.IMG
|             |         |-CIVA_FS2_061128171652_3_0.IMG
|             |         |-CIVA_FS2_061128171701_4_0.IMG
|             |         |-CIVA_FS2_061128171709_5_0.IMG
|             |         |-CIVA_FS2_061128181424_6_0.IMG
|             |         |-CIVA_FS2_061128181438_7_0.IMG
|             |         |-CIVA_FS2_061128181447_1_0.IMG
|             |         |-CIVA_FS2_061128181502_2_0.IMG
|             |         |-CIVA_FS2_061128181511_3_0.IMG
|             |         |-CIVA_FS2_061128181527_4_0.IMG
|             |         |-CIVA_FS2_061128181534_5_0.IMG
|             |         |-CIVA_FS2_061129083227_6_0.IMG
|             |         |-CIVA_FS2_061129083241_7_0.IMG
|             |         |-CIVA_FS2_061129083249_1_0.IMG
|             |         |-CIVA_FS2_061129083305_2_0.IMG
|             |         |-CIVA_FS2_061129083314_3_0.IMG
|             |         |-CIVA_FS2_061129083329_4_0.IMG
|             |         |-CIVA_FS2_061129083337_5_0.IMG
|             |         |-CIVA_FS2_061201193225_1_0.IMG
|             |         |-CIVA_FS2_061201193239_5_0.IMG
|             |         |-CIVA_FS2_061201195226_6_0.IMG
|             |         |-CIVA_FS2_061201195241_7_0.IMG
|             |-CIVAP---|-CIVA_FS2_061201195248_1_0.IMG
|             |         |-CIVA_FS2_061201195305_2_0.IMG
|             |         |-CIVA_FS2_061201195312_3_0.IMG
|             |         |-CIVA_FS2_061201195328_4_0.IMG
|             |         |-CIVA_FS2_061201195335_5_0.IMG
|             |         |-CIVA_FS2_061208012953_6_0.IMG
|             |         |-CIVA_FS2_061208013002_7_0.IMG
|             |         |-CIVA_FS2_061208013011_1_0.IMG
|             |         |-CIVA_FS2_061208013019_2_0.IMG
|             |         |-CIVA_FS2_061208013031_3_0.IMG
|             |         |-CIVA_FS2_061208013040_4_0.IMG
|             |         |-CIVA_FS2_061208013049_5_0.IMG
|             |         |-CIVA_FS2_070225015019_1_0.IMG
|             |         |-CIVA_FS2_070225015349_1_0.IMG
|             |         |-CIVA_FS2_070225015358_2_0.IMG
|             |         |-CIVA_FS2_070225015529_1_0.IMG
|             |         |-CIVA_FS2_070225015538_2_0.IMG
|             |         |-CIVA_FS2_070225015738_1_0.IMG
|             |         |-CIVA_FS2_070225015746_2_0.IMG
|             |         |-CIVA_FS2_070225015917_1_0.IMG
```

```
                               |              |          |-CIVA_FS2_070522154950_6_0.IMG
                               |              |          |-CIVA_FS2_070522154959_7_0.IMG
                               |              |          |-CIVA_FS2_070522155007_1_0.IMG
                               |              |          |-CIVA_FS2_070522155016_2_0.IMG
                               |              |          |-CIVA_FS2_070522155025_3_0.IMG
                               |              |          |-CIVA_FS2_070522155034_4_0.IMG
                               |              |          |-CIVA_FS2_070522155042_5_0.IMG
                               |              |
                               |-DATA--------|
                               |              |-CIVAM---|-MI--|-CIVA_FS2_061206111117_8_B.QUB
                               |                        |
                               |                        |     |-CIVA_FS2_061206121112_9_0.IMG
                               |                        |     |-CIVA_FS2_061206121127_9_1.IMG
                               |                        |-MV--|-CIVA_FS2_061206121136_9_2.IMG
                               |                        |     |-CIVA_FS2_061206124141_9_0.IMG
                               |                        |     |-CIVA_FS2_061206124156_9_1.IMG
                               |                        |     |-CIVA_FS2_061206124206_9_2.IMG
|-RL-M-CIVA-2-MARS-V1.0-|
                               |
                               |              |-CIVA_CALIBRATION_DESC.LBL
                               |              |-CIVA_CALIBRATION_DESC.TXT
                               |              |-CIVAROLIS_IME_ADP.LBL
                               |              |-CIVAROLIS_IME_ADP.PDF
                               |              |-DOCINFO.TXT
                               |              |-EAICD_CIVA.LBL
                               |              |-EAICD_CIVA.PDF
                               |              |-FIG1.PNG
                               |              |-FIG2.PNG
                               |              |-FIG3.PNG
                               |-DOCUMENT----|-TIMELINE_MARS.TXT
                               |              |-TIMELINE_MARS_DESC.TXT
                               |              |-TIMELINE_MARS_FLYBY.LBL
                               |              |-TIMELINE_MARS_FLYBY.PNG
                               |              |-TIMELINE_MARS_PC3.LBL
                               |              |-TIMELINE_MARS_PC3.PNG
                               |              |-TIMELINE_MARS_PC4.LBL
                               |              |-TIMELINE_MARS_PC4.PNG
                               |              |-TIMELINE_MARS_PC5.LBL
                               |              |-TIMELINE_MARS_PC5.PNG
                               |
                               |              |-BROWSE_INDEX.LBL
                               |              |-BROWSE_INDEX.TAB
                               |-INDEX-------|-INDXINFO.TXT
                               |              |-INDEX.LBL
                               |              |-INDEX.TAB
                               |
                               |-VOLDESC.CAT
```

10 Appendix F: PDS Glossary

Archive – An archive consists of one or more data sets along with all the documentation and ancillary information needed to understand and use the data. An archive is a logical construct independent of the medium on which it is stored.

Archive Volume, Archive Volume Set – A volume is a unit of media on which data products are stored; for example, one CD-ROM or DVD-ROM. An *archive volume* is a volume containing all or part of an archive; that is, data products plus documentation and ancillary files. When an archive spans multiple volumes, they are called an *archive volume set*. Usually the documentation and some ancillary files are repeated on each volume of the set, so that a single volume can be used alone.

Catalog Information – Descriptive information about a data set (e.g. mission description, spacecraft description, instrument description), expressed in Object Description Language (ODL), which is suitable for loading into a PDS catalog.

Data Product – A labeled grouping of data resulting from a scientific observation, usually stored in one file. A product label identifies, describes, and defines the structure of the data. An example of a data product is a planetary image, a spectrum table, or a time series table.

Data Set – An accumulation of data products. A data set together with supporting documentation and ancillary files is an archive.