Austrian Academy of Sciences Space Research Institute Department of Experimental Space Research

ROSETTA-MIDAS

To Planetary Science Archive Interface Control Document

MID-IWF-TN-0087

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1 Introduction

1.1 Purpose and Scope

The purpose of this EAICD (Experimenter to (Science) Archive Interface Control Document) is twofold. At first, it provides users of the MIDAS instrument with a detailed description of the product and a description and the methods by which it is generated, including data sources and destinations. Secondly, it is the official interface between the MIDAS instrument team and the archiving authority.

1.2 Archiving Authorities

The Planetary Data System Standard is used as an 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

1.2.1 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 will offer the creation of physical archive volumes on request.

1.3 Contents

This document describes the data flow of the MIDAS instrument on ROSETTA from the S/C until insertion into the PSA for ESA. It includes information on how data were processed, formatted, labelled 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. Software that may be used to access the product is explained further on.

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, design team) and any potential user of the MIDAS data.

1.5 Applicable Documents

- [1] Planetary Data System Data Preparation Workbook February 17, 1995, Version 3.1, JPL D-7669, Part1
- [2] Planetary Data System Standards Reference August 1, 2003, Version 3.6, JPL D-7669, Part 2
- [3] ROSETTA Archive Generation, Validation and Transfer Plan October 6, 2005, Issue 2.2, RO-EST-PL-5011
- [4] ROSETTA Experiment Interface Document Part A February 1, 2004, Issue 2, Rev. 3, RO-EST-RS-3001/EIDA
- [5] ROSETTA MIDAS Experiment Interface Document Part B February 15, 2001, Issue 2d, Rev. 0, RO-EST-RS-3010/EIDB
- [6] ROSETTA Data Delivery Interface Document (DDID) October 23, 2003, Issue B6, RO-ESC-IF-5003
- [7] MIDAS User Manual February 23, 2004, Issue 2, Rev. 1, MID-IWF-UM-0047
- [8] ROSETTA Time Handling February 28, 2006, Issue 1, Rev. 1, RO-EST-TN-3165
- [9] MIDAS Co-ordinate Systems October 28, 2008, Issue 1.0, MID-IWF-TD-0029

1.6 Relationships to Other Interfaces

N/A

1.7 Acronyms and Abbreviations

- AFM Atomic Force Microscope
- DAQ Data Acquisition
- DDID Data Delivery Interface Document
- DDS Data Disposition System
- EAICD Experimenter to (Science) Archive Interface Control Document
- EGSE Electrical Ground Support Equipment
- FM Flight Model
- FS Flight Spare Model



IDL	Interactive Data Language
IWF/OAW	Space Research Institute of the Austrian Academy of Sciences
JPL	Jet Propulsion Laboratory
LVDT	Linear Variable Differential Transformer
MIDAS	Micro-Imaging Dust Analysis System
N/A	Not applicable
NAIF	The Navigation and Ancillary Information Facility, JPL/NASA
NASA	National Aeronautics and Space Administration
OBT	S/C On-board Time (Spacecraft Elapsed Time according to [4])
PDS	Planetary Data System
PSA	Planetary Science Archive
QM	Qualification Model
SCET	Spacecraft Event Time (according to [6])
SPM	Scanning Probe Microscope
STM	Scanning Tunneling Microscopy
TB/TV	Thermal Balance/Thermal Vacuum

1.8 Contact Names and Addresses

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

2.1 Scientific Objectives

The experiment MIDAS (Micro-Imaging Dust Analysis System) is dedicated to the micro textural and statistical analysis of cometary dust particles. The instrument is based on the technique of atomic force microscopy. Under the conditions prevailing at the Rosetta Orbiter this technique permits textural and other analysis of dust particles to be performed down to a spatial resolution of 4 nm.

During the rendezvous with the comet MIDAS will provide the following information:

- images of single particles with a spatial resolution of 4 nm,
- statistical evaluation of the particles according to size, volume, and shape,
- size distribution of particles ranging from about 4 nm to a few µm,
- shape, volume and topographic structure of individual particles,
- temporal variation of particle fluxes,
- spatial variation of particle fluxes, and
- measurements on local elastic properties if further studies show that they do not affect the tip lifetime

During the cruise phase to the comet MIDAS may provide:

- characterization of the dust environment in the vicinity of the asteroids for which a fly-by is performed
- imaging of impact craters caused by fast interplanetary dust particles, and
- statistical analysis of craters on the exposed surface in terms of particle size and volume

MIDAS will deliver global images, i.e. complete images of the entire scan field, and images of individual dust particles. The latter are contained in the former, since selected particles are identified from the global image. These particles are then re-scanned with a much higher resolution. The measurements by the MIDAS instrument will address many of the questions related to cometary dust. In particular, the MIDAS instrument can measure and address the following qualities of the collected dust grains:

- 3D images of single particles
- Images of the textural complexity of particle aggregates
- Identification of crystalline material if idiomorphic or hypidiomorphic shapes are developed
- Identification of sub-features on clean surfaces which provides insight into the growth conditions (e.g. twinning defects) and/or storage environment (e.g. dissolution marks)
- Statistical evaluation of the particles according to size, volume and shape



- Variation of particle fluxes between individual exposures of the collector unit on time scales of hours
- Four out of the sixteen sensors are capable of detecting a magnetic gradient between sensor and sample and allow the identification of ferromagnetic minerals or the visualisation of the internal magnetic structure of a grain.

2.2 AFM Operating Modes

Contact mode

The working point is set close to the repulsive force regime where the tip actually touches the surface. Typically, a force of the order 10^{-7} – 10^{-6} N is exerted on the sample. Owing to the strongly increasing repulsive force at decreasing distances, the tip cannot penetrate deeply into the surface and the soft cantilever bends. However, the pressure exerted by the tip is high and soft samples, particularly, can be scratched or damaged.

Dynamic mode

The cantilever is excited at its natural mechanical resonance frequency (~100 kHz) at close distance to the sample. The amplitude of the cantilever vibration is of the order 100 nm. Depending on the operational setting, the tip may or may not touch the sample during each oscillation. At small tip-sample separation of the order 5–10 nm, the interaction of the electron orbits results in a weak attractive force, and the resonance frequency of the cantilever changes owing to a virtual increase in its spring constant. The quantity thereby measured is not the force directly, but its gradient. As in the contact mode, vertical resolution in the nm range can be achieved. The force applied by the tip to the sample is of the order 10⁻⁸ N. This relatively small force and the absence of lateral forces makes damage to the tip less likely, and the lifetime of the tip increases considerably. The lateral resolution obtained in dynamic mode is comparable to that of the contact mode. However, dynamic mode images often represent not only the topography, but also to some extent the elastic properties of the sample under investigation. The mechanical resonance frequency of the cantilever has to be determined before any measurement in dynamic mode.

Magnetic force microscopy

This derivative of atomic force microscopy (Martin and Wickramasinghe, 1987) records a magnetostatic force between sample and a magnetised tip. Four of the MIDAS tips have been coated with a thin layer of cobalt. The deflections of their cantilevers then result from a combination of mechanical and magnetic forces, which can be separated by measurements at two different tip-sample distances. These tips map the magnetic structures of the particles in addition to the topographies.



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2.3 Operating Principle

MIDAS is designed to analyse micro dust particles collected in the cometary environment, irrespective of their electrical conductivity and shape, by means of atomic force microscopy. The size of the particles which can be analysed ranges from about 4 nm to a few µm. The dust collector system includes a shutter mechanism which controls the particle flux onto a wheel covered with special coating to provide maximum adhesion for the particles. Sixty-one separate targets at the wheel are available for subsequent exposure to the ambient dust flux. The MIDAS microscope consists of five functional parts: a one shot cover and a funnel to protect the aperture on the ground and during launch, the shutter to define the exposure time to the dust flux, the robotics system for manipulation of the dust particles, the scanner head, and the supporting electronics.

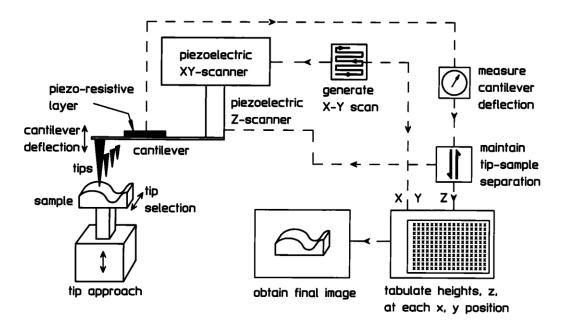


Fig. 2.1 – MIDAS Working Principle

At the heart of the atomic force microscope (AFM) is a very small tip which maps the surface of the particle. An AFM is capable, in principle, of imaging details down to atomic resolution. In the simplest case, the tip remains in permanent contact with the surface and follows its height variations with a control mechanism which keeps a constant force on the tip (contact mode). In a technically more complex mode, the tip scans the surface while its supporting cantilever vibrates at one of its natural resonance frequencies. Depending on the amplitude of the oscillation in dynamic mode, (a) the tip does not come closer to the surface than a few tenths of a nanometre (non-contact mode) or (b) the tip hits the surface during its sinusoidal oscillation (tapping mode). In all modes it is essential either to keep the force constant or to measure it accurately in order to derive an image of the surface.

The tip must move over the surface in a reproducible manner, which can be relatively easily achieved by piezo electric scanners in three independent directions. The combination of the tip, supporting cantilever, and piezo-electric actuators is called scanner head. Due to lifetime requirements, several tips will be employed (16 in total).



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2.4 Data Handling Process

The data products will be prepared and delivered by IWF/OAW in collaboration with partners from ESTEC. A list of contact persons, phone numbers and email addresses is given in section 1.8.

All data products are planned to be level 1b and/or level 2 data (PSA processing label) throughout the whole mission lifetime. Higher level data products will be included in the final archive volume distribution.

It is foreseen to use most of the already developed EGSE software modules for data processing. This software will be adapted to generate the data products from the raw data archive (locally stored laboratory data as well as DDS data after launch).

2.5 Overview of Data Products

The table below shows the data products which are intended to be archived. A detailed description of the different data types follows.

Data Type	Type Mnemonic	PDS Data Type
Housekeeping Data (Standard, Extended)	HK1, HK2	TABLE
Frequency Scan Data	FSC	SERIES
Single Point Approach Data (Control Data)	SPA	TABLE
Single Point Sampling Data (High Resolution Data)	SPS	SERIES
Line Scan Data	LIN	TABLE
Image Scan Data	IMG	IMAGE
Feature Vector Data (Regions Of Interest)	ROI	TABLE
Event Data	EVN	TABLE
Cantilever Utilisation History	САН	TABLE
Target Utilisation History	TGH	TABLE

Table 2.1 - MIDAS Archive D	ata Products
-----------------------------	--------------

Housekeeping Data

MIDAS generates two types of housekeeping data:

- The standard housekeeping report contains basic information and reflects the "general condition" of the instrument (e.g. voltage monitors, temperatures).
- The much larger extended housekeeping report includes the status of the instrument sub-systems (e.g. linear stage, approach) and all parameters related to the science operations.

Typical data cadences are 4 seconds for the standard HK report and 8 seconds for the extended HK report for laboratory generated data. The individual data rates can be changed via telecommand and will be much lower during normal flight operations.



Frequency Scan Data

In order to set the operating point (excitation frequency) for a certain cantilever (tip), the resonance frequency has to be determined. This is achieved by performing a frequency sweep in a commanded frequency range. The operating point is set relative to the detected resonance amplitude. A frequency scan produces up to 8 data packets (depending of the commanded frequency range and resolution) of 256 data acquisition points each.

The frequency scan is performed

- every time approaching the surface,
- whenever a new tip is selected, or
- during long-lasting (dynamic) scans when re-adjustment of the frequency is required.

The cantilevers (tips) are numbered from 1 to 16 and are addressable by 2 blocks of 8 cantilevers each (physically the cantilevers are structured into four cantilever arrays):

Tip # Description	Description	Cantilever selection		
	Block #	Cantilever #		
1-4	Cantilever array #1	1	1-4	
5-8	Cantilever array #2	1	5-8	
9-12	Cantilever array #3	2	1-4	
13-16	Cantilever array #4 (cobalt coated)	2	5-8	

Tip, cantilever block and cantilever number are also present in the <u>extended housekeeping data</u> product. Please note that the <u>cantilever number ranges from 0 to 7</u> in this data product.

Single Point Approach Data

The MIDAS instrument software is capable of monitoring selected data acquisition process parameters (cantilever AC, DC and phase signal; Z set value) simultaneously in a single scan position. This feature can be enabled or disabled when performing a line scan and is not available for the full image scan. The associated data packet contains the last 256 processed parameter values before the measurement reading is recorded. During a line scan, 32 uniformly distributed positions are monitored. The parameter MAIN_SCAN_CNT indicates the pixel number within the line where the approach vector has been recorded.

Single Point Sampling Data

The data acquisition monitoring structure is also used for a more complex instrument mode. This "high resolution" scanning mode allows the sampling of the above-mentioned parameters with a frequency of up to 700 samples per second. The scanner head remains in the same X/Y position when taking the data samples (STEP_SIZE parameter is 0). Thus the Single Point Sampling data product corresponds to a single point located on the target surface.

By getting into contact with the surface (static or DC mode), the cantilever DC signal can be used to measure micro-vibrations with a maximum frequency of 350 Hz. This mode is frequently used during the pointing and interference scenario.



In order to detect possible micro-vibrations, a Fast Fourier Transform (FFT) has to be applied to the DC sample vector. Analysis of the resulting frequency spectrum will give an indication (spectral lines with higher amplitude) on micro-vibrations.

Line Scan Data

Additionally to the full image scan, MIDAS is able to scan single lines in either X or Y direction. The line scan values have two different meanings depending on the commanded scanning mode:

- In dynamic or contact mode the Z piezo set values at the surface are stored in the line scan.
- In magnetic mode the differences of the cantilever AC signals at the surface and at a given distance from the surface are recorded.

The size of a line scan is a multiple of 32, ranging from 32 to a maximum of 512 DAQ points.

Image Scan Data

The image scan is the key operation of the instrument MIDAS. The on-board image memory of 1 MB can hold a maximum of 8 standard images (256x256 pixel / 1 DAQ channel = 128 kB). The image dimensions are multiples of 32 pixels, ranging from 32 to a maximum of 512 DAQ points.

During a single image scan up to 8 data channels can be measured in parallel. At the present time 14 data channels are available (the value in curly braces gives the calibration curve number as defined in the calibration table MIDCALIB.TAB defined in chapter 3.4.2.2):

- [ZS] Z piezo set value (this is the default channel for all scanning modes) {40}
- [AC] Cantilever AC signal at surface (required for magnetic mode) {3}
- [PH] Cantilever Phase signal {13}
- [DC] Cantilever DC signal {3}
- [XH, YH, ZH] X, Y, Z piezo high voltage monitor {8}
- [M1, M2, M3] Cantilever AC signal at (magnetic) retract position 1,2,3 {3}
- [YP, ZP] Y, Z piezo position (measured) {3}
- [YE, ZE] Y, Z piezo offset error (control loop deviation set value / measured value) {3}
- [S1, S2] Data point acquisition status information

If more than one data channel is selected for a scan, the software generates a separate image for every channel.

Feature Vector Data

Another facet of the instrument software is the calculation of so-called "feature vectors" for an already acquired image. These vectors are providing statistical information (10 parameters in total) of features found in the image, for example area or volume. The features are selected dependent on a number of commandable criteria. By weighting the selection criteria, it is possible to determine a feature which suits best the given requirements. The coordinates of the determined feature can then be used to automatically zoom-in into the underlying image.

A maximum of 1024 feature vectors can be stored for a single image. The vectors are packed into statistical data packets containing 64 vectors each.



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Event Data

Every task (e.g. mechanical sub-system movement, scan, image processing) running on the instrument has associated a number of events providing information about the status of the task (e.g. started, finished and aborted). In order to keep track of the task execution, the events will also be part of the MIDAS data archive.

A list of events is given in the MIDAS User Manual in section 2.3.3.1 "TM data packet overview".

Cantilever Utilisation History Data

The MIDAS scanner head holds 16 different cantilevers (tips) mainly for redundancy purposes, and four of these tips are coated with magnetic material and may be used for magnetic mode scans. For the interpretation of the AFM images it is necessary to know the history of the tip which has been used for the image acquisition. A list of operating times and associated scanning parameters (e.g. scanning mode, gain levels and excitation level) will be stored for each cantilever.

The cantilever history files are cumulative, containing the data from the start of the mission up to and including the mission phase represented in a dataset.

Target Utilisation History Data

For each of the 64 scanning targets (including the three calibration targets) a list of events concerning the target will be maintained and stored in the archive. Dedicated information like the dust flux during exposure recorded by GIADA or the scanning tip number will be stored in this table.

The targets are numbered from 1 to 64 and each target is subdivided into 16 addressable segments (or scan bands). This results in a total number of 1024 addressable target segments. The segments are numbered from 0 to 1023, with segment 0 referring to the centre of target 1:

Target #	# Description Addressed by segment #		ient#	
		Min	Centre	Max
1	Dust collector target	1017	0	7
2	TGZ02 – Z calibration (106 nm height)	9	16	23
3	TGX01 – used for X/Y calibration	25	32	39
4	TGT01 – X/Y calibration and tip imaging	41	48	55
5	Dust collector target	57	64	71
64	Dust collector target	1001	1008	1015

The target history files are cumulative, containing the data from the start of the mission up to and including the mission phase represented in a dataset.

2.5.1 Pre-Flight Data Products

MIDAS will provide laboratory data from the TB/TV acceptance tests of the FM. Since the generation of the feature vectors was not implemented in the instrument S/W at that time, it is also intended to create a data set from dedicated FS or QM tests.



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2.5.2 Sub-System Tests

A series of micro-vibration tests were performed on the QM.

2.5.3 Instrument Calibrations

X/Y/Z Calibration

The X-, Y- and Z-sensors of the MIDAS instrument are calibrated by means of three reference grids which are mounted on the target wheel. These reference grids are scanned on a more or less regular basis in order to re-calibrate the scanner head:

• TGX01 – used for X/Y calibration

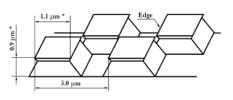
The silicon calibration grating of the TGX series is a chessboard-like array of square pillars with sharp undercut edges formed by (110) crystallographic planes of silicon.

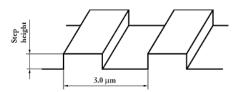
• TGZ02 – Z calibration (106 nm height)

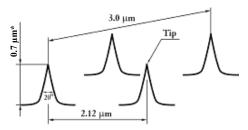
Calibration gratings of the TGZ series are 1-D arrays of rectangular SiO_2 steps on a Si wafer. The structure is coated by Si_3N_4 to prevent Si from oxidation. The step height value is calibrated over the whole active area.

• TGT01 – X/Y calibration and tip imaging

The silicon calibration grating of the TGT01 series is an array of sharp tips, characterized by strict symmetry of tip sides, small cone angle (less than 20 degrees) and small curvature radius of the tips (less than 10 nm) over the whole active area.







The dimensions marked (*) show approximate values and are given for information only.

The archive will contain the following calibration data:

- Tip resonance curves as a function of the excitation frequency in [V]
- Tip positions as a function of the linear stage LVDT monitor in [V] and [µm] (see [9])
- Tip images acquired by sampling calibration grating TGT01
- X/Y step calibration (can be derived from sampling calibration grating TGX01)
- Z step calibration (can be derived from sampling calibration grating TGZ02)
- HK parameter conversion from raw to physical values



2.5.4 Other Files written during Calibration

Numerous reference measurements with commercial AFM's (Zeiss, Park) have been performed. The resultant image database is used as reference for the analysis and interpretation of MIDAS generated images.

2.5.5 In-Flight Data Products

A list of data products as well as a detailed description is already provided at the beginning of section 2.5.

The data products are planned to be level 1b and/or level 2 data (PSA processing label) throughout the whole mission lifetime. Higher level data products are likely to be included in the final archive volume distribution.



2.5.6 Software

2.5.6.1 Data Archiving Software

The MIDAS data archiving software is a graphical user interface written in IDL and is used to prepare the MIDAS archive data sets to be delivered to the PSA.

🎒 MIDAS Data Archiver - D:\Projekte\Midas\Archiving\mid_dav\RO-X-MIDAS-3-MARS-PC3-5-V1.0.ini 📃 🔲 🗶				
File Options Help				
Add Data Source	D:\Daten\Midas\Mission\PC3 TLM_*_1???.dat , 0 , 1 , 1 , 0			
Remove Data Source	D:\Daten\Midas\Mission\Pi D:\Daten\Midas\Mission\Pi	D:\Daten\Midas\Mission\PC4\ , TLM_*_1???.dat , 0 , 1 , 1 , 0 D:\Daten\Midas\Mission\PC5\ , TLM_*_1???.dat , 0 , 1 , 1 , 0		
Remove All Sources				
	DATA SET DESC ID	PC3-5		
	DATA_SET_DESC_NAME	PC3-5		
	MISSION_PHASE	MARS SWING-BY ; MARS ; 2006-07-29 ; 2007-05-28		
	MISSION_TARGET	CHECKOUT ; N/A ; CHECK ; X		
	PRODUCT_VERSION_ID	1.0		
	VOLUME_DESC	Payload Checkout 3-5 Data		
General Keyword Settings	VOLUME_START_TIME	2006-08-26T17:00:00		
	VOLUME_STOP_TIME	2007-05-23T15:00:00		
	DATA_QUALITY	2 ; Data ok.		
	INSTRUMENT_MODE	NORMAL ; Data generated by S/W stored in on-board EEPROM.		
	DATA_SET_ID	RO-X-MIDAS-3-MARS-PC3-5-V1.0		
	DATA_SET_NAME	ROSETTA-ORBITER CHECK MIDAS 3 MARS PC3-5 V1.0		
	This dataset includ	es MIDAS data from the payload checkouts #3 to #5:		
	Scenario ID	Date (YYDDDHH) Observation description		
Dataset Summary	PC3 (passive) 1	0623817-0623820 MIDAS passive C/O part A		
	2	0624216-0624219 MIDAS passive C/O part B		
Un-board Time Correlation	On-board Time Correlation C Ground (1.1.1970) C TimePkts • SPICE Offset [s] > 0 < (press RETURN to apply changes)			
Show Frame List	Frame List 40 file(s) and 75322 frame(s) selected.			
Create Data Set				
PSA Volume Verifier scan index verify version Warnings Infos Stop after error #>50				
PDS Tools Package	PDS Tools Package ddict kwwtool lwtool			

Fig. 2.2 – MIDAS Data Archiving S/W

Key features of the archiving software are:

- Data sets are created directly from the MIDAS raw data archive by means of data set templates which are completed during data processing.
- The S/W is capable of managing so called "data set profiles" in order to ease reproduction of entire data sets.



• A number of label verification tools (PVV, NASA PDS tools) are already integrated into the archiving software. This allows the user to validate the data sets immediately after generation.

2.5.6.2 Data Verification Software

This software is used to display and validate the contents of an entire MIDAS archive data set interactively. The software is entirely written in IDL and the source code is included in the data sets. The source files (extension *.PRO) are located in the DOCUMENT directory of a data set. A detailed description of the software is provided in section 5.

2.5.6.3 Third Party Software Packages

NASAView

NASAView (<u>http://pds.nasa.gov/tools/nasa-view.shtml</u>) is a PDS archive product display program that runs on multiple platforms in a GUI environment. The tool can be used to view the MIDAS images located in the DATA/IMG directory.

🕅 NASAView 2.13 March 2006				
File Edit Image Large Image Selection Label (Options Help			
1019 Image - IMG_1019 X	NASAView - Image Attributes - IMG_101 OBJECT = BCR_IMAGE LINES = 256 LINE_SAMPLES = 256 SAMPLE_BITS = 16 SAMPLE_TYPE = LSB_UNSIGNED_INTEGER DESCRIPTION = "Z piezo position set value" SCALING_FACTOR = 1.6400E-001 OFFSET = 0.0000E+000			

Fig. 2.3 – MIDAS Image taken during LUTETIA Fly-by

PDS Tools Package

The PDS Tools Package (<u>http://pds.nasa.gov/tools/pds-tools-package.shtml</u>) is the complete set of PDS Engineering Node supported tools. This package contains a single installer file which includes the option to install the following tools:

- Keyword Definition (ddict): Lists all keywords and their definitions from the specified file(s).
- Keyword Verifier (kwvtool): Lists all keywords and a distinct set of their values from the specified file(s).



- Label Parser: The Java-based label parser parses an ODL label and generates an XML representation.
- Label Verifier (Ivtool): Performs validation of PDS labels.
- Line Analyzer (line): Analyzes each line of a file and reports anomalies.
- Make Index (make_index): Creates an index file (pdsdd.idx) from a data dictionary file (pdsdd.full).
- Perl Validation Toolkit: Validates PDS volumes (includes lvtool and kwvtool).
- Table Checker (table_check): Performs a variety of tests on PDS table objects.
- Table to Label Generator (tab2lab): Generates PDS labels from values in a table.
- Table Verifier (tbtool): Utility for validating, browsing and summarizing data that is organized by rows and columns and is described by a PDS label.

The PDS Tools Package also includes libraries which are utilized by the tools listed above and are available for use in customized applications:

- Label Library (lablib): This library, written in C, can be used to read, process and write PDS labels.
- Label Library Light (lablib3): This library, written in C, can be used to read, process and write PDS labels. Compared to lablib, this library is smaller, faster and has a simpler interface.
- ODLC Library (odlc): This library, written in C, can be used to access data that meet the standards of the PDS.
- Object Access Library (oal): This library, written in C, can be used to access data that meet the standards of the PDS.



2.5.7 Documentation

The following documents will be included in the MIDAS archive DOCUMENT directory:

- MIDAS User Manual
- MIDAS EAICD
- MIDAS Co-ordinate Systems
- MIDAS instrument paper as presented in the Space Science Review (2007)

These documents are converted to ASCII format. Associated drawings are stored as "Portable Network Graphic" (PNG) files.

In addition, PDF versions of the listed documents are available from the same directory.

2.5.8 Derived and other Data Products

N/A

2.5.9 Ancillary Data Usage

N/A



3 Archive Format and Content

3.1 Format and Conventions

3.1.1 Deliveries and Archive Volume Format

The logical archive volumes will contain one data set per volume. Up to now, three basic types of logical archive volumes are planned:

- Selected laboratory data
- Checkout data generated during flight (cruise phase)
- Data acquired in the close comet environment (cometary phase)

3.1.2 Data Set ID Formation

The MIDAS data set identifiers are defined as follows (see archive plan [3]):

```
"RO-{target ID}-MIDAS-{level}-{phase}-{description}-Vx.y"
{target ID} = {C, A, E, M, CAL, X, D, SS, C}
{level} = processing level = {3, 5}
{phase} = mission phase = {GRND, CVP, CR1, ...}
{description} = free character string containing only A-Z, 0-9 (e.g. TV)
```

3.1.3 Data Set Name Formation

The MIDAS data set names are defined as follows (see archive plan [3]):

```
"ROSETTA-ORBITER {target name} MIDAS {level} {phase} {description} Vx.y"
{target name} = {67P, STEINS, LUTETIA, ...}
{level} = processing level = {3, 5}
{phase} = mission phase = {GRND, CVP, CR1, ...}
{description} = free character string containing A-Z, 0-9, - (e.g. TV-TEST)
```

3.1.4 Data Directory Naming Convention

For all data sets the data directory is structured as follows:

• /DATA[/{data type}]/file(s)

{data type} = {EVN, FSC, HK1, HK2, IMG, LIN, ROI, SPA, SPS}
Cantilever and target history files (CAH, TGH) are stored in the data directory root.



3.1.5 File Naming Convention

The following file naming scheme will be used for all data sets (the "extra" field is optional and depends on the data type):

• {data type}_{start}_{stop}[_{extra}].{ext}

{data type} = {CAH, EVN, FSC, HK1, HK2, IMG, LIN, ROI, SPA, SPS, TGH}

{start} = begin of observation rounded to nearest hour, format = yydddhh

{stop} = end of observation rounded to nearest hour, format = yydddhh

{extra} = more specific information about the file content:

data type	extra information	possible values	field format	
HK1, HK2, EVN		not used		
FSC, SPA,	sequence counter [nnn]	001FFF	nnn tt	
SPS, LIN	tip number [tt]	0116	nnn_tt	
	sequence counter [nnn]	001999		
IMG	DAQ channel [dd]	ZS, AC, PH, DC, M1, M2, M3, XH, YH, ZH, YP, ZP, YE, ZE, S1, S2 ^{*)}	nnn_dd	
POL	sequence counter [nnn]	001999	nnn ff	
ROI target number [ff]		0164	nnn_ff	
САН	tip number [tt]	0116	tt	
TGH	target number [ff]	0164	ff	

^{*)} A description of the DAQ channels is given in section 2.5 (Image Scan Data).

{ext} = depends on the data type (e.g. IMG for images, DAT/TAB for binary/ASCII tables)

3.2 Standards Used in Data Product Generation

3.2.1 PDS Standards

The MIDAS archive is based on the PDS Standard version 3.6 released in August 2003.

3.2.2 Time Standards

All MIDAS timing information of archive data products that are mapped to binary tables (e.g. housekeeping data telemetry packets), is given in the Spacecraft Elapsed Time (referred to as OBT to prevent confusion with the SCET defined in the DDID) format as defined in [4], section 2.7. The format used to represent the OBT is 4 bytes of unit seconds followed by 2 bytes of fractional seconds and is stored in the TM packet data field header. **The OBT is set to zero at 00:00:00 UTC on 1 Jan 2003.** The instrument is synchronised with the S/C OBT on a regular



basis (typically every 30 minutes). In order to convert the OBT to UTC the NAIF SPICE software library is used. A more detailed description of the ROSETTA time standards is given in [8].

To represent UTC time values in archive data products represented by ASCII tables (e.g. cantilever history data), the ASCII Time Code A format, defined by the Consultative Committee for Space Data Systems (CCSDS) is used. The ASCII Time Code A is a 24 character string of the format "YYYY-MM-DDThh:mm:ss.dddZ". According to the archive plan the trailing "Z" is omitted and no quotes are used

In ground-based data sets the OBT reference is **00:00:00 UTC on 1 Jan 1970**. Since the S/C clock is not defined for ground based data, there is no relationship between the SPACECRAFT_CLOCK_START/STOP_COUNT keywords (set to "N/A") and the START/STOP_TIME keywords (representing UTC) in the data labels. This has been taken into account by adding the NATIVE_START/STOP_TIME keywords to the data labels. The **native start/stop time** is given in seconds since 00:00:00 UTC on 1 Jan 1970 with leap seconds not taken into account (also referred to as UNIX time).

3.2.3 *Reference Systems*

MIDAS Coordinate Systems

The following reference systems are applicable to the MIDAS instrument:

- Unit Reference Frame: The basic co-ordinate system to be used for MIDAS at instrument level.
- **AFM Reference Frame:** The ARF system is used in the context of scanner operations and is fixed to the frame of the scanner table.
- **Target Reference Frame:** Defines the co-ordinate system on any individual target area (or target) on the collector.

A detailed description of the MIDAS X/Y/Z reference systems can be found in the MIDAS Coordinate Systems document [9].

J2000 System

The Earth Mean Equator and Equinox of Julian Date 2451545.0 (referred to as the J2000 system) is the standard inertial reference frame. Some of the geometry keywords given in the data labels are expressed in J2000 coordinates (e.g. SC_SUN_POSITION_VECTOR).

3.2.4 Other Applicable Standards

In order to represent and store the images in the MIDAS archive, the raw data images are converted to BCR. The BCR-STM file format has been developed for easy exchange of SPM files independent of the instruments used (see SPIP Reference Guide at http://www.imagemet.com/WebHelp6/Default.htm).

The header is 2048 bytes long and written in ASCII characters, which can be edited by a text editor. The first line identifies the format and should be:

• **fileformat** = bcrstm

Additional parameters are defined as follows:

• **xpixels** and **ypixels** defines the number of pixels in the image



- xlength and ylength defines the scanning range in nm
- xunit, yunit and zunit units for the three axes (if not defined nm will be the default unit)
- current defines the tunneling current in nA (optional)
- **bias** defines the bias voltage in V (optional)
- **starttime** defines the starting time of the scanning (DD MM YY hh:mm:ss:hh) (optional)
- **scanspeed** is measured in nm/sec (optional)
- **intelmode** = 1 indicates that the data is written in little-endian 16-bit integers (LSB first; e.g. Intel x86 processors)
- **intelmode** = 0 indicates that the data is written in big-endian 16-bit integers (MSB first; e.g. Motorola 6800 processors)
- **bit2nm** is the scale factor for scaling the integer height data to nm
- **xoffset** and **yoffset** defines physical offset in nm (optional)
- **voidpixels** defines the value of void pixels (should be set equal to 32767; if omitted, the value is assumed to be 0)

Comments can be written by starting the line with the characters '%' or '#'.

It is possible to integrate new parameters as long the header size does not exceed 2048 bytes.

The body of the BCR file contains **xpixels*****ypixels** 16 bit signed integer data values.

3.3 Data Validation

The following tools are used in order to validate the generated MIDAS data sets:

PSA Volume Verifier (PVV)

The PVV is a tool constructed by the PSA team to allow instrument teams from all of ESA's planetary missions to check their datasets before they are delivered to the PSA database for ingestion into the long-term archive. The tool allows a user to verify PDS compliance of a label, and validates all aspects of the data set structure / content prior to delivery to the PSA. The PVV is systematically used by the PSA team to check data sets as part of the ingestion process to the Planetary Science Archive (PSA).

NASA PDS Tools

The PDS Tools Package is the complete set of PDS Engineering Node supported tools. The following tools of the package are used:

- **ddict** Extracts the data dictionary definition for every keyword used in a specified PDS label file, a specified list of PDS label Files, all of the labels in a directory, or all of the files on an entire volume. DDICT also lists those keywords that are not in the dictionary.
- **kwvtool** This software creates a list of all keywords and their values found in a PDS label file or in a group of PDS label files.
- **line** The LINE program analyzes each line in each file and reports on the status of certain PDS standards and the value associated with some of the PDS keywords.
- **Ivtool** This software checks PDS labels for compliance with the labeling standards established by the PDS for data product labels.



- **NASAView** This program allows the user to display and examine PDS archive data products interactively.
- **table_check** The table checker program is a tool that checks PDS labels and its corresponding data files. It parses a label, checks for label and data errors (BINARY or ASCII files), and reports and summarizes its findings.
- **tbtool** The PDS Table Browser is a utility for validating, browsing, and summarizing data that is organized by rows and columns and is described by a PDS label file.

MIDAS Data Set Browser

This software is used to display and validate the contents of an entire MIDAS archive data set interactively. The software is entirely written in IDL and the source code files are included in the DOCUMENT directory of the data sets (see chapter 5).



3.4 Content

The MIDAS archive will contain data from important laboratory measurements, instrument checkout data generated in the interplanetary cruise phase and instrument data acquired in the close comet environment, as well as derived or merged instrument data e.g. the cantilever utilisation history or the target exposure history.

3.4.1 Volume Set / Data Set

The Rosetta archive is an online archive, where the data are delivered electronically. Thus there is no need to bundle several data sets into one volume, and one data set corresponds to one volume. A data set will include the data products as well as the secondary data, software and documentation that completely document and support the use of these data products. In general, the data products from the different instruments are contained in separate data sets, but merged data sets are possible. Data sets may include data products from one or more mission phases. Data products of different data processing levels are contained in separate data sets.

3.4.2 Directories

The top-level structure of the ROOT directory of a typical MIDAS data archive volume (= data set) corresponds to chapter 19 of the PDS Standards Reference [AD2] and is summarised below:

3.4.2.1 Root Directory

.PDSVOLUME: Archive data file catalogue generated by PVV.

AAREADME.TXT: This file describes the volume (= data set) as a whole. It gives an overview of the contents and organisation of the data set, general instructions for its use and contact information.

ERRATA.TXT: This file describes errors and/or anomalies found in this and previous volumes (= data sets). As erroneous data sets should be corrected and delivered again, there is no need for this file.

VOLDESC.CAT: This file contains the VOLUME object, which gives a high-level description of the contents of the volume (= data set).

3.4.2.2 Calibration Directory

This directory contains the calibration files used in the processing of the raw data or needed to use the data products in the volume (= data set).

CALINFO.TXT: Description of the contents of the CALIB directory.

MIDCALIB.LBL: PDS label associated to the standard MIDAS calibration table.

MIDCALIB.TAB: Standard MIDAS calibration table in PDS ASCII format.



The following table shows the standard calibration curves used for MIDAS housekeeping and science data calibration:

1 0.0 1.0 One to one conversion 2 -10.0 4.884005E-03 V 12 bit DAC set value [-1010 V] 3 0.0 3.051804E-04 V 16 bit ADC data [-1010 V] 4 -10.0 3.051804E-04 V 16 bit DAC set value [-1010 V] 5 -273.0 1.142998E-02 degC Temperature [-273101.52 °C] 6 0.0 9.170596E-04 V +15 voltage monitor [-3030 V] 7 0.0 9.170596E-04 V +15 voltage monitor [-40240 V] 8 100.0 4.272530E-03 V Piezo HV voltage monitor [-40240 V] 9 0.0 1.0 um XYz age position monitor [014000 nm] 11 0.0 2.136263E-01 nm XYZ position monitor [014000 nm] 12 21.0 42.0 us Pulse generator pulse width [212752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] </th <th>Reference #</th> <th>Calibration Offset</th> <th>Calibration Factor</th> <th>Unit</th> <th>Description</th>	Reference #	Calibration Offset	Calibration Factor	Unit	Description
3 0.0 3.051804E-04 V 16 bit ADC data [-1010 V] 4 -10.0 3.051804E-04 V 16 bit DAC set value [-1010 V] 5 -273.0 1.142998E-02 degC Temperature [-273101.52 °C] 6 0.0 9.170596E-04 V +15 voltage monitor [-3030 V] 7 0.0 9.170596E-04 V -15 voltage monitor [-40240 V] 9 0.0 1.0 um Linear position set value [0.65535 um] 10 0.0 0.1 um XY stage positioning [0.6553.5 um] 11 0.0 2.136263E-01 nm XYZ position monitor [014000 nm] 12 21.0 42.0 us Pulse generator pulse width [212752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency tsep/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [0	1	0.0	1.0		One to one conversion
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5 -273.0 1.142998E-02 degC Temperature [-273101.52 °C] 6 0.0 9.170596E-04 V +15 voltage monitor [-3030 V] 7 0.0 9.170596E-04 V -15 voltage monitor [-3030 V] 8 100.0 4.272530E-03 V Piezo HV voltage monitor [-40240 V] 9 0.0 1.0 um Linear position set value [06553.5 um] 10 0.0 0.1 um XY stage positioning [06553.5 um] 11 0.0 2.136263E-01 nm XYZ position monitor [014000 nm] 12 21.0 42.0 us Pulse generator pulse width [212752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency tiph word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [0655355] 22 -0.065904 0.010293 A MIDAS LCL 6A	3	0.0	3.051804E-04	V	16 bit ADC data [-1010 V]
6 0.0 9.170596E-04 V +15 voltage monitor [-3030 V] 7 0.0 9.170596E-04 V -15 voltage monitor [-3030 V] 8 100.0 4.272530E-03 V Piezo HV voltage monitor [-40240 V] 9 0.0 1.0 um Linear position set value [065535 um] 10 0.0 0.1 um XY stage positioning [06553.5 um] 11 0.0 2.136263E-01 nm XYZ position monitor [014000 nm] 12 21.0 42.0 us Pulse generator pulse width [212752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B power <td>4</td> <td>-10.0</td> <td>3.051804E-04</td> <td>V</td> <td>16 bit DAC set value [-1010 V]</td>	4	-10.0	3.051804E-04	V	16 bit DAC set value [-1010 V]
7 0.0 9.170596E-04 V -15 voltage monitor [-3030 V] 8 100.0 4.272530E-03 V Piezo HV voltage monitor [-40240 V] 9 0.0 1.0 um Linear position set value [065535 um] 10 0.0 0.1 um XY stage positioning [06553.5 um] 11 0.0 2.136263E-01 nm XYZ position monitor [014000 nm] 12 21.0 42.0 us Pulse generator pulse width [212752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency high word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6A power 25 -2.007376 0.286776 W MIDAS LCL 6B power	5	-273.0	1.142998E-02	degC	Temperature [-273101.52 °C]
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12 21.0 42.0 us Pulse generator pulse width [21.2752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency high word [02999.56 kHz] 16 0.0 6.984E-04 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 <t< td=""><td>10</td><td>0.0</td><td>0.1</td><td>um</td><td>XY stage positioning [06553.5 um]</td></t<>	10	0.0	0.1	um	XY stage positioning [06553.5 um]
12 21.0 42.0 us [21.2752491 us] 13 0.0 5.493248E-03 deg Cantilever phase signal [-180180 deg] 14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency high word [02999.56 kHz] 16 0.0 6.984E-04 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 0.164	11	0.0	2.136263E-01	nm	XYZ position monitor [014000 nm]
14 0.0 1.525902E-03 % F-scan operating variables [0100 %] 15 0.0 4.577034E+01 Hz Frequency high word [02999.56 kHz] 16 0.0 6.984E-04 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6B power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05	12	21.0	42.0	us	
15 0.0 4.577034E+01 Hz Frequency high word [02999.56 kHz] 16 0.0 6.984E-04 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6B power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm X DA	13	0.0	5.493248E-03	deg	Cantilever phase signal [-180180 deg]
16 0.0 6.984E-04 Hz Frequency step/low word [045.77 Hz] 17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6A current 24 -1.845312 0.288204 W MIDAS LCL 6B power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (c	14	0.0	1.525902E-03	%	F-scan operating variables [0100 %]
17 0.0 1.0 sec Time in seconds [065535] 22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6B power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 3.814 nm Y DAC set value (open	15	0.0	4.577034E+01	Hz	Frequency high word [02999.56 kHz]
22 -0.065904 0.010293 A MIDAS LCL 6A current 23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6A power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 3.814 nm Y DAC set value (open loop = default)	16	0.0	6.984E-04	Hz	Frequency step/low word [045.77 Hz]
23 -0.071692 0.010242 A MIDAS LCL 6B current 24 -1.845312 0.288204 W MIDAS LCL 6A power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (open loop = default)	17	0.0	1.0	sec	Time in seconds [065535]
24 -1.845312 0.288204 W MIDAS LCL 6A power 25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	22	-0.065904	0.010293	А	MIDAS LCL 6A current
25 -2.007376 0.286776 W MIDAS LCL 6B power 30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (closed loop) 43 0.0 3.814 nm X DAC set value (closed loop)	23	-0.071692	0.010242	А	MIDAS LCL 6B current
30 0.0 1.0 Bit pattern for image types 31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	24	-1.845312	0.288204	W	MIDAS LCL 6A power
31 800.0 -2.71276E-02 um Approach LVDT position 32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (closed loop) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	25	-2.007376	0.286776	W	MIDAS LCL 6B power
32 16.398 1.8221 mm Linear stage LVDT position 33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (open loop = default) 43 0.0 3.814 nm Y DAC set value (open loop = default)	30	0.0	1.0		Bit pattern for image types
33 0.0 3.051804E-04 % F-scan operating point [-100100 %] 34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	31	800.0	-2.71276E-02	um	Approach LVDT position
34 0.0 6.103609E-05 Feature vector weight factor [04] 35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	32	16.398	1.8221	mm	Linear stage LVDT position
35 0.0 1.525902E-05 Linear regression x/y factor 40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	33	0.0	3.051804E-04	%	F-scan operating point [-100100 %]
40 0.0 0.164 nm Z DAC set value (closed loop) 41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (closed loop)	34	0.0	6.103609E-05		Feature vector weight factor [04]
41 0.0 3.814 nm X DAC set value (open loop = default) 42 0.0 1.389 nm X DAC set value (closed loop) 43 0.0 3.814 nm Y DAC set value (open loop = default)	35	0.0	1.525902E-05		Linear regression x/y factor
420.01.389nmX DAC set value (closed loop)430.03.814nmY DAC set value (open loop = default)	40	0.0	0.164	nm	Z DAC set value (closed loop)
43 0.0 3.814 nm Y DAC set value (open loop = default)	41	0.0	3.814	nm	X DAC set value (open loop = default)
	42	0.0	1.389	nm	X DAC set value (closed loop)
44 0.0 1.389 nm Y DAC set value (closed loop)	43	0.0	3.814	nm	Y DAC set value (open loop = default)
	44	0.0	1.389	nm	Y DAC set value (closed loop)



3.4.2.3 Catalog Directory

This directory contains the catalog object files for the entire volume (= data set):

CATINFO.TXT: Description of the contents of the CATALOG directory.

DATASET.CAT: PDS data set catalog information about the data set currently being submitted.

INST.CAT: PDS instrument catalog information about the MIDAS instrument (likely to be the same in all deliveries, unless updates are needed).

INSTHOST.CAT: PDS instrument host catalog information about the Rosetta spacecraft and the mounting relationship of the instruments within the spacecraft; *provided by ESA*.

MISSION.CAT: PDS mission catalog information about the Rosetta mission; provided by ESA.

REFERENCE.CAT: PDS reference catalog information about the every journal article, book or other published reference mentioned in the above catalog objects or their components.

SOFTWARE.CAT: PDS software catalog information about the software submitted in the data set.

TARGET.CAT: PDS target catalog information about the observation target, i.e. comet, asteroid, Earth or Mars; *provided by ESA*.

3.4.2.4 Index Directory

This directory contains the index files summarising all data products in the volume (= data set) by mode, key instrument parameters or mission phase, and organised to facilitate finding the data of interest for a particular scientific question. Information about the observation geometry of the data products are also included here, i.e. spacecraft position and attitude, illumination conditions etc. Information that is not accurately known at the time of delivery and thus will probably be updated later is stored in the index files rather than in the data product labels.

INDXINFO.TXT: Description of the contents of the INDEX directory.

3.4.2.4.1 Dataset Index File, index.lbl and index.tab

INDEX.LBL: Detached label for the index table INDEX.TAB. The INDEX_TABLE specific object is used to identify and describe the columns of the index table.

INDEX.TAB: Index of the data set in tabular format.

3.4.2.4.2 Other Index Files

None



3.4.2.5 Software Directory

This directory will not be provided in the data sets. Nevertheless, the source codes (IDL routines) for data calibration, visualization and analysis will be provided in the DOCUMENT directory.

3.4.2.6 Label Directory

This directory contains PDS labels and includes files (referenced by a pointer in a PDS label) that are not packaged with the data products or in the data directory. For example, the format descriptions (columns) of the standard and extended housekeeping data products are located in this directory.

LABINFO.TXT : Description of the contents of the LABEL directory.

3.4.2.7 Document Directory

This directory provides documentation and supplementary and ancillary information to assist in understanding and using the data products in the volume (= data set). The documentation describes the MIDAS instrument as well as the MIDAS data sets and calibration. The MIDAS EAICD is included. According to the PDS standards the documents are present in ASCII format to ensure long-term readability. Document versions in PDF format are also provided in this directory.

DOCINFO.TXT : Description of the contents of the DOCUMENT directory.

3.4.2.8 Extras Directory

This directory will not be provided in the data sets.

3.4.2.9 Data Directory

This directory contains the actual data such as images or tables. PDS labeled data files or data files with detached PDS label files are arranged in a logical subdirectory structure (see section 3.1.4, *Data Directory Naming Convention*). Format specifications referred to in PDS labels are provided in the LABEL directory.

3.4.2.10 Browse, Geometry and Gazetter Directory

These directories are not provided in the data sets.

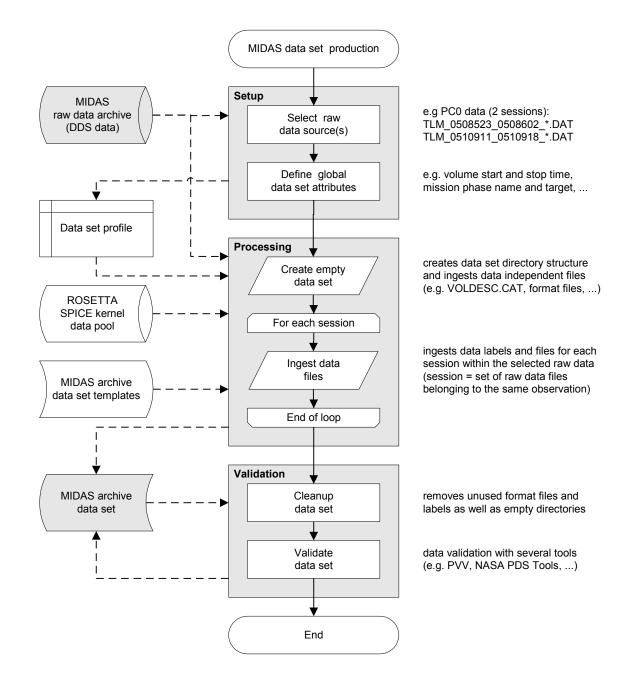


4 Detailed Interface Specifications

4.1 Structure and Organization Overview

4.1.1 Data Processing Diagram

The diagram below shows the MIDAS archive data set production principle:





4.1.2 Data Product Preparation

The preparation of the different data products is carried out in two different ways, depending on the data type:

- **Plain TM packet copy:** The archive data files are generated from the plain DDS raw data telemetry packets with the DDS header removed (e.g. housekeeping data files).
- **Derived data products:** At least one additional processing step is required in order to generate the data files (e.g. image data files).

The following table gives an overview of the MIDAS data products and the associated type of data preparation (session = set of raw data files belonging to the same observation and/or time range):

Data Type	Mnemonic	Data Processing	Table Type
Housekeeping Data	HK1, HK2	plain TM copy; one file per session	BINARY
Frequency Scan Data	FSC	plain TM copy; one file per scan	BINARY
Single Point Approach Data	SPA	plain TM copy; one file per approach	BINARY
Single Point Sampling Data	SPS	plain TM copy; one file per scan	BINARY
Line Scan Data	LIN	plain TM copy; one file per line	BINARY
Image Scan Data	IMG	converted to BCR format; one file per image and image data type	BINARY
Feature Vector Data	ROI	plain TM copy; one file per task	BINARY
Event Data	EVN	converted to ASCII; one file per session	ASCII
Cantilever Utilisation History	САН	extracted from cumulative cantilever history file; one file per data set	ASCII
Target Utilisation History	TGH	extracted from cumulative target history file; one file per data set	ASCII



4.2 Data Sets, Definition and Content

4.2.1 Data Set Production

According to the ROSETTA Archive Plan there is one separate data set per mission phase in the pre-cometary phase. The PDS formatted MIDAS data archives are delivered at the latest 6 months after the end of the single mission phases.

After arriving at the comet, a continuous data flow is anticipated (mission phases approach, Lander delivery and relay, escort, extended mission), and the PDS formatted MIDAS data sets are delivered in 3-month intervals. The last proprietary, validation and archive preparation period of 6 months starts at the end of the Rosetta mission.

Mission Phase	Start Date	End Date	Date Set ID
GROUND	2000-01-01	2004-03-01	data set selection ongoing
LAUNCH	2004-03-02	2004-03-04	no data
COMMISSIONING	2004-03-05 2004-09-06	2004-06-06 2004-10-16	RO-CAL-MIDAS-3-CVP-FULL-V1.0
CRUISE 1	2004-06-07	2004-09-05	no data
EARTH SWING-BY 1	2004-10-17	2005-04-04	RO-X-MIDAS-3-EAR1-PC0-V1.0
CRUISE 2	2005-04-05	2006-07-28	RO-X-MIDAS-3-CR2-PC1-2-V1.0
MARS SWING-BY	2006-07-29	2007-05-28	RO-X-MIDAS-3-MARS-PC3-5-V1.0
CRUISE 3	2007-05-29	2007-09-12	no data
EARTH SWING-BY 2	2007-09-13	2008-01-27	RO-X-MIDAS-3-EAR2-PC6-7-V1.0
CRUISE 4-1	2008-01-28	2008-08-03	RO-X-MIDAS-3-CR4A-PC8-V1.0
STEINS FLY-BY	2008-08-04	2008-10-05	no data
CRUISE 4-2	2008-10-06	2009-09-13	RO-X-MIDAS-3-CR4B-PC9-V1.0
EARTH SWING-BY 3	2009-09-14	2009-12-13	RO-X-MIDAS-3-EAR3-PC10-V1.0
CRUISE 5	2009-12-14	2010-05-16	RO-X-MIDAS-3-CR5-PC12-V1.0
LUTETIA FLY-BY	2010-05-17	2010-09-03	RO-A-MIDAS-3-AST2-LUTE-V1.0
RENDEZVOUS MANEUVER 1	2010-09-04	2011-06-07	no data
CRUISE 6	2011-06-08	2014-01-20	no data
PRELANDING	2014-01-21	2014-11-18	RO-D-MIDAS-3-PRL-SAMPLES-V1.0
COMET ESCORT 1	2014-11-19	2015-03-10	RO-C-MIDAS-3-ESC1-SAMPLES-V1.0
COMET ESCORT 2	2015-03-11	2015-06-30	RO-C-MIDAS-3-ESC2-SAMPLES-V1.0
COMET ESCORT 3	2015-07-01	2015-10-20	RO-C-MIDAS-3-ESC3-SAMPLES-V1.0
COMET ESCORT 4	2015-10-21	2016-01-12	RO-C-MIDAS-3-ESC4-SAMPLES-V1.0
ROSETTA EXTENS. 1	2016-01-13	2016-04-05	RO-C-MIDAS-3-EXT1-SAMPLES-V1.0
ROSETTA EXTENS. 2	2016-04-06	2016-06-28	RO-C-MIDAS-3-EXT2-SAMPLES-V1.0
ROSETTA EXTENS. 3	2016-06-29	2016-09-30	RO-C-MIDAS-3-EXT3-SAMPLES-V1.0

The following data sets are provided (as defined in the ROSETTA Mission Calendar):



4.2.2 Instrument Mode Definition

The MIDAS operational concept is based on tasks, rather than on modes. In order to perform a scientific observation, several tasks are executed one after the other. Therefore it is not very meaningful to describe a full observation (from instrument switch-on to switch-off) with a single mode identifier. Nevertheless, two rudimental instrument "modes" have been identified:

INSTRUMENT_MODE_ID	INSTRUMENT_MODE_DESC	
NORMAL	Data generated by S/W stored in on-board EEPROM.	
MODIFIED_NORMAL	Data generated by temporarily patched on-board S/W.	

4.2.3 Data Quality Definition

The following table lists the data quality identifiers and data quality descriptions used in the MIDAS data labels:

DATA_QUALITY_ID	DATA_QUALITY_DESC
-1	Data quality information is not supplied.
0	Bad data.
1	Use with caution.
2	Data ok.

4.2.4 Geometry Information

The following geometry keywords are used in the MIDAS data labels:

Geometry Keyword	Comment
SC_SUN_POSITION_VECTOR	"N/A" for ground based data sets.
SC_TARGET_POSITION_VECTOR	"N/A" for ground based data sets.
SC_TARGET_VELOCITY_VECTOR	"N/A" for ground based data sets.
SPACECRAFT_ALTITUDE	"N/A" for ground based and pre-comet data sets.
SUB_SPACECRAFT_LATITUDE	"N/A" for ground based and pre-comet data sets.
SUB_SPACECRAFT_LONGITUDE	"N/A" for ground based and pre-comet data sets.



4.2.5 Mission Specific Keywords

The following mission specific keywords (namespace ROSETTA) are used in the MIDAS data labels:

Mission Specific Keyword	Data Values	Description
MIDAS_LIN_STAGE_POS	-9.00 - +9.00 <v></v>	Position of the linear stage given by the linear LVDT position sensor. For a description of the relationship between tip number and linear stage position see [9], chapter 4.2.2.
MIDAS_SCANNING_MODE	"DYNAMIC" "CONTACT" "MAGNETIC"	Data acquisition mode.
MIDAS_SCAN_DATA_TYPE	"ZS:Z_SET_VAL" "AC:CANT_AC_MON" "AR:CANT_AC_RET" "PH:CANT_PH_MON" "DC:CANT_DC_MON" "XH:X_HV_MON" "YH:Y_HV_MON" "ZH:Z_HV_MON" "XP:X_POS_MON" "YP:Y_POS_MON" "YP:Y_POS_MON" "YE:Y_ERR_MON" "YE:Y_ERR_MON" "ZE:Z_ERR_MON" "S1:DAQ_STATUS_1" "S2:DAQ_STATUS_2" "M1:CANT_AC_MAG1" "M2:CANT_AC_MAG2" "M3:CANT_AC_MAG3"	Image scans data type. A detailed description of the different data types is given in chapter 2.5, "Image Scan Data".
MIDAS_SCAN_DIRECTION	{M,X,Y} M = MAIN_X, MAIN_Y X = X_LTOH, X_HTOL Y = Y_LTOH, Y_HTOL	Main, X and Y image and line scan direction. LTOH indicates scans from low to high piezo control voltages (default). HTOL denotes the opposite direction.
MIDAS_SCAN_START_XY	(X,Y) X = 065535 Y = 065535	Start coordinates (origin) of an image, line or single point scan relative to the X/Y stage origin. The coordinates are given in DAC (digital-analogue converter) set values.
MIDAS_SCAN_STOP_XY	(X,Y) X = 065535 Y = 065535	End coordinates of an image, line, or single point scan relative to the X/Y stage origin. The coordinates are given in DAC set values.



MIDAS_SEGMENT_NUMBER	01023	Selected scan segment. The correlation between target number and segment number is described in chapter 2.5, "Target Utilisation History".
MIDAS_TARGET_NAME	"TGZ02" "TGX01" "TGT01" "SILICON" "SOLGEL"	Name of scan target. TGZ02, TGX01 and TGT01 are used for (re-)calibration of the scanner head (see chapter 2.5.3). Silicon and SOLGEL targets are used for duct collection.
MIDAS_TARGET_NUMBER	164	Selected scan target. The correlation between target number and segment number is described in chapter 2.5, "Target Utilisation History".
MIDAS_TARGET_TYPE	"CALIBRATION" "PLAIN SILICON" "SOLGEL COATED"	Type of scan target. Plain silicon and SOLGEL coated targets are used for dust collection.
MIDAS_TIP_NUMBER	116	Selected scan cantilever. For a description of the relationship between tip number and linear stage position see [9], chapter 4.2.2.



4.3 Data Product Design

4.3.1 Data Product Design – Standard Housekeeping Data

The MIDAS standard housekeeping data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <u>STRUCTURE</u> keyword in the PDS labels:

- Data directory: /DATA/HK1
- File naming: HK1_yydddhh_yydddhh.DAT
- File structure: /LABEL/HK1 STRUCTURE.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A typical PDS label for a standard housekeeping data file is given below:

PDS VERSION ID	= PDS3
LABEL REVISION NOTE	= " <label note="" revision="">"</label>
RECORD TYPE	= FIXED LENGTH
RECORD BYTES	= 56
FILE RECORDS	= <file records=""></file>
DATA SET ID	= " <data id="" set="">"</data>
DATA SET NAME	= " <data name="" set="">"</data>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	
PRODUCT CREATION TIME	= <product creation="" time=""></product>
PRODUCT TYPE	= EDR
PROCESSING LEVEL ID	= <processing_level_id></processing_level_id>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_HASE NAME	= " <mission name="" phase="">"</mission>
MISSION_INAGE_NAGE	- (MISSION_INAGE_NAME)
INSTRUMENT_HOST_ID	= <instrument host="" id=""></instrument>
INSTRUMENT_HOST_NAME	= " <instrument host="" name="">"</instrument>
INSTRUMENT ID	= <instrument id=""></instrument>
INSTRUMENT NAME	= " <instrument name="">"</instrument>
INSTRUMENT TYPE	= " <instrument type="">"</instrument>
	-
INSTRUMENT_MODE_ID	= <instrument_mode_id></instrument_mode_id>
INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
TARGET NAME	= " <target name="">"</target>
_	_
TARGET_TYPE	= " <target_type>"</target_type>
START TIME	= <start time=""></start>
START_TIME STOP TIME	= <start_time> = <stop_time></stop_time></start_time>
SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME	
NATIVE COADE TIME	- NAMENTAL COUNT?"
	= <native_start_time></native_start_time>
NATIVE_STOP_TIME	= <native_stop_time></native_stop_time>
DRODUCED ID	
PRODUCER_ID	= " <producer_id>"</producer_id>
PRODUCER_FULL_NAME	
PRODUCER_INSTITUTION_NAME	= " <producer_institution_name>"</producer_institution_name>



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DATA_QUALITY_ID DATA_QUALITY_DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
/* GEOMETRY INFORMATION */	
SC_SUN_POSITION_VECTOR	= <sc_sun_position_vector></sc_sun_position_vector>
SC_TARGET_POSITION_VECTOR SC_TARGET_VELOCITY_VECTOR	= <sc_target_position_vector> = <sc_target_velocity_vector></sc_target_velocity_vector></sc_target_position_vector>
SPACECRAFT ALTITUDE	= <spacecraft altitude=""></spacecraft>
SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	= <sub_spacecraft_latitude></sub_spacecraft_latitude>
SUB_SPACECRAFT_LONGITUDE	= <sub_spacecraft_longitude></sub_spacecraft_longitude>
/* DATA FILE POINTER(S) */	
^HK1_TABLE	= " <file_name>"</file_name>
/* DATA OBJECT DEFINITION(S) */	,
OBJECT	= HK1 TABLE
INTERCHANGE_FORMAT	
ROWS COLUMNS	= <file_records> = 28</file_records>
ROW BYTES	= 56
NAME	= "MIDAS standard HK"
^STRUCTURE	= "HK1_STRUCTURE.FMT" = HK1 TABLE
END_OBJECT	- UUT_INDIE
END	

The standard housekeeping data file structure is defined as follows:

OBJECT	= COLUMN
NAME	= "PACKET_ID"
DESCRIPTION	= "Telemetry packet identifier."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 1
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET SEQUENCE CONTROL"
DESCRIPTION	= "Telemetry packet sequence counter."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 3
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET LENGTH"
DESCRIPTION	= "Telemetry packet length."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 5
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT SECONDS"
DESCRIPTION	= "S/C clock count at packet generation."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 7
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT FRACTION"
DESCRIPTION	= "Fractional part of S/C clock count."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 11



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BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "PACKET PUS AND CRC" NAME = "Telemetry packet PUS-Version and CRC flag." = MSB UNSIGNED INTEGER DESCRIPTION DATA TYPE START_BYTE = 13 BYTES = 1 END OBJECT = COLUMN OBJECT = COLUMN = "PACKET TYPE" NAME = "Telemetry packet type." DESCRIPTION = "Telemetry packet _____ = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 1 BYTES END_OBJECT = COLUMN = COLUMN = "PACKET SUBTYPE" OBJECT NAME = "Telemetry packet sub-type." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 15 BYTES = 1 END OBJECT = COLUMN OBJECT = COLUMN NAME = "PACKET PAD FIELD" = "FALLE1_FAD_field = "Telemetry packet padding field." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 16 = 1 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "STRUCTURE_ID"
= "Telemetry packet structure identifier."
= MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA_TYPE START_BYTE = 17 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "SOFTWARE_VERSION"
= "On-board software version." NAME DESCRIPTION = MSB_UNSIGNED_INTEGER DATA_TYPE START BYTE = 19 BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "INSTRUMENT MODE" NAME DESCRIPTION = "Instrument mode status word." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 21 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "BASEPLATE TEMPERATURE" NAME = "AFM base plate temperature sensor readout." DESCRIPTION DATA TYPE = MSB_INTEGER START_BYTE BYTES = 2.3 = 2 OFFSET = 0.0 SCALING_FACTOR = 0.01143= KELVIN UNTT = COLUMN END OBJECT OBJECT = COLUMN = "PREAMPLIFIER TEMPERATURE" NAME = "Cantilever preamplifier temperature readout." DESCRIPTION = MSB_INTEGER DATA_TYPE = 25 START BYTE



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BYTES	= 2
OFFSET	= 0.0
SCALING FACTOR	= 0.01143
UNIT -	= KELVIN
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "CONVERTER TEMPERATURE"
DESCRIPTION	= "Power converter temperature readout." = MSB_INTEGER
DATA_TYPE	
START_BYTE	= 27
BYTES	= 2
OFFSET	= 0.0
SCALING_FACTOR	= 0.01143
UNIT	= KELVIN
END_OBJECT	= COLUMN
OD TECH	
OBJECT NAME	= COLUMN = "CSSC XREF TEMPERATURE"
DESCRIPTION	- CSSC_AREF_IEMPERATORE - "Capacitive sensor V reference temperature "
DATA TYPE	= "Capacitive sensor X reference temperature." = MSB_INTEGER
START BYTE	= 29
BYTES	= 2
OFFSET	= 0.0
SCALING FACTOR	= 0.01143
UNIT -	= KELVIN
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CSSC_YREF_TEMPERATURE"
DESCRIPTION	= "Capacitive sensor Y reference temperature."
DATA_TYPE	= MSB_INTEGER
START_BYTE	= 31
BYTES	= 2
OFFSET SCALING FACTOR	= 0.0 = 0.01143
UNIT	= 6.01143 = KELVIN
END OBJECI	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
—	
- OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet."</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33</pre>
- OBJECT DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2</pre>
- OBJECT DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0</pre>
- OBJECT DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN</pre>
- OBJECT DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05"</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout."</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = "VOLTAGE_MONITOR_P15"</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout."</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." MSB_INTEGER = 37</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = COLUMN = ''VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = COLUMN = COLUMN = COLUMN = COLUMN = ''VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 </pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." MSB_INTEGER = 37</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.0143 = KELVIN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 = 0.0</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 KELVIN = COLUMN = COLUMN = 'VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.000030518 = V = COLUMN = 'VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 = 0.0 = 0.00091706</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT OBJECT CBJECT OBJECT OBJECT OBJECT OBJECT OBJECT DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 = 0.0 = 0.00091706 = V = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 = 0.0 = 0.00091706 = V = COLUMN = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT OBJECT CBJECT OBJECT OBJECT OBJECT OBJECT OBJECT DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "INLET_TEMPERATURE" = "Temperature measured at the dust inlet." = MSB_INTEGER = 33 = 2 = 0.0 = 0.01143 = KELVIN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P05" = "+5V voltage monitor readout." = MSB_INTEGER = 35 = 2 = 0.0 = 0.00030518 = V = COLUMN = COLUMN = COLUMN = "VOLTAGE_MONITOR_P15" = "+15V voltage monitor readout." = MSB_INTEGER = 37 = 2 = 0.0 = 0.00091706 = V = COLUMN</pre>



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DATA TYPE	= MSB INTEGER
START BYTE	= 39
BYTES	= 2
OFFSET	= 0.0
SCALING FACTOR	= 0.00091706
UNIT	= V
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "DIGITAL STATUS 1"
DESCRIPTION	= "Digital lines status word #1."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 41
BYTES	=2
END OBJECT	= COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	= "DIGITAL STATUS 2"
DESCRIPTION	= "Digital lines status word #2."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 43 = 2
BYTES	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "DIGITAL_STATUS_3"
DESCRIPTION	= "Digital lines status word #3."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 45
BYTES	= 2
END_OBJECT	= COLUMN
	- COLIMNI
OBJECT	= COLUMN
NAME	= "DIGITAL_STATUS_4"
DESCRIPTION	= "Digital lines status word #4."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 47
BYTES	= 2
END_OBJECT	= COLUMN
0.0.7000	
OBJECT	= COLUMN
NAME	= "DIGITAL_STATUS_5"
DESCRIPTION	<pre>= "Digital lines status word #5."</pre>
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 49
BYTES	= 2
END_OBJECT	= COLUMN
	001 [30]
OBJECT	= COLUMN
NAME	= "ADC_OVERFLOW_FLAGS"
DESCRIPTION	= "Analog-Digital Converter overflow flags."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 51
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CRC16_CHECKSUM"
DESCRIPTION	= "Telemetry packet checksum (CRC 16)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 55
BYTES	= 2
END OBJECT	= COLUMN



4.3.2 Data Product Design – Extended Housekeeping Data

The MIDAS extended housekeeping data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <u>STRUCTURE</u> keyword in the PDS labels:

- Data directory: /DATA/HK2
- File naming: HK2 yydddhh yydddhh.DAT
- File structure: /LABEL/HK2 STRUCTURE.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A typical PDS label for an extended housekeeping data file is given below:

	2202
PDS_VERSION_ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD_TYPE	= FIXED_LENGTH
RECORD_BYTES	= 524
FILE RECORDS	= <file records=""></file>
	_
DATA SET ID	= " <data id="" set="">"</data>
DATA SET NAME	= " <data_set_name>"</data_set_name>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	= " <product id="" version="">"</product>
PRODUCT CREATION TIME	= <product creation="" time=""></product>
PRODUCT_ID PRODUCT_VERSION_ID PRODUCT_CREATION_TIME PRODUCT_TYPE	= EDR
PROCESSING_LEVEL_ID	= <processing_level_id></processing_level_id>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
	= " <mission name="" phase="">"</mission>
MISSION_PHASE_NAME	- (MISSION_PHASE_NAME)
TNOUDDIMENT LOCU TO	- CINCEDUMENT LICCE IDS
INSTRUMENT_HOST_ID	- <instrument_host_id <="" td=""></instrument_host_id>
INSTRUMENT_HOST_NAME	= " <instrument host="" name="">"</instrument>
INSTRUMENT_ID	= <instrument id=""></instrument>
INSTRUMENT_NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT_TYPE	= " <instrument_type>"</instrument_type>
INSTRUMENT_MODE_ID	= <instrument_mode_id></instrument_mode_id>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE INSTRUMENT_MODE_ID INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
	= " <target_name>"</target_name>
TARGET TYPE	= " <target_name>"</target_name>
IARGEI_IIPE	- <iargei_iipe></iargei_iipe>
START TIME	= <start time=""></start>
STOP TIME	= <stop time=""></stop>
SDYCECDYEL CIOCK SAYDA COINM	- "<\$TADE COUNTS"
STACECRAFT CLOCK START COUNT	
NATTIE CHART CLOCK STOF COUNT	- \NATIVE COUNT/
NATIVE START TIME	- NATIVE START TIME/
START_TIME STACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME NATIVE_STOP_TIME	- NNAIIVE_SIUP_TIME>
PRODUCER_ID PRODUCER_FULL_NAME	- "ZDDODIICED FILL NAMES"
DRODUCER FULL NAME	= " <producer_full_name>"</producer_full_name>
FRODUCER_INSTITUTION_NAME	- /LUODOCEV_INSITIOTION_NAME/
DATA QUALITY ID	= <data id="" quality=""></data>
	= " <data_quality_desc>"</data_quality_desc>
DATA_QUALITY_DESC	- NDATA_QUALITI_DESC>"



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/* GEOMETRY INFORMATION */ SC_SUN_POSITION_VECTOR SC_TARGET_POSITION_VECTOR SC_TARGET_VELOCITY_VECTOR SPACECRAFT_ALTITUDE SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	<pre>= <sc_target_position_vector> = <sc_target_velocity_vector> = <spacecraft_altitude> = <sub_spacecraft_latitude></sub_spacecraft_latitude></spacecraft_altitude></sc_target_velocity_vector></sc_target_position_vector></pre>
/* DATA FILE POINTER(S) */	
^HK2_TABLE	= " <file_name>"</file_name>
/* DATA OBJECT DEFINITION(S) */	
OBJECT INTERCHANGE_FORMAT ROWS COLUMNS ROW_BYTES NAME ^STRUCTURE END_OBJECT	<pre>= HK2_TABLE = BINARY = <file_records> = 259 = 524 = "MIDAS extended HK" = "HK2_STRUCTURE.FMT" = HK2_TABLE</file_records></pre>
END	

The extended housekeeping data file structure is defined as follows:

OD TECH	
OBJECT NAME	= COLUMN = "PACKET ID"
	= "Telemetry packet identifier."
DESCRIPTION DATA_TYPE	
START_BYTE	= MSB_UNSIGNED_INTEGER = 1
BYTES	$= \frac{1}{2}$
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET SEQUENCE CONTROL"
DESCRIPTION	= "Telemetry packet sequence counter."
DESCRIPTION DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 3
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_LENGTH"
DESCRIPTION	= "Telemetry packet length."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 5
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_OBT_SECONDS"
DESCRIPTION	= "S/C clock count at packet generation."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 7
BYTES	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_OBT_FRACTION"
DESCRIPTION	= "Fractional part of S/C clock count."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 11
BYTES END OBJECT	= 2 = COLUMN



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OBJECT = COLUMN = "PACKET PUS AND CRC" NAME DESCRIPTION = "Telemetry packet PUS-Version and CRC flag." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 13 = 1 BYTES END OBJECT = COLUMN = COLUMN OBJECT = COLUMN
= "PACKET_TYPE"
= "Telemetry packet type."
= MSB_UNSIGNED_INTEGER
= 14 NAME DESCRIPTION DATA_TYPE START_BYTE = 14 = 1 BYTES = COLUMN END OBJECT = COLUMN OBJECT = "PACKET_SUBTYPE"
= "Telemetry packet sub-type."
= MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA_TYPE START_BYTE = 15 BYTES = 1 END OBJECT = COLUMN OBJECT = COLUMN = "PACKET_PAD_FIELD"
= "Telemetry packet padding field."
= MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START BYTE = 16 = 1 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "STRUCTURE_ID" = "Telemetry packet structure identifier." = MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 17 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = COLUMIN = "SOFTWARE_VERSION" = "On-board software version." = MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 19 BYTES = 2 END_OBJECT = COLUMN = COLUMN = "U_CAN_RMS" OBJECT NAME = "Cantilever AC signal readout." DESCRIPTION DATA TYPE = MSB INTEGER START BYTE = 21 BYTES = 2 OFFSET = 1.52590E - 004SCALING FACTOR = 3.05180E-004 = V UNIT END OBJECT = COLUMN OBJECT = COLUMN = "U CAN AMP DC" NAME = "Cantilever DC signal readout." DESCRIPTION DATA TYPE = MSB_INTEGER START_BYTE BYTES = 23 = 2 OFFSET = 1.52590E-004 SCALING_FACTOR = 3.05180E-004 = V UNTT = COLUMN END OBJECT OBJECT = COLUMN NAME = "U CAN PHASE" = "Cantilever phase signal readout." DESCRIPTION = MSB_INTEGER DATA_TYPE = 25 START BYTE



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BYTES	= 2
OFFSET	= 2.74662E-003
	= 5.49325E-003
UNIT	= deg
	5
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APP POS MON"
DESCRIPTION	= "Approach position sensor readout."
DATA TYPE	= MSB INTEGER
START BYTE	<pre>= "APP_POS_MON" = "Approach position sensor readout." = MSB_INTEGER = 27</pre>
BYTES	= 2
	= 1.52590E-004 = 3.05180E-004
SCALING_FACTOR	= 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
DECODIDETON	
DESCRIPTION DATA_TYPE	= "LIN_POS_MON" = "Linear stage position sensor readout." = MSB_INTEGER
DA'I'A_'I'YPE	= MSB_INTEGER
START_BYTE	= 29
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING_FACTOR	= 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
00.7000	
OBJECT	= COLUMN
NAME	= "X PR OUT"
DESCRIPTION	= "X piezo control loop offset error readout."
DATA TYPE	= MSB INTEGER
START BYTE	<pre>= "X_PR_OUT" = "X_piezo control loop offset error readout." = MSB_INTEGER = 31</pre>
BYTES	= 2
OFFSET	= 1.52590E - 004
SCALING_FACTOR	= 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
END_OBJECT	= COLUMN
_	
- Object	= COLUMN
- Object	= COLUMN
- OBJECT NAME DESCRIPTION	= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout."
- Object	<pre>= COLUMN = "Y_PR_OUT" = "Y_piezo control loop offset error readout." = MSB_INTEGER</pre>
- OBJECT NAME DESCRIPTION	= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout."
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y_piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z PR OUT"</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN</pre>
- OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout."</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PIEZO control loop offset error readout." = MSB_INTEGER = 35</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT"</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "XPIEZO_VSENS_OUT" = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout."</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PIEZO control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "XPIEZO_VSENS_OUT" = "XPIEZO_VSENS_OUT" = "XPIEZO_NICHTEGER = 37</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "XPIEZO_VSENS_OUT" = "XPIEZO_VSENS_OUT" = "XPIEZO_NICHTEGER = 37</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.00002E+002</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.00002E+002 = 4.27253E-003 = V</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = "Z_PR_OUT" = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.00002E+002 = 4.27253E-003</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.0002E+002 = 4.27253E-003 = V = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = COLUMN = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.00002E+002 = 4.27253E-003 = V = COLUMN = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES OFFSET SCALING_FACTOR UNIT END_OBJECT	<pre>= COLUMN = "Y_PR_OUT" = "Y piezo control loop offset error readout." = MSB_INTEGER = 33 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = COLUMN = "Z_PR_OUT" = "Z piezo control loop offset error readout." = MSB_INTEGER = 35 = 2 = 1.52590E-004 = 3.05180E-004 = V = COLUMN = "XPIEZO_VSENS_OUT" = "X piezo high voltage monitor readout." = MSB_INTEGER = 37 = 2 = 1.0002E+002 = 4.27253E-003 = V = COLUMN</pre>



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	DATA TYPE	= MSB INTEGER
	START BYTE	= 39
	BYTES	= 2
		= 1.00002E+002
	SCALING FACTOR	= 4.27253E - 003
	_	
END	OBJECT	= COLUMN
OBJ	ECT	= COLUMN
	NAME	= "XPIEZO POS"
	DESCRIPTION	= "X piezo position sensor readout."
		= MSB INTEGER
		= 41
	—	= 2
	OFFSET	= 1.52590E-004 = 3.05180E-004
	UNIT	= V
END	OBJECT	= COLUMN
OBJ	ECT	= COLUMN
	NAME	= "YPIEZO POS"
	DESCRIPTION	= "Y piezo position sensor readout." = MSB_INTEGER
	DATA TYPE	= MSB_INTEGER
	START BYTE	= 43
		= 1.52590E - 004
		= 3.05180E-004
	UNIT	= V
END	OBJECT	= COLUMN
OBJ	ECT	= COLUMN
	NAME	= "ZPIEZO POS"
	DESCRIPTION	= "Z piezo position sensor readout."
	DATA TYPE	= "ZPIEZO_POS" = "Z piezo position sensor readout." = MSB_INTEGER
	START BYTE	= 45
		= 1.52590E-004
	_	= 3.05180E-004
	UNIT	= V
END	OBJECT	= COLUMN
OBJ		= COLUMN
	NAME	= "ZPIEZO VSENS OUT"
		= "Z piezo high voltage monitor readout."
		= MSB INTEGER
		= 47
	BYTES	= 2
		= 2 = 1.00002E+002
	_	= 4.27253E-003
	UNIT	
END	_OBJECT	= COLUMN
OBJ		= COLUMN
	NAME	= "ABORT_FULLSCAN"
	DESCRIPTION	= "Flag, set if ABORT command was sent during a full
scan."		
	DATA TYPE	= MSB UNSIGNED INTEGER
	START BYTE	= 49
	BYTES	= 2
END	OBJECT	= COLUMN
5110		••=•
OBJ	ECT	= COLUMN
000	NAME	= "ABORT FUNCTION"
		=
+ "	DESCRIPTION	= "Flag, set if ABORT command was sent during an active
task."		
	DATA_TYPE	= MSB_UNSIGNED_INTEGER
	START_BYTE	= 51
	BYTES	= 2
END	OBJECT	= COLUMN
OBJ	ECT	= COLUMN
	NAME	= "ABORT LINE"
	DESCRIPTION	= "Flag, set if Z DAC value reached its lower limit (-
10V)."		-
	DATA TYPE	= MSB UNSIGNED INTEGER



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START_BYTE	= 53
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "ABORT_POINT"
DESCRIPTION	= "Flag, set if Z DAC value reached its upper limit
(+10V)."	
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 55
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "AC_GAIN"
DESCRIPTION	<pre>= "Gain level for cantilever AC signal amplifier (0-7)." = MSB_UNSIGNED_INTEGER</pre>
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 57
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "APPR BACKW STARTED"
DESCRIPTION	<pre>= "APPR_BACKW_STARTED" = "Flag, set if backward approach task is active." = MSB_UNSIGNED_INTEGER</pre>
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 59
BYTES	= 2
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "APPR FINISHED"
DESCRIPTION	= "Flag, set if segment surface was detected during
forward approach."	ing, see if segment carrace has accorded daring
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 61
BYTES	= 2
	= 2 = COLUMN
END_OBJECT	
OBJECT	
NT 7 MT	= COLUMN
NAME	= "APPR_FINE_STEP"
DESCRIPTION	<pre>= "AFPR_FINE_SIEP" = "Flag, set if fine steps are applied during approach." - MSE INSTEMPE INTEGEP</pre>
DAIA_IIID	- MOD UNDIGNED INTEGER
START_BYTE	= 63
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APPR_ON_MAX_POS"
DESCRIPTION	= "Flag, set if max. position was reached during an
approach task."	
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 65
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APPR_ON_MIN_POS"
DESCRIPTION	= "Flag, set if min. position was reached during an
approach task."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 67
BYTES	= 2
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "APPR POSITION"
DESCRIPTION	= "Approach position sensor readout during an approach
task."	
DATA TYPE	= MSB INTEGER
START BYTE	= 69
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E - 004
UNIT	= V
END OBJECT	= V = COLUMN
END_ODUECT	- COTOLIN



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OBJECT = COLUMN = "APPR POS SET" NAME DESCRIPTION = "Approach position set value for next forward approach step." DATA TYPE = MSB INTEGER START_BYTE = 71 = 2 BYTES OFFSET = 1.52590E - 004SCALING_FACTOR = 3.05180E-004 = V UNTT END OBJECT = COLUMN OBJECT = COLUMN = "APPR_STARTED" NAME = "Flag, set if forward approach task is active." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE START_BYTE = 73 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "APPR_POS_ABS"
= "Approach position set value for absolute approach NAME DESCRIPTION movement." DATA TYPE = MSB INTEGER START BYTE = 75 BYTES = 2 OFFSET = 1.52590E-004 SCALING_FACTOR = 3.05180E-004 = V UNIT END OBJECT = COLUMN OBJECT = COLUMN = "APPR_DIR" = "Flag, set if approach direction is towards surface." NAME DESCRIPTION DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 77 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "APPR_ABS_STARTED"
= "Flag, set if absolute approach positioning task is NAME DESCRIPTION active." DATA TYPE = MSB_UNSIGNED_INTEGER = 79 START_BYTE = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN NAME = "APPR TIMO CNT" = "Holds remaining seconds until approach timeout DESCRIPTION occurs." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 81 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "AVERAGE" NAME = "Average factor for Z strain gauge signal DESCRIPTION measurement." DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 8.3 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "CANTILEVER" NAME = "Selected cantilever of current cantilever block (0-DESCRIPTION 7)." DATA TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 85 = 2 BYTES



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	END OBJECT	= COLUMN
NAME = CANT_BLOCK" DESCRIPTION = "CANT_BLOCK" NAME = CANT_BLOCK" NAME = COLUMN OJATA TYPE = 0 END_OSJECT = COLUMN OJATA TYPE = 0 END_OSJECT = COLUMN OJATA TYPE = 0 DIATA TYPE = 0 END_OSJECT = COLUMN NAME = CANT_SIGNAL" DESCRIPTION = "CANT_SIGNAL" END_OSJECT = 0 SCLING FACTOR = 3.05180F-04 SCLING FACTOR = 0.010M NAME = "CALL X_CYCLE STATED" NAME = "CALL X_CYCLE STATED" NAME = "CALL X_CYCLE STATED" NAME = "CALL X_CYCLE STATED" DIATA TYPE = MSS UNSIGNED_INTEGER STATE STATE = 0 DIATA TYPE = 0 DIATA TYPE = MSS UNSIGNED_INTEGER STATE STATE = 0 DIATA TYPE = 0	_	
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END_GOUNCT = COLUMN NAME = "CANT SIGNAL" DESCRIPTION = COLUMN NAME = "CART SIGNAL" DESCRIPTION = COLUMN START BYTE = 89 BTTES = 2 OFFEST = 0.51505-004 SUMM (***********************************	DATA TYPE	= MSB UNSIGNED INTEGER
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BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN NAME = "CAL_Y_CYCLE_FINISHED" DESCRIPTION = "Flag, set if Y position sensor calibration task has completed successfully." DATA TYPE = MSE_UNSIGNED_INTEGER START_BYTE = 97 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN NAME = "CAP_SENS_EN" DESCRIPTION = "Flag, set if X/Y position sensor control is enabled." DATA TYPE = 99 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN	START BYTE	
- - OBJECT = COLUMN NAME = "CAL_Y CYCLE FINISHED" DESCRIPTION = "Flag, set if Y position sensor calibration task has completed successfully." = DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 97 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN DATA_TYPE = COLUMN OBJECT = COLUMN DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 99 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN NAME = "CAL_CYCLES" DESCRIPTION = "X/Y position sensor calibration cycle counter." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN<		= 2
NAME= "CAL_Y_CYCLE_FINISHED"DESCRIPTION= "Flag, set if Y position sensor calibration task hascompleted successfully."= MSB_UNSIGNED_INTEGERDATA_TYPE= 97START_BYTE= 97BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNNAME= "CAP_SENS_EN"DESCRIPTION= "Flag, set if X/Y position sensor control is enabled."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 99BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNMAME= "CAL_CYCLES"DESCRIPTION= "X/Y position sensor calibration cycle counter."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 101BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMNBYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMN	END_OBJECT	= COLUMN
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DESCRIPTION= "Flag, set if X/Y position sensor control is enabled."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 99BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNNAME= "CAL_CYCLES"DESCRIPTION= "X/Y position sensor calibration cycle counter."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 101BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMNOBJECT= COLUMN	OBJECT	= COLUMN
DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 99 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN NAME = "CAL_CYCLES" DESCRIPTION = "X/Y position sensor calibration cycle counter." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN		
START_BYTE = 99 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN NAME = "CAL_CYCLES" DESCRIPTION = "X/Y position sensor calibration cycle counter." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN		-
BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN NAME = "CAL_CYCLES" DESCRIPTION = "X/Y position sensor calibration cycle counter." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN		
OBJECT = COLUMN NAME = "CAL_CYCLES" DESCRIPTION = "X/Y position sensor calibration cycle counter." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 101 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN	BYTES	= 2
NAME= "CAL_CYCLES"DESCRIPTION= "X/Y position sensor calibration cycle counter."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 101BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMN	END_OBJECT	= COLUMN
DESCRIPTION= "X/Y position sensor calibration cycle counter."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 101BYTES= 2END_OBJECT= COLUMNOBJECT= COLUMN	OBJECT	
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START_BYTE=101BYTES=2END_OBJECT=COLUMNOBJECT=COLUMN		
BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN	_	
- OBJECT = COLUMN	_	
	END_OBJECT	= COLUMN
	OBJECT	= COLUMN
	NAME	



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DESCRIPTION	= "Holds remaining seconds until X/Y position sensor
calibration timeout occurs."	
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 103
BYTES	= 2
END_OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "COR TAB"
DESCRIPTION	= "Selected correction table (0=norm temp, 1=high temp,
2=low temp)."	
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 105
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "CO CMD"
DESCRIPTION	= "Last checkout (technical) command which has been
executed on-board."	
	= MSB UNSIGNED INTEGER
START BYTE	= 107
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "CUR LIN POS"
DESCRIPTION	= "Current linear position sensor value measured during
linear stage movement."	· · · · · · · · · · · · · · · · · · ·
-	= MSB INTEGER
START_BYTE	= 109
BYTES	= 2
OFFSET	= 1.52590E-004
	= 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CYCLES"
DESCRIPTION	= "Holds number of Z increments and decrements during
single point scan."	notab hamber of a incremented and decremented during
	= MSB UNSIGNED INTEGER
START BYTE	= 111
BYTES	= 2
END OBJECT	= COLUMN
	0010m
OBJECT	= COLUMN
NAME	= "DATA TYPE"
DESCRIPTION	= "Image scan data type (0=z-topography, 1=z-error,
)."	image beam data type (0 2 topography, i 2 tribi,
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 113
BYTES	= 2
END OBJECT	= 2 = COLUMN
OBJECT	= COLUMN
NAME	= "DC GAIN"
DESCRIPTION	= "Gain level for cantilever DC signal amplifier (0-7)."
DATA TYPE	= Gain level for cantilever be signal amplifier (0-7). = MSB UNSIGNED INTEGER
START BYTE	= MSB_ONSIGNED_INIEGER = 115
BYTES	= 115 = 2
END OBJECT	= 2 = COLUMN
END_ODORCI	COTOLIN
OBJECT	= COLUMN
NAME	= COLUMN = "DC PULSEWIDTH"
DESCRIPTION	<pre>- DC_FOLSEWIDIA = "Approach DC motor pulse width set value."</pre>
DATA TYPE	= MSB UNSIGNED INTEGER
—	= MSB_ONSIGNED_INTEGER = 117
START_BYTE BYTES	= 117 = 2
OFFSET	= 2.10000E+001
SCALING_FACTOR	= 4.20000E+001
UNIT	= USEC
END_OBJECT	= COLUMN
OBJECT	= COLUMN



NAME	= "DECR_APPR_POS"
DESCRIPTION	= "Flag, set if approach advances to next position."
	= MSB_UNSIGNED_INTEGER
START_BYTE	= 119
BYTES	= 2
END_OBJECT	= COLUMN
	= COLUMN
NAME	<pre>= "DSCAN_RAND_AMPL" = "Dummy_scan_random noise amplitude set value." = MSB_UNSIGNED_INTEGER</pre>
DESCRIPTION	= "Dummy scan random noise amplitude set value."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
	= 121
BYTES	= 2
END_OBJECT	= COLUMN
05 75 05	
OBJECT	= COLUMN
NAME	= "DELTA_APPR_POS"
	= "Approach position signal decrement used in coarse
approach steps."	
	= MSB_INTEGER = 123
_	
	= 2
OFFSET	= 1.52590E - 004
	= 3.05180E-004
END_OBJECT	= COLUMN
	= COLUMN
NAME DESCRIPTION	= "DELTA_OP_PERC"
	= "Allowed deviation from cantilever signal operating
point in % of resonance amplitu	
DATA_TYPE	= MSB_UNSIGNED_INTEGER = 125
_	
OFFSET SCALING FACTOR	= 0.00000E+000
	= 1.52590E-003
END_OBJECT	= COLUMN
OBJECT	= COLUMN
	= "DELTA OP AMPL"
	= "Allowed deviation from cantilever signal operating
point (calculated)."	- Allowed deviation flom cantilevel Signal operating
	= MSB INTEGER
	= 127
_	= 2
SCALING_FACTOR	= 1.52590E-004 = 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
	CODOLINI,
OBJECT	= COLUMN
NAME	= "DUMMY FULL SCAN"
DESCRIPTION	= "Flag, set if dummy image scan task is active."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 129
BYTES	= 2
END OBJECT	= COLUMN
=	
OBJECT	= COLUMN
OBJECT NAME	
	= COLUMN
NAME	= COLUMN = "EXC_LEV"
NAME DESCRIPTION	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)."</pre>
NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL"</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "Dummy scan sine amplitude set value."</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "Dummy scan sine amplitude set value." = MSB_UNSIGNED_INTEGER</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "DUMMY scan_sine amplitude set value." = MSB_UNSIGNED_INTEGER = 133</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "Dummy_scan_sine amplitude set value." = MSB_UNSIGNED_INTEGER = 133 = 2</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "DUMMY scan_sine amplitude set value." = MSB_UNSIGNED_INTEGER = 133</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "Dummy scan sine amplitude set value." = MSB_UNSIGNED_INTEGER = 133 = 2 = COLUMN</pre>
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "EXC_LEV" = "Gain level for cantilever excitation (0-7)." = MSB_UNSIGNED_INTEGER = 131 = 2 = COLUMN = COLUMN = "DSCAN_SINE_AMPL" = "Dummy_scan_sine amplitude set value." = MSB_UNSIGNED_INTEGER = 133 = 2</pre>



detection."

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= "DSCAN_ZERO_OFFS"
= "Dummy scan zero offset set value." NAME DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START BYTE = 135 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = COLUMN
= "DSCAN_GRAD_SINE"
= "Dummy scan X/Y gradient and sine period set value."
= MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 137 = 2 BYTES = COLUMN END_OBJECT OBJECT = COLUMN = "F_SCAN_NO_THRES" NAME = "Flag, set if threshold amplitude has not been found DESCRIPTION during frequency scan." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 139 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "F SCAN CYCLE" NAME DESCRIPTION = "Current scan cycle of the automatic frequency scan task." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 141 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "APPR STUCK CNT" NAME = "Number of times the approach stuck event will be DESCRIPTION ignored." DATA TYPE = MSB UNSIGNED INTEGER = 143 START_BYTE BYTES = 2 END_OBJECT = COLUMN = COLUMN OBJECT = "F SCAN_STARTED" NAME = "Flag, set if the automatic frequency scan task is DESCRIPTION active." DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 145 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN NAME = "F SCAN FINISHED" DESCRIPTION = "Flag, set if the automatic frequency scan task has completed." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 147 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "F_STEP"
= "Nominal frequency scan step increment." NAME DESCRIPTION DATA_TYPE START_BYTE = MSB_UNSIGNED_INTEGER = 149 BYTES = 2 = 0.00000E+000 OFFSET = 6.98253E-004 SCALING_FACTOR = Hz UNTT END_OBJECT = COLUMN = COLUMN = "F_STEP_HI" OBJECT NAME = "Frequency scan step increment for threshold DESCRIPTION



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DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 151 BYTES = 2 OFFSET = 0.00000E+000 SCALING_FACTOR = 6.98253E-004 UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = "FULLSCAN_STARTED" DESCRIPTION = "FLag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
BYTES = 2 OFFSET = 0.00000E+000 SCALING_FACTOR = 6.98253E-004 UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
OFFSET= 0.00000E+000SCALING_FACTOR= 6.98253E-004UNIT= HzEND_OBJECT= COLUMNOBJECT= COLUMNNAME= "FULLSCAN_STARTED"DESCRIPTION= "Flag, set if the image scan task is active."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 153	
SCALING_FACTOR = 6.98253E-004 UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
SCALING_FACTOR = 6.98253E-004 UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
END_OBJECT = COLUMN OBJECT = COLUMN NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
OBJECT= COLUMNNAME= "FULLSCAN_STARTED"DESCRIPTION= "Flag, set if the image scan task is active."DATA_TYPE= MSB_UNSIGNED_INTEGERSTART_BYTE= 153	
NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
NAME = "FULLSCAN_STARTED" DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
DESCRIPTION = "Flag, set if the image scan task is active." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 153	
START_BYTE = 153	
START_BYTE = 153	
BYTES = 2	
END_OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "GAIN STEP"	
DESCRIPTION = "Gain control increment/decrement for X/Y position	on
sensor calibration."	
DATA TYPE = MSB UNSIGNED INTEGER	
START BYTE = 155	
$\frac{1}{3}$	
END_OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "HK2_PERIOD"	
DESCRIPTION = "Extended HK report update period in seconds."	
DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 157	
START BYTE = 157	
BYTES = 2	
END OBJECT = COLUMN	
_	
OBJECT = COLUMN	
NAME = "LAST TC"	
_	
DESCRIPTION = "Last received private telecommand (MSB=type,	
LSB=subtype)."	
DATA_TYPE = MSB_UNSIGNED_INTEGER	
START_BYTE = 159	
BYTES = 2	
END_OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "LIN MOVE STARTED"	
NAME = "LIN_MOVE_STARTED" DESCRIPTION = "Flag, set if a linear stage movement task is act	cive."
DATA TYPE = MSB UNSIGNED INTEGER	
START BYTE = 161^{-1}	
BYTES = 2	
END OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "LIN_MOVE_FINISHED"	
DESCRIPTION = "Flag, set if a linear stage movement task has	
completed."	
DATA_TYPE = MSB_UNSIGNED_INTEGER	
START_BYTE = 163	
BYTES = 2	
END_OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "TEST LIN LVDT"	
DESCRIPTION = "Flag, set if linear stage position sensor is	
evaluated during task."	
DATA TYPE = MSB UNSIGNED INTEGER	
START BYTE = 165	
-	
END_OBJECT = COLUMN	
OBJECT = COLUMN	
NAME = "LINE_SCAN_CNT"	
DESCRIPTION = "Number of scanned image lines so far."	
DATA TYPE = MSB UNSIGNED INTEGER	
START BYTE = 167^{-1}	
BYTES $= 2$	
END OBJECT = COLUMN	



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OBJECT = COLUMN = "LINE NUM STEPS" NAME DESCRIPTION = "Total number of image lines to be scanned." = MSB UNSIGNED INTEGER DATA TYPE = 169 START_BYTE BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "LINESCAN_DONE" NAME = "Flag, set if the line scan task has completed." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE START_BYTE = 171 = 2 BYTES END OBJECT = COLUMN = COLUMN = "LINESCAN_STARTED" OBJECT NAME = "Flag, set if the line scan task is active." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 173 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "LINMOVE TIMO CNT" NAME = "Holds remaining seconds until linear stage timeout DESCRIPTION occurs." = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 175 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "LINMOVE TIMO" NAME = "Linear stage movement timeout set value." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE START_BYTE = 177 BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN = "MAIN_SCAN_CNT" NAME = "Number of scanned pixels in main scan direction DESCRIPTION (within line) so far." DATA_TYPE = MSB UNSIGNED INTEGER START BYTE = 179 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "MAIN SCAN DIR" NAME DESCRIPTION = "Main dummy/image/line scan direction (0=X, 1=Y)." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 181 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "MAIN NUM STEPS" NAME = "TATA_INGM_DISTS" = "TOTAL number of pixels in main scan direction." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE = 183 START_BYTE = 2 BYTES END OBJECT = COLUMN = COLUMN OBJECT = "MAGN_RETRACT_DIST" NAME = "Z retraction distance for magnetic mode." DESCRIPTION = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 185 BYTES = 2 END OBJECT = COLUMN



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OBJECT = COLUMN = "MSUB CYCLES" NAME = "Maximum number of scan cycles per single point() DESCRIPTION function call." DATA TYPE = MSB UNSIGNED INTEGER = 187 START_BYTE BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "MAX CYCLES" NAME = "Maximum number of scan cycles allowed for a single DESCRIPTION point." DATA_TYPE = MSB_UNSIGNED_INTEGER = 189 START_BYTE = 2 BYTES = COLUMN END_OBJECT OBJECT = COLUMN NAME = "MAX CAL CYCLES" = "Maximum number of X/Y position sensor calibration DESCRIPTION cycles." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 191 BYTES = 2 = COLUMN END OBJECT = COLUMN OBJECT NAME = "LAST APPR DIR" = "Approach movement direction during last approach DESCRIPTION task." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 193 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "NO OF FSCANS" NAME = "Number of frequency sweep cycles for the automatic DESCRIPTION frequency scan." DATA_TYPE = 195 = MSB UNSIGNED INTEGER START_BYTE BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN = "OFFS STEP" NAME = "Offset control increment/decrement for X/Y position DESCRIPTION sensor calibration." = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 197 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "OP POINT PERC" NAME = "Threshold value of cantilever signal in % of DESCRIPTION resonance amplitude for data acquisition." DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 199 START_BYTE BYTES = 2 = 0.00000E+000 OFFSET = 1.52590E-003 SCALING_FACTOR END OBJECT = COLUMN OBJECT = COLUMN = "OP POINT AMPL" NAME = "Threshold value of cantilever signal for data DESCRIPTION acquisition (calculated)." DATA_TYPE = MSB INTEGER START BYTE = 201 BYTES = 2 = 1.52590E-004 OFFSET SCALING_FACTOR = 3.05180E-004 = V UNIT



	- 0011001
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "OP_UP"
DESCRIPTION	= "Cantilever signal threshold value upper limit
(calculated)."	- MOD INDUCED
DATA_TYPE START BYTE	= MSB_INTEGER = 203
BYTES	= 205
OFFSET	= 1.52590E - 004
SCALING FACTOR	= 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "OP LO"
	= "Cantilever signal threshold value lower limit
(calculated)."	
DATA_TYPE	= MSB_INTEGER = 205
BYTES OFFSET	= 2 = 1.52590E=004
SCALING FACTOR	= 1.52590E-004 = 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	<pre>= "PERCENT_OP_AMPL" = "% of resonance amplitude at which to set the</pre>
operating frequency (+=right,	= "% of resonance amplitude at which to set the
DATA TYPE	= MSB INTEGER
START BYTE	= MSB_INTEGER = 207
BYTES	= 2
OFFSET	= 1.52590E-003 = 3.05180E-003
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PARAMETER"
DESCRIPTION	= "Parameter part of last executed parameter command."
DATA_TYPE	<pre>= "PARAMETER" = "Parameter part of last executed parameter command." = MSB_UNSIGNED_INTEGER = 209 - 2</pre>
START_BYTE BYTES	= 209 = 2
END OBJECT	= COLUMN
_	
OBJECT NAME	= COLUMN
NAME	= "PARAMETER_CMD"
DESCRIPTION DATA TYPE	<pre>= "PARAMETER_CMD" = "Command code of last executed parameter command." = MSB_UNSIGNED_INTEGER</pre>
START BYTE	= 211
BYTES	= 2
END_OBJECT	= COLUMN
	0011301
OBJECT	= COLUMN = "PULSE DELAY"
NAME DESCRIPTION	= "POLSE_DELAY" = "Pulse delay mode for linear stage motor (0-3)."
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 213
BYTES	= 2
END_OBJECT	= COLUMN
	= COLUMN
OBJECT NAME	= COLOMN = "PULSEWIDTH"
DESCRIPTION	= "Piezo motor driver pulse width."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 215
BYTES	= 2
OFFSET SCALING FACTOR	= 2.10000E+001 = 4.20000E+001
SCALING_FACTOR UNIT	= 4.20000E+001 = usec
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "REF_SEARCH_STARTED"



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DESCRIPTION	= "Flag, set if wheel reference point search has
started."	· · · ·
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 217
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	<pre>= COLOMN = "RELAY_STATUS" = "Power relay status flags." = MSB_UNSIGNED_INTEGER 010_</pre>
NAME	- RELAI_SIAIUS - "Dever relay status flags "
DESCRIPTION DATA TYPE	= "Power relay status liags."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BITE	= 219
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "RESONANCE AMPL" = "Cantilever signal amplitude at resonance frequency."
DESCRIPTION	= "Cantilever signal amplitude at resonance frequency."
DATA_TYPE	= MSB_INTEGER = 221
START BYTE	= 221
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 1.52590E-004 = 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "RETRACT DIST"
DESCRIPTION	<pre>= "RETRACT_DIST" = "Z retraction before advancing to next scan position." = MSB_UNSIGNED_INTEGER = 223</pre>
DATA TYPE	- MOR UNCTONED INTECER
DATA_TIPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 223
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SCAN_MODE"
DESCRIPTION	<pre>- SCAN_MODE - SCAN_MODE - "Scanning mode (0=dynamic, 1=contact, 2=magnetic)." - MSB_UNSIGNED_INTEGER</pre>
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 225
BYTES	= 2
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "SCAN ERROR CNT"
DESCRIPTION	= "Holds the number of pixels where the max. number of
scan cycles was exceeded."	norad one namber of privers where one want namber of
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 227
BYTES	= 227
	= 2 = COLUMN
END_OBJECT	ATTOTION AND A DESCRIPTION
	- COLIMNI
OBJECT	= COLUMN
NAME	= "SEARCH_ALGOR"
DESCRIPTION	= "Cantilever resonance frequency search mode."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 229
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SEND_CO_FR"
DESCRIPTION	= "Flag, set if checkout frame is sent periodically."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 231
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "DST SELECT"
DESCRIPTION	= "Data set selection for cleanup/transfer (bit 15 =
oldest, bit 14 = newest)."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 233
BYTES	= 2
END OBJECT	= 2 = COLUMN



OBJECT = COLUMN = "SEGMENT PULSES" NAME DESCRIPTION = "Wheel encoder ticks for segment selection." = MSB UNSIGNED INTEGER DATA TYPE = 235 START_BYTE BYTES = 2 = COLUMN
= "SEGMENT_SEARCH_STARTED"
= "Flag, set if segment search task is active."
= MSB_UNSIGNED_INTEGER
= 237 = COLUMN END OBJECT OBJECT NAME DESCRIPTION DATA TYPE START_BYTE = 2 BYTES = COLUMN END OBJECT = COLUMN
= "SEGMENT_FOUND" OBJECT NAME = "Flag, set if the wheel segment search has completed DESCRIPTION successfully." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 239 BYTES = 2 END OBJECT = COLUMN = COLUMN OBJECT = "SEGMENT_NO" = "Wheel segment selection set value (0-1023)." = MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 241 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "SET LIN POS" NAME = "Linear stage position sensor value for absolute DESCRIPTION positioning (calculated)." DATA_TYPE START_BYTE = MSB INTEGER = 243 = 2 BYTES = 1.52590E - 004OFFSET SCALING_FACTOR = 3.05180E-004 = V UNIT END OBJECT = COLUMN OBJECT = COLUMN = "SET LIN POS ABS" NAME = "Linear stage position sensor set value for absolute DESCRIPTION positioning." DATA TYPE = MSB INTEGER START BYTE = 245 BYTES = 2 OFFSET = 1.52590E-004 SCALING FACTOR = 3.05180E-004 = V UNIT = COLUMN END OBJECT OBJECT = COLUMN = "REGULAR EXT CODE" NAME = "Flag, set if the extended program code area is DESCRIPTION entered every millisecond." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 247 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "SHUT_CLOSE_STARTED" NAME = "Flag, set if the shutter closing task is active." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 249 = 2 BYTES END OBJECT = COLUMN



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OBJECT = COLUMN = "SHUT_OPEN_STARTED"
= "Flag, set if the shutter opening task is active." NAME DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 251 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "SHUTTER TIMO CNT" NAME = "Holds remaining seconds until a shutter movement DESCRIPTION timeout occurs." DATA TYPE = MSB UNSIGNED_INTEGER = 253 START_BYTE = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "SINGLE_F_SCAN" NAME = "Flag, set if the single frequency scan is active." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 255 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "SURF_DETECTED" NAME = "Flag, set if surface was detected during approach." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 257 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN "TECH MODE"
= "Flag, set if technical mode commands are enabled." NAME DESCRIPTION DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 259 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "TIMEOUTS"
= "Timeout status flags." NAME DESCRIPTION DATA_TYPE = MSB UNSIGNED INTEGER = 261 = 2 START_BYTE BYTES END OBJECT = COLUMN OBJECT = COLUMN NAME = "TIP NO" = "Cantilever selection set value (0-15)." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 263 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "U MAX" NAME = "Maximum cantilever signal amplitude detected during DESCRIPTION frequency scan so far." DATA_TYPE = MSB INTEGER START_BYTE = 265 BYTES = 2 OFFSET = 1.52590E - 004SCALING_FACTOR = 3.05180E-004 = V UNTT END_OBJECT = COLUMN OBJECT = COLUMN = "VREF_ACC" NAME = "X/Y position sensor calibration accuracy." DESCRIPTION DATA TYPE = MSB_INTEGER START_BYTE = 267 = 2 BYTES



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OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "VXREF1"
DESCRIPTION	= "X position sensor reference voltage 1."
	= MSB INTEGER
	= 269
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E-004
UNIT -	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "VXREF2"
DESCRIPTION	<pre>= "X position sensor reference voltage 2." = MSB INTEGER</pre>
	= 271
BYTES	= 2
OFFSET	= 1.52590E - 004
	= 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	
	= COLUMN
NAME	= "VYREF1"
DESCRIPTION	<pre>= "Y position sensor reference voltage 1." = MSB_INTEGER</pre>
	$= MSB_INTEGER$ = 273
_	= 273
BYTES	
	= 1.52590E - 004
_	= 3.05180E-004 = V
UNIT END OD IE CH	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "VYREF2"
	- VINETZ
DATA TYPE	<pre>= "Y position sensor reference voltage 2." = MSB INTEGER</pre>
START BYTE	= 275
BYTES	= 275
	= 1.52590E-004
	= 3.05180E-004
UNIT	= V
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "WAIT CYCLE"
DESCRIPTION	= "Flag, set if a wait cycle is active."
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 277
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "WAITING_TIME"
DESCRIPTION	= "Holds number of seconds until the wait cycle
completes."	
_	= MSB_UNSIGNED_INTEGER
START_BYTE	= 279
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN = "WAX ACTUATOR"
NAME DESCRIPTION	= "WAX_ACTUATOR" = "AFM base plate lock mechanism actuator selection
(0=actuator 1, 1= actuator 2)."	
DATA_TYPE START BYTE	= MSB_UNSIGNED_INTEGER = 281
BYTES	= 281 = 2
END OBJECT	= 2 = COLUMN



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OBJECT = COLUMN = "WAXACT TIMO CNT" NAME = "Holds number of seconds until a base plate release DESCRIPTION task timeout occurs." = MSB UNSIGNED_INTEGER DATA TYPE START_BYTE = 283 BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "WAXACT STATUS" NAME = "AFM base plate lock mechanism actuator heating status DESCRIPTION (1=main, 2=red, 4=extended)." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 285 BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN NAME = "WAXACT EXT CNT" DESCRIPTION = "Holds number of seconds until base plate actuator extended heating cycle completes." = MSB_UNSIGNED_INTEGER = 287 DATA TYPE START_BYTE BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN NAME = "WAXACT TIMO" = "AFM base plate lock mechanism actuator heating DESCRIPTION timeout set value." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 289 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "WHEEL TIMO CNT" NAME = "Holds number of seconds until a wheel segment DESCRIPTION selection timeout occurs." = MSB_UNSIGNED_INTEGER DATA_TYPE START_BYTE = 291 BYTES = 2 END_OBJECT = COLUMN OBJECT = COLUMN = "X_ORIGIN" NAME DESCRIPTION = "X offset of image with respect to the X/Y table origin." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 293 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "X NUM STEPS" NAME = "Number of scan pixels in X direction (n times 32, DESCRIPTION n=1-16)." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 295 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "X SCAN DIRECTION" NAME = "Flag, indicates X scan direction (0=low to high DAC DESCRIPTION voltage, 1= high to low)." DATA_TYPE START_BYTE = MSB_UNSIGNED_INTEGER = 297 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "X_STEP_SIZE" NAME = "X scan step set value in DAC units." DESCRIPTION



DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 299
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "XY ACTUATOR"
DESCRIPTION	= "X/Y table lock mechanism actuator selection (0= x-
actuator, 1= y-actuator)."	
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 301
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "XYACT MAIN STARTED"
DESCRIPTION	= "Flag, set if heating cycle of the main X or Y
actuator is active."	
DATA TYPE	= MSR IINSIGNED INTEGER
_	= MSB_UNSIGNED_INTEGER = 303
START_BYTE BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "XYACT_RED_STARTED"
DESCRIPTION	= "Flag, set if heating cycle of the redundant X or Y
actuator is active."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 305
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "XYACT_TIMO"
DESCRIPTION	= "X/Y table lock mechanism actuator heating timeout set
value."	
DATA_TYPE	= MSB_UNSIGNED_INTEGER = 307
START_BYTE	= 307
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "XYACT_TIMO_CNT"
DESCRIPTION	= "Holds number of seconds until an X/Y table release
timeout occurs."	
DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 309
BYTES	= 2
END_OBJECT	= COLUMN
	001 13 81
OBJECT	= COLUMN
NAME	= "Y_STEP_SIZE"
DESCRIPTION	= "Y scan step set value in DAC units."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 311
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "Y ORIGIN"
DESCRIPTION	= "Y offset of image with respect to the X/Y table
origin."	- offood of image with respect to the N/I table
DATA TYPE	= MSB UNSIGNED INTEGER
_	= 313
START_BYTE	
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "Y_SCAN_DIRECTION"
DESCRIPTION	= "Flag, indicates Y scan direction (0=low to high DAC
voltage, 1= high to low)."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 315
BYTES	= 2
END OBJECT	= COLUMN
	0010111



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OBJECT = COLUMN = "Y NUM STEPS" NAME DESCRIPTION = "Number of scan pixels in Y direction (n times 32, n=1-16)." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 317 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "Z_STEP_SIZE" = "Z_scan_step_set value in DAC units." NAME DESCRIPTION = MSB_UNSIGNED_INTEGER DATA_TYPE START_BYTE = 319 BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN = "HK2_OVFL_FLAGS"
= "ADC channel overflow flags." NAME DESCRIPTION = MSB_UNSIGNED_INTEGER = 321 DATA_TYPE START BYTE BYTES = 4 END OBJECT = COLUMN OBJECT = COLUMN = "DELTA DC CONTACT" NAME DESCRIPTION = "Maximum allowed cantilever DC value change during surface approach." DATA_TYPE START_BYTE = MSB_INTEGER = 325 BYTES = 2 OFFSET = 1.52590E - 004SCALING_FACTOR = 3.05180E-004 UNIT = V END OBJECT = COLUMN OBJECT = COLUMN = "CANT SIGNAL RETR" NAME = "Cantilever signal at retracted position (magnetic DESCRIPTION mode)." DATA TYPE = MSB_INTEGER START_BYTE = 327 BYTES = 2 = 1.52590E-004 OFFSET SCALING_FACTOR = 3.05180E-004 UNIT = V END_OBJECT = COLUMN OBJECT = COLUMN = "DST_INFO" NAME = "Data set control status word (0-7=ID, 8-11=status, DESCRIPTION 12-15=transfer mode)." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 329 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = COLORIN = "LONG_Z" = "Last Z piezo position set value during scan." = MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 331 = 2 BYTES END_OBJECT = COLUMN = COLUMN OBJECT = "Z GAIN" NAME = "Gain level for Z position sensor (strain gauge)." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 333 BYTES = 2 END OBJECT = COLUMN



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OBJECT = COLUMN = "GC X" NAME = " X/\overline{Y} position sensor X gain control value." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 335 = 2 BYTES END OBJECT = COLUMN = COLUMN OBJECT = "GC Y" = "X/Y position sensor Y gain control value." NAME DESCRIPTION DATA_TYPE START_BYTE = MSB UNSIGNED_INTEGER = 337 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN NAME = "OFC_X" = "X/Y position sensor X offset control value." DESCRIPTION DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 339 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "OFC_Y" NAME DESCRIPTION = "X/Y position sensor Y offset control value." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 341 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "SCAN ALGOR" NAME DESCRIPTION = "Scan algorithm (1=window detection, 2=p-controller, else threshold detection)." DATA_TYPE START_BYTE = MSB UNSIGNED_INTEGER = 343 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "FIRST_THRES_DET" NAME = "Flag, set for first threshold detection cycle at DESCRIPTION current scan location." DATA TYPE = MSB UNSIGNED INTEGER = 345 START_BYTE = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "DUST FLUX" NAME = "GIADA dust flux monitor value readout." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 347 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "OP POINT PCONTROL"
= "P-controller (scanning) operating point value NAME DESCRIPTION (calculated).' = MSB INTEGER DATA TYPE START_BYTE BYTES = 349 = 2 OFFSET = 1.52590E-004 SCALING_FACTOR = 3.05180E-004 = V UNTT = COLUMN END_OBJECT OBJECT = COLUMN NAME = "OP POINT PCONTR PERC" = "P-controller (scanning) operating point set value in DESCRIPTION % of resonance amplitude." DATA TYPE = MSB UNSIGNED INTEGER



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	START_BYTE	= 351
		= 2
	OFFSET	= 0.00000E+000
	SCALING FACTOR	= 1.52590E-003
END	OBJECT	= COLUMN
OBJE	ECT	= COLUMN
	NAME	= "PCONTR_KC"
	DESCRIPTION	<pre>= "PCONTR_KC" = "P-controller (scanning) gain control set value." = MSB_UNSIGNED_INTEGER = 353</pre>
	DATA_TYPE	= MSB_UNSIGNED_INTEGER
	START_BYTE	= 353
		= 2
END_	OBJECT	= COLUMN
0.0.75		001-12.01
OBJE		= COLUMN
		= "PCONTR ACTIVE"
during		= "Flag, indicates that the P-controller is active
during s	scanning."	- MOD INNCIONED INTECED
	DATA_TYPE START BYTE	= MSB_UNSIGNED_INTEGER = 355
		= 2
		= COLUMN
	= >= 0 = 0 =	····
OBJE	ECT	= COLUMN
0201	171/17	
	DESCRIPTION	= "Identifier of last generated on-board event."
	DATA TYPE	<pre>= "LAST_EVENT" = "Identifier of last generated on-board event." = MSB_UNSIGNED_INTEGER = 357 - 2</pre>
	START BYTE	= 357
	BYTES	= 2
END	OBJECT	= COLUMN
_	_	
OBJE		= COLUMN
		= "X_DAC_VAL"
	DESCRIPTION	= "Last DAC value applied to the X piezo of the scanner
head."		
	DATA_TYPE	= MSB_UNSIGNED_INTEGER = 359
		= 2
END_	OBJECT	= COLUMN
OBJE		= COLUMN
		= "Y DAC VAL"
		= "Last DAC value applied to the Y piezo of the scanner
head."	DESCRIPTION	- hast bke value applied to the i piezo of the scanner
neau.	DATA TYPE	= MSB UNSIGNED INTEGER
		= 361
	· _	= 2
		= COLUMN
	=	
OBJE	ECT	= COLUMN
	NAME	= "Z_DAC_VAL"
	DESCRIPTION	= "Last DAC value applied to the Z piezo of the scanner
head."		
	_	= MSB_UNSIGNED_INTEGER
	· _	= 363
		= 2
END_	OBJECT	= COLUMN
0.0		
OBJE		= COLUMN
		<pre>= "Z_SETTLE_TIME" = "Z piezo settling time in milliseconds before</pre>
advancir	DESCRIPTION ng to next scan position.	
auvancii		= MSB UNSIGNED INTEGER
		= 365
	_	= 2
END		= COLUMN
	-	
OBJE	ECT	= COLUMN
		= "XY_SETTLE_TIME"
	DESCRIPTION	= "X/ \overline{Y} piezo settling time in milliseconds before
advancir	ng to next scan position.	
		= MSB_UNSIGNED_INTEGER
	_	= 367
		= 2
END	OBJECT	= COLUMN



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OBJECT = COLUMN = "DUST FLUX MIN" NAME DESCRIPTION = "GIADA dust flux monitor lower limit (exposure time increases when exceeded)." DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 369 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "DUST FLUX MAX" NAME = "GIADA dust flux monitor upper limit (exposure time DESCRIPTION decreases when exceeded)." = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 371 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "F SCAN MODE" NAME = "Flag, set if threshold detection after frequency scan DESCRIPTION is skipped." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 373 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "F THRES HI" NAME = "Cantilever operating point frequency (high word)." = MSB_UNSIGNED_INTEGER = 375 DESCRIPTION DATA TYPE START_BYTE = 2 BYTES = 0.00000E+000 OFFSET SCALING_FACTOR = 4.57703E+001 UNTT = Hz = COLUMN END OBJECT OBJECT = COLUMN = "F_THRES_LO" NAME = "Cantilever operating point frequency (low word)." = MSB_UNSIGNED_INTEGER = 377 DESCRIPTION DATA_TYPE START_BYTE BYTES = 2 OFFSET = 0.00000E+000SCALING_FACTOR = 6.98253E-004 UNIT = Hz END_OBJECT = COLUMN OBJECT = COLUMN = "F SYNTH" NAME = "Last output value of frequency synthesizer." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 379 = 4 BYTES OFFSET = 0.00000E+000 = 6.98253E-004 SCALING FACTOR UNIT = Hz END OBJECT = COLUMN OBJECT = COLUMN = "HK1_PERIOD" NAME = "Standard HK report update period in seconds." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE START_BYTE = 383 = 2 BYTES END_OBJECT = COLUMN OBJECT = COLUMN = "F HI" NAME = "Last output value of frequency synthesizer (high DESCRIPTION word)." DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 385



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I	BYTES =	= 2
(OFFSET =	= 0.00000E+000
ç		= 4.57703E+001
	_	= Hz
END_C	OBJECT =	= COLUMN
OBJEC		= COLUMN
1	NAME =	= "F LO"
I	DESCRIPTION =	= "Last output value of frequency synthesizer (low
word)."		
	DATA_TYPE =	- MSB INSTANED INTECED
1		= 387
2	- <u> </u>	
		= 2
(OFFSET =	= 0.00000E+000
9	SCALING FACTOR =	= 6.98253E-004
Ţ	UNIT -	= Hz
		= COLUMN
	0000001	COLORIN
OBJEC		= COLUMN
1	NAME =	= "FRES HI"
I	DESCRIPTION =	= "Detected cantilever resonance frequency (high word)."
T	DATA TYPE =	= MSB UNSIGNED INTEGER
	DATA_TYPE = START BYTE =	= 389
		= 2
		= 0.00000E+000
S	SCALING_FACTOR =	= 4.57703E+001
τ	UNIT -	= Hz
END (OBJECT =	= COLUMN
	-	
OBJEC	<u>о</u> щ	= COLUMN
OBJEC	-	
1	NAME =	= "FRES_LO" = "Detected cantilever resonance frequency (low word)." = MSB_UNSIGNED_INTEGER = 391
I	DESCRIPTION =	= "Detected cantilever resonance frequency (low word)."
I	DATA TYPE =	= MSB UNSIGNED INTEGER
ç	START BYTE	= 391
		= 2
		= 2 = 0.00000E+000
	JFFSEI -	
	SCALING_FACTOR =	
Ţ	UNIT =	= Hz
END (OBJECT =	= COLUMN
_		
OBJEC	<u>े</u> म =	= COLUMN
 N		= "READ ANALOG"
		—
		= "Flag, set if analog channels readout is performed
periodica	-	
		= MSB_UNSIGNED_INTEGER
5	_	= 393
E	BYTES =	= 2
END (OBJECT =	= COLUMN
	-	
OBJEC	¬ψ -	= COLUMN
		= "F_SGL_START"
		= "Frequency scan start value of current cycle."
		= MSB_UNSIGNED_INTEGER
5	START BYTE =	= 395
	—	= 4
		= 0.00000E+000
		= 6.98253E-004
	_	
		= Hz
END C	OBJECT =	= COLUMN
OBJEC	CT =	= COLUMN
		= "F INC"
		= "Frequency scan increment value between cycles (256
times F S		reducine's pour fuctoment varae permeent cycrep (200
_	,	- MOD UNOTONED THEREED
	_	= MSB_UNSIGNED_INTEGER
	—	= 399
E	BYTES =	= 4
(OFFSET =	= 0.00000E+000
		= 6.98253E-004
	_	= Hz
END_(OBJECT =	= COLUMN
OBJEC	CT =	= COLUMN
1	NAME =	= "DC AMPL SET"
		= "DC threshold value for contact mode scanning."
		· · ··································



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DATA TYPE START BYTE	= MSB_INTEGER
BYTES	= 2
	= 1.52590E-004
SCALING_FACTOR UNIT	= 3.05180E - 004
	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CHECK DC SIGNAL"
DESCRIPTION	
during approach is enabled."	
DATA_TYPE START_BYTE	= MSB_UNSIGNED_INTEGER
START BYTE	= 405
BYTES	= 2
END_OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "U CANT DC START"
DESCRIPTION	= 0_CANI_DC_SIARI = "Cantilever DC signal value at the beginning of the
coarse approach."	
	= MSB INTEGER
DATA_TYPE START_BYTE	= MSB_INTEGER = 407
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E - 004
BYTES OFFSET SCALING_FACTOR UNIT	= V
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "CONTACT"
	= "Flag, set if surface contact has occurred during
coarse approach."	.,,
DATA TYPE	= MSB UNSIGNED INTEGER
DATA_TYPE START_BYTE	= MSB_UNSIGNED_INTEGER = 409
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "AUTO F ADJUST"
	= "Flag, set if frequency adjustment is enabled during
image scan."	
5	= MSB UNSIGNED INTEGER
START BYTE	= 411
BYTES	= 2
END OBJECT	= COLUMN
	0010111
OBJECT	= COLUMN
NAME	= "WHEEL COUNTS"
	= "Remaining wheel encoder counts until segment is
reached."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 413
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PULSE APPLIED"
DESCRIPTION	= "Flag, set if an approach pulse has been applied."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 415
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "LAST APPR POSITION"
DESCRIPTION	= "Last approach position used for checking the approach
movement."	
DATA TYPE	= MSB INTEGER
START BYTE	= 417
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E - 004
UNIT	= V
END OBJECT	= COLUMN



OBJECT	= COLUMN
NAME	= "MOVEMENT CHECKED"
DESCRIPTION	= "Flag, set if the approach movement has been checked."
DATA TYPE	
START_BYTE	= MSB_UNSIGNED_INTEGER = 419
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT NAME	= COLUMN
	= "CUR_APPROACH_POS"
DESCRIPTION approach movement."	= "Current approach position used for checking the
DATA TYPE	= MSB INTEGER
START BYTE	= 421
BYTES	= 2
OFFSET	= 1.52590E - 004
SCALING_FACTOR	= 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	- UTEST COUNT
NAME	= "TEST_COUNT" = "Holds number of milliseconds until approach movement
is checked."	- nords number of milliseconds until approach movement
	= MSB UNSIGNED INTEGER
START BYTE	= 423
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APPR_TEST_COUNT"
DESCRIPTION value)."	= "Approach movement test interval in milliseconds (set
	= MSB_UNSIGNED_INTEGER
START BYTE	= 425
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	<pre>= "DELTA_OP_AMPL_DC" = "Contact mode operating point deviation (calculated)."</pre>
	= "Contact mode operating point deviation (calculated)."
DATA_TYPE	= MSB_INTEGER = 427
START_BYTE BYTES	= 427 = 2
OFFSET	= 2 = 1.52590E-004
SCALING_FACTOR	= 3.05180E - 004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "DELTA_OP_PERC_DC"
DESCRIPTION	= "Contact mode operating point deviation in % of
cantilever DC set value." DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 429
BYTES	= 2
OFFSET	= 0.00000E+000
SCALING FACTOR	= 1.52590E-003
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "OP_UP_DC"
DESCRIPTION DATA TYPE	= "Contact mode operating point amplitude upper limit." = MSB INTEGER
START BYTE	= 431
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E - 004
UNIT -	= V
END_OBJECT	= COLUMN
	0011001
OBJECT	= COLUMN - "OR LO DO"
NAME DESCRIPTION	<pre>= "OP_LO_DC" = "Contact mode operating point amplitude lower limit."</pre>
DESCRIPTION	- concact mode operating point amplitude lower limit."



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DATA TYPE	= MSB INTEGER
START BYTE	= 433
BYTES	= 2
OFFSET	= 1.52590E-004 = 3.05180E-004
SCALING_FACTOR	= 3.05180E - 004
UNIT	= V
END OBJECT	= COLUMN
	COLOMI
OBJECT	= COLUMN
NAME	= "DELTA_APPR_LVDT"
DESCRIPTION	= "Minimum approach position change before incrementing
the stuck counter."	
DATA TYPE	= MSB_INTEGER = 435
START BYTE	= 435
BYTES	= 2
OFFSET	= 1.52590E - 004
SCALING FACTOR	= 1.52590E-004 = 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APPR_POS_MAX"
DESCRIPTION	= "Approach sensor position upper limit (set value)."
DATA TYPE	= MSB INTEGER
START BYTE	<pre>= "APPR_POS_MAX" = "Approach sensor position upper limit (set value)." = MSB_INTEGER = 437 - 2</pre>
BYTES	= 2
OFFSET	= 1.52590E-004
SCALING FACTOR	= 3.05180E - 004
_	
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	<pre>= COLOMIN = "APPR_POS_MIN" = "Approach sensor position lower limit (set value)." = MSB_INTEGER = 439 = 2</pre>
DESCRIPTION	= "Approach sensor position lower limit (set value)."
DATA_TYPE	= MSB_INTEGER
START BYTE	
BYTES	
DIIES	
OFFSET	= 1.52590E - 004
_	= 3.05180E-004
UNIT	= V
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "FINE ADJUSTMENT STARTED"
DESCRIPTION	= "Flag, set if the approach fine adjustment has
started."	riag, oco ri ono approach rino adjacomono nac
DATA TYPE	- MSB IINSIGNED INTEGED
=	= MSB_UNSIGNED_INTEGER = 441
START_BYTE	
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "TASK ACTIVE"
DESCRIPTION	= "Flag, set if a task is active (e.g. scan)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 443
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "APPR_NUM_PULSES"
DESCRIPTION	= "Number of approach pulses to apply before testing the
approach movement."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 445
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CANT_HIRES_STARTED"
DESCRIPTION	= "Flag, set if the cantilever high resolution DAQ task
is active."	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 447
BYTES	= 2
	-



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END OBJECT	= COLUMN
	00200
OBJECT	= COLUMN
NAME	= "CANT_HIRES_TIME"
DESCRIPTION resolution measurements."	= "Time in milliseconds between two cantilever high
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 449
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CANT_HIRES_PKTS"
	= "Total number of cantilever high resolution DAQ data
packets." DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 451
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CANT HIRES TIME CNT"
DESCRIPTION	= "Time in milliseconds since last cantilever high
resolution measurement."	
DATA TYPE	= MSB_UNSIGNED_INTEGER = 453
START_BYTE BYTES	= 453 = 2
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "CANT_HIRES_PKTS_CNT"
DESCRIPTION generated so far."	= "Number of cantilever high resolution DAQ data packets
-	= MSB UNSIGNED INTEGER
START BYTE	= 455
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "CAL STATE"
DESCRIPTION	<pre>= "X/Y position sensor calibration task status word." = MSB_UNSIGNED_INTEGER</pre>
START_BYTE	= 457
BYTES END OBJECT	= 2 = COLUMN
	COTOLIN'
OBJECT	= COLUMN
NAME	= "SW_DATA_PAGE"
DESCRIPTION DATA TYPE	= "Page number for S/W backup/restore." = MSB UNSIGNED INTEGER
START BYTE	= 459
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SW STATUS"
DESCRIPTION	= $"S/\overline{W}$ encoding/decoding task status word."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 461
BYTES END OBJECT	= 2 = COLUMN
_	
OBJECT	= COLUMN
NAME DESCRIPTION	= "SW_PAR_SET_ADDR" = "Last S/W parameter address."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 463
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SW PAR SET VAL"
DESCRIPTION	= "Last S/W parameter set value."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 465



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BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "SW_PAR_HK1_ADDR" = "Address of 1st adjustable HK parameter readout." NAME DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE = 467 START_BYTE BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = COLORN = "SW_PAR_HK2_ADDR" = "Address of 2nd adjustable HK parameter readout." NAME DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 469= 2 BYTES = COLUMN END OBJECT = COLUMN = "SW PAR HK3 ADDR" OBJECT NAME = "Address of 3rd adjustable HK parameter readout." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 471 BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "SW_PAR_HK4_ADDR" = "Address of 4th adjustable HK parameter readout." NAME DESCRIPTION = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 473 BYTES = 2 = COLUMN END OBJECT OBJECT = COLUMN = "SW_PAR_HK1_VAL" NAME = "Value of 1st adjustable HK parameter readout." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA_TYPE START_BYTE = 475= 2 BYTES = COLUMN END OBJECT = COLUMN OBJECT = "SW_PAR_HK2_VAL" NAME = "Value of 2nd adjustable HK parameter readout." DESCRIPTION DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 477 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "SW PAR HK3 VAL" NAME DESCRIPTION = "Value of 3rd adjustable HK parameter readout." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 479 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "SW PAR HK4 VAL" NAME = "Value of 4th adjustable HK parameter readout." DESCRIPTION DATA TYPE = MSB_UNSIGNED_INTEGER = 481 START_BYTE = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "FVECT MODE" NAME = "Feature vector calculation mode." DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 483 BYTES = 2 END OBJECT = COLUMN



OBJECT

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OBJECT = COLUMN = "FVECT LPERC" NAME = "Feature detection threshold value in percent of DESCRIPTION min/max Z value." = MSB UNSIGNED INTEGER DATA TYPE = 485 START BYTE BYTES = 2 = 0.00000E+000 OFFSET SCALING_FACTOR = 1.52590E-003 END_OBJECT = COLUMN OBJECT = COLUMN = COLUMN
= "FVECT_LEVEL"
= "Calculated feature vector threshold value."
= MSB_UNSIGNED_INTEGER NAME DESCRIPTION DATA TYPE START_BYTE = 487 = 2 BYTES END_OBJECT = COLUMN = COLUMN = "FVECT XMARGIN" OBJECT NAME = "Feature vector X margin (pixel) with respect to DESCRIPTION selected image." DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 489 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "FVECT YMARGIN" NAME = "Feature vector Y margin (pixel) with respect to DESCRIPTION selected image." DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 491 = 2 BYTES END OBJECT = COLUMN = COLUMN OBJECT = "FVECT STATUS" NAME = "Feature vector calculation status word." DESCRIPTION = MSB_UNSIGNED_INTEGER DATA_TYPE START_BYTE = 493 BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN = "FVECT NUMPTS" NAME = "Required number of points related to a feature in DESCRIPTION order to be selected." = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 495 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "FVECT AVG Z" NAME = "Required average height over Z level for a feature in DESCRIPTION order to be selected." DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 497 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "FVECT RATIO" NAME = "Required minimum pixels/area ratio for a feature in DESCRIPTION order to be selected." DATA_TYPE START_BYTE = MSB_UNSIGNED_INTEGER = 499 BYTES = 2 = 0.00000E+000 OFFSET SCALING_FACTOR = 1.52590E-003 END OBJECT = COLUMN

= COLUMN



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		= "FVECT_ZFACTOR"
		= "Feature vector calculation zoom factor in % of
feature		
	DATA_TYPE	= MSB_INTEGER
	START_BYTE	= 501 = 2
		= 1.52590E-003 = 3.05180E-003
FND		= COLUMN
		COHOTAN
OBJ	ECT	= COLUMN
	NAME	= "SC ENABLED"
	DESCRIPTION	= "Flag, set if science data transfer is enabled?"
	DATA_TYPE	<pre>= "Flag, set if science data transfer is enabled?" = MSB_UNSIGNED_INTEGER = 503</pre>
		= 2
END	OBJECT	= COLUMN
OBJ	Э.С.Ф.	= COLUMN
010	NAME	= "POINT READY"
		= "Flag, set if cantilever signal is within operating
point r		· , · · · · · · · · · · · · · · · · · ·
-	DATA TYPE	= MSB_UNSIGNED_INTEGER = 505
		= 2
END	OBJECT	= COLUMN
	ECT	= COLUMN
OB0.		= "IMAGE POINT"
	DESCRIPTION	= "Z set value or AC signal difference (magnetic mode)
for las	t DAQ point."	1 000 varao or no orginar arrieronoo (magnooro moao)
		= MSB_UNSIGNED_INTEGER
		= 507
		= 2
END	OBJECT	= COLUMN
0.0.1	R.C.M.	
OBJ		- "IIN TID CENTED"
	DESCRIPTION	<pre>= "LIN_TIP_CENTER" = "Linear LVDT value to center the currently selected</pre>
tip wit	hin the target."	
- <u>-</u> -	DATA TYPE	= MSB INTEGER
	START_BYTE	= 509
	BYTES	= 2
		= 1.52590E - 004
	_	= 3.05180E-004
END		= V = COLUMN
END	OBJECI	- COLOMN
OBJ	ECT	= COLUMN
	NAME	= "F ADJUST AMPL"
		= "Threshold amplitude for automatic f-adjusting during
scans."		
1	DATA_TYPE	= MSB_INTEGER
1	START_BYTE BYTES	= 511 = 2
1	OFFSET	= 2 = 1.52590E-004
	SCALING FACTOR	= 3.05180E-004
	UNIT	= V
END	OBJECT	= COLUMN
-		
OBJ		= COLUMN
	NAME	= "HK2_SPARE_1"
1	DESCRIPTION DATA TYPE	<pre>= "Extended HK report spare word #1." = MSB UNSIGNED INTEGER</pre>
	START BYTE	= MSB_UNSIGNED_INTEGER = 513
1	BYTES	= 2
END	OBJECT	= COLUMN
-	_	
OBJ		= COLUMN
1	NAME	= "HK2_SPARE_2"
1	DESCRIPTION	= "Extended HK report spare word #2."
	DATA_TYPE START BYTE	= MSB_UNSIGNED_INTEGER = 515
1	BYTES	= 2
END	OBJECT	= 2 = COLUMN
L		



OBJECT NAME	= COLUMN = "HK2 SPARE 3"
DESCRIPTION	
DATA TYPE	
START BYTE	
BYTES	= 2
END OBJECT	= COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	= "HK2 SPARE 4"
DESCRIPTION	
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 519
BYTES	= 2
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "HK2 SPARE 5"
DESCRIPTION	= "Extended HK report spare word #5."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 521
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "HK2 FRAME CS"
DESCRIPTION	= "Frame checksum (CRC16), including frame header."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 523
BYTES	= 2
END OBJECT	= COLUMN
_	



4.3.3 Data Product Design – Frequency Scan Data

The MIDAS frequency scan data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the ^STRUCTURE keyword in the PDS labels:

- Data directory: /DATA/FSC
- File naming: FSC yydddhh yydddhh nnn tt.DAT
- File structure: /LABEL/FSC_PREFIX.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A frequency scan comprises n (n=1...8) scan cycles of 256 samples each. This data can be mapped to a frequency series table with n rows and 1 column having 256 items. Thus the sampling parameter interval of the table object is 256 times the sampling parameter interval of the associated column object. The frequency range for a given scan is defined by the following keywords of the FREQUENCY_SERIES object:

- Start frequency: MINIMUM SAMPLING PARAMETER
- Scan cycles: ROWS (total number of samples = 256*ROWS)
- Frequency step: SAMPLING PARAMETER INTERVAL/256
- Frequency range: (256*ROWS 1)*SAMPLING PARAMETER INTERVAL/256

A typical PDS label for a frequency scan data file is given below:

PDS_VERSION_ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD TYPE	= FIXED LENGTH
RECORD BYTES	= 576
FILE_RECORDS	= <file_records></file_records>
DATA SET ID	= " <data id="" set="">"</data>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	= " <product id="" version="">"</product>
PRODUCT CREATION TIME	= <product creation="" time=""></product>
PRODUCT TYPE	= EDR
PROCESSING_LEVEL_ID	= <processing_level_id></processing_level_id>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission_phase_name>"</mission_phase_name>
INSTRUMENT HOST ID	= <instrument host="" id=""></instrument>
INSTRUMENT HOST NAME	= " <instrument host="" name="">"</instrument>
INSTRUMENT ID	= <instrument_id></instrument_id>
INSTRUMENT_NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT_TYPE	= " <instrument_type>"</instrument_type>
INSTRUMENT_MODE_ID	= <instrument_mode_id></instrument_mode_id>
INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>



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TARGET_NAME TARGET_TYPE	= " <target_name>" = "<target_type>"</target_type></target_name>
PRODUCER_ID PRODUCER_FULL_NAME PRODUCER_INSTITUTION_NAME	= " <producer_id>" = "<producer_full_name>" = "<producer_institution_name>"</producer_institution_name></producer_full_name></producer_id>
DATA_QUALITY_ID DATA_QUALITY_DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
/* GEOMETRY INFORMATION */	
SC_SUN_POSITION_VECTOR SC_TARGET_POSITION_VECTOR SC_TARGET_VELOCITY_VECTOR SPACECRAFT_ALTITUDE SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	<pre>= <sc_sun_position_vector> = <sc_target_position_vector> = <sc_target_velocity_vector> = <spacecraft_altitude> = <sub_spacecraft_latitude> = <sub_spacecraft_longitude></sub_spacecraft_longitude></sub_spacecraft_latitude></spacecraft_altitude></sc_target_velocity_vector></sc_target_position_vector></sc_sun_position_vector></pre>
/* MISSION SPECIFIC KEYWORDS */	
ROSETTA:MIDAS_TIP_NUMBER	= <midas_tip_number></midas_tip_number>
/* DATA FILE POINTER(S) */	
^ROW_PREFIX_TABLE ^FREQUENCY_SERIES	= " <file_name>" = "<file_name>"</file_name></file_name>
/* DATA OBJECT DEFINITION(S) */	
NAME INTERCHANGE_FORMAT ROWS COLUMNS	<pre>= ROW_PREFIX_TABLE = PKT_HEADER = BINARY = <file_records> = 23 = 62 = 514 = "Frequency scan header table" = "FSC_PREFIX.FMT" = ROW_PREFIX_TABLE</file_records></pre>
OBJECT NAME INTERCHANGE_FORMAT ROWS COLUMNS ROW_BYTES ROW_PREFIX_BYTES ROW_SUFFIX_BYTES SAMPLING_PARAMETER_NAME SAMPLING_PARAMETER_UNIT	<pre>= FREQUENCY_SERIES = FREQUENCY_DATA = BINARY = <file_records> = 1 = 512 = 62 = 2 = FREQUENCY = HERTZ = <fsc_interval> /* time between rows */</fsc_interval></file_records></pre>
START_BYTE BYTES ITEMS ITEM_BYTES SAMPLING_PARAMETER_NAME SAMPLING_PARAMETER_UNIT SAMPLING_PARAMETER_INTE SCALING_FACTOR	<pre>= HERTZ RVAL = <fsc_sampling> /* time between samples */ = 3.0518E-04</fsc_sampling></pre>
OFFSET	= 0.0



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DERIVED_MINIMUM = 0.0 DERIVED_MAXIMUM = 10.0 END_OBJECT = COLUMN END_OBJECT = FREQUENCY_SERIES END

The frequency scan row prefix structure is defined as follows:

/* FSC PREFIX STRUCTUR	<pre>{E */</pre>
OBJECT NAME	= COLUMN = "PACKET_ID" = "Telemetry packet identifier."
DESCRIPTION DATA_TYPE START_BYTE	= MSB_UNSIGNED_INTEGER = 1
BYTES END_OBJECT	= 2 = COLUMN
OBJECT NAME	= COLUMN
DESCRIPTION DATA_TYPE	<pre>= "PACKET_SEQUENCE_CONTROL" = "Telemetry packet sequence counter." = MSB_UNSIGNED_INTEGER _ 2</pre>
START_BYTE BYTES END OBJECT	= 3 = 2 = COLUMN
- OBJECT	= COLUMN
NAME DESCRIPTION DATA_TYPE	<pre>= "PACKET_LENGTH" = "Telemetry packet length." = MSB_UNSIGNED_INTEGER</pre>
START_BYTE BYTES END_OBJECT	= 5 = 2 = COLUMN
OBJECT NAME DESCRIPTION DATA TYPE START BYTE	= COLUMN = "PACKET_OBT_SECONDS" = "S/C clock count at packet generation." = MSB_UNSIGNED_INTEGER = 7
BYTES END_OBJECT	= 4 = COLUMN
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "PACKET_OBT_FRACTION" = "Fractional part of S/C clock count." = MSB_UNSIGNED_INTEGER = 11 = 2</pre>
END_OBJECT OBJECT	= COLUMN = COLUMN
NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>"PACKET_PUS_AND_CRC" = "Telemetry packet PUS-Version and CRC flag." = MSB_UNSIGNED_INTEGER = 13 = 1</pre>
END_OBJECT	= COLUMN
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "PACKET_TYPE" = "Telemetry packet type." = MSB_UNSIGNED_INTEGER = 14 = 1</pre>
END_OBJECT	= COLUMN
OBJECT NAME DESCRIPTION DATA TYPE	= COLUMN = "PACKET_SUBTYPE" = "Telemetry packet sub-type." = MSB UNSIGNED INTEGER



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NYTES	START BYTE	= 15
END_GOJECT - COLUMN NAME - "CALCET PAD FIELD" DESCRIPTION - "Telemetry packet padding field." DESCRIPTION - "Telemetry packet structure identifier." END_GOJECT - COLUMN NAME - "STRUCTURE_ID" DESCRIPTION - "Telemetry packet structure identifier." DIT_TYPE - MSD_UNISHOND_INTEGER BYTES END_GOJECT - COLUMN OJJECT - COLUMN NAME - "SOFTWARE_VERSION" DESCRIPTION - "Telemetry packet structure identifier." DIT_TYPE - MSD_UNISHOND_INTEGER BYTES BYTES - 2 END_GOJECT - COLUMN OJJECT - COLUMN NAME - "SOFTWARE_VERSION" DESCRIPTION - "On-FOARD_INTEGER SYNCES - SOFTWARE_VERSION" DESCRIPTION - "START_TIMM" DESCRIPTION - "START_TIMM" DESCRIPTION - "START_TIMM" DESCRIPTION - "START_TEQUENCY" DESCRIPTION - "START_TEQUENCY" DATA_TYPE - MSB_UNSIGNED_INTEGER START_BYTE - 21 END_GOJECT - COLUMN NAME - "START_TEQUENCY" DESCRIPTION - "START_TEQUENCY" DATA_TYPE - MSB_UNSIGNED_INTEGER START_BYTE - 23 END_GOJECT - COLUMN NAME - "FREQUENCY SYMEP" DESCRIPTION - "FREQUENCY SYMEP" DESCRIPTION - "Detected max. cantilever signal amplitude (UP to the current scan cycle)." DATA_TYPE - 31 DATA_TYPE - 44 END_GOJECT - COLUMN NAME - "FREQUENCY AT MAX" ESCRIPTION - "DETECT - COLUMN NAME - "ACMAININD_INTEGER START_BYTE - 31 DATA_TYPE - 31	_	
NAME "PACKET PAD FIELD" DESCRIPTION " "Telemetry packet padding field." DATA_TYPE MS_UNSIGNED_INTEGER START_HYTE IS END_GALECT COLUMN OBJECT COLUMN OBJECT COLUMN DESCRIPTION TO STRENCTURE ID" DATA_TYPE START_UNTE I DATA_TYPE START_UNTE IS START_HYTE IS END_OBJECT COLUMN OBJECT COLUMN DESCRIPTION IS START_HYTE IS START_TYPE MS_UNSIGNED_INTEGER START_TYPE START_UNTE IS START_TYPE START_UNTE IS DESCRIPTION IS DESCRIPTION IS DESCRIPTION IS DESCRIPTION IS DESCRIPTION IS DESCRIPTION IS DESCRIPTION IS START_TYPE IS START_TYPE IS START_TYPE IS DATA_TYPE IS START_STTE IS DESCRIPTION IS DATA_TYPE IS START_STTE IS DATA_TYPE IS START_STTE IS START_TYPE IS START_TY		
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DESCRIPTION = "TelemeTry Facket padding field." DESCRIPTION = 16 BYTES = 16 END_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN MARE = "STRUCTURE ID" DESCRIPTION = "ITIONETLY DAVKS STUCTURE Identifier." DATA, TYPE = MSS UNSIGNED_INTEGER START_BYTES = 2 END_OBJECT = COLUMN OGJECT = COLUMN NAME = "START_TIME" DESCRIPTION = "SCC CIOC count at frequency scan start." DATA TYPE = MSE UNSIGNED_INTEGER START_BYTE = 21 END_OBJECT = COLUMN OGJECT = COLUMN OGJECT = COLUMN OGJECT = COLUMN NAME = "START_FREQUENCY" DESCRIPTION = "START_FREQUENCY" DESCRIPTION = "START_FREQUENCY" DATA_TYPE = MSE_UNSIGNED_INTEGER START_BYTE = 25 ENT_OBJECT = COLUMN OBJECT = COLUMN NAME = "START_FREQUENCY" DATA_TYPE = MSE_UNSIGNED_INTEGER START_BYTE = 25 ENT_OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN OBJECT = COLUMN NAME = "START_FREQUENCY.STEP" DATA_TYPE = MSE_UNSIGNED_INTEGER START_BYTE = 25 END_OBJECT = COLUMN NAME = "AC MAXIMUM" NAME = "AC MAXIMUM" NAME = "AC MAXIMUM" NAME = "CACMAXIMUM" NAME = "REQUENCY_AT_MAX" DESCRIPTION = "FREQUENCY_AT_MAX" DESCRIPTION = "CACMAXIMUM" NAME = "REQUENCY_AT_MAX" DATA_TYPE = AG START_BYTE = 31 BYTES = 2 SCALING_FACTOR = COLUMN NAME = "REQUENCY_AT_MAX" NAME	OBJECT	= COLUMN
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DESCRIPTION - "Telemetry"packet structure identifier." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 17 BYTES : 2 END_ORJECT : COLUMN OBJECT : COLUMN NAME : "SOTWARE VERSION" DESCRIPTION : "Or-board software version." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 19 BYTES : 2 END_ORJECT : COLUMN OBJECT : COLUMN NAME : "START_TIMM" DESCRIPTION : "S'ACC Jock count at frequency scan start." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 21 END_ORJECT : COLUMN NAME : "START_TIMM" DESCRIPTION : "S'ACC Jock count at frequency scan start." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 21 END_ORJECT : COLUMN OBJECT : COLUMN NAME : "START_TREQUENCY" DESCRIPTION : "START_TREQUENCY" DESCRIPTION : "START_TREQUENCY" DESCRIPTION : "START_TREQUENCY" DESCRIPTION : "START_TREQUENCY" DESCRIPTION : "START_VALUE OF frequency sweep." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 25 BYTES : 4 END_ORJECT : COLUMN NAME : "TRCTEMENT VALUE OF frequency sweep." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 25 END_ORJECT : COLUMN NAME : "TRCTEMENT VALUE OF frequency sweep." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 29 END_ORJECT : COLUMN OBJECT : COLUMN NAME : "TRCTEMENT VALUE OF frequency sweep." DATA TYPE : MSB_UNSIONED_INTEGER START_BYTE : 29 END_ORJECT : COLUMN NAME : "TRCTEMENT SCAN CANTIEVER START_BYTE : 29 END_ORJECT : COLUMN NAME : "TRCTEMENT SCAN CANTIEVER START_BYTE : 21 END_ORJECT : COLUMN NAME : "TRCTEMENT SCAN CANTIEVER START_BYTE : 23 END_ORJECT : COLUMN OBJECT : COLUMN NAME : "TRCTEMENT SCAN CANTIEVER START_BYTE : 23 SCALING PACTOR : 3.0518E-04 OFFSET : 0.0 ENDEGALECT : COLUMN NAME : "TREQUENCY AT MAX" DESCRIPTION : "TREQUENCY MARE THE mAXIMUM SIGNAL AMPLIAT_TYPE : MSB_UNSIONED_INTEGER START_BYTE : 33 ENTES : 4 END_ORJECT : COLUMN	NAME	
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DESCRIPTION = "Frequency where the maximum signal amplitude was detected." DATA_TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 33 BYTES = 4 END_OBJECT = COLUMN		
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START_BYTE= 33BYTES= 4END_OBJECT= COLUMN		
BYTES = 4 END_OBJECT = COLUMN		
END_OBJECT = COLUMN		
_		
	END_ODORCI	- COTOLIN
OBJECT = COLUMN	OBJECT	= COLUMN
NAME = "NUM SCANS"		= "NUM SCANS"
DESCRIPTION = "Total number of frequency scan cycles."	DESCRIPTION	= "Total number of frequency scan cycles."



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DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 37
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SCAN CYCLE"
DESCRIPTION	= "Current scan cycle number."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 39
BYTES	= 2
END OBJECT	= COLUMN
	0010111
OBJECT	= COLUMN
NAME	= "CANT TIP NUM"
DESCRIPTION	= "Selected cantilever [1-8]." = MSB_UNSIGNED_INTEGER
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 41
BYTES	= 2
END_OBJECT	= COLUMN
	COHOM
OBJECT	= COLUMN
NAME	= "CANT BLK NUM"
DESCRIPTION	= "Selected cantilever block [1-2]." = MSB_UNSIGNED_INTEGER
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 43
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "EXCITATION LEVEL"
DESCRIPTION	= "Gain level of piezo-electric actuator
	used for cantilever excitation [0-7]."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 45
BYTES	= 2
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "AC_GAIN_LEVEL"
DESCRIPTION	= "Gain level of cantilever AC signal
	amplifier [0-7]."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 47
BYTES	= 2
END_OBJECT	= COLUMN
0.5.75.05	
OBJECT	= COLUMN
NAME	= "SPARE"
DESCRIPTION	= "Currently not used."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 49
BYTES	= 14
ITEMS	= 7
ITEM_BYTES END OBJECT	= 2 = COLUMN



4.3.4 Data Product Design – Single Point Approach Data

The MIDAS single point approach data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <code>^STRUCTURE</code> keyword in the PDS labels:

- Data directory: /DATA/SPA
- File naming: SPA yydddhh yydddhh nnn tt.DAT
- File structure: /LABEL/SPA_STRUCTURE.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A single point approach scan data record comprises 4 data channels with up to n (n=1-256) data samples each. The actual number of data samples (valid for all channels) for a record is given in the NUM SAMPLES column.

A typical PDS label for a single point approach data file is given below:

PDS VERSION ID	= PDS3
LABEL REVISION NOTE	= " <label note="" revision="">"</label>
DECODD WYDE	
RECORD_TYPE	= FIXED_LENGTH
RECORD BYTES	= 2096
FILE RECORDS	= <file records=""></file>
	= " <data id="" set="">"</data>
DATA_SET_ID	
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	= " <product id="" version="">"</product>
PRODUCT_ID PRODUCT_VERSION_ID PRODUCT_CREATION_TIME PRODUCT_TYPE	- \FKUDUCI_CREATION_TIME>
FRODUCI_TIFE	- EDK
PROCESSING LEVEL ID	= <processing id="" level=""></processing>
MISSION ID	= ROSETTA
MISSION_ID	
MISSION_NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission_phase_name>"</mission_phase_name>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID	= <instrument host="" id=""></instrument>
TNOTDIMENT LOOT NAME	- "ZINGTDIMENT LOST NAMEN"
INSTRUMENT_ID	= <instroment_id></instroment_id>
INSTRUMENT NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT TYPE	= " <instrument type="">"</instrument>
INSTRUMENT MODE ID	= <instrument id="" mode=""></instrument>
INSTRUMENT MODE DESC	= " <instrument desc="" mode="">"</instrument>
INSIROMENI_MODE_DESC	- <instroment_mode_desc <="" td=""></instroment_mode_desc>
TARGET NAME	= " <target name="">"</target>
TARGET TYPE	= " <target type="">"</target>
-	—
START TIME	= <start time=""></start>
=	=
STOP_TIME	= <stop_time></stop_time>
SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT	= " <start_count>"</start_count>
SPACECRAFT CLOCK STOP COUNT	= " <stop count="">"</stop>
NATIVE START TIME	= <native start="" time=""></native>
	= <native stop="" time=""></native>
NATIVE_STOP_TIME	- \NATIVE_STOF_TIME/
PRODUCER_ID	= " <producer_id>"</producer_id>



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PRODUCER FULL NAME	= " <producer_full_name>" = "<producer_institution_name>"</producer_institution_name></producer_full_name>
PRODUCER_INSTITUTION_NAME	= " <producer_institution_name>"</producer_institution_name>
DATA_QUALITY_ID DATA_QUALITY_DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
Durin_gountri_bube	CDUIN_GOURITI_PEOCO
/* GEOMETRY INFORMATION */	
SC_SUN_POSITION_VECTOR SC_TARGET_POSITION_VECTOR SC_TARGET_VELOCITY_VECTOR SPACECRAFT_ALTITUDE SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	= <sc position="" sun="" vector=""></sc>
SC_TARGET_POSITION_VECTOR	= <sc_target_position_vector></sc_target_position_vector>
SC_TARGET_VELOCITY_VECTOR	= <sc_target_velocity_vector></sc_target_velocity_vector>
SPACECRAFT_ALTITUDE	= <spacecraft_altitude></spacecraft_altitude>
SUB_SPACECRAFT_LATTITUDE	= <sub_spacecraft_lattude></sub_spacecraft_lattude>
SUB_SPACECRAFT_LONGITUDE	= <sub_spacecraft_longitude></sub_spacecraft_longitude>
/* MISSION SPECIFIC KEYWORDS */	
ROSETTA:MIDAS TIP NUMBER	= <midas number="" tip=""></midas>
ROSETTA:MIDAS_TIP_NUMBER ROSETTA:MIDAS_TARGET_NUMBER ROSETTA:MIDAS_TARGET_TYPE	= <midas number="" target=""></midas>
ROSETTA:MIDAS TARGET TYPE	= <midas target="" type=""></midas>
ROSETTA:MIDAS_TARGET_NAME	= <midas_target_name></midas_target_name>
DOCEMMA .MIDAC IIN CMACE DOC	- ANTRAS ITM STACE DOCN
ROSETTA:MIDAS_LIN_SIAGE_POS	- (MIDAS_LIN_SIAGE_POS/ = (MIDAS_SEGMENT NUMBER>
ROSETTA:MIDAS SCAN START XY	= <midas_scan_start_xy></midas_scan_start_xy>
ROSETTA:MIDAS SCAN STOP XY	= <midas scan="" stop="" xy=""></midas>
ROSETTA:MIDAS_LIN_STAGE_POS ROSETTA:MIDAS_SEGMENT_NUMBER ROSETTA:MIDAS_SCAN_START_XY ROSETTA:MIDAS_SCAN_STOP_XY ROSETTA:MIDAS_SCAN_DIRECTION	= <midas_scan_direction></midas_scan_direction>
ROSETTA:MIDAS SCANNING MODE	
/* DATA FILE POINTER(S) */	
^SPA_TABLE	= " <file_name>"</file_name>
/* DATA OBJECT DEFINITION(S) */	,
OBJECT	= SPA TABLE
INTERCHANGE FORMAT	
ROWS	= <file_records></file_records>
	= 27
ROW_BYTES	= 2096
DESCRIPTION ^STRUCTURE	= "MIDAS SCAN CONTROL QATA" - "SDA STRUCTURE EMT"
END OBJECT	<pre>= 2096 = "MIDAS scan control data" = "SPA_STRUCTURE.FMT" = SPA_TABLE</pre>
END	

The single point approach record structure is defined as follows:

/* SPA FRAME STRUCTURE	*/
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES	<pre>= COLUMN = "PACKET_ID" = "Telemetry packet identifier." = MSB_UNSIGNED_INTEGER = 1 = 2</pre>
END_OBJECT	= COLUMN
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT	<pre>= COLUMN = "PACKET_SEQUENCE_CONTROL" = "Telemetry packet sequence counter." = MSB_UNSIGNED_INTEGER = 3 = 2 = COLUMN</pre>
OBJECT NAME DESCRIPTION DATA TYPE	<pre>= COLUMN = "PACKET_LENGTH" = "Telemetry packet length." = MSB UNSIGNED INTEGER</pre>



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START_BYTE	= 5
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT SECONDS"
DESCRIPTION	= "S/C clock count at packet generation."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 7
BYTES	= 4
END OBJECT	= COLUMN
	COLONN
OBJECT	= COLUMN
NAME	= "PACKET_OBT_FRACTION"
DESCRIPTION	= "Fractional part of S/C clock count."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 11
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_PUS_AND_CRC"
DESCRIPTION	= "Telemetry packet PUS-Version and CRC flag."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 13
BYTES	= 1
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "PACKET TYPE"
DESCRIPTION	= "Telemetry packet type."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 14
BYTES	= 1
END OBJECT	= COLUMN
END_ODDECT	
OBJECT	= COLUMN
NAME	= "PACKET SUBTYPE"
DESCRIPTION	= "Telemetry packet sub-type."
	= MSB_UNSIGNED_INTEGER
DATA_TYPE	
START_BYTE	= 15
BYTES	= 1
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_PAD_FIELD"
DESCRIPTION	= "Telemetry packet padding field."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 16
BYTES	= 1
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "STRUCTURE_ID"
DESCRIPTION	= "Telemetry packet structure identifier."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 17
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SOFTWARE_VERSION"
DESCRIPTION	= "On-board software version."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 19
BYTES	= 2
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "LINEAR POS"
DESCRIPTION	= "Linear stage position sensor readout."
DATA TYPE	= MSB INTEGER
START BYTE	= 21
BYTES	= 2
OFFSET	= 1.52590E-004



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SCALING_FACTOR	= 3.05180E-004
UNIT -	= VOLT
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	
DECORTORION	<pre>= COLUMN = "WHEEL POS" = "Current wheel position (segment number)." = MSB_UNSIGNED_INTEGER = 23 = 2</pre>
DESCRIPTION	= "Current wheel position (segment number)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 23
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "TIP NUMBER"
DESCRIPTION	= "Number of selected tip "
DAWA WVDF	- MGB INTECED INTECED
	- NSE_ONSEGNED_INTEGEN
DVERO	<pre>= COLUMN = "TIP_NUMBER" = "Number of selected tip." = MSB_UNSIGNED_INTEGER = 25 = 2 = COLUMN</pre>
BITES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "X ORIGIN"
DESCRIPTION	= "Scan origin in X direction (DAC units)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	<pre>= COLUMN = "X_ORIGIN" = "Scan origin in X direction (DAC units)." = MSB_UNSIGNED_INTEGER = 27</pre>
START_BYTE BYTES	= 2
21120	
END_OBJECT	= COLUMN
OBJECT	<pre>= COLUMN = "Y_ORIGIN" = "Scan origin in Y direction (DAC units)." = MSB_UNSIGNED_INTEGER = 29 = 2</pre>
NAME	= "Y_ORIGIN"
DESCRIPTION	= "Scan origin in Y direction (DAC units)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 29
BYTES	= 2
DIIDO	
END_OBJECT	= COLUMN
	<pre>= COLUMN = "STEP_SIZE" = "Line scan step size (DAC units)." = MSB_UNSIGNED_INTEGER = 31 = 2</pre>
OBJECT	= COLUMN
NAME	= "STEP_SIZE"
DESCRIPTION	= "Line scan step size (DAC units)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 31
BYTES	= 2
END OBJECT	= COLUMN
END_OBOLCI	
05 TE 05	
OBJECT	= COLUMN
NAME	<pre>= COLUMN = "NUM_STEPS" = "Number of line scan steps (pixels)." = MSB_UNSIGNED_INTEGER = 33</pre>
DESCRIPTION	= "Number of line scan steps (pixels)."
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 33
BYTES	= 2
END OBJECT	= COLUMN
OBIECT	- COLUMN
OBJECT	= COLUMN = "SCAN MODE"
NAME	=
DESCRIPTION	= "Scanning mode for image acquisition):
	Bit 0-7: 0=DYN[amic], 1=CON[tact], 2=MAG[netic],
	Bit 8: line scan direction (0=std.,1=reverse),
	Bit 12: main scan direction (0=X,1=Y)"
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 35
BYTES	= 2
END OBJECT	= COLUMN
	oo lorm
OBJECT	= COLUMN
NAME	= "MAIN_SCAN_CNT"
DESCRIPTION	= "Current main scan counter."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 37
BYTES	= 2
END OBJECT	= COLUMN
	0020m.
OBJECT	= COLUMN
NAME	= "NUM_SAMPLES"
DESCRIPTION	= "Total number of measurements."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
——————	



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START_BYTE	= 39
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SPARE"
DESCRIPTION DATA TYPE	<pre>= "Currently not used." = MSB_UNSIGNED_INTEGER</pre>
DATA TYPE	= MSB_UNSIGNED_INTEGER = 41
START_BYTE BYTES	= 41 = 6
ITEMS	= 3
ITEM_BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= CONTAINER
NAME	
START_BYTE	= FRAME_STRUCTURE = 47
BYTES	= 8
REPETITIONS	= 256 = "Container for the 256 repeating
	DC, phase and Z position signal."
OBJECT	= COLUMN
NAME DESCRIPTION	= "AC_SAMPLE" = "Cantilever AC signal sample "
DATA TYPE	= MSB INTEGER
START_BYTE	<pre>= COLUMN = "AC_SAMPLE" = "Cantilever AC signal sample." = MSB_INTEGER = 1 = 2</pre>
BYTES	= 2
SCALING_FACTOR OFFSET	= 5.0518E - 04 = 0.0
TINTT	= VOLT = "F6.2"
DERIVED_MINIMUM DERIVED_MAXIMUM	= 0.0
END_OBJECT	= 10.0 = COLUMN
OBJECT	<pre>= COLUMN = "DC_SAMPLE" = "Cantilever DC signal samples." = MSB_INTEGER = 3 = 2</pre>
NAME	= "DC_SAMPLE"
DESCRIPTION DATA TYPE	= Cancilever DC signal samples. = MSB INTEGER
START BYTE	= 3
BYTES	= 2
SCALING_FACTOR OFFSET	= 3.0518E - 04
TINTT	= 0.0 = VOLT
FORMAT	= VOLT = "F6.2"
DERIVED MINIMUM	= -10.0
DERIVED_MAXIMUM	= +10.0
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PHASE_SAMPLE"
NAME DESCRIPTION DATA_TYPE START_BYTE	= "Cantilever phase signal samples."
START BYTE	= 5
BYTES	= 2
SCALING_FACTOR	
OFFSET UNIT	= 0.0 = DEGREE
FORMAT	= "F6.1"
	= -180.0
DERIVED_MAXIMUM	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "Z POS SAMPLE"
DESCRIPTION	= "Z piezo position monitor (strain gauge)." = MSB_INTEGER
DATA_TYPE START BYTE	= MSB_INTEGER = 7
BYTES	= 2
SCALING_FACTOR	= 3.0518E-04
OFFSET	
UNIT FORMAT	= VOLT = "F6.2"
DERIVED MINIMUM	= -10.2



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DERIVED_MAXIMUM END_OBJECT	= +10.0 = COLUMN
END_OBJECT	= CONTAINER
OBJECT NAME DESCRIPTION DATA_TYPE START_BYTE BYTES END_OBJECT	<pre>= COLUMN = "CRC16_CHECKSUM" = "Telemetry packet checksum (CRC 16)." = MSB_UNSIGNED_INTEGER = 2095 = 2 = COLUMN</pre>



4.3.5 Data Product Design – Single Point Sampling Data

The MIDAS single point sampling data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <code>^STRUCTURE</code> keyword in the PDS labels:

- Data directory: /DATA/SPS
- File naming: SPS yydddhh yydddhh nnn tt.DAT
- File structure: /LABEL/SPS_PREFIX.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A single point sampling scan comprises n (n=1-65535) scan cycles with 4 data channels of 256 samples each. This data can be mapped to a time series table consisting of n rows and 4 interleaved columns with 256 items. Thus the sampling parameter interval of the table object is 256 times the sampling parameter interval of the associated column object. The time range for a given scan is defined by the following keywords of the TIME_SERIES object:

- Scan cycles: ROWS (total number of samples per channel = 256*ROWS)
- Time step: SAMPLING PARAMETER INTERVAL/256
- Time range: (256*ROWS 1)*SAMPLING PARAMETER INTERVAL/256

A typical PDS label for a single point sampling data file is given below:

PDS VERSION ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD TYPE	= FIXED LENGTH
RECORD BYTES	= 2096
FILE_RECORDS	= <file records=""></file>
DATA SET ID	= " <data id="" set="">"</data>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT_ID	= " <product_id>"</product_id>
PRODUCT_VERSION_ID	= " <product_version_id>"</product_version_id>
PRODUCT_CREATION_TIME PRODUCT_TYPE	= <product_creation_time> = EDR</product_creation_time>
PROCESSING_LEVEL_ID	- LDR = <processing id="" level=""></processing>
INCCESSING_DEVED_ID	
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission_phase_name>"</mission_phase_name>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME	= <instrument_host_id> = "<instrument host="" name="">"</instrument></instrument_host_id>
INSTRUMENT ID	= <instrument id=""></instrument>
INSTRUMENT NAME	= " <instrument name="">"</instrument>
INSTRUMENT TYPE	= " <instrument type="">"</instrument>
INSTRUMENT MODE ID	= <instrument id="" mode=""></instrument>
INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
DADCER NAME	= " <target name="">"</target>
TARGET_NAME TARGET TYPE	= " <target_name>" = "<target_type>"</target_type></target_name>
IARGEI_IIFE	- \IARGEI_IIFE/



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START_TIME STOP_TIME SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME NATIVE_STOP_TIME	<pre>= <start_time> = <stop_time> = "<start_count>" = "<stop_count>" = <native_start_time> = <native_stop_time></native_stop_time></native_start_time></stop_count></start_count></stop_time></start_time></pre>
PRODUCER_ID PRODUCER_FULL NAME	
DATA_QUALITY_ID DATA_QUALITY_DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
/* GEOMETRY INFORMATION */	
SC_SUN_POSITION_VECTOR SC_TARGET_POSITION_VECTOR SC_TARGET_VELOCITY_VECTOR SPACECRAFT_ALTITUDE SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	<pre>= <sc_sun_position_vector> = <sc_target_position_vector> = <sc_target_velocity_vector> = <spacecraft_altitude> = <sub_spacecraft_latitude> = <sub_spacecraft_longitude></sub_spacecraft_longitude></sub_spacecraft_latitude></spacecraft_altitude></sc_target_velocity_vector></sc_target_position_vector></sc_sun_position_vector></pre>
/* MISSION SPECIFIC KEYWORDS */	
ROSETTA:MIDAS_TIP_NUMBER ROSETTA:MIDAS_TARGET_NUMBER ROSETTA:MIDAS_TARGET_TYPE ROSETTA:MIDAS_TARGET_NAME	= <midas_tip_number> = <midas_target_number> = <midas_target_type> = <midas_target_name></midas_target_name></midas_target_type></midas_target_number></midas_tip_number>
ROSETTA:MIDAS_LIN_STAGE_POS ROSETTA:MIDAS_SEGMENT_NUMBER ROSETTA:MIDAS_SCAN_START_XY ROSETTA:MIDAS_SCAN_STOP_XY ROSETTA:MIDAS_SCAN_DIRECTION	<pre>= <midas_lin_stage_pos> = <midas_segment_number> = <midas_scan_start_xy> = <midas_scan_stop_xy> = <midas_scan_direction></midas_scan_direction></midas_scan_stop_xy></midas_scan_start_xy></midas_segment_number></midas_lin_stage_pos></pre>
ROSETTA:MIDAS_SCANNING_MODE	= <midas_scanning_mode></midas_scanning_mode>
/* DATA FILE POINTER(S) */	
^ROW_PREFIX_TABLE ^TIME_SERIES	= " <file_name>" = "<file_name>"</file_name></file_name>
/* DATA OBJECT DEFINITION(S) */	
NAME INTERCHANGE_FORMAT ROWS	<pre>= ROW_PREFIX_TABLE = PKT_HEADER = BINARY = <file_records> = 22 = 46 = 2050 = "Control data prefix table" = "SPS_PREFIX.FMT" = ROW_PREFIX_TABLE</file_records></pre>
ROW_BYTES ROW_SUFFIX_BYTES SAMPLING_PARAMETER_NAME SAMPLING_PARAMETER_UNIT SAMPLING_PARAMETER_INTERVAL	= SECONDS
NAME DATA_TYPE START_BYTE BYTES	= AC_SAMPLES = MSB_INTEGER = 1 = 2042



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ITEMS	= 256
ITEM BYTES	= 2
ITEM OFFSET	
SAMPLING PARAMETER NAME	
SAMPLING PARAMETER UNIT	
SAMPLING_PARAMETER_INTH	2 0510B 04
SCALING_FACTOR	= 3.0518E-04
OFFORI	- 0.0
	= 0.0
DERIVED_MAXIMUM	= 10.0
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= DC_SAMPLES
	= MSB_INTEGER
START BYTE	= 3
BYTES	= 2042
ITEMS	= 256
TTEM BYTES	= 2
ITEM OFFSET	= 8
SAMPLING PARAMETER NAME	
SAMPLING PARAMETER UNIT	
SAMPLING PARAMETER INT	
SAMPLING_PARAMETER_INT	2 0510B 04
SCALING_FACTOR OFFSET	= 3.0518E-04
	= 0.0
	= 10.0
END_OBJECT	= COLUMN
	= COLUMN
NAME	= PHASE_SAMPLES
	= MSB_INTEGER
START_BYTE	= 5
BYTES	= 2042
ITEMS	= 256
ITEM BYTES	= 2
ITEM OFFSET	= 8
SAMPLING PARAMETER NAME	E = TIME
SAMPLING PARAMETER UNIT	
SAMPLING PARAMETER INTH	
SCALING FACTOR	= 3.0518E - 04
SCALING_FACTOR OFFSET	
	= 0.0
	= 0.0 = 10.0
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= Z_POS_SAMPLES = MSB INTEGER
START_BYTE	= 7
BYTES	= 2042
ITEMS	= 256
ITEM BYTES	= 2
ITEM_OFFSET	= 8
SAMPLING PARAMETER NAME	E = TIME
SAMPLING PARAMETER UNIT	
SAMPLING PARAMETER INTE	
SCALING FACTOR	
OFFSET	= 0.0
	= 0.0
=	
_	= 10.0
	= COLUMN
O_OBJECT	= TIME_SERIES
<u>,</u>	
)	

The single point sampling prefix structure is defined as follows:

/* SPS PREFIX STRUCTURE */

OBJECT

= COLUMN



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NAME	= "PACKET ID"
DESCRIPTION	= "Telemetry packet identifier."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 1
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME DESCRIPTION	= "PACKET_SEQUENCE_CONTROL"
DATA TYPE	<pre>= "PACKET_SEQUENCE_CONTROL" = "Telemetry packet sequence counter." = MSB_UNSIGNED_INTEGER _ 2</pre>
START BYTE	= 3
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET LENGTH"
DESCRIPTION	= "Telemetry packet length."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 5
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT NAME	- "DACKET OFT SECONDS"
	= "PACKET_OBT_SECONDS" = "S/C clock count at packet generation." = MSB_UNSIGNED_INTEGER
DESCRIPTION DATA TYPE	- S/C CIOCK COUNT at packet generation.
START BYTE	= 7
BYTES	= 4
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT FRACTION"
DESCRIPTION	= "PACKET_OBT_FRACTION" = "Fractional part of S/C clock count."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 11
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME DESCRIPTION	= "PACKET_PUS_AND_CRC" = "Telemetry packet PUS-Version and CRC flag."
DATA TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 13
BYTES	= 1
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET TYPE"
DESCRIPTION	= "Telemetry packet type."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 14
BYTES	
END_OBJECT	= COLUMN
OBIECE	
OBJECT	- "DACKET SUDTYDE"
NAME DESCRIPTION	= "PACKET_SUBTYPE" = "Telemetry packet sub-type "
DATA TYPE	= "Telemetry packet sub-type." = MSB UNSIGNED INTEGER
START BYTE	= 15
BYTES	= 1
END OBJECT	= COLUMN
—	
OBJECT	= COLUMN
NAME	= "PACKET_PAD_FIELD"
DESCRIPTION	= "Telemetry packet padding field."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 16
BYTES	
END_OBJECT	= COLUMN
OBIECT	= COLUMN
OBJECT NAME	= COLUMN = "STRUCTURE ID"
DESCRIPTION	= "Telemetry packet structure identifier."
DATA TYPE	= MSB UNSIGNED INTEGER
	- <u> </u>



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START BYTE	= 17
BYTES	= 2
END OBJECT	= COLUMN
END_ODDEC1	- COLOMN
OBJECT	= COLUMN
NAME	= "SOFTWARE VERSION"
DESCRIPTION	= "On-board software version."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 19
BYTES	= 19 = 2
	_
END_OBJECT	= COLUMN
OBJECT	= COLUMN
	= "LINEAR POS"
NAME DESCRIPTION	
DESCRIPTION	<pre>= "Linear stage position sensor readout." - MOR INTECED</pre>
DATA_TYPE START BYTE	= MSB_INTEGER = 21
BYTES	= 21 = 2
	= 2 = 1.52590E-004
OFFSET	
SCALING_FACTOR UNIT	= 3.05180E-004 = VOLT
END OBJECT	= COLUMN
END_OBJECT	- COLOMN
OBJECT NAME	= COLUMN
	= "WHEEL POS"
DESCRIPTION DATA TYPE	<pre>= "Current wheel position (segment number)." = MSB UNSIGNED INTEGER</pre>
	$= MSB_ONSIGNED_INTEGER$ $= 23$
START_BYTE BYTES	- 25 = 2
END_OBJECT	= COLUMN
OD IECH	
OBJECT	= COLUMN
NAME	= "TIP_NUMBER"
	= "Number of selected tip."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 25
BYTES	= 2
END_OBJECT	= COLUMN
00.700	
OBJECT	= COLUMN
NAME	= "X_ORIGIN" = "Scan origin in X direction (DAC units)."
DESCRIPTION	= "Scan origin in X direction (DAC units)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 27
BYTES	= 2
END_OBJECT	= COLUMN
00.700	
OBJECT	= COLUMN
NAME	= "Y_ORIGIN"
DESCRIPTION	= "Scan origin in Y direction (DAC units)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 29
BYTES	
END_OBJECT	= COLUMN
0.0.70.07	
OBJECT	= COLUMN
NAME	= "STEP_SIZE"
DESCRIPTION	= "Line scan step size (DAC units)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 31
BYTES	
END_OBJECT	= COLUMN
00.700	
OBJECT	= COLUMN
NAME	= "NUM_STEPS"
DESCRIPTION	= "Number of line scan steps (pixels)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 33
BYTES	
END_OBJECT	= COLUMN
0.0.70.07	
OBJECT	= COLUMN
NAME	= "SCAN_MODE"
DESCRIPTION	= "Scanning mode for image acquisition):
	<pre>Bit 0-7: 0=DYN[amic], 1=CON[tact], 2=MAG[netic],</pre>



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	Bit 8: line scan direction (0=std.,1=reverse),
DATA TYPE	Bit 12: main scan direction (0=X,1=Y)"
START BYTE	= MSB_UNSIGNED_INTEGER = 35
BYTES	- 55 = 2
EITES END OBJECT	= 2 = COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	= "MAIN SCAN CNT"
DESCRIPTION	= "Current main scan counter."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 37
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "NUM SAMPLES"
DESCRIPTION	= "Total number of measurements."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 39
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SPARE"
DESCRIPTION	= "Currently not used."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 41
BYTES	= 6
ITEMS	= 3
ITEM BYTES	= 2
END OBJECT	= COLUMN



4.3.6 Data Product Design – Line Scan Data

The MIDAS line scan data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the ^STRUCTURE keyword in the PDS labels:

- Data directory: /DATA/LIN
- File naming: LIN_yydddhh_yydddhh_nnn_tt.DAT
- File structure: /LABEL/LIN_STRUCTURE.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A line scan can have n (n=32, 64, ..., 512) data points depending on the commanded number of pixels in the main scan direction. The line scan records have a fixed size, capable of holding the maximum number of 512 line scan data points. The actual number of data points for a given record can be determined from the NUM STEPS column.

<u>Note:</u> The column TIP_NUMBER is always 0 for telemetry data generated prior to payload checkout #4 (corrected via S/W upload). Nevertheless, the proper value can be obtained from the mission specific keyword MIDAS_TIP_NUMBER which is included in the PDS label.

A typical PDS label for a line scan data file is given below:

PDS_VERSION_ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD_TYPE RECORD_BYTES FILE_RECORDS	<pre>= FIXED_LENGTH = 1072 = <file_records></file_records></pre>
DATA_SET_ID	= " <data_set_id>"</data_set_id>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT_ID PRODUCT_VERSION_ID PRODUCT_CREATION_TIME PRODUCT_TYPE PROCESSING_LEVEL_ID	<pre>= "<product_id>" = "<product_version_id>" = <product_creation_time> = EDR = <processing_level_id></processing_level_id></product_creation_time></product_version_id></product_id></pre>
MISSION_ID	= ROSETTA
MISSION_NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission_phase_name>"</mission_phase_name>
INSTRUMENT_HOST_ID	<pre>= <instrument_host_id></instrument_host_id></pre>
INSTRUMENT_HOST_NAME	= " <instrument_host_name>"</instrument_host_name>
INSTRUMENT_ID	= <instrument_id></instrument_id>
INSTRUMENT_NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT_TYPE	= " <instrument_type>"</instrument_type>
INSTRUMENT_MODE_ID	= <instrument_mode_id></instrument_mode_id>
INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
TARGET_NAME	= " <target_name>"</target_name>
TARGET_TYPE	= " <target_type>"</target_type>
START_TIME	= <start_time></start_time>
STOP_TIME	= <stop_time></stop_time>



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SPACECRAFT CLOCK START COUNT	= " <start count="">"</start>
SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME	= " <stop count="">"</stop>
NATIVE START TIME	= <native start="" time=""></native>
NATIVE STOP TIME	= <native stop="" time=""></native>
PRODUCER ID	= " <producer id="">"</producer>
PRODUCER_FULL_NAME	= " <producer_full_name>"</producer_full_name>
PRODUCER_ID PRODUCER_FULL_NAME PRODUCER_INSTITUTION_NAME	= " <producer_institution_name>"</producer_institution_name>
DATA_QUALITY_ID	= <data_quality_id></data_quality_id>
DATA_QUALITY_DESC	= " <data_quality_desc>"</data_quality_desc>
/* GEOMETRY INFORMATION */	
SC_SUN_POSITION_VECTOR	= <sc_sun_position_vector></sc_sun_position_vector>
SC_TARGET_POSITION_VECTOR	= <sc_target_position_vector></sc_target_position_vector>
SC_TARGET_VELOCITY_VECTOR	<pre>= <sc_target_velocity_vector></sc_target_velocity_vector></pre>
SPACECRAFT_ALTITUDE	= <spacecraft_altitude></spacecraft_altitude>
SUB_SPACECRAFT_LATITUDE	= <sub_spacecraft_latitude></sub_spacecraft_latitude>
SUB_SPACECRAFI_LONGITUDE	<pre>= <sc_sun_position_vector> = <sc_target_position_vector> = <sc_target_velocity_vector> = <spacecraft_altitude> = <sub_spacecraft_latitude> = <sub_spacecraft_longitude></sub_spacecraft_longitude></sub_spacecraft_latitude></spacecraft_altitude></sc_target_velocity_vector></sc_target_position_vector></sc_sun_position_vector></pre>
/* MISSION SPECIFIC KEYWORDS *	
/ MIDDION DIBOTTIC NETWORDS	1
ROSETTA MIDAS TIP NUMBER	= <midas number="" tip=""></midas>
ROSETTA:MIDAS TARGET NUMBER	= <midas number="" target=""></midas>
ROSETTA:MIDAS TARGET TYPE	= <midas target="" type=""></midas>
ROSETTA:MIDAS_TIP_NUMBER ROSETTA:MIDAS_TARGET_NUMBER ROSETTA:MIDAS_TARGET_TYPE ROSETTA:MIDAS_TARGET_NAME	= <midas name="" target=""></midas>
ROSETTA:MIDAS LIN STAGE POS	= <midas lin="" pos="" stage=""></midas>
ROSETTA:MIDAS SEGMENT NUMBER	= <midas number="" segment=""></midas>
ROSETTA:MIDAS SCAN START XY	= <midas scan="" start="" xy=""></midas>
ROSETTA:MIDAS_SCAN_STOP_XY	= <midas_scan_stop_xy></midas_scan_stop_xy>
ROSETTA: MIDAS_LIN_STAGE_POS ROSETTA: MIDAS_SEGMENT_NUMBER ROSETTA: MIDAS_SCAN_START_XY ROSETTA: MIDAS_SCAN_STOP_XY ROSETTA: MIDAS_SCAN_DIRECTION	= <midas_scan_direction></midas_scan_direction>
ROSETTA:MIDAS_SCANNING_MODE	= <midas_scanning_mode></midas_scanning_mode>
/* DATA FILE POINTER(S) */	
ATTNE SCAN TARTE	= " <file name="">"</file>
^LINE_SCAN_TABLE	- <rill_name></rill_name>
/* DATA OBJECT DEFINITION(S) *	/
, Brin obolici Blithillon(5)	1
OBJECT	= LINE SCAN TABLE
INTERCHANGE_FORMAT	= BINARY
ROWS	= <file records=""></file>
COLUMNS	- 23 -
ROW BYTES	= 1072
DESCRIPTION	= "MIDAS line scan data"
^STRUCTURE	= "LIN_STRUCTURE.FMT"
END_OBJECT	= 1072 = "MIDAS line scan data" = "LIN_STRUCTURE.FMT" = LINE_SCAN_TABLE
END	

The line scan data structure is defined as follows:

OBJECT	= COLUMN
NAME	= "PACKET ID"
DESCRIPTION	= "Telemetry packet identifier."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 1
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET SEQUENCE CONTROL"
DESCRIPTION	= "Telemetry packet sequence counter."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	
	-
BYTES	= 2



END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET LENGTH"
DESCRIPTION	= "Telemetry packet length."
DATA_TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 5
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT SECONDS"
DESCRIPTION	= "S/C clock count at packet generation."
DATA TYPE	= "S/C clock count at packet generation." = MSB_UNSIGNED_INTEGER
START_BYTE	= 7
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT FRACTION"
DESCRIPTION	= "Fractional part of S/C clock count."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 11
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_PUS_AND_CRC"
DESCRIPTION	= "Telemetry packet PUS-Version and CRC flag."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 13 = 1
BYTES END OBJECT	= I = COLUMN
_	
OBJECT	= COLUMN
NAME	= "PACKET_TYPE" = "Telemetry packet type."
DESCRIPTION DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 14
BYTES	= 1
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_SUBTYPE"
DESCRIPTION	<pre>= "Telemetry packet sub-type."</pre>
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 15
BYTES END OBJECT	= 1 = COLUMN
OBJECT	= COLUMN
NAME	= "PACKET_PAD_FIELD"
DESCRIPTION	= "Telemetry packet padding field."
DATA_TYPE START BYTE	= MSB_UNSIGNED_INTEGER = 16
BYTES	= 10
END OBJECT	= COLUMN
_	
OBJECT	- COLUMN
NAME DESCRIPTION	= "STRUCTURE_ID" = "Telemetry packet structure identifier."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 17
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SOFTWARE VERSION"
DESCRIPTION	= "On-board software version."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 19
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN



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= "LINEAR_POS"
= "Linear stage position sensor readout." NAME DESCRIPTION = MSB INTEGER DATA TYPE START BYTE = 21 = 2 BYTES = 1.52590E - 004OFFSET SCALING FACTOR = 3.05180E-004 = VOLT UNIT = COLUMN END OBJECT OBJECT = COLUMN = "WHEEL POS" NAME = "Current wheel position (segment number)." DESCRIPTION DATA_TYPE START_BYTE = MSB_INTEGER = 23 = 2 BYTES = COLUMN END_OBJECT OBJECT = COLUMN = "TIP NUMBER" NAME = "Number of selected tip." DESCRIPTION DATA_TYPE = MSB_UNSIGNED_INTEGER START BYTE = 25 BYTES = 2 END OBJECT = COLUMN OBJECT = COLUMN = "X ORIGIN" NAME DESCRIPTION = "Scan origin in X direction (DAC units)." = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 27 = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN = "Y ORIGIN" NAME = "Scan origin in Y direction (DAC units)." = MSB_UNSIGNED_INTEGER DESCRIPTION DATA TYPE START_BYTE = 29 BYTES = 2 = COLUMN END_OBJECT = COLUMN OBJECT = "STEP_SIZE" NAME = "Line scan step size (DAC units)." DESCRIPTION DATA_TYPE = MSB UNSIGNED INTEGER = 31 START_BYTE = 2 BYTES END OBJECT = COLUMN OBJECT = COLUMN NAME = "NUM STEPS" = "Number of line scan steps (pixels)." DESCRIPTION DATA TYPE = MSB UNSIGNED INTEGER START BYTE = 33 = 2 BYTES = COLUMN END OBJECT OBJECT = COLUMN = "SCAN MODE" NAME = "SCAN_MODE
= "Scanning mode for image acquisition):
Bit 0-7: 0=DYN[amic], 1=CON[tact], 2=MAG[netic],
Bit 8: line scan direction (0=std.,1=reverse),
Bit 12: main scan direction (0=X,1=Y)" DESCRIPTION = MSB UNSIGNED INTEGER DATA TYPE START_BYTE = 35 BYTES = 2 = COLUMN END_OBJECT OBJECT = COLUMN = "LINE_SCAN_CNT" NAME = "Current line scan counter." DESCRIPTION DATA TYPE = MSB_UNSIGNED_INTEGER START_BYTE = 37 = 2 BYTES



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END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SPARE"
DESCRIPTION	= "Currently not used."
DATA TYPE	= Currently not used. = MSB UNSIGNED INTEGER
START BYTE	= 39
BYTES	= 8
ITEMS	= 4
ITEM BYTES	= 2
=	= 2 = COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	= "Z SET VALUE"
DESCRIPTION	= "Line scan data vector (Z piezo DAC set value)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 47
BYTES	= 1024
ITEMS	= 512
ITEM BYTES	= 2
SCALING FACTOR	= 1.6400E-001
OFFSET	= 0.0000E + 000
UNIT	= "nm"
END OBJECT	= COLUMN
	COHOM
OBJECT	= COLUMN
NAME	= "CRC16 CHECKSUM"
DESCRIPTION	= "Telemetry packet checksum (CRC 16)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 1071
BYTES	= 2
END OBJECT	= COLUMN



4.3.7 Data Product Design – Image Scan Data

The MIDAS image data files are stored in BCR format which is described in chapter 3.2.4. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL:

- Data directory: /DATA/IMG
- File naming: IMG_yydddhh_yydddhh_nnn_dd.IMG

A typical PDS label for an image data file is given below:

PDS VERSION ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD TYPE	= FIXED LENGTH
_	-
RECORD BYTES	= 2048
FILE RECORDS	= <file records=""></file>
DATA SET ID	= " <data id="" set="">"</data>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT_ID	= " <product id="">"</product>
PRODUCT_VERSION_ID PRODUCT_CREATION_TIME	= " <product_version_id>" = <product_creation_time></product_creation_time></product_version_id>
PRODUCT CREATION TIME	= <product creation="" time=""></product>
PRODUCT_TYPE	= EDR
PROCESSING LEVEL ID	= <processing id="" level=""></processing>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission name="" phase="">"</mission>
TNOUDLINENU LLOOM TD	- ATNONDIMENT LLOCA INN
	- (INSIROMENI_HOSI_ID/
INSTRUMENT HOST NAME	= " <instrument host="" name="">"</instrument>
INSTRUMENT ID	= <instrument id=""></instrument>
INSTRUMENT NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT TYPE	= " <instrument type="">"</instrument>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE INSTRUMENT_MODE_ID INSTRUMENT_MODE_DESC	- CINCEDUMENT MODE IDS
INSIROMENI_MODE_ID	- (INSIROMENI_MODE_ID/
INSTRUMENT MODE DESC	= " <instrument desc="" mode="">"</instrument>
MADORE NAME	
TARGET_NAME	= " <target_name>"</target_name>
TARGET TYPE	= " <target type="">"</target>
START TIME	= <start time=""></start>
STOP TIME	= <stop time=""></stop>
START TIME STOP_TIME SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME	
SPACECRAFT_CLOCK_START_COUNT	= " <start_count>"</start_count>
SPACECRAFT CLOCK STOP COUNT	= " <stop count="">"</stop>
NAIIVE_SIARI_IIME	- \NATIVE_START_TIME>
NATIVE STOP TIME	= <native stop="" time=""></native>
PRODUCED ID	
PRODUCER_ID	= " <producer_id>" = "<producer_full_name>"</producer_full_name></producer_id>
PRODUCER FULL NAME	= " <producer full="" name="">"</producer>
DODICED INSTITUTION NAME	= " <producer institution="" name="">"</producer>
INODUCEN_INSTITUTION_NAME	
DATA QUALITY ID	= <data_quality_id></data_quality_id>
DATA_QUALITY_DESC	= " <data_quality_desc>"</data_quality_desc>
/* GEOMETRY INFORMATION */	
SC SUN POSITION VECTOR	= <sc position="" sun="" vector=""></sc>
SC TARGET POSITION VECTOR	= <sc position="" target="" vector=""></sc>
SC_TARGET_VELOCITY_VECTOR	= <sc_target_velocity_vector></sc_target_velocity_vector>
SPACECRAFT ALTITUDE	= <spacecraft altitude=""></spacecraft>
SUD_SFACECKAFI_LAIIIUDE	- SUB_SFACECRAFI_LATITUDE/
SUB SPACECRAFT LONGITUDE	<pre>= <sc_sun_position_vector> = <sc_target_position_vector> = <sc_target_velocity_vector> = <spacecraft_altitude> = <sub_spacecraft_latitude> = <sub_spacecraft_longitude></sub_spacecraft_longitude></sub_spacecraft_latitude></spacecraft_altitude></sc_target_velocity_vector></sc_target_position_vector></sc_sun_position_vector></pre>
/* MISSION SPECIFIC KEYWORDS *	/
/ MISSION SPECIFIC REIWORDS ^	/



ROSETTA:MIDAS_TIP_NUMBER ROSETTA:MIDAS_TARGET_NUMBER ROSETTA:MIDAS_TARGET_TYPE ROSETTA:MIDAS_TARGET_NAME	= <midas number="" target=""></midas>
ROSETTA:MIDAS_LIN_STAGE_POS ROSETTA:MIDAS_SEGMENT_NUMBER ROSETTA:MIDAS_SCAN_START_XY ROSETTA:MIDAS_SCAN_STOP_XY ROSETTA:MIDAS_SCAN_DIRECTION	= <midas_segment_number> = <midas_scan_start_xy> = <midas_scan_stop_xy></midas_scan_stop_xy></midas_scan_start_xy></midas_segment_number>
ROSETTA:MIDAS_SCANNING_MODE ROSETTA:MIDAS_SCAN_DATA_TYPE	= <midas_scanning_mode> = <midas_scan_data_type></midas_scan_data_type></midas_scanning_mode>
/* DATA FILE POINTER(S) */	
^BCR_HEADER ^BCR_IMAGE	<pre>= "<file_name>" = ("<file_name>",2)</file_name></file_name></pre>
	<pre>= BCR_HEADER = 2048 = TEXT = BINARY = 1 = " the Image Metrology SPIP application. given in file /DOCUMENT/MID_EIDC.pdf" = BCR_HEADER</pre>
OBJECT LINES LINE_SAMPLES SAMPLE_BITS SAMPLE_TYPE DESCRIPTION SCALING_FACTOR OFFSET END_OBJECT	<pre>= BCR IMAGE = <lines> = <line_samples> = 16 = LSB_UNSIGNED_INTEGER = "<description>" = <scaling_factor> = <offset> = BCR_IMAGE</offset></scaling_factor></description></line_samples></lines></pre>
END	



4.3.8 Data Product Design – Feature Vector Data

The MIDAS feature vector data files are binary tables containing the plain telemetry packets as retrieved from the DDS. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the ^STRUCTURE keyword in the PDS labels:

- Data directory: /DATA/ROI
- File naming: ROI yydddhh yydddhh nnn ff.DAT
- File structure: /LABEL/ROI_STRUCTURE.FMT

Parameters having a physical representation can be calibrated by applying the OFFSET, SCALING_FACTOR and UNIT keywords (defined in the related column object in the format file) to the raw value:

• physical_value = OFFSET + raw_value*SCALING FACTOR [UNIT]

A feature vector record comprises 64 feature vector frames having identical vector parameters. The actual number of feature vectors for a record is given in the NUM_VECTORS column. The repeating structure of the 64 feature vectors is defined by means of the PDS CONTAINER object.

A typical PDS label for a feature vector data file is given below:

PDS_VERSION_ID	= PDS3
LABEL_REVISION_NOTE	= " <label_revision_note>"</label_revision_note>
RECORD_TYPE RECORD_BYTES FILE_RECORDS	<pre>= FIXED_LENGTH = 2096 = <file_records></file_records></pre>
DATA_SET_ID	= " <data_set_id>"</data_set_id>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
	<pre>= "<product_id>" = "<product_version_id>" = <product_creation_time> = EDR = <processing_level_id></processing_level_id></product_creation_time></product_version_id></product_id></pre>
MISSION_ID	= ROSETTA
MISSION_NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission_phase_name>"</mission_phase_name>
INSTRUMENT_HOST_ID	<pre>= <instrument_host_id></instrument_host_id></pre>
INSTRUMENT_HOST_NAME	= " <instrument_host_name>"</instrument_host_name>
INSTRUMENT_ID	= <instrument_id></instrument_id>
INSTRUMENT_NAME	= " <instrument_name>"</instrument_name>
INSTRUMENT_TYPE	= " <instrument_type>"</instrument_type>
INSTRUMENT_MODE_ID	= <instrument_mode_id></instrument_mode_id>
INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
TARGET_NAME	= " <target_name>"</target_name>
TARGET_TYPE	= " <target_type>"</target_type>
START_TIME	<pre>= <start_time></start_time></pre>
STOP_TIME	= <stop_time></stop_time>
SPACECRAFT_CLOCK_START_COUNT	= " <start_count>"</start_count>
SPACECRAFT_CLOCK_STOP_COUNT	= " <stop_count>"</stop_count>
NATIVE_START_TIME	= <native_start_time></native_start_time>
NATIVE_STOP_TIME	= <native_stop_time></native_stop_time>



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PRODUCER ID	= " <producer id="">"</producer>
PRODUCER_FULL_NAME	= " <producer_full_name>"</producer_full_name>
PRODUCER_INSTITUTION_NAME	= " <producer_institution_name>"</producer_institution_name>
	= <data_quality_id></data_quality_id>
DATA_QUALITY_DESC	= " <data_quality_desc>"</data_quality_desc>
/* GEOMETRY INFORMATION */	
OC OUN DOCTOTON VECTOR	- ZOO OINI DOCTUTON VUCUODS
SC_SUN_POSITION_VECTOR SC_TARGET_POSITION_VECTOR	- <sc_sun_position_vector></sc_sun_position_vector>
SC_TARGET_FOSTITION_VECTOR	- <sc_irrgei_fosition_vector></sc_irrgei_fosition_vector>
SPACECRAFT ALTITUDE	= <spacecraft altitude=""></spacecraft>
SUB SPACECRAFT LATITUDE	=
SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE	=
/* DATA FILE POINTER(S) */	
^ROI_TABLE	= " <file_name>"</file_name>
/* DATA OBJECT DEFINITION(S) */	
, Brin obolici Blimition(c),	
OBJECT	= ROI TABLE
INTERCHANGE FORMAT	= BINARY
ROWS	= <file_records></file_records>
COLUMNS	= 35
ROW_BYTES	= 2096
	= "MIDAS feature vector data"
^STRUCTURE	= "ROI_STRUCTURE.FMT"
END_OBJECT	= ROI_TABLE
END	
200	

The feature vector structure is defined as follows:

/* MIDAS FEATURE VECTOR FRA	AME STRUCTURE */
0.5.75.05	
OBJECT	= COLUMN
NAME	= "PACKET_ID"
DESCRIPTION	= "Telemetry packet identifier."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 1
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET SEQUENCE CONTROL"
DESCRIPTION	= "Telemetry packet sequence counter."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 3
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET LENGTH"
DESCRIPTION	= "Telemetry packet length."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 5
BYTES	= 2
END OBJECT	= 2 = COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	= "PACKET OBT SECONDS"
DESCRIPTION	= "S/C clock count at packet generation."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 7
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "PACKET OBT FRACTION"
DESCRIPTION	= "Fractional part of S/C clock count."
DIDOUTITION	Tractional part of 5/6 crock count.



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DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 11
DUTE DUTE	
BYTES	= 2
END OBJECT	= COLUMN
=	
OBJECT	
OBULCI	= COLUMN
NAME	= "PACKET_PUS_AND_CRC"
DESCRIPTION	= "Telemetry packet PUS-Version and CRC flag."
DESCRIPTION DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 13
BYTES	= 1
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME DESCRIPTION	= "PACKET_TYPE"
DESCRIPTION	= "Telemetry packet type."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 14
BYTES	= 1
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "PACKET_SUBTYPE"
DESCRIPTION	= "Telemetry packet sub-type."
DATA TYPE	= MSB_UNSIGNED_INTEGER
	= 15
START_BYTE	
BYTES	= 1
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "PACKET PAD FIELD"
DESCRIPTION	= "Telemetry packet padding field."
DESCRIPTION DATA_TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 16
BYTES	= 1
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "STRUCTURE ID"
DESCRIPTION	= "Telemetry packet structure identifier."
DATA TYPE	= MSB UNSIGNED INTEGER
_	
START_BYTE	= 17
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SOFTWARE VERSION"
DESCRIPTION	= "On-board software version."
DATA TYPE	= MSB UNSIGNED INTEGER
—	
START_BYTE	= 19
BYTES	= 2
END OBJECT	= COLUMN
_	
OBJECT	= COLUMN
NAME	= "DATASET_ID"
DESCRIPTION	= "Identifier of analysed data set."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 21
=	
BYTES	= 2
END_OBJECT	= COLUMN
=	
OBJECT	= COLUMN
NAME	= "TOT_VECTORS"
DESCRIPTION	= "Total number of detected features."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 23
=	
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "VECTOR_IDX"
DESCRIPTION	= "Index of first feature vector (x2)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 25
=	
BYTES	= 2



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END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	
NAME	= "NUM_VECTORS"
DADA TYDE	- NUMBER OF TEALURE VECTORS IN PACKET.
OTATA_IIFE	- MSB_ONSIGNED_INTEGER
BYTES	<pre>= "NUM_VECTORS" = "Number of feature vectors in packet." = MSB_UNSIGNED_INTEGER = 27 = 2</pre>
	= 2 = COLUMN
END_OBJECT	- COLOMN
OBJECT	= COLUMN
NAME	
DESCRIPTION	= "MIN_Z_VALUE" = "Minimum Z value of image."
DATA TYPE	= MSB_UNSIGNED_INTEGER
DATA_TYPE START_BYTE	= MSB_UNSIGNED_INTEGER = 29
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "MAX Z VALUE"
DESCRIPTION	= "Maximum Z value of image." = MSB_UNSIGNED_INTEGER
DATA TYPE	= MSB UNSIGNED INTEGER
START_BYTE	= 31
BYTES	= 2
END OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SELECTED_IDX"
DESCRIPTION	<pre>= "SELECTED_IDX" = "Index of favoured feature vector." = MSB UNSIGNED INTEGER</pre>
START_BYTE	= 35
BYTES	= 2
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "SELECTED_WEIGHT"
DESCRIPTION	= "Weighting of favoured feature vector."
DESCRIPTION DATA_TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 35
BYTES	= 2
SCALING_FACTOR	= 6.1036E-5
OFFSET	= 0.0
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "LIN REG OFFS"
DESCRIPTION	= "Linear regression offset value."
DESCRIPTION DATA_TYPE	= MSB_UNSIGNED_INTEGER
START BYTE	= 37
BYTES	= 2
END OBJECT	= COLUMN
-	
OBJECT	= COLUMN
NAME	= "LIN_REG_XFACT"
DESCRIPTION	= "Linear regression X factor (x65535)."
DATA_TYPE	= MSB_UNSIGNED_INTEGER
START_BYTE	= 39
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= "LIN REG YFACT"
DESCRIPTION	= "Linear regression Y factor (x65535)."
DATA TYPE	= MSB UNSIGNED INTEGER
START BYTE	= 43
BYTES	= 4
END_OBJECT	= COLUMN
OBJECT	= CONTAINER
NAME	= "VECTOR_STRUCTURE"
START_BYTE	= 47
BYTES	= 32 = 64
REPETITIONS DESCRIPTION	= 64 = "Represents the format of the 64
DESCRIPTION	repeating feature vector attributes."
	repeating reactive vector accrimites.



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OBJECT = COLUMN = "NUM POINTS" NAME DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 1 = 2 BYTES = "Number of feature vector data points." DESCRIPTION END OBJECT = COLUMN OBJECT = COLUMN = "X IDX MAX" NAME DATA_TYPE START_BYTE = MSB_UNSIGNED_INTEGER = 3 BYTES = 1 = "Maximum X position index." DESCRIPTION = COLUMN END OBJECT OBJECT = COLUMN NAME = X IDX MIN DATA_TYPE = MSB UNSIGNED INTEGER START_BYTE = 4 BYTES = 1 = "Minimum X position index." = COLUMN DESCRIPTION END OBJECT OBJECT = COLUMN NAME = Y IDX MAX DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 5 BYTES = 1 = "Maximum y position index."
= COLUMN DESCRIPTION END OBJECT OBJECT = COLUMN = Y IDX MIN NAME DATA_TYPE START_BYTE = MSB UNSIGNED INTEGER = 6 = 1 BYTES = "Minimum Y position index." DESCRIPTION = COLUMN END_OBJECT OBJECT = COLUMN = Z MAX LVL NAME DATA TYPE = MSB_UNSIGNED INTEGER START_BYTE = 7 = 2 BYTES = "Maximum Z value over threshold level." DESCRIPTION = COLUMN END_OBJECT OBJECT = COLUMN NAME = X IDX SUM DATA TYPE = MSB UNSIGNED INTEGER START_BYTE = 9 BYTES = 4 DESCRIPTION = "Sum of X position indices." = COLUMN END OBJECT OBJECT = COLUMN = Y IDX SUM NAME = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 13 BYTES = 4 DESCRIPTION = "Sum of Y position indices." END_OBJECT = COLUMN OBJECT = COLUMN = Z IDX_SUM NAME = MSB_UNSIGNED_INTEGER DATA TYPE START_BYTE = 17 = 4 BYTES DESCRIPTION = "Sum of Z position indices." END OBJECT = COLUMN OBJECT = COLUMN



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NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END_OBJECT	<pre>= XX_IDX_SUM = MSB_UNSIGNED_INTEGER = 21 = 4 = "Sum of X*X position indices." = COLUMN</pre>
START_BYTE BYTES	<pre>= COLUMN = YY IDX_SUM = MSB_UNSIGNED_INTEGER = 25 = 4 = "Sum of Y*Y position indices." = COLUMN</pre>
START_BYTE BYTES	<pre>= COLUMN = XY_IDX_SUM = MSB_UNSIGNED_INTEGER = 29 = 4 = "Sum of X*Y position indices." = COLUMN = CONTAINER</pre>
OBJECT NAME DATA_TYPE START_BYTE BYTES DESCRIPTION END_OBJECT	<pre>= COLUMN = CRC16_CHECKSUM = MSB_UNSIGNED_INTEGER = 2095 = 2 = "Telemetry packet checksum (CRC 16)." = COLUMN</pre>



4.3.9 Data Product Design – Event Data

The MIDAS event data files are ASCII tables containing the list of events within a given time period. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <code>^STRUCTURE</code> keyword in the PDS labels:

- Data directory: /DATA/EVN
- File naming: EVN yydddhh yydddhh.TAB
- File structure: /LABEL/EVN STRUCTURE.FMT

A typical PDS label for an event data file is given below:

PDS VERSION ID	= PDS3
LABEL REVISION NOTE	= " <label note="" revision="">"</label>
RECORD TYPE	= FIXED LENGTH
	_
RECORD_BYTES	= 80
FILE_RECORDS	= <file_records></file_records>
DATA_SET_ID	= " <data_set_id>"</data_set_id>
DATA_SET_NAME	= " <data_set_name>"</data_set_name>
PRODUCT_ID	= " <product_id>"</product_id>
PRODUCT_VERSION_ID	= " <product_version_id>"</product_version_id>
PRODUCT_VERSION_ID PRODUCT_CREATION_TIME	= <product_creation_time></product_creation_time>
PRODUCT TYPE	= EDR
PROCESSING LEVEL ID	= <processing id="" level=""></processing>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME	= " <mission name="" phase="">"</mission>
INSTRUMENT HOST ID	= <instrument host="" id=""></instrument>
INSTRUMENT HOST NAME	- " <instroment host="" names"<="" td=""></instroment>
INSTRUMENT TO	
INSTRUMENT_ID	- VINSIROMENI_ID/
INSIKOMENI NAME	
INSTRUMENT_TYPE	= " <instrument_type>"</instrument_type>
INSTRUMENT_MODE_ID	= <instrument id="" mode=""></instrument>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE INSTRUMENT_MODE_ID INSTRUMENT_MODE_DESC	= " <instrument_mode_desc>"</instrument_mode_desc>
TARGET_NAME	= " <target_name>"</target_name>
TARGET_TYPE	= " <target_type>"</target_type>
START_TIME	= <start_time></start_time>
STOP_TIME	= <stop_time></stop_time>
SPACECRAFT_CLOCK_START_COUNT	= " <start_count>"</start_count>
SPACECRAFT_CLOCK_STOP_COUNT	= " <stop_count>"</stop_count>
SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME	= <native start="" time=""></native>
NATIVE STOP TIME	= <native stop="" time=""></native>
PRODUCER ID	= " <producer id="">"</producer>
PRODUCER_FULL_NAME	= " <producer_full_name>"</producer_full_name>
PRODUCER INSTITUTION NAME	= " <producer institution="" name="">"</producer>
DATA QUALITY ID	= <data id="" quality=""></data>
DATA_QUALITY_DESC	= " <data desc="" quality="">"</data>
	*
/* GEOMETRY INFORMATION */	
SC SUN POSITION VECTOR	= <sc position="" sun="" vector=""></sc>
SC TARGET POSITION VECTOR	= <sc_target_position_vector></sc_target_position_vector>
SC TARGET FOSTITION_VECTOR	= <sc_target_fostition_vector></sc_target_fostition_vector>
SPACECRAFT_ALTITUDE	= <spacecraft_altitude></spacecraft_altitude>



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SUB SPACECRAFT LATITUDE	=
SUB SPACECRAFT LONGITUDE	=
/* DATA FILE POINTER(S) */	
, ,	
^EVENT TABLE	= " <file name="">"</file>
/* DATA OBJECT DEFINITION(S) *	/
, Brith Obolici Berinition (5)	
OBJECT	= EVENT TABLE
INTERCHANGE FORMAT	= ASCII
ROWS	= <file records=""></file>
COLUMNS	= 5
ROW BYTES	= 80
DESCRIPTION	= "MIDAS event data"
^STRUCTURE	= "EVN STRUCTURE.FMT"
END OBJECT	= EVENT TABLE
END	

The event data file structure is defined as follows:

OBJECT	= COLUMN
NAME	= EVENT_OBT
DATA_TYPE	= ASCII_REAL
START_BYTE	= 1
BYTES	= 14
UNIT	= SECOND
DESCRIPTION	= "S/C clock count at event generation."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EVENT UTC
DATA TYPE	= DATE
START BYTE	= 16
BYTES	= 23
DESCRIPTION	= "Event generation time in UTC format."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EVENT CNT
DATA TYPE	= ASCII_INTEGER
START BYTE	= 40
BYTES	= 5
DESCRIPTION	= "On-board event counter."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EVENT SID
DATA TYPE	= ASCII INTEGER
START BYTE	= 46
BYTES	= 5
DESCRIPTION	= "Event identifier."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EVENT NAME
DATA TYPE	= CHARACTER
START BYTE	= 53
BYTES	= 25
DESCRIPTION	= "Event description."
END OBJECT	= COLUMN



4.3.10 Data Product Design – Cantilever Utilisation History Data

The MIDAS cantilever history data files are ASCII tables containing the list of events for a certain cantilever within a given time period. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the ^STRUCTURE keyword in the PDS labels:

- Data directory: / DATA
- File naming: CAH yydddhh yydddhh tt.TAB
- File structure: /LABEL/CAH STRUCTURE.FMT

A typical PDS label for a cantilever history data file is given below:

PDS VERSION ID	= PDS3
LABEL REVISION NOTE	= " <label note="" revision="">"</label>
RECORD TYPE	= FIXED LENGTH
RECORD BYTES	= 119
FILE RECORDS	= <file records=""></file>
DATA SET ID	= " <data id="" set="">"</data>
DATA SET NAME	= " <data name="" set="">"</data>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	
PRODUCT_VERSION_ID PRODUCT_CREATION_TIME	= " <product_version_id>" = <product_creation_time></product_creation_time></product_version_id>
PRODUCT TYPE	= EDR
PROCESSING LEVEL ID	= <processing_level_id></processing_level_id>
MISSION ID	= ROSETTA
MISSION PHASE NAME	= "INTERNATIONAL ROSETTA MISSION" = " <mission_phase_name>"</mission_phase_name>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE INSTRUMENT_MODE_ID INSTRUMENT_MODE_DESC	= <instrument host="" id=""></instrument>
INSTRUMENT HOST NAME	= " <tnstrument host="" name="">"</tnstrument>
INSTRUMENT ID	= <instrument id=""></instrument>
INSTRUMENT NAME	= " <instrument name="">"</instrument>
INSTRUMENT_NAME	- " <instroment_name>"</instroment_name>
INSTRUMENT MODE TD	- <instroment_iiie <="" td=""></instroment_iiie>
INSTRUMENT_MODE_ID	- "KINSTROMENT MODE DESCO"
INSTROMENT_HODE_DESC	- (INSIROMENI_MODE_DESC)
TARGET NAME	= " <target name="">"</target>
TARGET TYPE	= " <target_type>"</target_type>
START TIME	= <start time=""></start>
STACI_IIII	- <stor td="" times<=""></stor>
SPACECRAFT CLOCK START COUNT	= " <start count="">"</start>
SPACECRAFT CLOCK STOP COUNT	= "< STOP COUNT>"
START_TIME STOP_TIME SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME NATIVE_STOP_TIME	- <native start="" td="" times<=""></native>
	- <native starl="" td="" times<=""></native>
NATIVE_STOT_TIME	- (NATIVE_STOT_TIME)
PRODUCER ID	= " <producer id="">"</producer>
PRODUCER FULL NAME	= " <producer_id>" = "<producer_full_name>" = "<producer_institution_name>"</producer_institution_name></producer_full_name></producer_id>
PRODUCER INSTITUTION NAME	= " <producer institution="" name="">"</producer>
DATA QUALITY ID	= <data id="" ouality=""></data>
DATA QUALITY DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
/* DATA FILE POINTER(S) */	
^EVENT TABLE	= " <file name="">"</file>
/* DATA OBJECT DEFINITION(S) *	/



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OBJECT	= EVENT TABLE
NAME	= CANTILEVER HISTORY
INTERCHANGE FORMAT	= ASCII
ROWS	= <file records=""></file>
COLUMNS	= 11
ROW BYTES	= 119
DESCRIPTION	= "MIDAS cantilever history data"
^STRUCTURE	= "CAH STRUCTURE.FMT"
END OBJECT	= EVENT TABLE
—	-
END	

The cantilever history data structure is defined as follows:

/* CANTILEVER HISTORY	DATA STRUCTURE */
OBJECT	= COLUMN
NAME	
DATA TYPE	= START_OBT = ASCII_REAL
START BYTE	= 1
BYTES	= 15
UNIT	= SECOND
DESCRIPTION	= "S/C clock count at event start."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= START_UTC
DATA_TYPE	= DATE
START_BYTE	= 17
BYTES	= 23
DESCRIPTION	= "Event start time in UTC format."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= STOP_OBT = ASCII_REAL = 41
DATA_TYPE START BYTE	= ASCII_REAL
	= 41
BYTES	= 15
UNIT	= SECOND
DESCRIPTION END OBJECT	= SECOND = "S/C clock count at event stop." = COLUMN
END_ODDECT	
OBJECT	= COLUMN
NAME	= STOP_UTC = DATE
DATA_TYPE	
START_BYTE	= 57
BYTES	= 23 = "Event stop time in UTC format."
DESCRIPTION	
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EVENT
DATA_TYPE	= CHARACTER
START_BYTE	= 82 = 8
BYTES DESCRIPTION	
END OBJECT	<pre>= "Textual description of the event." = COLUMN</pre>
	COLUMN
OBJECT	= COLUMN
NAME	= AC_GAIN = ASCII_INTEGER
DATA_TYPE START BYTE	= ASCII_INTEGER
	= 93
BYTES	= 1 - "Coin level of contileven DC simpl
DESCRIPTION	= "Gain level of cantilever AC signal amplifier [0-7]."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= DC_GAIN
DATA_TYPE	= ASCII_INTEGER
START BYTE	= 95



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5475.0	1
BYTES	
DESCRIPTION	= "Gain level of cantilever DC signal amplifier [0-7]."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= EXC_LVL
DATA_TYPE	= ASCII_INTEGER
START_BYTE	= 97
BYTES	= 1
DESCRIPTION	= "Gain level of piezo-electric actuator used for cantilever excitation [0-7]."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= U_MAX
DATA_TYPE	= ASCII_REAL
UNIT	= VOLT
START_BYTE	= 99
BYTES	= 5
DESCRIPTION	= "Max. cantilever signal amplitude detected during frequency scan."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= F MAX
DATA TYPE	= ASCII REAL
UNIT	= HERTZ
START BYTE	= 105
BYTES	= 8
DESCRIPTION	= "Frequency where the maximum signal amplitude was detected."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= SCAN_MODE
DATA TYPE	= CHARACTER
START BYTE	= 115
BYTES	= 3
DESCRIPTION	= "Scanning mode for image acquisition e.g.
	DYN[amic], CON[tact] or MAG[netic]."
END OBJECT	= COLUMN
END_OBJECT	= COLUMN



4.3.11 Data Product Design – Target Utilisation History Data

The MIDAS target history data files are ASCII tables containing the list of events for a certain target within a given time period. Each data file has associated a detached PDS label with the same name as the data file it describes, but with the extension .LBL. The data file columns are defined in a separate format file referred to by the <u>STRUCTURE</u> keyword in the PDS labels:

- Data directory: / DATA
- File naming: TGH yydddhh yydddhh tt.TAB
- File structure: /LABEL/TGH STRUCTURE.FMT

A typical PDS label for a target history data file is given below:

PDS VERSION ID	= PDS3
LABEL REVISION NOTE	= " <label note="" revision="">"</label>
RECORD TYPE	= FIXED LENGTH
RECORD BYTES	= 92
FILE RECORDS	= <file records=""></file>
DATA SET ID	= " <data id="" set="">"</data>
DATA SET NAME	= " <data name="" set="">"</data>
PRODUCT ID	= " <product id="">"</product>
PRODUCT VERSION ID	= " <product id="" version="">"</product>
PRODUCT_VERSION_ID PRODUCT_CREATION_TIME	= <product creation="" time=""></product>
PRODUCT TYPE	= EDR
PROCESSING LEVEL ID	= <processing_level_id></processing_level_id>
MISSION ID	= ROSETTA
MISSION NAME	= "INTERNATIONAL ROSETTA MISSION" = " <mission_phase_name>"</mission_phase_name>
MISSION PHASE NAME	= " <mission name="" phase="">"</mission>
INSTRUMENT HOST ID	= <instrument host="" id=""></instrument>
INSTRUMENT HOST NAME	= " <instrument host="" name="">"</instrument>
INSTRUMENT ID	= <instrument id=""></instrument>
INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE INSTRUMENT_MODE_ID INSTRUMENT_MODE_DESC	= " <instrument name="">"</instrument>
INSTRUMENT TYPE	= " <instrument type="">"</instrument>
INSTRUMENT MODE ID	= <instrument id="" mode=""></instrument>
INSTRUMENT MODE DESC	= " <instrument desc="" mode="">"</instrument>
TARGET NAME	= " <target_name>" = "<target_type>"</target_type></target_name>
TARGET TYPE	= " <target type="">"</target>
START TIME	= <start time=""></start>
STOP TIME	= <stop time=""></stop>
SPACECRAFT_CLOCK_START_COUNT	= " <start_count>"</start_count>
SPACECRAFT_CLOCK_STOP_COUNT	= " <stop_count>"</stop_count>
NATIVE_START_TIME	= <native_start_time></native_start_time>
START_TIME STOP_TIME SPACECRAFT_CLOCK_START_COUNT SPACECRAFT_CLOCK_STOP_COUNT NATIVE_START_TIME NATIVE_STOP_TIME	= <native_stop_time></native_stop_time>
PRODUCER_ID	= " <producer_id>" = "<producer_full_name>" = "<producer_institution_name>"</producer_institution_name></producer_full_name></producer_id>
PRODUCER_FULL_NAME	= " <producer_full_name>"</producer_full_name>
PRODUCER_INSTITUTION_NAME	= " <producer_institution_name>"</producer_institution_name>
DATA_QUALITY_ID DATA_QUALITY_DESC	= <data_quality_id> = "<data_quality_desc>"</data_quality_desc></data_quality_id>
DATA_QUALITY_DESC	= " <data_quality_desc>"</data_quality_desc>
/* DATA FILE POINTER(S) */	
^EVENT_TABLE	= " <file_name>"</file_name>
/* DATA OBJECT DEFINITION(S) *	/



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OBJECT	= EVENT TABLE
NAME	= TARGET HISTORY
INTERCHANGE FORMAT	= ASCII
ROWS	= <file records=""></file>
COLUMNS	= 5
ROW BYTES	= 92
DESCRIPTION	= "MIDAS target history data"
^STRUCTURE	= "TGH STRUCTURE.FMT"
END OBJECT	= EVENT TABLE
—	_
END	

The target history data structure is defined as follows:

OBJECT	= COLUMN
NAME	= START_OBT
DATA_TYPE	= ASCII_REAL
START_BYTE	= 1
BYTES	= 15
UNIT	= SECOND
DESCRIPTION	<pre>= SECOND = "S/C clock count at event start."</pre>
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= START UTC
DATA TYPE	= DATE
START_BYTE	= 17
BYTES	= 23
DESCRIPTION	= "Event start time in UTC format."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= STOP OBT
NAME DATA_TYPE	= ASCII REAL
START BYTE	= 41
BYTES	= 15
UNIT	= SECOND
DESCRIPTION	= "S/C clock count at event stop."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
NAME	= STOP UTC
DATA TYPE	= DATE
START BYTE	= 57
BYTES	= 23
	= "Event stop time in UTC format."
END_OBJECT	= COLUMN
OBJECT	= COLUMN
	= EVENT
NAME DATA_TYPE	= CHARACTER
START BYTE	= 82
BYTES	= 8
DESCRIPTION	= "Textual description of the event."
END OBJECT	= COLUMN



5 Appendix: Available Software to read PDS files

The MIDAS archive data sets can be displayed and validated with the <u>MIDAS Data Set Browser</u> software. The contents of a MIDAS archive data set can be browsed by means of a tree-like structure, displaying the data set directory hierarchy (nodes) an the associated data files (leafs). The software is entirely written in IDL and the source code is included in the data sets.

🗂 MIDAS Data Set Browser - Revision 7 2008-02-0	8 12:11:50Z	×
BOX-MIDAS-3-MARS-PC3-5-V1.0	D:\Daten\Midas\Archiving\latest\RO-X-MID	AS-3-MARS-PC3-5-V1.0\DATA\FSC\FSC_0623817_0623820_005_05.
	PDS_VERSION_ID LABEL_REVISION_NOTE	= PDS3 = "2008-02-20 IWF:HJJ auto-generated"
⊡ - Gan DATA ⊕ - EVN ⊡ - FSC - G FSC - G FSC_0623817_0623820_001_01.	RECORD_TYPE RECORD_BYTES FILE_RECORDS	= FIXED_LENGTH = 576 = 1
 — ■ FSC_0623817_0623820_002_02 ■ FSC_0623817_0623820_003_03. ■ FSC_0623817_0623820_004_04. ■ FSC_0623817_0623820_005_05. 	DATA_SET_ID DATA_SET_NAME PRODUCT_ID	= "R0-X-HIDAS-3-HARS-PC3-5-V1.0" = "ROSETTA-ORBITER CHECK MIDAS 3 MARS PC3-5 V1.0" = "FSC_0623817_0623820_005_05"
 = FSC_0623817_0623820_006_06. = FSC_0623817_0623820_007_07. = FSC_0623817_0623820_008_08. = FSC_0623817_0623820_009_09.	PRODUCT_ID PRODUCT_VERSION_ID PRODUCT_CREATION_TIME PRODUCT_TYPE PROCESSING_LEVEL_ID	= "1.0" = 2008-02-20T16:28:25 = EDR = 3
FSC_0623817_0623820_010_10.	MISSION_ID MISSION_NAME MISSION_PHASE_NAME	= ROSETTA = "INTERNATIONAL ROSETTA MISSION" = "MARS SWING-BY"
PRODUCT = FREQUENCY_SCAN_DATA PACKET_ID = 3132 PACKET_SEQUENCE_CONTROL = 49156 PACKET_LENGTH = 569 PACKET_OBT_SECONDS = 115238632 PACKET_OBT_FRACTION = 39911 PACKET_OBT_FRACTION = 30911	INSTRUMENT_HOST_ID INSTRUMENT_HOST_NAME INSTRUMENT_ID INSTRUMENT_NAME INSTRUMENT_TYPE	= R0 = "ROSETTA-ORBITER" = HIDAS = "MICRO-IMACING DUST ANALYSIS SYSTEM" = "SCANNING PROBE MICROSCOPE"
PACKET_PUS_AND_CRC = 64 PACKET_TYPE = 20 PACKET_SUBTYPE = 3 PACKET_PAD_FIELD = 0 STRUCTURE_ID = 131 SOFWARE_VERSION = 100 START_IME = 115238615 START_FREQUENCY = 116916224 FREQUENCY_STEP = 1432 NC_WANDUM = 17428	10 	0623817062382000505.DAT
AC_MAXIMUM = 17428 PREQUENCY_AT_MAX = 117099520 NUM_SCANS = 1 SCAN_CYCLE = 1 CANT_TIP_NUM = 5 CANT_FLR_NUM = 1 EXCITATION_LEVEL = 3 AC_GAIN_LEVEL = 3 SPARE DATA_GAND_EC		
DATA_SAMPLES Plot Parameter Selection DATA_RECORD_1_0F_1	0	81750.0 81800.0 81850.0 81900.0 Frequency [Hz]
Exit Data Set Browser		

Figure 5.1 shows a frequency scan from the RO-X-MIDAS-3-MARS-PC3-5 data set:

The browser window is structured into two panels holding the following components (from top to bottom):

Left Panel:- Data set hierarchy window – used for navigation
- Data file attribute window – shows data file attributes (e.g. row prefix values)
- Plot parameter selection window – plot parameter selectionRight Panel:- Data file path windows – displays the full path of the selected PDS file
- Text window – displays text files or PDS data file labels

- Graphic/Table window – used for data plotting or tabular data display



5.1 **Program Description**

5.1.1 Program Installation

Before starting the program, the source files need to be copied to a directory on a machine having IDL (6.4 or higher) installed. The source files (extension *.PRO) are located in the DOCUMENT directory of a data set. In order to make IDL aware of the new modules, the directory holding the source files should be added to the IDL path preferences (File->Preferences->Path).

5.1.2 Starting the Program

After starting up IDL, the MIDAS Data Set Browser can be started with the following command:

IDL> mid_browse [,_data_set_root]

The parameter *data_set_root* is optional. It can be used to define the root directory of the MIDAS data set (usually the directory holding the AAREADME.TXT and VOLDESC.CAT files) at start-up. If this parameter is not present, the S/W displays a file selection dialog from where the root directory can be selected.

5.1.3 Navigating the Data Set

The upper left window shows a tree-like structure displaying the data set hierarchy (directories and files).

Directories can be expanded/collapsed by clicking on the '+'/'-' symbol in front of the directory icon. Double-clicking on the directory icon or the directory name toggles between expanded and collapsed mode.

The up and down arrow keys can be used to navigate sequentially through the directories and files.

Data set files are usually displayed with the file extension included. Nevertheless, in order to reduce the amount of displayed files, the file extension is stripped of from files located in the DATA directory and all subjacent directories. This results in a common filename (without extension) for the data files and the respective PDS labels.

5.1.4 Data Display

Information from a data set file can be retrieved by selecting the file in the data set hierarchy window (entry is highlighted).

Text files:

Data set files having the extension .CAT, .FMT, .LBL, .TAB and .TXT are displayed in the upper right text display window. No data validation is applied to these files.

Adobe PDF files:

When selecting a Portable Data Format file, the file is displayed in the application associated to the .PDF file extension on the system (if any).



PNG Images:

Images stored in PNG format are displayed in the graphic panel located in the lower right corner of the main window.

Files in the DATA directory:

Files located in and underneath the DATA directory are treated differently than the data set files already mentioned.

PDS labels are validated and ^STRUCTURE statements are expanded. The resulting PDS labels are displayed in the text window. Comments are removed from the PDS labels.

The associated data files are loaded and the information is displayed in several windows, depending on the data product type:

- EVN, CAH and TGH Data: The table contents are displayed in the table data panel located in the lower left corner of the main window.
- FSC Data: The resonance curve of one scan cycle of the frequency sweep is displayed in the graphic panel. The red square indicates the resonance peak which has been found by the on-board S/W within the current scan cycle. General frequency scan cycle attributes (row prefix) are displayed in the data file attribute panel. If more than one frequency sweep record is stored in the selected data file, the plot parameter drop-list can be used to navigate through the records.
- HK1, HK2 Data: Housekeeping data parameters are plotted in the graphic panel. The parameters can be selected from the plot parameter drop-list. Due to the rather poor performance of the 3rd party S/W for reading and validating the PDS labels, loading of the extended housekeeping data (HK2) might take some time.
- IMG Data: Images are displayed in the graphic panel.
- LIN Data: Line scans are displayed in the graphic panel. General line scan attributes (row prefix) are displayed in the data file attribute panel. If more than one line scan record is stored in the selected data file, the plot parameter drop-list can be used to navigate through the records.
- SPA, SPS Data: Single point scans are displayed in the graphic panel. General single point scan attributes (row prefix) are displayed in the data file attribute panel. If more than one single point scan record is stored in the selected data file, the plot parameter drop-list can be used to navigate through the records.

5.2 Program Source Files

5.2.1 MIDAS Data Set Browser

The MIDAS Data Set Browser comprises the following IDL source modules:

- mid_browse.pro the MIDAS Data Set Browser main module
- escape.pro utility for handling escape sequences in strings
- file_tok.pro returns file name tokens (directory, name, extension) from strings
- ini_file.pro utility for saving and restoring program settings
- tostr.pro extended string conversion (e.g. date values)



5.2.2 Small Bodies Node (SBN) PDS Library

The READPDS library was created at the Small Bodies Node (SBN) of the Planetary Data System (PDS) to read PDS image and data files

The library consists of the following modules:

- apply_bitmask.pro applies bitmask on integer arrays or scalars
- arrcolpds.pro reads a PDS binary array or collection into IDL array or structure
- arr_struct.pro populates an IDL structure for array object to be read
- break_string.pro separates a scalar string into parts using ',' delimiter
- clean.pro removes non-printable characters from scalar strings
- col_struct.pro populates an IDL structure for collection object to be read
- elem_struct.pro populates an IDL structure for element object to be read
- get_idl_type.pro retrieves IDL data type for given PDS data type element
- get_index.pro retrieves viable end_object index position in a PDS label
- headpds.pro retrieves the PDS label from a file
- imagepds.pro retrieves image data from PDS image files
- objpds.pro retrieves viable PDS objects from the labels
- pdspar.pro retrieves specified data from the PDS labels
- pointpds.pro retrieves pointer information for PDS object from label
- preplabel.pro prepares the label for parsing
- qubepds.pro retrieves qube data from PDS qube files
- readpds.pro calls other routines to obtain images, tables, arrays, etc
- remove.pro removes specified characters from a string
- tablepds.pro retrieves data from PDS ascii and binary table files
- test_integer.pro tests whether given string is integer within given range
- verify_arrcol.pro verifies the label's array/collection objects
- verify_arr.pro verifies a given PDS array and its sub objects
- verify_col.pro verifies a given PDS collection and its sub objects
- verify_elem.pro verifies a given PDS element object
- verify_image.pro verifies the label's image objects
- verify_label.pro verifies the entire PDS label so that it meets PDS standards
- verify_qube.pro verifies the label's qube objects
- verify_table.pro verifies the label's table objects



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6 Appendix: Example of Directory Listing of Data Set X

[TOP-LEVEL-DIRECTORY]	
 PDSVOLUME.TXT AAREADME.TXT VOLDESC.CAT	Archive data file catalog generated by PVV. Overview description of the data set contents. Description of the contents of this volume.
 [CALIB]	Directory containing PDS calibration objects.
CALINFO.TXT MIDCALIB.LBL + MIDCALIB.TAB	Description of files in the CALIB directory. PDS label describing the MIDAS calibration table. Standard MIDAS calibration table in PDS ASCII format.
[CATALOG]	Directory containing PDS catalog objects.
CATINFO.TXT DATASET.CAT INST.CAT INSTHOST.CAT MISSION.CAT REFERENCE.CAT SOFTWARE.CAT + TARGET.CAT	Description of files in the CATALOG directory. Description of the MIDAS data set. Description of the MIDAS instrument. Description of the ROSETTA spacecraft. Description of the ROSETTA mission. List of publications mentioned in catalog files. Description of provided S/W to read the data set. Description of the ROSETTA mission targets.
[DATA]	Directory containing the MIDAS data files.
[EVN]	Directory containing MIDAS event data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS event data files in ASCII format.
[FSC]	Directory containing MIDAS frequency scan data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS frequency scan data files in binary format.
[HK1]	Directory containing MIDAS standard HK data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS standard HK data files in binary format.
[HK2]	Directory containing MIDAS extended HK data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS extended HK data files in binary format.
[IMG]	Directory containing MIDAS image data.
*.LBL + *.BCR	Detached label files describing the data. MIDAS image data files in STM-BCR format.
[LIN]	Directory containing MIDAS line scan data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS line scan data files in binary format.
[ROI]	Directory containing MIDAS feature vector data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS feature vector data files in binary format.
[SPA]	Directory containing MIDAS DAQ approach data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS DAQ approach data files in binary format.
[SPS]	Directory containing MIDAS DAQ sampling data.
*.LBL + *.TAB	Detached label files describing the data. MIDAS DAQ sampling data files in binary format.



 CAH*.TAB TGH*.TAB + *.LBL	MIDAS cantilever history files in ASCII format. MIDAS target history files in ASCII format. Detached label files describing the data.
[DOCUMENT]	Directory containing volume related documents.
MID_SSRV.TXT MID_SSRV.PDF MID_SSRV *.PNG MID_USER.TXT MID_USER.PDF MID_USER *.PNG MID_*.LBL	MIDAS to PSA interface document in ASCII format. MIDAS to PSA interface document in PDF format. MIDAS to PSA I/F document images in PDS format. MIDAS instrument paper in ASCII format. MIDAS instrument paper in Adobe PDF format. MIDAS instrument paper images in PNG format. MIDAS user manual in ASCII format. MIDAS user manual in Adobe PDF format. MIDAS user manual in Adobe PDF format. MIDAS user manual images in PNG format. PDS labels for documents. PDS labels describing MIDAS S/W source modules.
+[INDEX]	Directory containing index files.
INDXINFO.TXT INDEX.TAB + INDEX.LBL	Description of files in the INDEX directory. Index table of MIDAS data in this data set. PDS label for INDEX.TAB file.TBW