Instrument User Manual (FM)

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e – Change Record Sheet, Document History

Instrument User Manual			
Reference Number: **MER-DLR-MA-001**			
Issue	Rev.	Date	Change
1	Draft0	5/2011	N/A
1	Draft1	1/2012	Update as result of ICDR RIDs
1	Draft2	1/2013	Update before first PSR: - Ch5.1/Table 5-2: Modes and data rates/power updated - Appendix7: Mode table updated - Ch5.30/5.31: Mode sheets updated - Ch5.32/ Ch5.33 added for new modes 29 and 30 - Ch3.5 (TC/TM Interface) updated - Ch.3.1, ch.5 (Instrument power budgets) updated
1	0	04/2013	Update for final PSR: - Ch 0 (Parameter Management) written - Ch 3.5.9 (Science Data transfer) updated - Ch 3.5.10 (Private Packet Services) updated - Appendix 9…11 (TC/TM packets, event list) updated - Ch 3.5.4 (On-Boar Timer Synchronization) updated - Ch 7.15 (EPA Release Management) written - Ch 7.6.2 (TIR Science Data Processing) Figure added - Ch 7.1 (ICU Memory Layout) added - Ch 7.4 (Software configuration files) added - Appendix 12 (CONFIGURATION PRAMETER LIST) updated - Appendix 15 (ON-BOARD SOFTWARE TRAP TABLE) added - Ch 7.16.1 (Watchdog handling and unexpected re-boot) added - Ch 7.16.2 (Event filtering and limitation) added - Appendix 3 (Mechanical Interface Control Drawings) updated - Appendix 4 (Thermal Interface Control Drawings) updated
1	1	07/2013	- Ch 7.14 (Pointing Unit (POI)) added - Ch 7.17 (Analog HK Measurement) added - Ch 2.5 (Getting Started after Instrument Power-on) added - Ch 6: Draft list of flight operation procedures added (PSR AI#27) - Ch 3.1.1: Remark removed (PSR AI#27) - Ch 3.5.1.1: Services 12,18 and 19 removed from table (PSR AI#27) - Ch 3.5.2.2 added (TC accept/execution timing) (PSR AI#27) - Ch 4.4.2 updated (PSR AI#27) - Ch 4.4.1 / Table 4-2 updated (PSR AI#27) - Ch 7.13.5: Timing SW upload added (PSR AI#27) - Ch 7.2 (SpW interface initialization/configuration) added (PSR AI#27) - Ch 7.11 (SHH control) written (PSR AI#27) - Ch 0 (Diagnostic) written - Ch 3.3.5 – Table 3.6 Temperature sensors updated
1	2	07/2013	- Parameter table updated (Appendix) - Bolometer parameter settings (chapter revised)
2	0	05/2015	Updates related to update to APS v3.4.2233 05/2015: - Update TC list and packets (Appendix 9) - Update TM list and packets (Appendix 10) - Update of Event list (Appendix 11, Table 4-1)

			- Update of Configuration Parameter List (Appendix 12) - Diagnostic mode description updaten (Table 3-17 added) - Description mode WarmUp updated (chapter 5.5)
2	1	07/2015	Update related to review DB v3.5 by E.Bach: - Command TC_Test_Function(STSVoltageCurrentMeasurement) ZMR00047 removed from table 3.5-8 (not in APS v3.4.2233 05/2015 anymore) - Events EID 43803 and 43804 removed from table 4-1 (not used in APS v3.4.2233 05/2015 anymore) - Unit of parameters HK_TEMP_RAD_CHA and HK_TEMP_RAD_CHB of packet TM_TestLog(DIAG RAD_REL) (YMR42143) renamed to DN (raw value)
2	2	06/2017	Update for Instrument-Flight-Acceptance-Review (IFAR): - Applicable FM software configuration updated (chapter 1.2 updated) - List of on-board software parameter updated related to MERTIS APS v3.5.2394 02/2016 (see Appendix 12 and Appendix 13) - Note added for service 6 memory dump (one dump packet per request) related to NCR BC-ASD-NC-00508, AI C1-1 (chapter 3.5.7 updated accordingly) - Description of execution internal RTEMS commands added (chapter 7.18) - some TBDs/TBCs resolved - Description added for uploading and boot of a new APS executable temporary in RAM (chapter 7.13.5 updated)
2	3	09/2017	Update related to the outcome of Instrument-Flight-Acceptance-Review (IFAR): - MERTS LCL switch-off limit added (AI#7), chapter 4.4.2 External FDIR - RAM boot procedure updated (AI#8), chapter 7.13.5 updated - MERTIS NECP updated (AI#9), chapter 4.2.1 updated - Description event limiter improved (AI#10), chapter 7.16.2 updated - Additional information EEPROM patch procedure added (AI#11), chapter 7.13.5 updated - Information added about internal EEPROM storage format (AI#14), chapter 7.19 added - Harmonize default values for some on-board parameters in UM (AI#15), update UM at different places - Safe mode data rate corrected to 0,02kBits/s (Editorial TC01), chapter 5.3 updated - Description parameter dump corrected (Editorial TC02), chapter 3.5.10.1 updated - Description science data packets corrected (Editorial TC03), chapter 3.5.9 updated - Version of reference documents updated (Editorial TC04) - Reference to Flight Operation Plan corrected (Editorial TC06)
2	4	11/2017	Update related to results of further review (DLR/ESA): - Update of TRP1/TRP2 limits in accordance with EID-B, Iss2.0 (Table 3-5)
2	5	07/2022	Figure 3-6 FM integrated on MPO added Note added in chapters 5.31, 5.32 and 5.33 (limitations for 100msec TIS repetition time, with ref. to the anomaly report BC_SC-154 [RD8])
2	6	09/2023	Note added in chapter 5.1 about commanding after powering on MERTIS, ref. BC_SC-162 [RD9])
2	7	03/2024	Parameter PAR_CALIBRATION_PERIOD changed to 500s maximum value and 120s default value (chapters 2.5.3, 5.34, 7.5.2 and appendices 9, 10, 14)

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1. Introduction

1.1. Purpose

This document contains the instrument user manual (IUM) for the MERTIS FM (Flight Model). It is focused on general descriptions about scientific objectives, instrument design and external interfaces, as well as operations and constrains.

1.2. Scope

MERTIS (MErcury Radiometer and Thermal Infrared Spectrometer) is an imaging infrared spectrometer with an integrated micro-radiometer experiment, which is located on the BepiColombo Mercury Planetary Orbiter (MPO).

1.1 Intended Readership

This User Manual (UM) is indented for readers with medium knowledge of the MERTIS instrument. The reader should be familiar with operation and telecommanding of MERTIS and with the telemetry concept as written in chapter 3.5, page 42.

Readers are persons responsible for MERTIS test and operations, the Principle investigator (PI) and other team members involved in the project or the BepiColombo mission.

1.2 Applicability Statement

This document applies to the Flight Model (FM) of the MERTIS instrument with the following software version installed and the related compatible SCOS2000 database to be integrated in the SRDB:

- Primary Boot software:

  PBS V2.1.670 6/2012 (main and redundant)

- Application (Secondary Boot) software:

  APS V3.5.2394, 02/2016 (main and redundant)

- Configuration parameter file for FM (used by APS):

  FM_MAIN_CFG Rev. 2437 02/2017 (main)

  FM_RED_CFG Rev. 2437 02/2017 (redundant)

- Database SCOS2000:

  MER-DLR-SC-001_FM_3_5_MERT_FM_Main_V5_TC_TM_Export_SCOS2000_10052015_161356

1.3. Abbreviations

APS	Application Software
ASD	Astrium Deutschland
BB3	Blackbody 300K
BB7	Blackbody 700K
BEL	Bolometer Analog Electronics
BOL	Bolometer
CUC	CCSDS Unsegmented Time Code
DLR	German Aerospace Center
DM	Development Model
EDAC	Error Detection And Correction unit
EOP	Entrance OPtics
FPGA	Field Programmable Gate Array
EM	Engineering Model
EID	Event IDentifier
EPA	Emergency Pointing Actuator
ESA	European Space Agency

ESD	Electrostatic Discharge
FM	Flight Model
FOV	Field Of View
GSE	Ground Support Equipment
HAR	HARness Board
HEA	Heater
HK	Housekeeping
ICU	Instrument Controller Unit
IfP	Institut für Planetologie
IMS	Instrument Mechanical Structure
MERTIS	MErcury Radiometer and Thermal Infrared Spectrometer
MICD	Mechanical Interface Control Document
MPO	Mercury Planetary Orbiter
MIS	MPO Interface Simulator
N/A	Not Applicable
NCR	Nonconformance Report
OST	Opto-mechanical STructure
PBS	Primary Boot Software
PI	Principal Investigator
POI	Pointing Unit
PSU	Power Supply Unit
RAD	Radiometer (incl. Focal Plate and Slit)
RBA	Reflective Planet BAffle
REL	Radmeter Electronics
SOP	Spectrometer Optics
SRDB	Satellite Reference DataBase
STS	Short Term Shutter
TEC	Thermal Electrical Cooler
QM	Qualification Model
S/C	Spacecraft
SHH	Sensor Head Heater
SpW	SpaceWire
TBC	To Be Confirmed
TBD	To Be Determined
TBW	To Be Written
TC	TeleCommand
TEM / HK	Temperature Sensors / Housekeeping
TEC	Thermal Electrical Cooler (Peltrier Cooler)
TIR	Thermal Infrared Radiometer
TIS	Thermal Infrared Spectrometer
TM	TeleMetry Packet

1.4. Applicable Documents

AD1	EID-C Part 15, Instrument User Manual Template

1.5. Reference Documents

RD1	MERTIS EID-B, BC-EST-RS-02521, Issue 2, Rev.0, 02/2015
RD2	EID-A, BC-EST-RS-01140, Issue 2, Rev 4, November 2014
RD3	MERTIS Instrument Requirement Specification, MER-DLR-RS-002, Issue 2.1, 5/2012
RD4	FM TV Test Report, MER-KTM-RP-102, Issue 1, 04/2013
RD5	MERTIS Flight Operation Plan, MER-DLR-PL-011, Issue 1 Rev 0, 05/2011
RD6	Magnetic Test of Mertis QM, BC-MAG-MC-00102, Issue 1.0 05/2012
RD7	MERTIS Hardware to Software ICD, MER-DLR-IC-002, Issue 1.1, 09/2012
RD8	BepiC Anomaly Report, BC_SC-154 huge number of TM(5,2) generated, 12/2020
RD9	BepiC Anomaly Report, BC_SC-162 MERTIS LCL OOL detected during switch on using LCL A, 03/2021

2. GENERAL DESCRIPTION

2.1. Scientific Objectives

Among the terrestrial planets, Mercury plays a special role. It is the smallest planet, the densest, the one with the probably oldest surface heavily gardened by space weathering, and it shows large daily surface temperature variations. Understanding Mercury is crucial to develop a better understanding of the early processes in the inner solar system, of how our Earth formed, how it evolved, and how it interacts with the Sun.
The scientific goal of MERTIS is to provide detailed information about the mineralogical composition of the Mercury's surface layer by measuring the spectral emittance in the spectral range from 7-14µm with a high spatial resolution and spectral resolution. Furthermore MERTIS will obtain radiometric measurements in the spectral range from 7-40 µm to study thermo-physical properties of the surface material.

MERTIS has four main scientific objectives, building on the general science objectives defined instrument:

- Study of Mercury's surface composition
- Identification of rock-forming minerals
- Mapping of the surface mineralogy
- Study of surface temperature and thermal inertia

MERTIS will provide detailed insight into the surface composition of Mercury and will allow studying the mineralogy on spatial scales of 500m and less. They will give important constraints for models of the formation of the planet.

2.2. Scientific Performances

The high surface temperature and the general notion that the surface of Mercury might be rich in feldspars was the driver for the development of MERTIS. Because the surface of Mercury is hot and there is no molecular atmosphere with rotational absorption bands, Mercury is an ideal target for mid-infrared emission spectroscopy.
The scientific requirements are discussed in detail in AD2. Here only a summary is given.

The MERTIS shall identify the following mineral phases and their correlation to surface features:

- Christiansen features and Reststrahlen bands of proposed surface minerals
- Differentiation of end-member of plagioclase group
- Pyroxenes
- Elemental sulphur
- Representation of complex mineral spectra (e.g. sulphates)

The surface temperature of Mercury has the largest diurnal variations of all terrestrial planets. While the daytime temperature can reach up to 700K, the night-time temperature can drop below 100K. While the spectrometer part of MERTIS allows a measurement of temperature down to about 300K, with the addition of the radiometer channel MERTIS can measure temperatures over the whole diurnal cycle with a high accuracy. To determine the thermal inertia and related thermo-physical properties the night side temperature of Mercury has to be measurement down to a temperature of 100K with an NETD of less than 1 K.
Based on an initial instrument design the scientific performances were simulated to iterate the necessary parameters. It was performed by a computer program allowing the simulation of spectral signal and noise values depending on Mercury surface and instrument parameters. That program allows quantitative and visual assessments of simulated spectra in order to optimize the instrument parameters and to predict the quality of future measurements.

The performance requirements for MERTIS are in general characterized by:

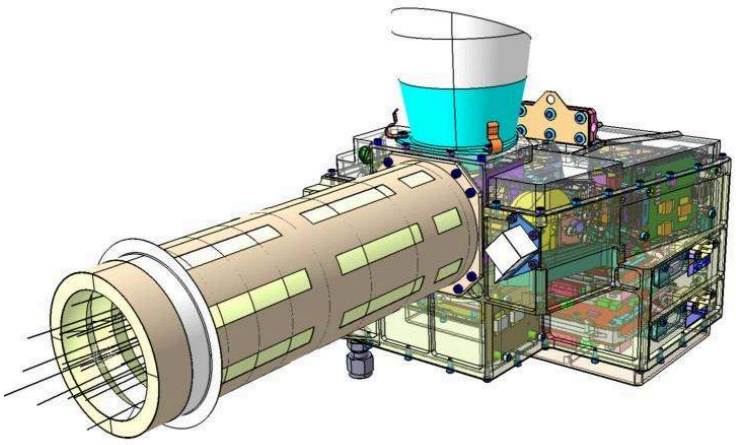
Spectral coverage	7 – 14 µm
Spectral resolution	< 200nm
SNR for spectral range 7-14ìm	> 100
Spatial resolution for global mapping	500m
Targeted observation with better than 500m	5 - 10% of the surface
NETD at 100K surface temperature	≤ 1K

Table 2-1: General MERTIS performance requirements

2.3. Instrument Hardware

2.3.1 Architecture

As shown in Figure 2-1 the general instrument architecture comprises two functionally and thermally independent parts - the Sensor Head with the entrance and the spectrometer optics and the two detectors as well as the overall Instrument Mechanical Structure with the main electronics units. The suite is completed by a pointing unit which orients the optical path to incoming radiation sequentially from Mercury view, free space and the two black body devices emitting at 300K and 700K as calibration targets (BB3 and BB7).
Passing a highly reflective planet baffle in front of the instrument the IR radiation is guided via the pointing mirror through an IR-window (filter) to the entrance optics. This part ends up with a slit at the intermediate focus which is the interface to the spectrometer optics. Diffracted by a curved grating the beam is focused onto the spectrometer sensor, the un-cooled bolometer which is thermally stabilized by a TEC. All proximity electronics is contained within the Sensor Head. A critical issue is the thermal design of this unit because high changes in temperature would cause significant misinterpretation of science data measurements. Thermal links to radiators as well as specific couplings are foreseen to minimise the temperature fluctuations within the calibration cycle of the instrument. This cycle corresponds to a 270° revolution of the pointing unit within >20 sec with >65% duration at planet position. To get control over the instruments self induced radiation (i.e. sensor head background) and for noise depression a shutter (placed after the slit) is foreseen for reference/background signal generation.



The main electronics consists of a main and a cold redundant instrument controller and power supply. The Instrument Control Unit (ICU) performs the data acquisition, processing and transfer via Spacecraft interface (SpaceWire) controlled by an FPGA and the on-board software. Besides the Power Supply Unit (PSU), independent Spectrometer and Radiometer detector electronics as well as black body and shutter electronics modules are integrated achieving a very compact configuration.

Both spectrometer and radiometer detectors (BOL and RAD) have their separate controllers and read-out electronics (BEL and REL). A TEC electronics is implemented for the temperature control of the Bolometer chip stabilizing it on < 10mK.

There are two on-board calibration devices, the BB3 and BB7 with its analog control electronics. The Black Body BB3 represents housing/room temperature (near 300K) and is a passive device with an Acktar-black coating to achieve a high optical emissivity. The Black Body BB7 represents high Mercury temperature (near 700K) and is an active powered IR emitter including its own optics. BB3 and BB7 illumination will be periodically measured (in addition to the Space view) within the in-flight calibration cycle.

Sensor head heaters (HEA) are integrated too for the mission cold case operation, supplied by +28V and controlled by telecommanding.

Two mechanical actuators are present, the miniaturized shutter device (STS) at the spectrometer slit and the Pointing Unit (POI) with its Emergency Actuator (EPA), each with it's own controller electronics. The EPA is needed to release only in case of a POI motor failure to permanently force the Pointing Mirror pointing to the planet view. The EPA is powered from the +28V interface but internally controlled by a complex Safety logic and switches to avoid unwanted release of the EPA. The STS is needed for the the Spectrometer for covering the optical slit by closing the shutter in order to acquire data as reference signal representing the instruments background.

Several temperature sensors are installed measuring the temperature at special locations distributed inside the housing, optics and electronics units.

The On-Board Software is divided in two physical independent modules. The Primary Boot Software is stored in PROM and executes mainly the Safe mode as well as memory management functions. The Application Software is stored in EEPROM and performs Science mode operations as well as instrument control functions.

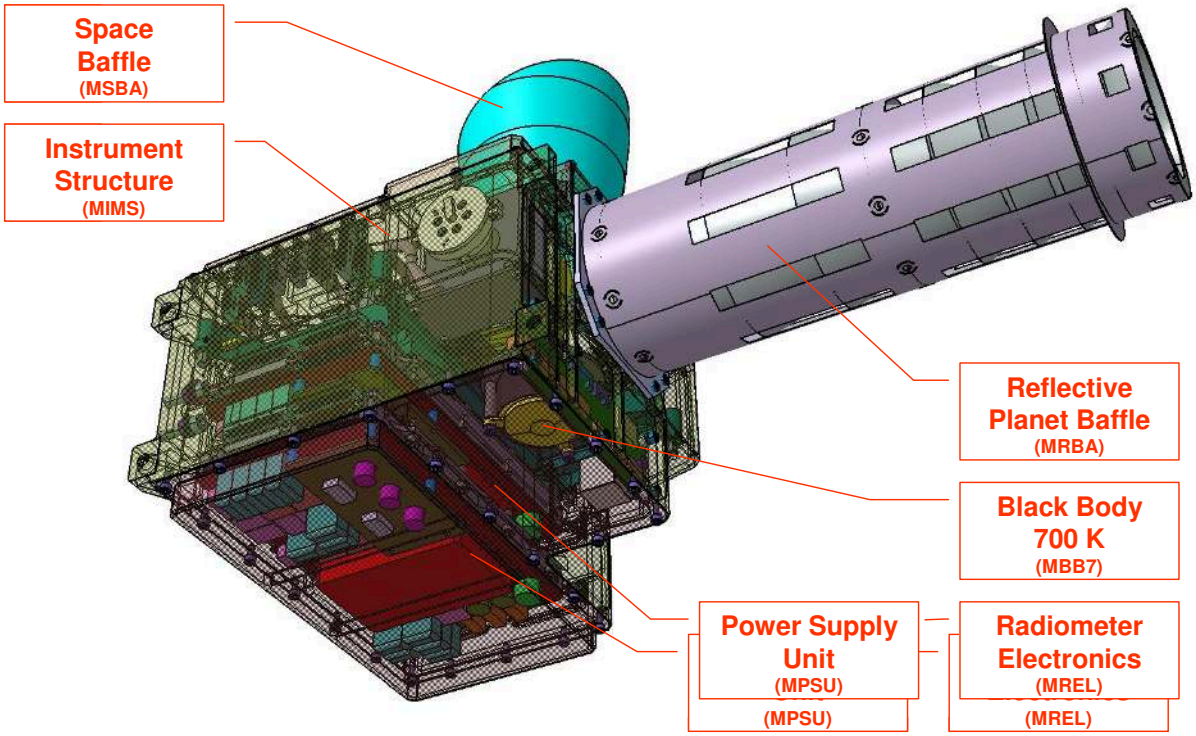


Figure 2-1: MERTIS Architecture Overview

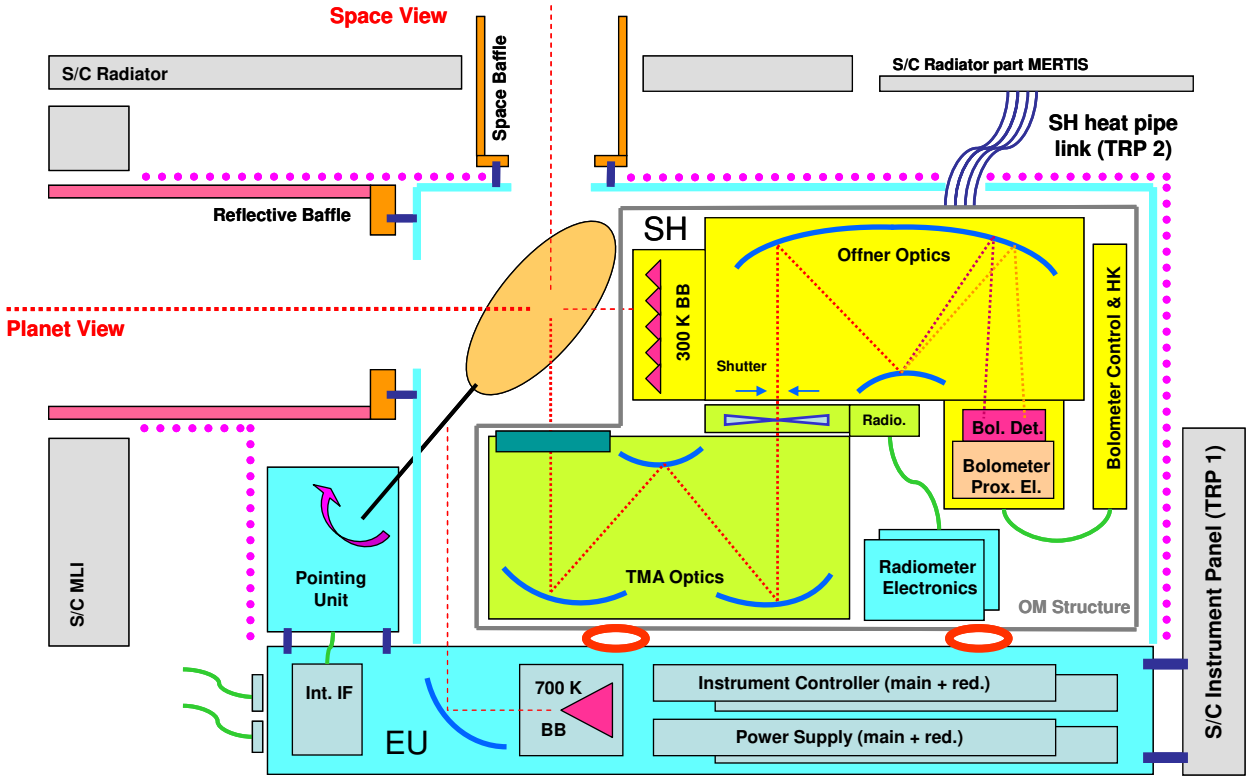


Figure 2-2: MERTIS Functional Block Diagram

Summarized, MERTIS consists of several sub-systems with dedicated functions as shown in table below.

Code	Sub-system	Main function
IRD	Infrared Entrance Filter Device	IR entrance filtering of IR radiation 7-40µm (rejection of radiation below 7µm)
EOP	Entrance Optics	TMA telescope imaging onto slit geometry, radiometer detector interface
SOP	Spectrometer Optics	Slit imaging and diffraction onto Bolometer detector array
OST	Opto-mechanical Structure	Mechanical structure of the Sensor Head sustaining optical elements for entrance and spectrometer optics, bolometer and radiometer focal plates and proximity electronics and 300 K black body, provides thermal instrument I/F for the Sensor Head
RBA	Reflective Planet Baffle	Reflective protection of planet view port against sun light, SC environment straylight and unwanted planet radiation
SBA	Space Port Baffle	Protection of space view port against planet and S/C environment straylight
POI	Pointing Unit	Mechanical pointing (rotating mirror) unit including motor drive electronics to orient instrument LOS to space and planet port as well as to 300K and 700K blackbodies, provides optical IF regarding the S/C
BB7	Blackbody 700K	Reference radiation source including point spread optics providing a hot temperature calibrator
BB3	Blackbody 300K	Reference radiation source providing a low temperature floating calibrator
STS	Short Term Shutter	Straylight offset control at spectrometer level (slit) for on-board data calibration (background data acquisition)
BOL	Bolometer	Bolometer focal plate providing spectrometer imaging data, the integrated TEC and bolometer chip temperature sensor used for temperature stabilization
BEL	Bolometer Analog Electronics	Bolometer Proximity Electronics with an ADC which provides digital video data and control electronics interfacing the ICU(s)
RAD	Radiometer Focal Plate and Slit	Focal plate with two 15 pixel thermopile array(s) with the spectrometer 80µm slit integrated
REL	Radiometer Analog Electronics	Thermopile Proximity electronics and ADCs providing digital radiometer and control data and HK interfacing the ICU via HAR board
HAR	HARness Board	Harness main board incl. connector interface of all subunits, provides digital temperature housekeeping (analog converted and digital status)
ICU	Instrument Controller Unit	Electrical IF to S/C and internal units, processing kernel for spectrometer and radiometer data, controlling of sub-systems incl. digital and analog housekeeping electronics for acquiring MERTIS scientific and operational HKs
IMS	Instrument Mechanical Structure	Main Instrument mechanical structure containing Electronics Unit out of MICU / MPSU combinations including the MHAR and 700 K black body, provides thermal/mechanical interface to S/C
PSU	Power Supply Unit	Power supply and distribution for all electrical units incl. Bolometer TEC power control electronics
PBS	Primary Boot Software	Instrument control after power-on (Safe mode), memory/APS management
APS	Application Software	Instrument control, processing of science and HK data, providing operational sequences/scientific modes

Table 2-2: MERTIS sub-system functions

A summary of the instrument performance is given by the data sheet in Appendix 1.

2.3.2 Measurement Principle

Both sensor channels, the spectrometer and the radiometer, are highly integrated sensors and use the same entrance optics and the same calibration sources according an in-plane separation arrangement. Both work in a push-broom mode synchronously with the same FOV.
The highly miniaturized radiometer is positioned at the slit of the spectrometer. The radiometer has two channels of 15 thermopile pixels, one channel on each side of the slit. On one channel an optical filter is placed directly on the thermopile array which selects the range from 7-14µm, the other channel without any filter is sensitive 7-40µm. While the first channel is used for cross calibration with the spectrometric channel, the latter will allow measurements of the surface temperature down to 100K with accuracy better than 1K.
The spectrometric channel is an IR-imaging spectrometer. It is based on a temperature stabilized but un-cooled micro-bolometer array providing spectral separation and spatial resolution according to its 2 dimensional shape.
The operation concept for both channels is characterized by intermediate scanning of the planet view and 3 different calibration targets (Space, BB3 and BB7 view) by the pointing unit/mirror as shown in chapter 7.5, called calibration/operation cycle.
The free space view represents a cold zero radiance reference allows determining the instrument energy, the 300K on-board black body represents the instrument temperature and the 700K on-board black body represents the hot Mercury's dayside surface temperature.
Acquiring calibration data from the 3 calibration targets is performed periodically every more than 20sec which leads to a duty cycle for science data acquisition from the planet of more than 65% average (see Figure 7-2).

2.3.3 Data Handling

In Figure 2-3 the data processing flow is shown for the Spectrometer data acquired from the bolometer array and the radiometer data acquired from the Thermopiles. It is foreseen to perform a lossless compression of the bolometer data. Mainly therefore a correction of data is done to achieve a high correlation and compression efficiency.

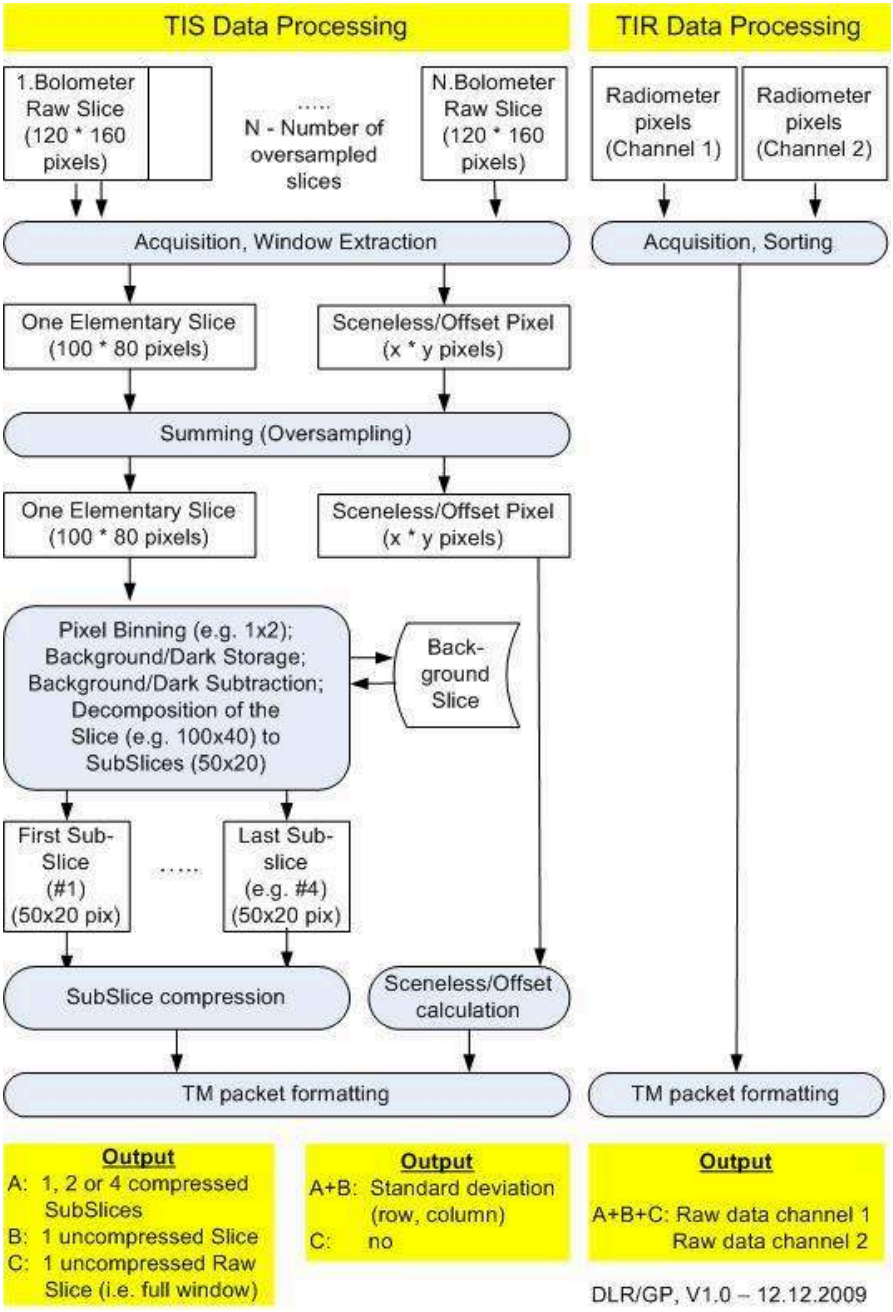


Figure 2-3: MERTIS science data processing flow

2.4. Instrument On-Board Software

2.4.1 Software Concept and Design

Two different software modules (PBS and APS) and related parameter sets are installed on the main and on the redundant ICU of MERTIS. Additionally there is the FPGA incl. “software” for interfacing the hardware and providing some modules needed for fast data processing. Note: for APS and PBS a separate parameter set is installed in EEPROM in order to separate functionality and parameter configuration of the software. This allows operating different hardware models with the same software but with different parameter configurations. Also the main or redundant channel has different parameter sets installed.
PBS and APS are physically separated from each other but from the user point of view there is no difference visible because both provide the same TC and TM interface. The PBS runs when the Safe mode is active, all other modes are provided by the APS.

In the FM the PBS is burned in a PROM and cannot be changed. The same is valid for FPGA software, it is burned in the ACTEL FPGA. Only the APS is loadable and maintained per telecommands in EEPROM and provides all MERTIS and application depended functionality.
The software architecture of the APS is shown in Figure 2-4.

By default at MERTIS power-on after initializing of the FPGA, the PBS is started but automatically it boots the APS from EEPROM so that the StandBy mode (executed by APS) is active after about 30sec without any telecommanding. A telecommanding is needed to change to any other mode or to use any other services.

After start-up, first the FPGA runs before the PBS and APS are booted and executed. The FPGA has the following tasks:

- booting, initializing the LEON-FT processor module
- booting, initializing and managing the SpaceWire communication
- managing the SDRAM and EEPROM access
- providing EDAC control for memory
- initializing the MERTIS specific hardware with a secure default configuration
- provide clocking, low level and fast interface communication
- provide fast bolometer windowing (extraction of a science window from the full window)
- provide partially support functions for data compression (i.e. Rice coding)

Entering the Safe mode by a special TC the PBS runs booted from PROM. It provides the following functions:

- Managing the instrument power-on procedure
- On-Board time synchronization/update and TM time stamping
- Start and Upload of APS and configuration parameter in EEPROM or in RAM
- EEPROM maintenance control
- Memory management (up-/download)
- TC receiving/execution for a small number of TCs
- TM formatting/sending for a small number of TMs
- ICU control and health check
- providing operation default HK

The APS provides the functionality executing all modes (except the Safe mode) as follows:

- On-Board time synchronization/update and TM time stamping
- TC receiving/execution of all TCs, except few which are only accepted in Safe mode
- TM formatting/sending of all TMs
- Memory management (only download)
- Sub-system power control
- Sub-system functional control and health check
- Providing operation default and operation extended HK
- Data acquisition, processing, compression and formatting

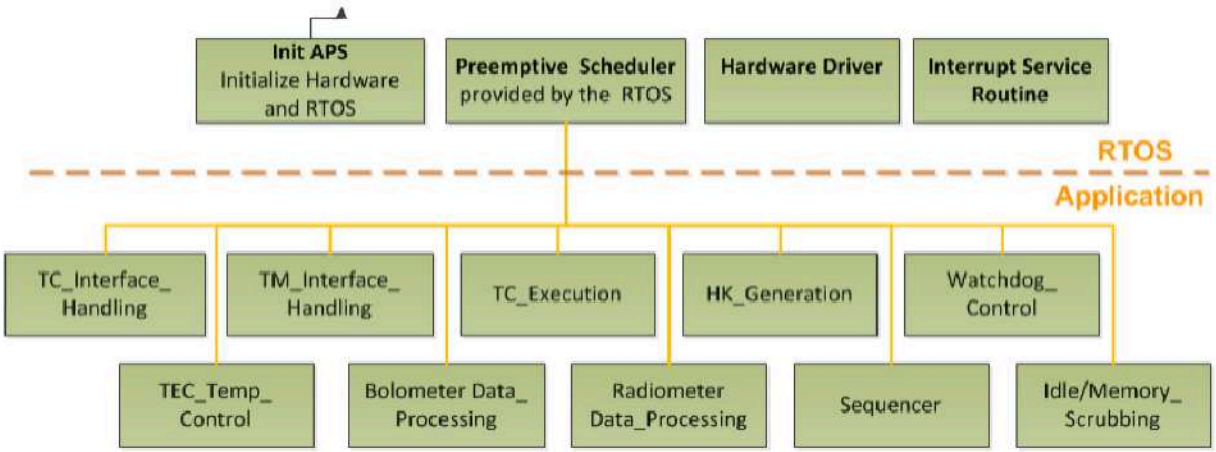


Figure 2-4: APS Architecture

Further details are to be extracted from the [RD1] or given in [RD3].

2.4.2 Software Maintenance

Changing the APS and the configuration parameter file in EEPROM is possible by Service 6 memory management telecommands. A special EGSE tool (EEPROM_upload.exe) can be used on-ground to manage the EEPROM configuration and upload functions.
On S/C level these function has to be managed by special scripts on the ground segment.

More details are provided in chapter 7.13.5.

2.4.3 Separation of Software Function and Instrument Configuration

The MERTIS on-board software concept bases on the separation of software function and parameter configuration. That means physically two files are stored in the EEPROM, the APS code file and the APS parameter configuration file with over 500 parameters. The same principle is valid for the PBS, but the difference is that the PBS code is stored in PROM and the small configuration file stored in EEPROM.

This concept has the advantage that the same software can be installed on each MERTIS model (e.g. FM, QM and EM) but with a different configuration file which contains different parameter needed e.g. for on-board calibration/calculation of housekeepings or considering different internal hardware interfaces and functions of each model, Also the main and redundant channels have different configuration files installed on each ICU/EEPROM mainly due to the fact that each ICU has its own ADC converting the analog housekeeping using different calibration parameters.

If a configuration file is not installed in EEPROM a default value (valid for FM main channel) of all parameters is compiled in the software itself so that e.g. the accuracy of the analog housekeepings may be is wrong but the nominal function of MERTIS is still guaranteed.

Nevertheless from the user point of view the TM/TC interface including the dynamic and resolution of the parameters is equal on main and redundant channel, and also between different models operated on Spacecraft or MERTIS team level.

2.5. Getting Started after Instrument Power-on

2.5.1 Preconditions before Powering-on

Hardware
Be sure that the hardware is properly installed and connected by main/redundant power and SpW cables.

Startup Software and Parameter Configuration
MERTIS is configured to startup automatically in the **StandBy** mode (default) executed by APS with a predefined startup parameter configuration used by APS. It is possible to configure this startup mode, the startup parameter configuration and the startup Pointing Unit position. This is needed for testing purposes or safety reasons and can be changed by *TC_APS_Boot_Mode*.

At MERTIS delivery the startup configuration is configured properly, so that no action is needed by the user before switching on or operating of MERTIS.

Note, the boot configuration is stored in EEPROM. If the configuration would not be present or corrupted MERTIS starts and remains the Safe mode e.g. to be able to upload the EEPROM.

SpaceWire Interface
It is assumed that the S/C enables the SpaceWire before switching-on MERTIS so that the interface can connect shortly after power-on.

2.5.2 Operation after Power-on

After power-on, MERTIS enters the Standby mode and the operation/performance is as follows:

- After about 10sec the SpaceWire link is connected (10 Mbit/s) assumed the S/C SpaceWire link has been enabled by the S/C.
- After about 30sec a boot message is sent as *TM_Event_Progress(APSBootReady)* (Note: the MERTIS EM consume 220mA – 230mA on the +28V interface)
- MERTIS sends *TM_OperationDefault_HK* and *TM_OperationExtended_HK* every 10sec starting after receiving of *TC_Time_Update* (synchronized time) or 5sec after the boot message is sent by MERTIS and a *TC_Time_Update* isn't received (unsynchronized time)
- The Standby mode is signalled by *TM_OperationDefault_HK(HK_STAT_MERTIS_MODE=2/StandBy)*
- Either the main or the redundant channel is powered-on, which is shown by *TM_Event_Progress(APS_BootReady) (HK_STAT_ICU_MAIN_RED=0/redundant or =1/main)*
- The analog voltages *TM_OperationDefault_HK(HK_VOLT_PSU_P34, HK_VOLT_PSU_P72)* show proper values
  HK_VOLT_PSU_P34 = 3,4…3,6V (Power Supply +3,4V voltage supplying the ICU/digital)
  HK_VOLT_PSU_P72 = 7,1…7,3V (Power Supply +7,2V voltage supplying the ICU/HK ADC)

2.5.3 Science Mode oepartion and timings (e.g. Mode Science_Raw=23)

After MERTIS is powered-on a default science mode can be started as follows:

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
1	---	0	Power on +28V
2	---	10	SpeceWire link is connected
3	TM_Event_Progress(APSBootReady)	30	HK_EVENT_PROG_ID:42002 - EVENT_APS_BOOT_READY HK_STAT_BOOT_LOCATION: 2 - EEPROM HK_STAT_BOOT_MODE: 2 - OPERATIONAL HK_STAT_BOOT_REASON: 0 - power-on HK_STAT_ICU_FPGA_VERSION: 17 HK_STAT_SW_VERSION: APS V3.5.2394 02/2016 PAR_BOOT_CONFIG: FM_MAIN/RED_CFG Rev. 2437 HK_STAT_ICU_MAIN_RED: 0 – redundant (or) 1 - main
4	TM_OperationDefault_HK	20	Every 20sec, HK_STAT_MERTIS_MODE=2(StandBy)
5	TM_OperationExtented_HK	20	Every 20sec
6	*TC_Time_Update*	N/A	
7	TM_TC_Acceptance_Success	< 0,1	
8	TM_TC_Execution_Success	< 4	
9	TM_OperationDefault_HK	20	
10	TM_OperationExtented_HK	20	
11	*TC_Operation_Parameter*	N/A	Important for Mode=23 setting PAR_REPETITION_RATE= 0 (100msec) PAR_TIR_REPETITION_FACTOR=8 (TIR repetition = 8) PAR_TIS_POWER= 1 (on) PAR_TIR_POWER= 1 (on) PAR_TEC_POWER= 1 (on) PAR_BB7_POWER= 1 (on) PAR_POI_POWER= 1 (on) PAR_STS_POWER= 1 (on) PAR_SHH_POWER= 0 (off) PAR_TIS_BIN_MODE= 0 (1x1) PAR_POI_MODE= 1 (Move) PAR_SHH_TEMP= 10 (°C) PAR_TIS_COMP_MODE= 0 (no compression) PAR_TIS_WIN_SIZE=0 (100x80pixel) Settings without influencing the mode PAR_CALIBRATION_PERIOD= 120 (sec) PAR_TIS_BCK_RATE= 10 (sec) PAR_TIS_SCIENCE_QUICKLOOK_PERIOD =60 (sec) PAR_TIR_SCIENCE_QUICKLOOK_PERIOD =60 (sec) PAR_ SCIENCE_HK_QUICKLOOK_PERIOD =60 (sec)
12	TM_TC_Acceptance_Success	< 0,1	
13	TM_TC_Execution_Success	< 0,1	
14	*TC_Power_Enable*	N/A	
15	TM_TC_Acceptance_Success	< 0,1	
16	TM_TC_Execution_Success	< 4	
17	TM_Event_Progress(ModeTransition)	< 0,1	HK_EVENT_PROG_ID: 42003 HK_STAT_CURRENT_MODE= 3 (**WarmUp**) HK_STAT_PREVIOUS_MODE= 2 (**StandBy**)
18	TM_OperationDefault_HK	20	HK_STAT_BB3_POWER: 1 - on HK_STAT_BB7_POWER: 1 - on HK_STAT_EEPROM_POWER: 0 - off HK_STAT_EPA_POWER: 0 - off HK_STAT_HK_POWER: 1 - on

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
			HK_STAT_ICU_MAIN_RED: 0 - redundant HK_STAT_ICU_NUM_AHB_CORRECTABLE_ERROR: 0 HK_STAT_ICU_NUM_AHB_ERROR: 0 HK_STAT_ICU_PROC_DUTY_CYCLE: 16 HK_STAT_LAST_ERROR_FREQUENCY: 0 HK_STAT_LAST_ERROR_ID: 0 HK_STAT_LAST_SPWLINK_ERROR: 0 - no error HK_STAT_MERTIS_MODE: 3 - WarmUp HK_STAT_NUM_TC_EXECUTED: 4 HK_STAT_NUM_TC_RECEIVED: 4 HK_STAT_NUM_TM_SENT: 16 HK_STAT_POI_POWER: 1 - on HK_STAT_SHH_POWER: 0 - off HK_STAT_SID: 1 - OperationDefaultHK HK_STAT_STS_POWER: 1 - on HK_STAT_TEC_POWER: 1 - on HK_STAT_TIR_POWER: 1 - on HK_STAT_TIS_POWER: 1 - on HK_STAT_TM_BUFFER_OVERFLOW: 0 - no HK_STAT_WATCHDOG: 0 - off HK_TEMP_ICU: 32,32 [°C] HK_TEMP_PSU: 33,53 [°C] HK_VOLT_PSU_P34: 3538 [mV] HK_VOLT_PSU_P72: 7207 [mV]
19	TM_OperationExtended_HK	20	HK_STAT_POI_BB3_VIEW: 0 - no HK_STAT_POI_BB7_VIEW: 0 - no HK_STAT_POI_PLANET_VIEW: 1 - yes HK_STAT_POI_SPACE_VIEW: 0 - no HK_STAT_REL_NUM_LATCHUP_ERROR: 0 HK_STAT_STS: 0 - open HK_STAT_TIS_TEC_STABLE: 0 - temp unstable HK_TEMP_BB3: 30 [°C] HK_TEMP_BB7: 390,98 [°C] HK_TEMP_BOL_CHIP: 30,007 [°C] HK_TEMP_BOL_HOUSING: 2,08 [°C] HK_TEMP_EOP_IR_FILTER: 2,03 [°C] HK_TEMP_EOP_TMA: -0,29 [°C] HK_TEMP_ICU: 32,32 [°C] HK_TEMP_OST_BASE_PLATE: 0,08 [°C] HK_TEMP_POI_MIRROR: 27,91 [°C] HK_TEMP_POI_MOTOR: 28,05 [°C] HK_TEMP_PSU: 33,53 [°C] HK_TEMP_RAD_SLIT: 27,86 [°C] HK_TEMP_RBA_BACK: 29,68 [°C] HK_TEMP_RBA_FRONT: 30,28 [°C] HK_TEMP_SOP_GRATING: -1,01 [°C] HK_TEMP_SOP_M1: 5,78 [°C] HK_TEMP_STS: 1,09 [°C]
20	*TC_Science_Enable*	N/A	PAR_PROCESS_ID: 62 - Science Data (X-band downlink)
21	TM_TC_Acceptance_Success	< 0,1	PAR_TC_APID: 972 (0x3CC)
22	TM_Operation_Parameter	< 0,1	See parameter table, parameter as commanded by TC_Operation_Parameter
23	TM_FunctionConfig_Parameter	< 0,1	See parameter table
24	TM_OperationExtended_HK	< 0,1	
25	TM_OperationExtended_HK	N/A	Every 20sec
26	TM_OperationDefault_HK	N/A	Every 20sec
27	TM_OperationExtended_HK	< 0,1	

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
28	TM_Science_TIS_Data	< 0,01	4 x TM_Science_TIS_Data every 100msec
29	TM_Science_TIS_Data	< 0,01	
30	TM_Science_TIS_Data	< 0,01	
31	TM_Science_TIS_Data	< 0,01	
32	TM_TC_Execution_Success	< 4	
33	TM_Event_Progress(ModeTransition)	< 0,1	HK_EVENT_PROG_ID: 42003 HK_STAT_CURRENT_MODE: 23 - **Science_Raw** HK_STAT_PREVIOUS_MODE: 3 - WarmUp
	---	N/A	Repetion until *TC_Science_Disable* (PAR_PROCESS_ID: 62)
38	TM_Science_TIS_Data	< 0,01	Repetition of 100msec
39	TM_Science_TIS_Data	< 0,01	
40	TM_Science_TIS_Data	< 0,01	
41	TM_Science_TIS_Data	< 0,01	
42	TM_Science_TIR_Data	< 0,1	Repetition of 800msec
43	…		
44	TM_OperationExtended_HK	N/A	Every 20sec
45	TM_OperationDefault_HK	N/A	Every 20sec
46	*TC_Science_Enable*	N/A	PAR_PROCESS_ID: 63 - Science Data (K-band downlink)
47	TM_TC_Acceptance_Success	< 0,1	
48	TM_TC_Execution_Success	< 4	
49	---	N/A	Repetion until *TC_Science_Disable* (PAR_PROCESS_ID: 63)
50	TM_Science_HK_Quicklook	N/A	Repetition of 60sec
51	TM_Science_TIS_Data_Quicklook	N/A	Repetition of 60sec
52	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
53	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
54	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
55	TM_Science_TIR_Data_Quicklook	0	Repetition of 60sec
56	*TC_Science_Disable*	N/A	PAR_PROCESS_ID: 63 - Science Data (K-band downlink)
57	TM_TC_Acceptance_Success	< 0,01	
58	TM_TC_Execution_Success	< 4	
59	*TC_Science_Disable*	N/A	PAR_PROCESS_ID: 62 - Science Data (X-band downlink)
60	TM_TC_Acceptance_Success	< 0,01	PAR_TC_APID: 972 (0x3CC)
61	TM_TC_Execution_Success	< 4	
62	TM_Event_Progress(ModeTransition)	< 0,01	HK_STAT_CURRENT_MODE: 3 - WarmUp HK_STAT_PREVIOUS_MODE: 23 - Science_Raw
63	TM_OperationDefault_HK	10	Every 20sec
64	TM_OperationExtended_HK	10	Every 20sec

(1) "N/A" means a TC can be sent immediately or with a waiting time

Table 2-3: MERTIS Science Default Mode Procedure

3. INSTRUMENT INTERFACES

3.1. Instrument Budgets

3.1.1 Power Consumption Budget

MERTIS power consumption is shown as follows for typical main modes. The power budget for each individual mode is shown in chapter 5.

SAFE / STAND-BY	SCIENCE (TIS and RAD)	SCIENCE_ HEATED **(cold case)**	SCIENCE TIR_ONLY	TIR_ONLY_ HEATED (cold case)
5,6 W	9,9 W	12.4 W (1)	7,9 W	12,0 W (1)

Table 3-1: MERTIS heat dissipation in the different operation mode categories

(1) Note, these power values are measured values as representative examples during TV test. But these values depend on the TRP2 temperature of MERTIS and how much the internal sensor head has to heat up getting a temperature over 0°C as minimum.
In this case TRP2 has a temperature of -5°C and the internal sensor head heater powered with a duty cycle of about 60% achieving 0°C (nominal case).
The maximum power consumption can be 15,1W when the heater is permanently on (i.e. 100% duty cycle) which is not nominal.

3.1.2 Power Profile

The power profile in Figure 3-1 shows a power-on and the science nominal mode after.

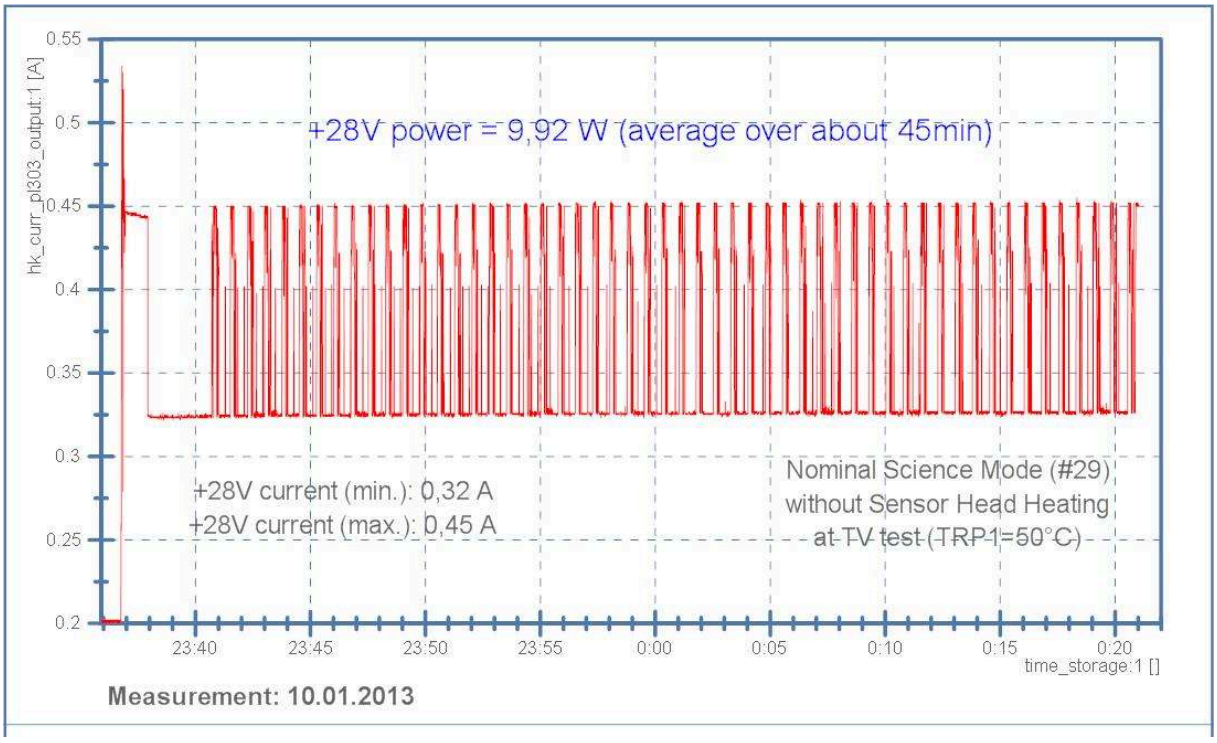


Figure 3-1: MERTIS Power Profile (nominal science mode)

In Appendix 7 the power consumption and profile are shown for a worst cold case operation when the sensor head is heated (e.g. TRP2=-5°C) and MERTIS is operated in a nominal science mode.

3.1.3 Mass Budget

The instrument mass is 3,07kg (measurement of FM).

3.1.4 Telemetry Data Rates

The **maximum average data rate** (science + HK telemetry) is about **965 kBits/sec** (mode **Science_Raw**/23). The minimum average data rate (HK telemetry only) is about 0,045 kBits/sec (mode **StandBy**/2).

More details about the average data rates for each mode are provided in Table **5-2**.

3.2. Mechanical Interfaces

3.2.1 Instrument Mechanical Layout

MERTIS consist of only one box therefore there isn't any intra-experiment harness. The main external mechanical interface is the MERTIS mounting plate with four feet which represents the first Thermal Reference Point (TRP1) to the S/C. Additionally there is a TRP2 for contacting MERTIS to a dedicated S/C radiator by a heat pipe for cooling and thermal stabilization of the Sensor Head. MERTIS is located at the S/C (MPO) at the nadir side close to the S/C radiator. The planet baffle looks though the S/C nadir panel and the space baffle though the S/C radiator.

The overall dimensions are provided in the following figures. More details are shown at the MICD in Appendix 3.

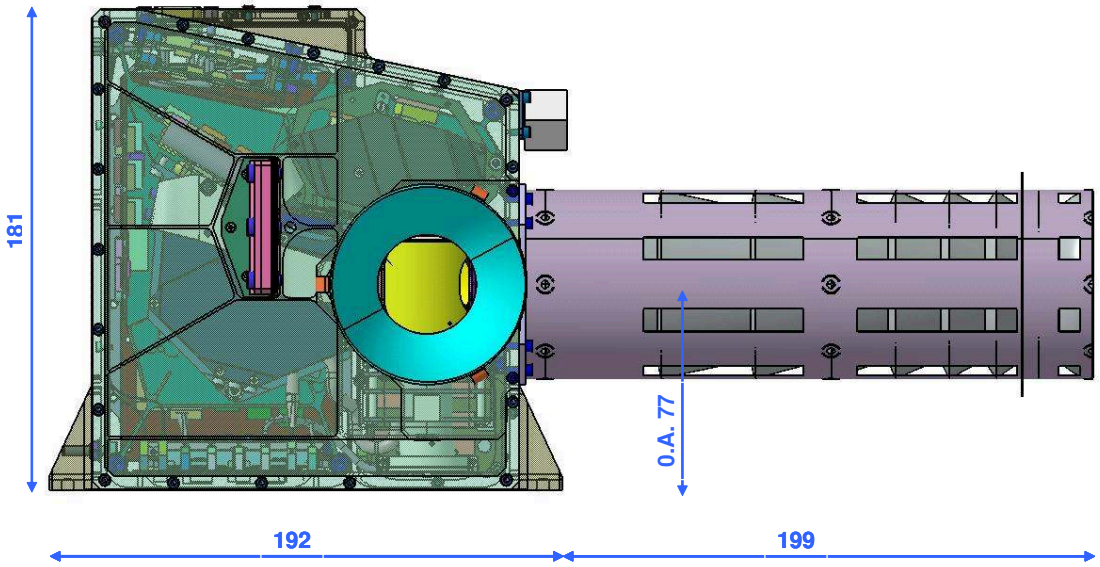


Figure 3-2: MERTIS top view

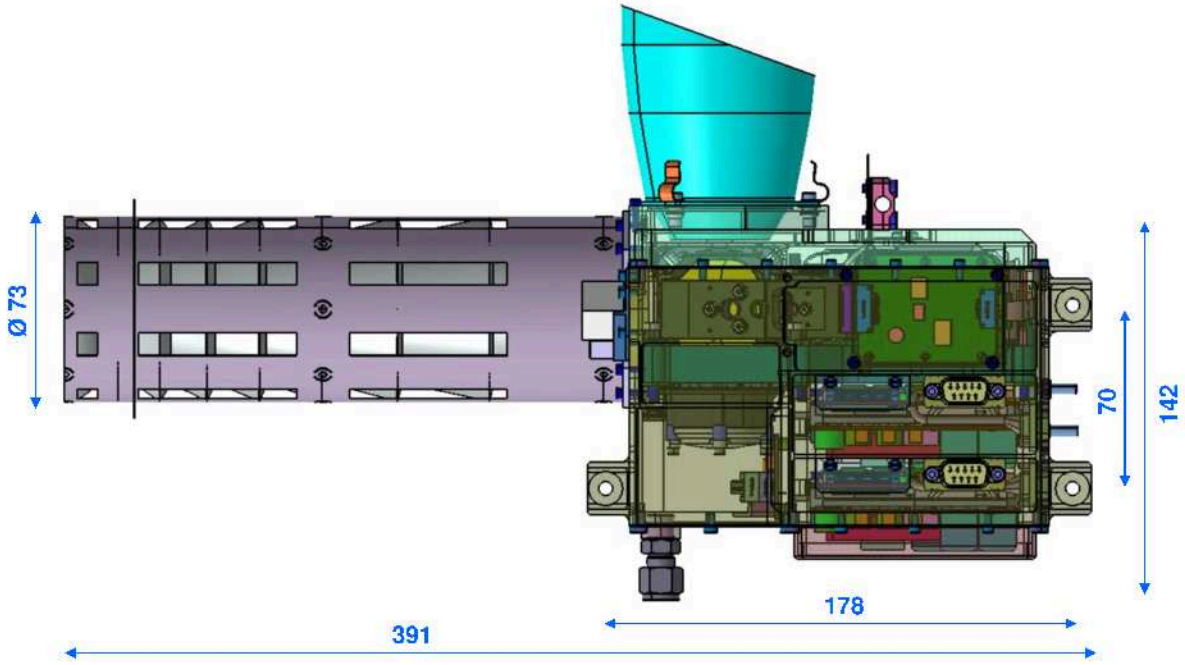


Figure 3-3: MERTIS side view

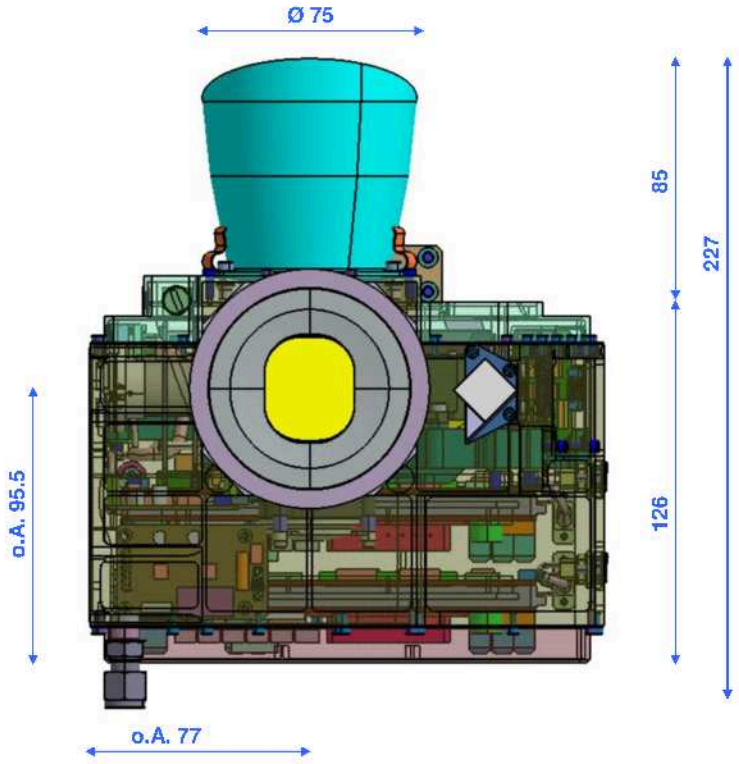


Figure 3-4: MERTIS front view

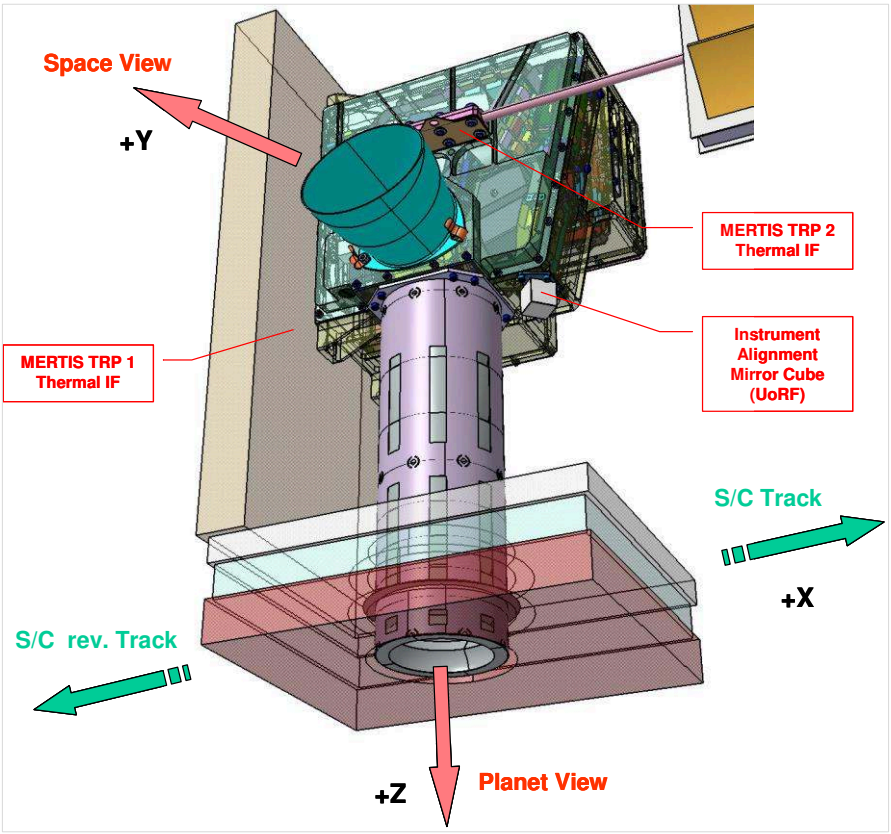


Figure 3-5: MERTIS to MPO accommodation

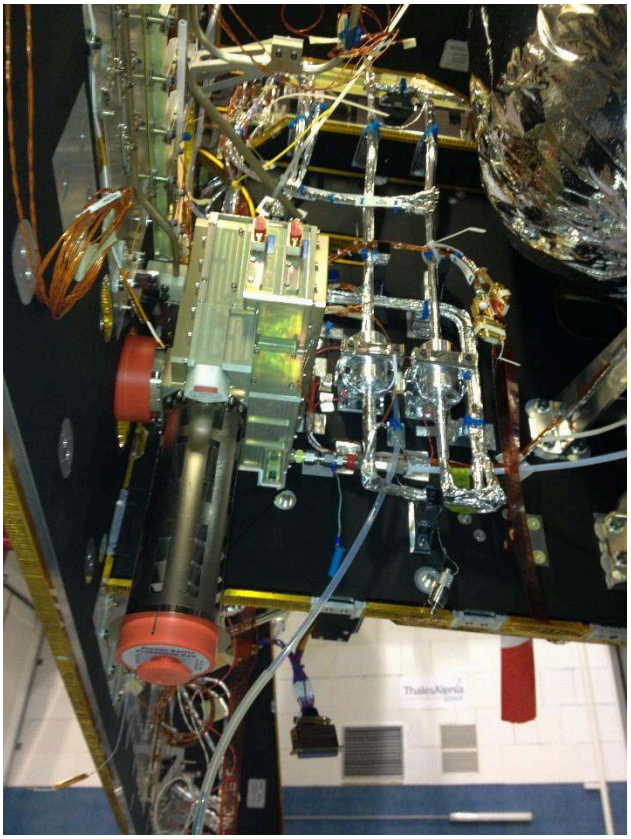


Figure 3-6: MERTIS FM integrated on the MPO (2013)

3.2.2 Accommodation Constraints

The MERTIS accommodation constrains are considered:

- The MPO provides an unobstructed view to the Planet for science imaging.
- MERTIS is accommodated so that the planet baffle aperture is not beyond the outer plane of the S/C MLI in order to minimise thermal load on MERTIS.
- The MPO provides an unobstructed view to cold space view of MERTIS for ensuring a proper calibration.

3.2.3 Sensitivity to Sun, Planetary Albedo and Infra-Red Illumination

MERTIS is a thermal infrared spectrometer and therefore very sensitive to thermal radiation originating from spacecraft structures inside the FOV of the planet or space baffle. Summarized the following precautions are considered:

- Direct solar illumination of the MERTIS optics has to be avoided.
- There is no hot spacecraft structure within the MERTIS planet or space port FOV. The cone of the UFOV of 4° x 1° plus at least 3 mm clearance is free of any hot spacecraft structures.
- It is assumed that the Planet baffle and the Space baffle is not exposed to direct solar illumination for more than 3 minutes at less then 37° from the LoS (Zmpo axs) to guarantee the survival of MERTIS.

3.2.4 Physical Properties

Properties as physical dimensions, co-ordinates of the Centre of Mass (CoM) and Moments of Inertia (MoI) are shown in the MICD in Appendix 3.

The MERTIS FM has a mass of 3,1kg

The Ponting Unit Mirror and the Mirror support mass (< 40g) are balanced around motor/rotation axis. Therefore MoI variations due to the instrument's mirror are not present or they are negligible small. Thus the requirement of 0.1 Kgm2 as specified in section 3.2.2.1.3 in the EID-A (AD1) will be fulfilled with respect to the total instruments MoI.

3.2.5 Mounting Attachment and Handling

The MERTIS instrument is attached to the spacecraft by means of 4 x M5 bolts as shown in the MICD in Appendix. The reference hole is shown on the MICD too. MERTIS is flat mounted to achieve a high thermal contact to the S/C.
Dedicated fixtures are provided by MERTIS as red-tag items to hold the heat pipe and the cols strap during the integration of the instrument into the spacecraft.

3.2.6 Baffle, MLI and Cold Finger Mechanical Interfaces

Baffles interfaces
The MERTIS planet baffle protrudes through the spacecraft MLI and includes a flange that is located at the level of the High Temperature MLI inner layer.
The cold space baffle protrudes through a hole in the spacecraft main radiator and does not need flanges.
Both baffles are attached to the instrument and have no structural interface with the spacecraft.
Details of this flange are given in the instrument MICD.

Cold finger interfaces
The MERTIS instrument has a cold finger to control the temperature of the sensor head. This cold finger is connected to a dedicated radiator via a heat pipe. The radiator and heat pipe are provided by the spacecraft. The cold finger is connected to the heat pipe with a MERTIS provided clamp. Thermal filler is introduced between the heat pipe and the clamp to improve the thermal contact. Details are shown on the MICD.

Instrument MLI interfaces
The MERTIS instrument has no MLI.

3.2.7 Purging Interfaces

Purging is needed for MERTIS, therefore a dedicated purging interface (Swagelok 1/4") is foreseen (located on the unit bottom near the mounting lugs). Ref. EID-A, #4040; The connector is oriented with its axis parallel to the S/C mounting panel. Refer to the MICD in Appendix 3.

3.2.8 Alignment and Pointing

MERTIS will have two aperture cones (28 x 39/44mm²/4° divergence) for the planet view and the view to cold space which is 90° apart. The Vertex is located far outside the instrument due to the small FOV (Z-365mm and Y+400 w.r.t. IRP). This is shown in the Mechanical ICD in Appendix 3.
MERTIS is a nadir-pointing instrument. The ILS is aligned with the +Z-axis of the spacecraft. Due to the FOV the swath of subsequent orbits will have an overlap of at least 10% (assuming periherm over the equator and an altitude of 400km). To ensure overlap between successive orbits an APE < 6 arcmin relative to the roll-axis (X-axis) is required. The APE relative to the pitch-axis is less constraint and should be less than < 10arcmin to minimize the geometric errors.
For MERTIS the two most relevant timescales are the dwell time of 109ms and the repetition time of ~210ms. Therefore we have defined two relative pointing errors (RPE 1 and 2) regarding these timescales. Any slow drifts as described by the PDE have little effect on the measurement done by MERTIS.
MERTIS will map 5-10% of the surface of Mercury with a spatial resolution better than 500m. For the nominal observation case the shortest necessary repetition time is ~210ms with a FOV in flight direction of 400m. To reduce the smear of the ground pixel to less than 500m at periherm the RPE 1 should be less than 30 arcsec relative to pitch and roll-axis. For greater altitudes the repetition times increase according to the decrease on ground speed of the footprint.
The nominal dwell time is 109ms. The RPE 2 within this 109ms period has to be less than 30 arcsec relative to pitch-axis to get continuous ground coverage. The RPE 2 relative to the roll-axis should be less than 30 arcsec to ensure radiometric measurements. For a larger RPE 2 part of the measured signal during an integration period would be attributed to the wrong ground pixel.
This high-resolution observation case defines the AME. It has to be small enough to allow the reconstruction of mineralogical maps from the data. Based on the high-resolution case during periherm passage an AME < 60 arcsec for roll- and pitch-axis is required.

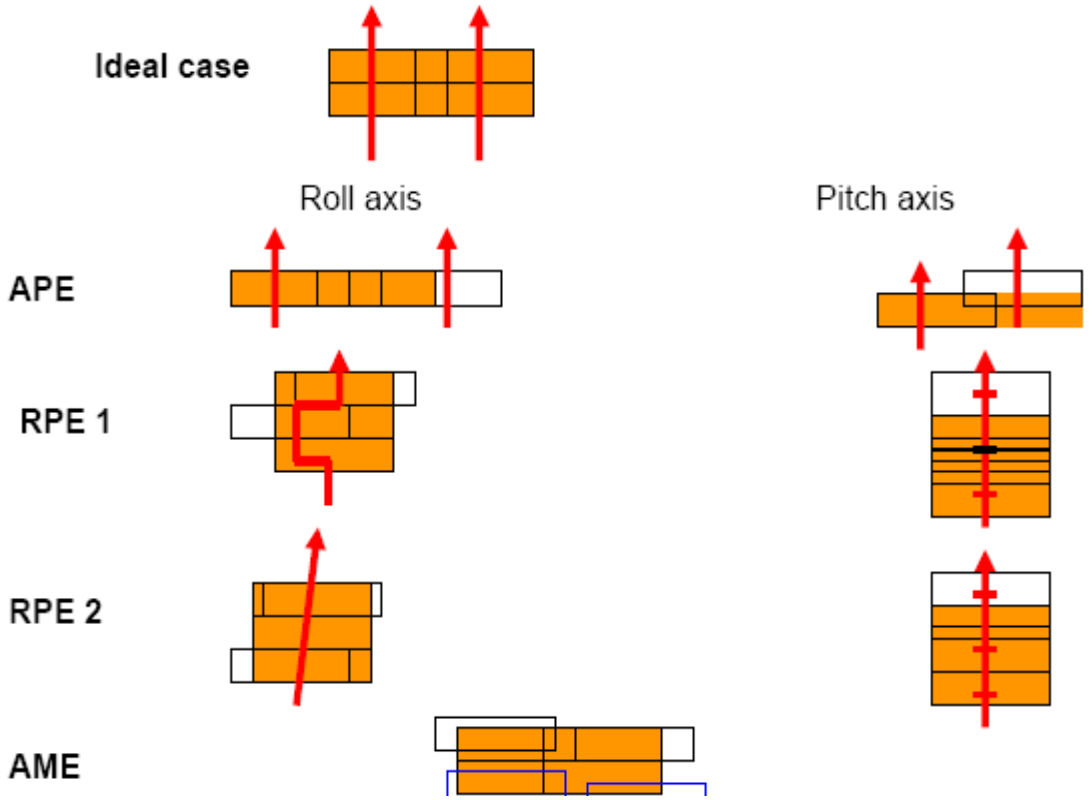


Figure 3-7: Effect of the pointing errors on the MERTIS measurements

3.2.8.1 Boresight and Field of View

The MERTIS vertex position, Scientific Field of View (FOV) and Unobstructed Field of View (UFOV) are defined in the Table 3-2 according to the Mechanical ICD in annex 1.

Unit	Vertex Position [mm]			Boresight Axis Orientation [deg]		Scientific Field of View [deg]		Unobstructed Field of View [deg]	
	X	Y	Z	SOA	SOE	SOA	SOE	SOA	SOE
MERTIS Planet view	+77	+68.5	-365	0	0	+/-2	+/-0.5	+/-2 + 2x3mm	+/-0.5 + 2x3mm
MERTIS cold space view	+77	-400	+134.4	90	0	+/-0.5	+/-2	+/-0.5 + 2x3mm	+/-2 + 2x3mm

Table 3-2: Sensor Viewing Angles

The field of view angles are specified as half cone angles. Refer to the MICD in Appendix 3.

3.2.8.2 Pointing Requirements

The MERTIS pointing requirements are summarized in the Table 3-3.

Pointing Required of the Boresight wrt S/C axis	Absolute Pointing Error	Relative Pointing Error	Absolute Measurement Accuracy
Planet view to nadir	± 360 arcsec	± 30 arcsec/210 msec	± 60 arcsec

Table 3-3: Pointing Requirements

Note: there are no pointing requirements related to the cold space view.

3.2.8.3 Alignment and Co-Alignment Requirements

The alignment requirements with respect to the spacecraft are defined in the Table 3-4.

Unit	Accuracy wrt S/C		Knowledge wrt S/C		Stability wrt S/C	
	Azimuth	Elevation	Azimuth	Elevation	Azimuth	Elevation
MERTIS planet view	± 5 arcmin	± 5 arcmin	± 30 arcsec	± 30 arcsec	N.A.	N.A.
MERTIS cold space view	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Table 3-4: Alignment Requirements

The co-alignment requirements with respect to other units are defined in the Appendix 3. While MERTIS has no direct co-alignment requirements, it requires for inter-instrument calibration and validation an overlap of the FOV with SYMBIOS-SYS VIHI. The VIHI scientific FOV being 1.83° (half cone) this condition will be achieved by mechanical tolerances and will be covered by the alignment requirements out of Table 3-4.

3.2.8.4 Method of On-Ground Alignment

The MERTIS alignment on the spacecraft will be performed by optical means. The location and orientation of the optical cubes are shown on the MICD in Appendix 3.

3.2.9 Mechanisms Perturbations

The torque impulse limits and the frequency-dependent exported vibration level limits detailed in Section 3.2.5.2 in the EID-A (AD1), will be used to define the 'worst case' performance requirements for the pointing unit mechanism.

Micro-vibrations can be induced by the start/ stop behaviour of the rotating mirror system. For operations the following profile has been defined as a baseline:

- Optical axis switch between 4 targets, cycle > 20 sec
- Dwell time at Mercury > 13 sec per rotation cycle
- Dwell time at calibration targets typ. 1-3 sec
- Target change time (incl. acceleration & deceleration) typ. 1 sec, worst case 0.2 sec
- Mass of rotor of the motor and the mirror in a screening cylinder ~ 40 grm
- Diameter of the mirror cylinder ~ 60 mm
- 4 stop positions at 90° steps (planet and space view position with mechanical limiter)

The moment generated by the accelerated mass is M = (½ m r²) (ð/ t²):

M = 1.41 mNm	for 0.2 sec target change (worst case)
M = 56.5 µNm	for 1 sec target change (nominal case)
M = J á	with J- inertia and á- angular acceleration
Ö = ð/2 = ½ á t²	with 90° steps between two stop positions
J = ½ m r²	for the inertia of the full cylinder

3.3. Thermal Interfaces

3.3.1 Thermal Design and Temperature Limits

Besides to secure the survival of the instrument in the Mercury operational orbit it is the main goal of the thermal design to minimise the temperature fluctuations within the imaging periods of the duty cycles since all temperatures of instrument components contribute to the stray light budget hence reducing the performance of MERTIS.
Because it is not realistic to keep temperature stability far below 1K over the mission, a concept of in-flight calibration including cross referencing of temperature targets which will be frequently viewed by the instrument has been established. Thus the temperature stability requirements can be reduced to one calibration cycle of e.g. 20 sec or possibly longer after which the offset data are resettled.
The MERTIS thermal design is based on a full passive approach at perihel (heating at mission cold cases) and includes the thermal decoupling of the electronics unit from the sensor head. The electronics units and the main structures are directly coupled to the mounting panel of the MPO via the TRP1. The sensor head is thermally coupled to a dedicated radiator via a cold finger TRP2.
The operational temperatures of the sensor head parts are fitted to the needs of the micro-bolometer. It has a stabilized operating temperature of +10 - +30°C for best performance which is maintained with an accuracy of 0.01 K with a TEC inside the detector package which acts based on its heat sink temperature as heat generator or cooler. To keep the difference between the TEC heat sink and the operating temperature within reasonable limits the sensor head structure is foreseen to couple to a dedicated S/C radiator via thermal flex link. This minimises the thermal gradients within the optical part which is helpful as the design is sensitive to this type of disturbances.
The individual MERTIS subunits work within the following temperature limits as shown by Table 3-5 (taken into account the thermal analysis).

	Sub-Unit	Operation		Non-Operation		Switch-on	Survi-val *	Temp.-Stability per CC (20sec)
		Temperature (°C)						
Sensor-Head (SH)	Offner Optics Black body 300 K Bolometer Detector Short Term Shutter	+ 10	+ 30	- 30	+ 50	- 20	+ 50	± 0.2 K
	TMA Optics Radiometer Detector	+ 10	+ 40	- 30	+ 50	- 20	+ 50	± 1 K
	Bolometer Electronics	- 20	+ 60	- 30	+ 60	- 20	+ 60	NA
Electr.-Unit (EU)	Instrument Controller Power Supply Radiometer Electronics Black Body 700 K	- 20	+ 70	- 30	+ 70	- 20	+ 70	NA
	Point Unit Motor/ Electronics	- 30	+ 60	- 30	+ 60	- 30	+ 75	NA
Inter-face extern	Pointing Unit Mirror Entrance Window Space Port Baffle	- 30	+ 60	- 30	+ 60	- 30	+ 80	NA
	Planet Reflective Baffle	- 30	+ 250	- 30	+250	- 30	+ 300	NA
TRP1 (EU)	MERTIS structure	- 20	+ 45	- 30	+ 50	-20…+45	+ 50	NA
TRP2 or STP (SH)	MERTIS structure/ TRP2/cold finger I/F	0**	+20**	- 30	+ 50	-20…+40	+ 20	± 2 K per Orbit

- * Survival Temperatures defined by 3 min direct solar exposure
- ** TRP 2 Temperatures, assumption: 4.5 W heat flux @ 20°C

Table 3-5: MERTIS subunits temperature limits

3.3.2 Thermal Measurements

In this chapter some typical temperature profiles are reported measured at the TV test campaign on MERTIS instrument level and TV chamber. This allows an estimation of expected temperatures when MERTIS is integrated on the S/C.

Case 1: FM temperatures in TIS+TIR science mode, at high TRP1 and TRP2 temp. conditions

In the table below the measured temperatures are shown as an example of how the temperature distribution looks like in a vacuum chamber at TV test in a hot TRP case (see [RD4]). Note that in this case the baffle is quiet cold and will be much hotter on the S/C at Mercury. Components with the highest temperatures are the power supply unit (MPSU) and the pointing unit (MPOI) motor.

Sub-System/Interface	Temperature Measured [°C]	Remark
Planet Baffle (MRBA front)	+45	Baffle not heated
Planet Baffle (MRBA back, flange instrument)	+42	Baffle not heated
Pointing Unit Mirror (MPOI mirror)	+50	
Pointing Unit Motor (MPOI Actuator)	+56	
TMA Optics (MEOP)	+36	
Sensor Head (MOST) Base Plate	+39	
Black Body (MBB3)	+35	
Bolometer housing (MBOL)	+36	
Bolometer chip	+35	
Shutter actuator (MSTS)	+36	
ICU redundant	+54	
PSU redundant	+60	
TRP1	+45	
TRP2 Strap	+20	

Case 2: FM temperatures in TIS+TIR science mode, at low TRP1 and TRP2 temp. conditions

In the table below the measured temperatures are shown as an example how the temperature distribution looks like in a vacuum chamber at TV test in a cold TRP case (see [RD4]). Note that in this case the baffle is quiet cold and will be hotter on the S/C at Mercury. Additionally the sensor head is heated/stabilized to 0°C. The components with the lowest temperatures are the power supply unit (MPSU) and the pointing unit (MPOI) motor.

Sub-System/Interface	Temperature Measured [°C]	Remark
Planet Baffle (MRBA front)	-20	Baffle not heated
Planet Baffle (MRBA back, flange instrument)	-18	Baffle not heated
Pointing Unit Mirror (MPOI mirror)	-12	
Pointing Unit Motor (MPOI Actuator)	-5	
TMA Optics (MEOP)	0	
Sensor Head (MOST) Base Plate	0	Heated/stabilized to 0°C
Black Body (MBB3)	0	
Bolometer housing (MBOL)	0	
Bolometer chip	+5	
Shutter actuator (MSTS)	0	
ICU redundant	-10	
PSU redundant	-2	
TRP1	-20	
TRP2 Strap	+1	

3.3.3 Thermal Interface Control Drawing

The TICD is provided in Appendix 4: THERMAL INTERFACE CONTROL DRAWINGS.

3.3.4 Thermal Control Heaters

MERTIS operates in Mercury cold seasons where the optics temperature can be -20°C and less.

Therefore MERTIS contains integrated heaters internally controlled by MERTIS and supplied by the +28V main or redundant interface. They are located on the sensor head (i.e. SOP structure) to heat up the optics and detectors in cold mission phases to at least 0 - 10°C.

The heaters have a power of max. 3.1 W. Two independent heaters are present for the main and the redundant channel. These heaters are controlled by the instrument and a basic two-point algorithm switching on when the lowest allowed temperature is achieved (e.g. 10°C) at sensor head.

The optics heaters are controlled by the operation parameter PAR_SHH_TEMP (defines the heater switch-on temperature) and PAR_SHH_POWER (enables the heaters) which can be changed/set by command *TC_Operation_Parameter*.

The following figure shows the location of the sensor head heaters in MERTIS instrument.

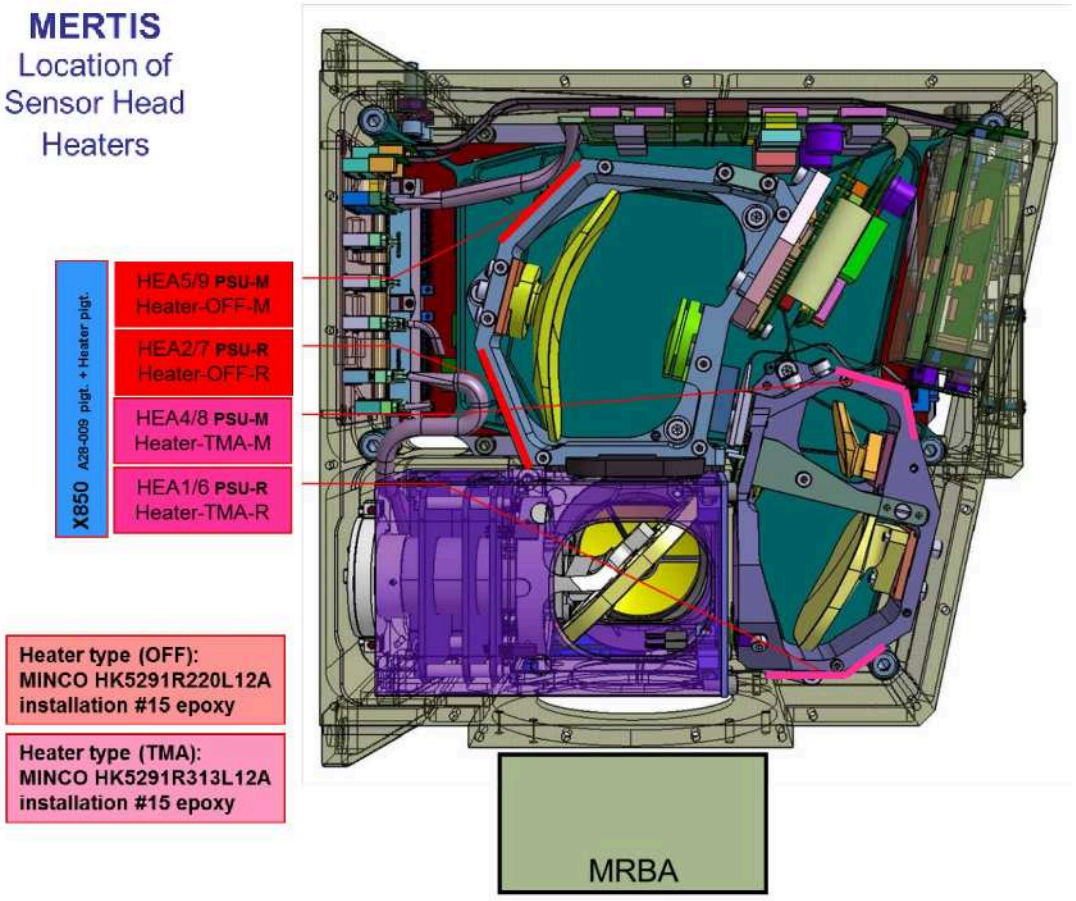


Figure 3-8: Location of MERTIS sensor head heaters

3.3.5 Temperature Monitoring

Additional to the S/C powered and MERTIS external thermistors several internal temperature sensors are located in MERTIS. They are read-out periodically by MERTIS and sent via HK to the S/C. Few measured temperatures are sent in Safe mode and all temperature values in the science modes.

All temperature sensors are doubled, one for the main and one for the redundant channel but they are mounted on the same location. They are read out either by main ICU or redundant ICU and measured values are sent as HKs either by the main or redundant SpaceWire interface

The MERTIS internal sensors are installed according to Figure 3.3-1and Table 3-6 .

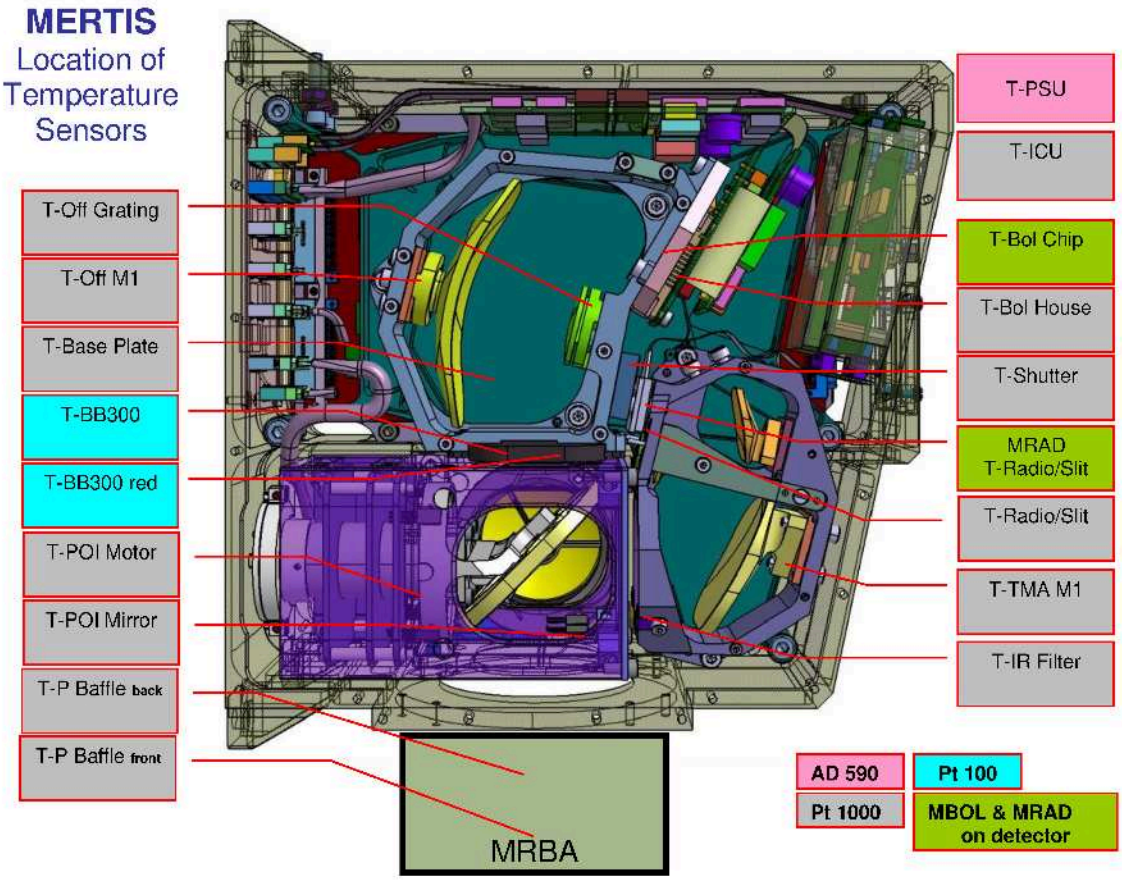


Figure 3.3-1: MERTIS Internal Temperature Sensor Location

Type	Location	Read-out by MICU	Reference in TM
Sensor Detector internal	BOL chip	Differential, CH0/1 – ADC 1	HK_TEMP_BOL_CHIP
AD 590	PSU DC/DC	Single ended, CH2 – ADC 1	HK_TEMP_PSU
Pt 1000	POI motor	Single ended, CH3 – ADC 1	HK_TEMP_POI_MOTOR
Pt 1000	POI mirror	Single ended, CH4 – ADC 1	HK_TEMP_POI_MIRROR
Status Voltage as temp.	BB7	Single ended, CH5 – ADC 1	HK_TEMP_BB7
Pt 100	BB3	Differential, CH6/7 – ADC 1	HK_TEMP_BB3
Resisitor ref. 100 Ohm	BB3 Reference	Differential, CH8/9 – ADC 1	HK_TEMP_BB3_REF
Pt 1000	RAD/Slit, Chan. A	Single ended, CH10 – ADC 1	HK_TEMP_RAD_CHA
Pt 1000	RAD/Slit, Chan. B	Single ended, CH10 – ADC 1	HK_TEMP_RAD_CHB
Pt 1000	ICU PCB	Single ended, CH14 – ADC 1	HK_TEMP_ICU
Pt 1000	RBA front	Single ended, CH0 – ADC 2	HK_TEMP_RBA_FRONT
Pt 1000	RBA back	Single ended, CH1 – ADC 2	HK_TEMP_RBA_BACK
Pt 1000	EOP IR-filter	Differential, CH2/3 – ADC 2	HK_TEMP_EOP_IR_FILTER
Pt 1000	EOP TMA M1	Differential, CH4/5 – ADC 2	HK_TEMP_EOP_TMA
Pt 1000	STS	Differential, CH6/7 – ADC 2	HK_TEMP_STS
Pt 1000	SOP grating	Differential, CH8/9 – ADC 2	HK_TEMP_SOP_GRATING
Pt 1000	OST base plate	Differential, CH10/11 – ADC 2	HK_TEMP_OST_BASE_PLATE
Pt 1000	SOP OFF M1	Differential, CH12/13 – ADC 2	HK_TEMP_SOP_M1
Pt 1000	BOL housing	Differential, CH14/15 – ADC 2	HK_TEMP_BOL_HOUSING

Table 3-6: MERTIS Temperature Sensors (Instrument controlled)

3.4. Electrical Interfaces and Grounding

Figure 3-9 shows the electrical S/C interface block diagram of the instrument.

The two power supply boards (PSU) and two instrument controller boards (ICU) are available (main and redundant), each of them has one external connector as +28V power and Spacewire interfaces. These pigtail connectors are mounted on the MERTIS housing, J02 and J04 (+28V power) or J01 and J03 (Spacewire) with short wires of about 30-40 mm length from the PCBs to the S/C connectors. The power interfaces are electrically independent from each other; also the +28V return lines are isolated from each other.

One technological/test connector (type Omnetics, J05 and J06) is soldered on each ICU which can be connected externally by removing the cover plate. The Omnetics connectors are soldered on the ICU board and are located about 20 mm behind the housing wall. Special facilities, i.e. a TIA board from DLR are needed to connect them for testing/debugging purposes via JTAG, RS232 (and Ethernet only for EM, not for QM/FM) to be performed by the MERTIS developer team only.

Internally every electrical sub-system and the temperature sensors are interfaced at the harness board (HAR).
The internal grounding star point locates on HAR (near the PSU internal interface connector) which represents the internal signal ground. It is electrically isolated from the chassis and interfaced by a thick and low resistance wire (about 50mm length) to the bonding stud J07. The bonding stud J07 is nominally connected externally to the chassis by a bar to J08.

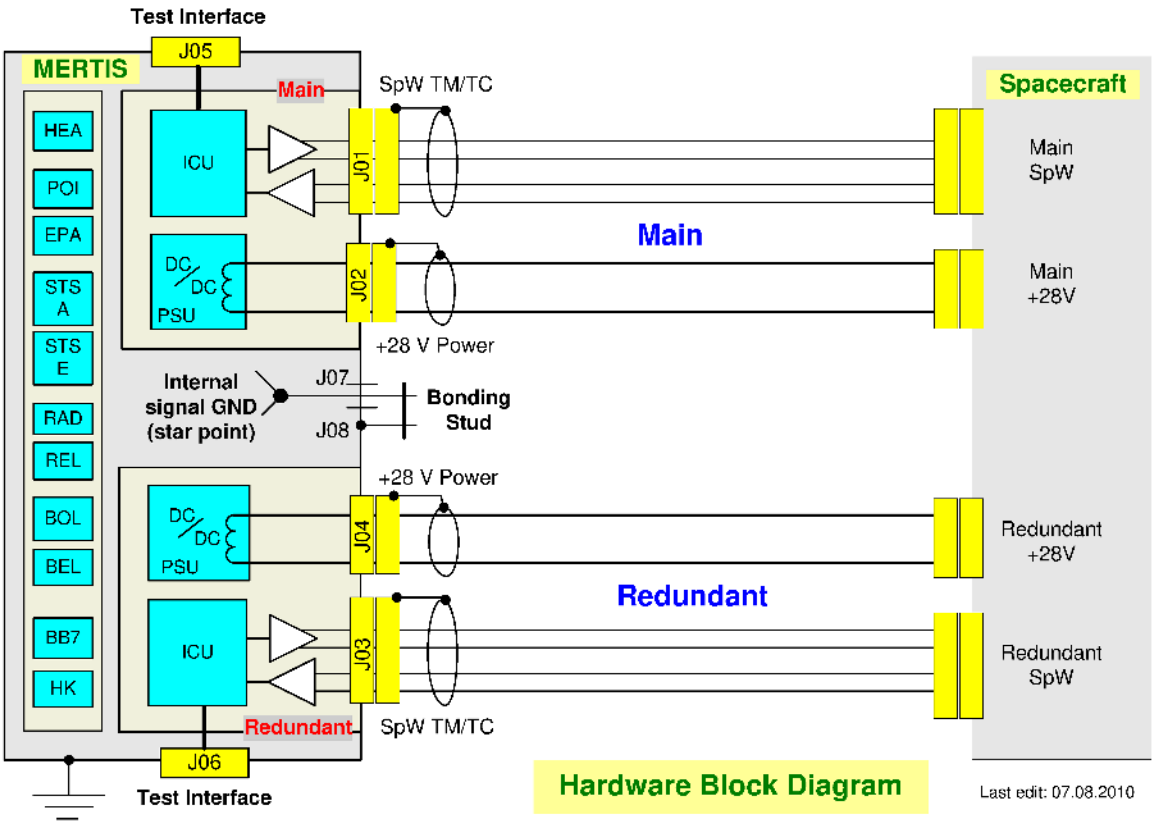


Figure 3-9: MERTIS Electrical S/C Interface Block Diagram

Note: two +28V return lines are not connected to each other.

3.4.1 Power Supply Interfaces

Power supply is performed by the S/C platform via LCL switch. MERTIS receives a DC regulated power to the +28V interface(s), either to the main +28V interface on the connector J02 or on the redundant +28V interface connector J04.
In the case of under voltage, the power is switched OFF by the instrument at about 23V with a hysteresis system which allows automatic power distribution when the voltage is coming back in the required range. The MERTIS power supply provides over temperature protection with power off at T > 100°C and a hysteresis, so it is switch-on again when it is cooled down to about 75°C.

Internally the +28V voltage is distributed to

- the DC/DC converter which generates switchable +3,4V, +7,2V and -7,2V supplying several the subsystems internally
- the Emergency Pointing Unit (EPA) internally controlled by a switch
- the cold case sensor head heaters internally controlled by a switch

All supplied components (DC/DC converter, EPA and Heaters) have a cold redundancy so that there are fully independent and electrically isolated from each other.
The DC output voltages of the main and redundant DC/DC converter(s) are cross coupled for supplying the MERTIS internal units either from the main or from the redundant DC/DC converters.

In general powering both main and redundant interfaces at the same time from the S/C is possible and would not lead to damages of MERTIS if it is operated in the IDLE or SAFE mode. But a real operation e.g. in a science mode could lead to an internal hardware conflict and is therefore forbidden.

The connector pin allocation and the input circuit diagram are shown in Appendix 6.

More details are shown in RD2.

3.4.2 SpaceWire / Data Handling Interface

MERTIS provides only two cold redundant Spacewire interfaces (main or redundant) as interface to the S/C for exchanging telecommands and telemetry data. MERTIS operates with the main or redundant interface as they are connected to the cold redundant ICU. If the main power is switched-on the main ICU and Spacewire interface works or if the redundant power is switched-on the redundant ICU and Spacewire interface works.

The interface data rate is 10Mbps, the maximum physical data rate in a real science mode is about 1,3Mbps.

The SpaceWire interface is initialized and operates about 10sec after power on due to ICU FPGA and on-board software initialization.

In Appendix 5 the pin allocation and circuit diagrams are shown.

More details are shown in RD2 and in chapter 7.2.

3.5. Telecommand and Telemetry Interface

3.5.1 TC and TM Services

3.5.1.1 Packet Services supported by MERTIS

MERTIS supports the following standard and private packet services:

Type	Kind	Service name
1	Standard	Telecommand verification
3	Standard	Housekeeping and Diagnostic Data Reporting
5	Standard	Event Reporting
6	Standard	Memory Management
9	Standard	Time Management
17	Standard	In-Flight Testing
21	Standard	Science Data Transfer
180	Private	Instrument Configuration
181	Private	Instrument Idle
182	Private	EPA Operation (Emergency Pointing Actuator)
183	Private	Instrument Test/Calibration

Table 3.5-1: MERTIS Packet Services

A set of telecommands and telemetry packets belongs to each packet service. The packet service number corresponds to the packet **Type** field in the DATA FIELD HEADER of the packet (see next

chapter). Each packet service is split into one or more sub-services corresponding to the packet **Sub-Type** field in the DATA FIELD HEADER of the packet.

The following table listed all services used by the MERTIS instrument including the service related to TC/TM packets:

Service Type	Service Sub-type	TC/TM	Packet	Description
1	1	TM	TM_TC_Acceptance_Success	TC acceptance success report
1	2	TM	TM_TC_Acceptance_Failure	TC acceptance failure report
1	7	TM	TM_TC_Execution_Success	TC success report
1	8	TM	TM_TC_Execution_Failure	TC execution failure report
3	5	TC	TC_HK_Enable	enabling HK report generation
3	6	TC	TC_HK_Disable	disabling HK report generation
3	129	TC	TC_HK_Period	period for HK report generation
3	25	TM	TM_OperationDefault_HK	default operation HK report
3	25	TM	TM_OperationExtended_HK	extended operation HK report
5	1	TM	TM_Event_Progress	progress event report
5	2	TM	TM_Event_Warning	warning event report
5	3	TM	TM_Event_Error	error event report
5	4	TM	TM_Event_Alarm	alarm event report (on-board action)
6	2	TC	TC_Memory_Load	loading memory area
6	5	TC	TC_Memory_Dump	dumping memory area
6	6	TM	TM_Memory_Dump	memory dump report
6	9	TC	TC_Memory_Check	checking memory area
6	10	TM	TM_Memory_Check	memory check report (CRC)
9	129	TC	TC_Time_Update	updating on-board timer
17	1	TC	TC_Test_Connection	testing connection to S/C
17	2	TM	TM_Test_Connection	connection test report
17	128	TC	TC_Test_MaxTcLength	test with maximum TC length
21	1	TC	TC_Science_Enable	enabling science mode
21	2	TC	TC_Science_Disable	disabling science mode
21	128	TC	TC_Reset_TM_Buffer	reset TM output buffer
21	3	TM	TM_Science_TIS_Data	TIS science data report (nom link)
21	3	TM	TM_Science_TIR_Data	TIR science data report (nom link)
21	3	TM	TM_Science_TIS_Data_QuickLook	TIS science data report (fast link)
21	3	TM	TM_Science_TIR_Data_QuickLook	TIR science data report (fast link)

Service Type	Service Sub-type	TC/TM	Packet	Description
180	1	TC	TC_EEPROM_Status	request EEPROM configuration
180	2	TM	TM_EEPROM_Status	EEPROM configuration report
180	3	TC	TC_Operation_Parameter	setting operation parameter
180	4	TC	TC_FunctionConfig_Parameter	setting function configuration param
180	5	TC	TC_Parameter_Dump	dump current parameter set
180	6	TM	TM_Operation_Parameter	operation parameter report
180	7	TM	TM_FunctionConfig_Parameter	function configuration param report
180	8	TC	TC_HK_Configuration_Status	request HK configuration
180	9	TM	TM_HK_Configuration_Status	HK configuration report
180	10	TC	TC_APS_BootMode	setting the APS boot mode
180	11	TC	TC_Diagnostic_Parameter	setting Diagnostic parameter
180	12	TC	TC_Calibration_Parameter	setting Calibration parameter
180	13	TM	TM_Diagnostic_Parameter	Diagnostic parameter report
180	14	TM	TM_Calibration_Parameter	Calibration parameter report
181	1	TC	TC_Safe_Enter	entering the Safe mode
181	2	TC	TC_StandBy_Enter	entering the StandBy mode
181	3	TC	TC_Power_Enable	enabling sub-system power
181	4	TC	TC_Power_Disable	disabling sub-system power
182	1	TC	TC_EPA_Activate	activate emergency power actuator
182	2	TC	TC_EPA_Confirm	confirm EPA activation
183	1	TC	TC_Test_Enable	enabling the Test mode
183	2	TC	TC_Test_Disable	disabling the Test mode
183	3	TC	TC_Diagnostic_Enable	enabling the Diagnostic mode
183	4	TC	TC_Diagnostic_Disable	disabling the Diagnostic mode
183	5	TC	TC_Test_Function	execution of a test function
183	6	TM	TM_TestLog	test log data report
183	7	TC	TC_Calibration_Enable	enabling the Calibration mode
183	8	TC	TC_Calibration_Enable	disabling the Calibration mode

Table 3.5-2: Packet Services and related TC/TMs

3.5.1.2 TC and TM General Packet Structure

Conventions (bit numbering, field alignment…)

Each TM and TC packet consists of a certain number of 16bit-Words (for simplicity called **Word**) , that means always an even number of octets. The maximum length is **124** words for

a **TC** and **2054** words for a **TM**. The graphical convention for a 16-bit word is the following:

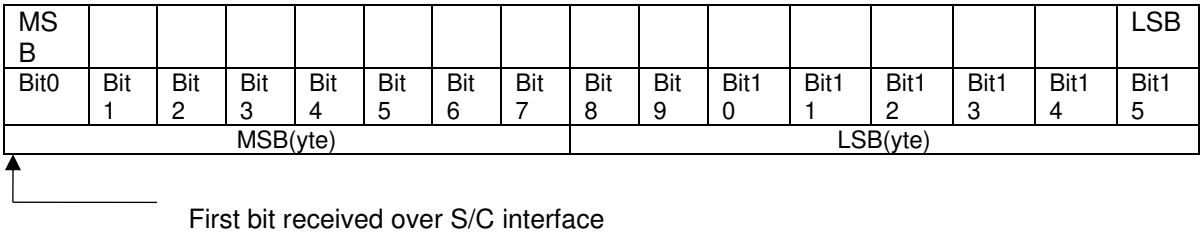


Figure 3-10: Bit numbering in TC/TM word

In a graphical representation of TC/TM packets the bit with position 0 (BitPos=0) is always the MSB (Bit0). The MSB is the first transferred bit of the word over S/C interface. The LSB (Bit15) is the last transferred bit (BitPos=15). The top word of a packet (WordPos=0) is the first word transferred over S/C interface and the bottom word (WordPos=n) is the last transferred one.

A packet consists of a number of parameters (logical items) packed into several physical 16bit-Words.

A packet parameter consists of a certain number of bits (at least one bit). The number of bits is 1…16 or a multiple of 16 bits (e.g. 32, 48). A parameter with a size <16 bits occupies only bits of one word and does not go over the word border (e.g. parameter uses Bi16/Word1 and Bit1/Word2 is not allowed).

Parameters in a packet word are right aligned (spare bits are located left/Bit1…Bitn). If a parameter uses a multiple of 16bit words (e.g. 32bit parameter) the MSW is always the first word in a packet (e.g. Word1=ParamMSW, Word2=ParamLSW).

PID, APID, SID, EID

The first word of each MERTIS TC/TM packet contains the Application Identifier (APID) which is the main identifier of a packet. The **APID** consists of two fields, the **Process ID (PID)** and the **Packet Category (PCAT)**. The PID values are specific for MERTIS, but the PCAT shows the packet category (e.g. HK data) which is common for BepiColombo payloads.

The **Structure Identifier (SID)** is used to recognize the different application parameter content for the same packet type (e,g. SID is used for HK packets which have the same APID, type and sub-type).

The **Event Identifier (EID)** is used for event report packets to identify the kind of event by means of an unambiguous number.

The following APIDs are used by the MERTIS instrument:

Process Id	Packet Category	Usage
60	12	TCs (fix for all TCs)
61	1	TM Ack-Reports for TCs
61	3	TM Parameter Reports
61	4	TM HK-Data
61	7	TM Event-Reports
61	9	TM Memory Dump/Check Reports
62	12	TM Science Data (Ka-band downlink with a latency of 1-2 weeks for Nominal Science)
63	12	TM Science Data (X-band downlink with a latency of 1-2 days for Sience QuickLook)
64	-	Reserved

Table 3.5-3: Application Process IDs

Parameter types and structure

Parameters can allocate a certain number of bits at a certain position in a packet word. Parameters can have the following types: unsigned signed, float, enum or variant.

The “enum” type is used to assign strings to a parameter number (e.g. 0=off, 1=on).

Checksums

The last packet word of each telecommand contains a 16bit checksum used for verification that the packet is received correctly. As checksum a 16bit CRC (cyclic redundancy code) is used related to the appendix A4 of the EID-A.

The following figures show the basic packet structure for TC and TM:

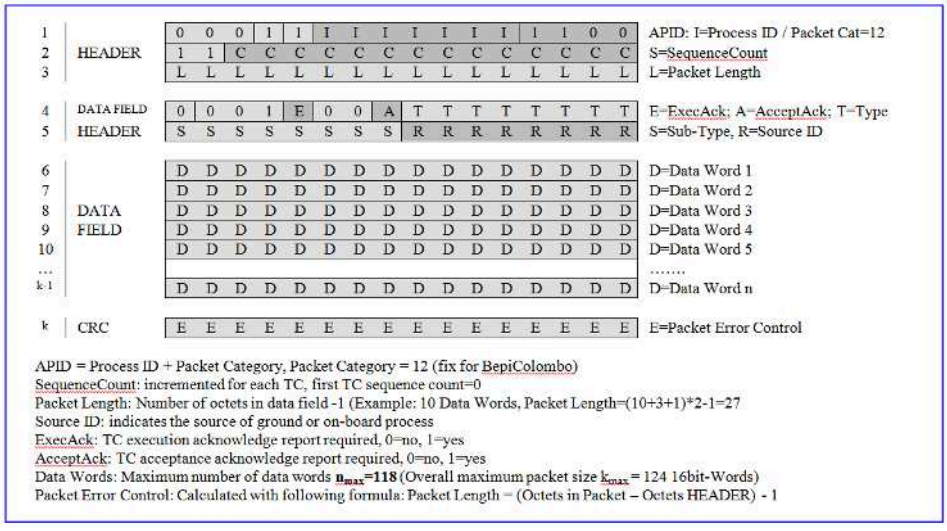


Figure 3-11: MERTIS General TC Packet Structure

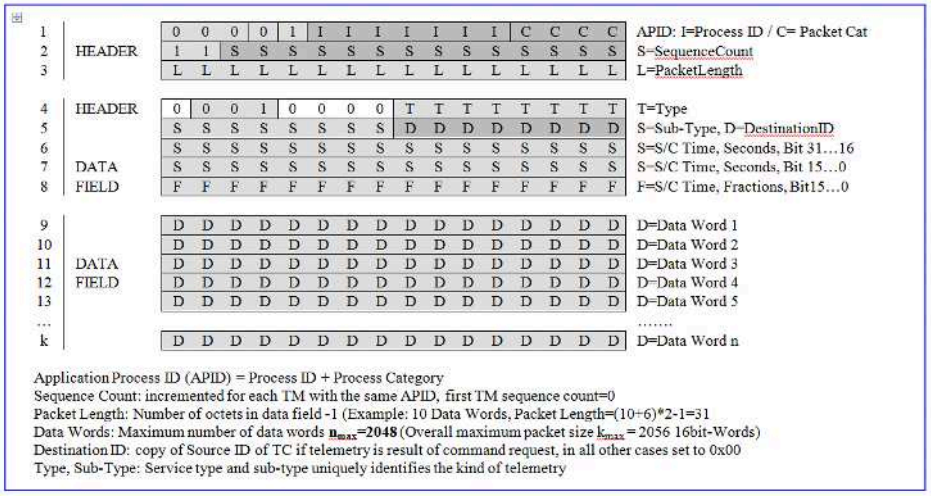


Figure 3-12: MERTIS General TM Packet Structure

The complete list and structure of MERTIS applicable telecommands and telemetry packets are provided in Appendix 9: TELECOMMAND PACKET LIST and Appendix 10: TELEMETRY PACKET LIST.

3.5.1.3 AcceptAck/ExecAck Flag Handling in TC Packet Header

The Header of telecommands contains two flags **AcceptAck** and **ExecAck**. Each flag can be set to **1(yes)** or **0(no)** which is a request for sending an acceptance success/failure or execution success/failure report as response of the instrument on a received command (Service 1). Note that the user doesn't get any response for successful or not successful acceptance or/and execution of the command if both flags are set to **0(no).** Therefore both flags are set to **1(yes)** by default.

3.5.1.4 Source/Destination Field Handling in TC and TM Packet Header

The header of each telecommand contains a field **SourceID** and the header of each telemetry packet a field **DestinationID**. The **SourceID** is the identifier of the process which sends a telecommand. This field can contain the following values:

SourceID	Meaning	Remark
0	Ground	
10	DMS	DMS = Data Management System
13	Payload Management	
14	System	
25	OBCPs	OBCP = On-Board Control Procedures
110	Mission Timeline	
111	TC Sequence	
112	Service 19 (Event/Action)	
113	Back-up MTL	MTL = Mission Timeline
120	Direct Command	

Table 3.5-4: Telecommand Source IDs

The **DestinationID** in the telemetry packet is the identifier of the process which shall receive the telemetry packet. In general the telemetry packet is the response on a telecommand request and therefore the **SourceID** is copied from the telecommand into the **DestinationID** of the corresponding telemetry packet. By this way the telemetry packets are sent to the process which has initiated an operational task. But there are some exceptions from this general rule. The following table shows setting of the **DestinationID** for different kinds of telemetry packets:

TM Packet	PID/ PCAT	Type/ SubType	Destination ID(s)	Remark/Rule
TM_TC_Acceptance_Success	61/1	1/1	10,13,14,25,110,111,112,113,120	Copy from TC
TM_TC_Acceptance_Failure(xxx)	61/1	1/2	10,13,14,25,110,111,112,113,120	Copy from TC
TM_TC_Acceptance_Failure(wrong SourceID)	61/1	1/2	0	Fix set to 0 (Ground)
TM_TC_Execution_Success	61/1	1/7	10,13,14,25,110,111,112,113,120	Copy from TC
TM_TC_Execution_Failure(xxx)	61/1	1/8	10,13,14,25,110,111,112,113,120	Copy from TC
TM_OperationDefault_HK	61/4	3/25	0	Fix set to 0 (Ground)
TM_OperationExtended_HK *	61/4	3/25	0	Fix set to 0 (Ground)
TM_Event_Progress(xxx)	61/7	5/1	0	Fix set to 0 (Ground)
TM_Event_Warning(xxx)	61/7	5/2	0	Fix set to 0 (Ground)
TM_Event_Error(xxx)	61/7	5/3	0	Fix set to 0 (Ground)
TM_Event_Alarm(xxx)	61/7	5/4	0	Fix set to 0 (Ground)
TM_Test_Connection	61/7	17/2	10,13,14,25,110,111,112,113,120	Copy from TC
TM_Memory_Dump(xxx)	61/9	6/6	0	Fix set to 0 (Ground)
TM_Memory_Check	61/9	6/10	0	Fix set to 0 (Ground)
TM_Science_TIS_Data *	62/12	21/3	0	Fix set to 0 (Ground)
TM_Science_TIS_Data_QuickLook *	63/12	21/3	0	Fix set to 0 (Ground)
TM_Science_TIR_Data *	62/12	21/129	0	Fix set to 0 (Ground)
TM_Science_TIR_Data_QuickLook *	63/12	21/129	0	Fix set to 0 (Ground)
TM_Science_HK *	62/12	21/130	0	Fix set to 0 (Ground)
TM_Science_HK_QuickLook *	63/12	21/130	0	Fix set to 0 (Ground)
TM_EEPROM_Status	61/3	180/2	0	Fix set to 0 (Ground)
TM_Operation_Parameter *	61/3	180/6	0	Fix set to 0 (Ground)
TM_FunctionConfig_Parameter *	61/3	180/7	0	Fix set to 0 (Ground)
TM_HK_Configuration_Status	61/3	180/9	0	Fix set to 0 (Ground)
TM_Diagnostic_Parameter(xxx) *	61/3	180/13	0	Fix set to 0 (Ground)
TM_Calibration_Parameter *	61/3	180/14	0	Fix set to 0 (Ground)
TM_TestLog(xxx) *	61/4	183/6	0	Fix set to 0 (Ground)

* => applicable for APS only !!

Table 3.5-5: Telemetry Packet Destination IDs

3.5.1.5 Sequence Counter Handling in TC and TM Packet Header

Both telecommands and telemetry packets contain a field **SequenceCount** used to count the number of sent/received TCs /TMs. The sequence counter of the first packet is always 0 and is incremented by 1 with each following packet of the same kind. After reaching the maximum (16383) the sequence counter starts again with 0.

The On-Board software maintains different sequence counters for different packets. For telecommands one sequence counter is used which is set by the sending process (not by MERTIS On-Board software). For telemetry packets separate sequence counters for TMs with the same APID and the same Destination ID are used which is set by the MERTIS On-Board software.

For MERTIS telemetry packets the following different sequence counters are maintained:

PID	PCAT	DestID	SeqCounter	Remark
61	1	0	SEQ_COUNT_61_1_0	TC Verification TM(1,2) for 'Wrong SourceID' sent to Ground
61	1	10	SEQ_COUNT_61_1_10	TC Verification TM(1,x) sent to DMS
61	1	13	SEQ_COUNT_61_1_13	TC Verification TM(1,x) sent to Payload Management
61	1	14	SEQ_COUNT_61_1_14	TC Verification TM(1,x) sent to System
61	1	25	SEQ_COUNT_61_1_25	TC Verification TM(1,x) sent to OBCPs
61	1	110	SEQ_COUNT_61_1_110	TC Verification TM(1,x) sent to Mission Timeline
61	1	111	SEQ_COUNT_61_1_111	TC Verification TM(1,x) sent TC-Sequences
61	1	112	SEQ_COUNT_61_1_112	TC Verification TM(1,x) sent to Service 19 (Recovery Action)
61	1	113	SEQ_COUNT_61_1_113	TC Verification TM(1,x) sent to Bach-Up Mission Timeline
61	1	120	SEQ_COUNT_61_1_120	TC Verification TM(1,x) sent to Ground command for direct execution
61	3	0	SEQ_COUNT_61_3_0	Parameter Reports TM(180,x) sent to Ground
61	4	0	SEQ_COUNT_61_4_0	HK-Data TM(3,25), TM(183,x) sent to Ground
61	7	0	SEQ_COUNT_61_7_0	Event-Reports TM(5,x) sent to Ground
61	7	10	SEQ_COUNT_61_7_10	Event-Reports TM(17,2) sent to DMS
61	7	110	SEQ_COUNT_61_7_110	Event-Reports TM(17,2) sent to Mission Timeline
61	7	111	SEQ_COUNT_61_7_111	Event-Reports TM(17,2) sent to TC-Sequences

61	7	120	SEQ_COUNT_61_7_120	Event-Reports TM(17,2) sent to Ground command for direct execution
61	9	0	SEQ_COUNT_61_9_0	Memory Dump reports TM(6,x) sent to Ground
62	12	0	SEQ_COUNT_62_12_0*	Science Data reports TM(21,x) sent to Ground
63	12	0	SEQ_COUNT_63_12_0*	Science Data QuickLook reports TM(21,x) sent to Ground

* => applicable for APS only !!

Table 3.5-6: Telemetry Packet Sequence Counters

In order to track the acceptance or execution of a sent telecommand the sequence counter of the TC is copied into the responding acceptance/execution report TM packet (see Service 1). Note that the complete sequence control field of the telecommand (second 16Bit-Word in TC HEADER) is copied into the acceptance/execution report TM packet.

3.5.1.6 Reset last error and SeqCounter

There is a possibility to reset the last error ID (HK_STAT_LAST_ERROR_ID) and all sequence counters, shown in the *TM_OperationDefault_HK* packet, to "0" (zero) in order to see that e.g. an error is occurred from a certain time after this reset.

The reset is done after disabling and re-enabling the TM HK transfer by sending *TC_HK_Disable* and *TC_HK_Enable*. This mechanism can be disabled by setting the on-board property parameter OBPAR_ICU_HK_COUNTER_RESET_WITH_HK_ENABLE to "0", by default it is “ON” (set to “1”).

3.5.2 Telecommand Receipt, Acceptance and Execution

3.5.2.1 Telecommand acceptance check

Each received telecommand is checked for its validity before execution. The list of valid telecommands for MERTIS is provided in Appendix 9: TELECOMMAND PACKET LIST. The general structure of all telecommands is shown in Figure 3-11.

The MERTIS On-Board software checks a telecommand by the following procedure:

A. Static check (check of packet layer).
B. Consistency check (check of application layer)

The **static TC check** A is performed as follows:

1. Check of packet size (check Packet Length against received bytes)
2. Check of Packet Error Control (CRC) by re-calculating CRC and comparing with received one
3. Check of correct APID (unique number for MERTIS)
4. Check the TC type and TC sub-type are valid for MERTIS
5. Check of correct Source ID (see list of valid Source IDs)

The **consistency TC check** B is performed as follows:

1. Check validity of TC type and sub-type (valid and allowed for current MERTIS mode)
2. Check that TC parameter values are in allowed range
3. Check that TC can be executed at this time (check against current mode)

Each TC which has **successfully passed** the **static check** will be confirmed by sending of a *TM_TC_Acceptance_Success* report in order to notify the user that the TC is accepted and will be executed. But this will only be done if the “TC Acceptance request bit” is set to 1(yes) in the TC header.

Each TC which has **not successfully passed** the **static check** will be confirmed by sending of a *TM_TC_Acceptance_Failure* report in order to notify the user that the TC is not accepted and therefore not executed. But this will only be done if the “TC Acceptance request bit” is set to 1(yes) in the TC header. The *TM_TC_Acceptance_Failure* contains the reason for non-acceptance in order to provide more details about the detected failure.

Each TC which has **successfully passed** the **consistency check** and was **properly executed** will be confirmed by sending of a *TM_TC_Execution_Success* in order to notify the user that the TC is successfully executed. But this is only be done if the “TC Execution request bit” is set to 1(yes) in the

TC header.

Each TC which has **not successfully passed** the **consistency check** or was **not properly executed** will be confirmed by sending of a *TM_TC_Execution_Failure* in order to notify the user that the TC is not executed. But this is only be done if the "TC Execution request bit" is set to 1(yes) in the TC header. The *TM_TC_Execution_Failure* contains the reason for non-execution in order to provide more details about the detected failure.

Each command which has successfully passed the static and consistency check will be executed by MERTIS.

Step 3 of the consistency check fails if the telecommand can not be executed at this time or in the current instrument status. For instance the command *TC_Science_Enable* will be rejected if the current MERTIS mode is **Safe**.

The following table shows which command can be executed in which modes:

MERTIS TCs	TC_Safe_Enter	TC_StandBy_Enter	TC_Power_Enable	TC_Power_Disable	TC_Test_Enable	TC_Test_Disable	TC_Diagnostic_Enable	TC_Diagnostic_Disable	TC_Diagnostic_Parameter(xxx)	TC_Science_Enable	TC_Science_Disable	TC_HK_Enable	TC_HK_Disable	TC_HK_Period	TC_Memory_Load	TC_Memory_Dump	TC_Memory_Check	TC_Time_Update	TC_Test_Connection	TC_Test_MaxTcLength	TC_Reset_TM_Buffer	TC_EEPROM_Status	TC_Operation_Parameter	TC_FunctionConfig_Parameter	TC_Parameter_Dump	TC_HK_Configuration_Status	TC_APS_BootMode	TC_EPA_Activate	TC_EPA_Confirm	TC_Test_Function(xxx)	TC_Calibration_Enable	TC_Calibration_Disable	TC_Calibration_Parameter	TC_Test_Function(POIMoveSteps)
Nr MERTIS Mode																																		
1 Safe	x	x										x	x	x	x	x	x	x	x		x	x				x	x							
2 StandBy	x	x	x		x		x		x			x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x				x	
3 WarmUp	x	x	x	x			x		x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x					x		x	x
4 Science_High_Res1	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
5 Science_High_Res2	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
6 Science_High_Res3	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
7 Science_Med_Res4	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
8 Science_Med_Res5	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
9 Science_Med_Res6	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
10 Science_Low_Res1	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
11 Science_Low_Res2	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
12 Science_Low_Res3	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
13 Science_TIR_Only	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
14 Calibration	x	x									x	x	x	x		x	x	x	x	x	x	x	x	x	x	x						x	x	
15 WarmUp_Heated	x	x	x	x						x		x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
16 Pointing_BB3View	x	x	x	x								x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
17 Pointing_PlanetView	x	x	x	x								x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
18 Science_TIS_Only	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
19 Science_TIR_Only_Heated	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
20 Science_High_Res_UnCompr	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
21 Science_High_Res_Heated	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
22 Science_Low_Res_Heated	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
23 Science_Raw	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
24 Science_PlanetView	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
25 Diagnostic	x	x						x				x	x	x		x	x	x	x	x	x	x			x	x								
26 Test	x	x				x						x	x	x		x	x	x	x	x	x	x				x				x				x
27 Science_Reduced_Swath1	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
28 Science_Reduced_Swath2	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
29 FullWin_UnCompr	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
30 FullWin_Compr	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x
50 UserDefined	x	x	x							x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x								x

X -> TC is allowed in this MERTIS Mode

Last edit: 03.07.2013

Table 3.5-7: Telecommand check against mode

The status of received and executed telecommands is reported in the *TM_OperationDefault_HK* packet which is nominally sent every 20sec (see parameters HK_STAT_NUM_TC_RECEIVED and HK_STAT_NUM_TC_EXECUTED in HK packet). Nominally the number of received and executed commands is equal if all received commands are accepted and executed.

3.5.2.2 Telecommand acceptance/execution timing

Nominally (acceptance/execution report request bit set in TC) each TC will be confirmed by sending of a *TM_TC_Acceptance_Success/ TM_TC_Acceptance_Failure* report after acceptance/non-acceptance and a *TM_TC_Execution_Success/ TM_TC_Execution_Failure* report after successful/not successful execution (more details see last chapter).
The acceptance/non-acceptance report (Service(1,1)/Service (1,2)) is sent by MERTIS **<0,5sec** after sending the command.
Sending of the execution success or failure report (Service(1,7)/Service (1,8)) depends on the operational condition of the instrument (e.g. phase of science data acquisition or processing) or the

execution duration of the function to be commanded by TC.
The following table provides the maximum reaction times for sending of the execution success report (Service(1,7)) for each command applicable for MERTIS:

Packet Name	Type	Sub-Type	SID/ EID	Max. Time (sec) for reception TM(1,7)	Remark
TC_HK_Enable *ZMR00001*	3	5	--	<1	
TC_HK_Disable *ZMR00002*	3	6	--	<1	
TC_HK_Period *ZMR00003*	3	129	--	<1	
TC_Memory_Load *ZMR00004*	6	2	--	<1	Load EEPROM with 226 Bytes (max TC capacity)
TC_Memory_Dump *ZMR00005*	6	5	--	<20sec	Dump 1MBytes from EEPROM
TC_Memory_Check *ZMR00006*	6	9	--	<2	Check 1MBytes from EEPROM
TC_Time_Update *ZMR00007*	9	129	--	<1	
TC_Test_Connection *ZMR00008*	17	1	--	<1	
TC_Test_MaxTcLength *ZMR00009*	17	128	--	<1	
TC_Science_Enable *ZMR00010*	21	1	--	<3	
TC_Science_Disable *ZMR00011*	21	2	--	<10	Depends on the current science data acquisition phase
TC_Reset_TM_Buffer *ZMR00012*	21	128	--	<2	
TC_EEPROM_Status *ZMR00013*	180	1	--	<2	
TC_Operation_Parameter *ZMR00014*	180	3	--	<5	
TC_FunctionConfig_Parameter *ZMR00015*	180	4	--	<8	
TC_Parameter_Dump *ZMR00016*	180	5	--	<1	
TC_HK_Configuration_Status *ZMR00017*	180	8	--	<1	
TC_APS_BootMode *ZMR00018*	180	10	--	<2	
TC_Diagnostic_Parameter *ZMR00058*	180	11	--	<3	
TC_Calibration_Parameter *ZMR00022*	180	12	--	<1	Execution Failure TM(1,8) (not implemented yet)
TC_Safe_Enter *ZMR00023*	181	1	--	<3 <20 until boot msg	
TC_StandBy_Enter *ZMR00024*	181	2	--	<6 <40 until boot msg	Max. time for booting APS executable from mode Safe
TC_Power_Enable *ZMR00025*	181	3	--	<3	
TC_Power_Disable *ZMR00026*	181	4	--	<3	
TC_EPA_Activate *ZMR00027*	182	1	--	<2	
TC_EPA_Confirm *ZMR00028*	182	2	--	<2	Note that Execution Success report only sent if <30sec before

					TC_EPA_Activate is sent
TC_Test_Enable *ZMR00029*	183	1	--	<2	
TC_Test_Disable *ZMR00030*	183	2	--	<2	
TC_Diagnostic_Enable *ZMR00031*	183	3	--	<10	
TC_Diagnostic_Disable *ZMR00032*	183	4	--	<7	
TC_Test_Function(WatchdogEnableDisable) *ZMR00033*	183	5	1	<1	
TC_Test_Function(SubSystemPower) *ZMR00034*	183	5	2	<2	
TC_Test_Function(POIMovePosition) *ZMR00035*	183	5	3	<5	Depends on POI position moved to, max. time for 270deg
TC_Test_Function(DataAcquisitionStart) *ZMR00036*	183	5	4	<10	
TC_Test_Function(DataAcquisitionStop) *ZMR00037*	183	5	5	<10	
TC_Test_Function(EventEnableDisable) *ZMR00038*	183	5	6	<2	
TC_Test_Function(WatchdogReset) *ZMR00039*	183	5	7	N/A	It is an immediately board reset, execution report is sent
TC_Test_Function(SingleHKRequest) *ZMR00040*	183	5	8	<2	
TC_Test_Function(SetPropertyParam) *ZMR00041*	183	5	9	<2	
TC_Test_Function(ExecuteCmd) *ZMR00042*	183	5	10	<2	
TC_Test_Function(SetICURegisterBit) *ZMR00043*	183	5	11	<2	
TC_Test_Function(SetPOIMode) *ZMR00044*	183	5	12	<2	
TC_Test_Function(POIMoveSteps) *ZMR00045*	183	5	13	<5	Depends on number of steps to be moved, max. time for 270deg
TC_Test_Function(ShutterOpenClose) *ZMR00046*	183	5	14	<2	
TC_Test_Function(TECDataMeasurement) *ZMR00048*	183	5	16	<2	
TC_Test_Function(RegisterSampling) *ZMR00049*	183	5	17	<2	
TC_Test_Function(DebugOnOff) *ZMR00050*	183	5	18	<2	
TC_Test_Function(RADRawDataOnOff) *ZMR00057*	183	5	19	<2	
TC_Test_Function(GetPropertyParam) *ZMR00059*	183	5	20	<2	
TC_Test_Function(GetPropertyParamAll) *ZMR00060*	183	5	21	<10	
TC_Test_Function(TECControl) *ZMR00051*	183	5	30	<2	
TC_Calibration_Enable *ZMR00052*	183	7	--	<1	Execution Failure TM(1,8) (not implemented yet)
TC_Calibration_Disable *ZMR00053*	183	8	--	<1	Execution Failure TM(1,8) (not implemented yet)

ZMR000xx => ID of the command in SCOS2000 database

Table 3.5-8: TC Execution Report Timing

3.5.3 Telemetry Generation and Transfer

MERTIS sends telemetry packets as response on telecommand requests or autonomously (HK packets or events). The complete list of telemetry packets which can be sent by the MERTIS On-Board software is provided in Appendix 10: TELEMETRY PACKET LIST. The general structure of all telemetry packets is shown in Figure 3-12.

Telemetry packets are time stamped with the time when the packet was build. This might be different from the time when the source data for the application data of the packet are acquired or collected. Therefore science telemetry packets (e.g. *TM_Science_TIS_Data*) contain an additional time (e.g. HK_STAT_TIS_DATA_ACQ_TIME) which is the time when source science data are acquired. This data acquisition time is needed for on-ground science data processing.

All time fields in telemetry packets have a CUC format with 32Bits seconds and 16Bits fractions of seconds. This is a relative time in seconds elapsed since the EPOCH. The EPOCH (e.g. NASA uses often 1. January 1958) is the data/time from where the seconds of the CUC are counted. For BepiColombo the EPOCH is defined with **22.08.1999 00:00:00.0000**.

The TM time stamp is obtained from the on-board SCET timer. The on-board timer will be synchronized with the BepiColombo system time by means of **Service 9** (Time Management).

Telemetry packets will be stored in a **TM buffer** after generating and before sending over the SpW interface to S/C. If the SpW interface is free TM packets are sent. MERTIS is able to store TM packets for at least **15 msec** in case the SpW interface is not free (S/C latency).

3.5.4 On-Board Timer Synchronisation

The MERTIS on-board timer runs with an inaccuracy of about 1,7sec/day. Therefore the timer must be synchronized continuously at least once in an hour.

MERTIS uses two possibilities, provided from the system, to synchronize the on-board timer:
- Synchronize time with received time from command *TC_Time_Update*
- Synchronize time with received time (6Bits of seconds) from SpW time codes

Synchronization on-board timer with *TC_Time_Update*
After power-on MERTIS the on-board timer will be synchronized with the BepiColombo system time by means of the **Service 9** (Time Management). After receiving the command *TC_Time_Update* the on-board timer will be set with the received time with the next incoming SpW time code.
If MERTIS doesn't receive a *TC_Time_Update* command within the first 60 seconds after power-on the on-board timer will be started unsynchronized (MSBit of time set to '1', start value 0x80000000:0x0000).

Synchronization on-board timer with SpW time codes
After receiving of each time code the deviation between the time code and the on-board time will be observed. If the deviation is greater than the configured maximum value, the on-board timer speeds up or slows down in order to make a gradual adjustment. This ensures that the on-board time is always monotonically increased. The adjustment will be done in range of +/-0.5%. That means the number of microseconds per 1ms tick of the on-board timer varies in the range of 995 to 1005.

The synchronization of the on-board time can be configured with following on-board property parameters:

OBPAR_SPW_GRSPW_SYSTIME_ADJUST_ENABLE
Enable the on-board timer synchronization. Default value is 1=enable.

OBPAR_SPW_GRSPW_SYSTIME_DEVIATION_MAX
Set the acceptable absolute maximum deviation between time code and on-board timer. Default value is 0,5ms.

The proper timer synchronization can be checked by reading out the following on-board variables:

OBVAR_SPW_GRSPW_TIMER_RELOAD
Current number of microseconds per 1ms tick.

OBVAR_SPW_GRSPW_SYSTIME_DEVIATION
Current deviation between on-board time and time code.

The deviation between on-board time and time code is reported in *TM_OperationExtended_HK* by parameter HK_STAT_OBTIME_SYNC_DELTA. Note that the synchronization of the on-board timer with SpW time codes is only performed by the APS and not by the PBS (no science data acquisition).

3.5.5 HK Reporting

MERTIS sends periodically HK telemetry packets (default every 20sec) in order to provide information about the current instrument status starting after power-on and on-board timer synchronization.

There are two kinds of HK telemetry packets sent by the MERTIS on-board software:
- Operation Default HK (packet *TM_OperationDefault_HK*) sent by PBS/APS
- Operation Extended HK (packet *TM_OperationExtended_HK*) sent by APS only

The Operation Default HK contains basic instrument status information e.g. ICU voltage, current and temperature, TC/TM counters or the last error event status.

The Operation Extended HK contains additional instrument status information needed especially for science data processing e.g. all temperatures of the optical channels and detectors.

The period of HK telemetry generation and sending can be adjusted by means of command *TC_HK_Period* separately for each kind of HK packet (Default/Extended HK) or for both.

HK telemetry generation and sending can be enabled or disabled by means of commands *TC_HK_Enable* or *TC_HK_Disable* separately for each kind of HK packet (Default/Extended HK) or for both.

By means of command *TC_HK_Configuration_Status* it is possible to get the current HK configuration status (period, enabled/disabled) for each kind of HK packet (Default/Extended HK). This is useful especially if HK generation is disabled. The response on this request command is a *TM_HK_Configuration_Status* which contains the read HK status information.

3.5.6 Event Reporting

MERTIS sends different kinds of events in order to notify the user about a reached progress of processing or about a not nominal or not expected behaviour of the MERTIS instrument.

Each event is notified by sending of an event telemetry packet. The event itself is unambiguous identified by a number or so-called **EventID** which is the first application parameter in the event packet.

MERTIS uses the following ranges for the **EventIDs** (EIDs):

EID range	Usage	Packet Name	Type, SubType
42000 … 42199	Progress events	*TM_Event_Progress*	5,1
42200 … 43799	Warning “Anomaly” events	*TM_Event_Warning*	5,2
43800 … 43899	Error “Ground Action” events	*TM_Event_Error*	5,3
43900 … 43999	Alarm “OnBoard Action” events	*TM_Event_Alarm*	5,4

Table 3.5-9: Event ID ranges

Progress events are sent in case that a certain important step of on-board processing is finished which is for instance important to proceed with an operational sequence. An example is the boot message sent after successful boot of the APS.

Warning events are sent in case that a not nominal condition is detected but no on-ground or on-board action is needed. At the most of the cases the user can proceed with operation.

Error events are sent in case that a not nominal condition is detected which requires an on-ground action before continuing with operation.

Alarm events are sent in case that a not nominal critical condition is detected which requires an on-board action to protect the instrument against damaging.

For contingency cases it is possible to supress sending of a certain event by sending command *TC_Test_Function(EventEnableDisable)*. For that purpose set parameters PAR_EVENT_ENABLE_DISABLE=0/disabled and PAR_EVENT_ID to the identifier of the event (see event list in appendix). Sending of the event can be enabled again by sending *TC_Test_Function(EventEnableDisable)* with PAR_EVENT_ENABLE_DISABLE=1/enabled.
Note that detection and handling of the event still will be done by the on-board software even though it is disabled. In *TM_OperationDefault_HK* a detected event is still reported in parameter HK_STAT_LAST_ERROR_ID.

Details about event parameter definition are provided in Appendix 11: EVENT LIST.

3.5.7 Memory Management

Each memory area (RAM, EEPROM, …) can be accessed by using the Memory Management Service6. Memory areas can be read, written or checked using dedicated telecommands.

The access can be performed at low level by giving only the memory address and a size of the accessed memory area. The size of the memory area is always to provide in number of bytes. The address area in the command will be checked by the on-board software before execution. The access type (read/write) of the requested memory and the availability of the address area will be checked.

The Memory Management service 6 is used especially for uploading of a new APS executable or configuration into EEPROM/RAM for maintenance purpose.

The following table list all MERTIS memory types with address range and access type:

Memory Name	Start Address	End Address	Item Size (in bits)	MemorID	Description
RAM	0x4000 0000	0x47FF FFFF	32	110	RAM area for program and data of running applications
EEPROM	0x2000 0000	0x201F FFFF	16	111	Permanent read- and writable memory for storage of MABS
REGISTER	0x8000 0000	0x9FFF FFFF	32	112	Register set for controling of MERTIS sub-systems
PROM	0x0000 0000	0x0000 7FFF	8	113	Permanent read-only memory for storage of PBS
AHBRAM	0x3800 0000	0x3800 03FF	32	114	AHBRAM AHB-bus memory
VRAM	0x2020 0000	0x203F FFFF	16	115	VRAM virtual memory

Table 3.5-10: Memory Types Service 6

For loading a memory area the *TC_Memory_Load* command can be used. By a single upload command up to 226 bytes data can be loaded into the memory.

For dumping a memory area the *TC_Memory_Dump* command can be used. Due to a known limitation of the BepiColombo system the user shall request only 4086 bytes memory as maximum by one single dump command request. That implies that ONE dump command TC_Memory_Dump initiates sending of only ONE dump telemetry packet *TM_Memory_Dump* with the maximum size of 4086 bytes. Using this operational approach for memory dump bursts of service 6 dump telemetry packets shall be avoided. Larger memory areas must be dumped by means of a series of dump request commands.
Normally by means of one single dump command the user can read the complete memory related to a memory type (Memory ID). As response on a *TC_Memory_Dump* the user gets one or more (depends on the size) *TM_Memory_Dump* packets where each packet contains a piece of the requested memory area. But due to the above mentioned reason this approach shall NOT be used.
Note that the sequence flags in the sequence control field of the header are not used for MERTIS. Each dump packet is a single independent packet. The dumped memory block can be composed on-ground by using the address within the packet.

For checking a memory area the *TC_Memory_Check* command can be used. By means of one single check command the user can check the complete memory related to a memory type (Memory ID). As response on a *TC_Memory_Check* the user gets one *TM_Memory_Check* packet containing the 16Bit-CRC calculated on-board for the content of the requested memory area.

3.5.8 In-Flight Diagnose and Test Service

MERTIS has several means for testing the proper function and performance of the instrument. For that purpose an in-flight **Diagnostic** mode and a **Test** mode can be used.

The **Test** mode can be activated from the **StandBy** mode. In the Test mode low level instrument control can be performed. This mode summarizes all not nominal applicable modes mainly for on-ground verification purposes (e.g. debugging, direct hardware access, etc.). From the Spacecraft point of view this mode is similar to a Science mode but not applicable on-board or only in exceptional cases. Starting of the **Test** mode is possible by command *TC_Test_Enable*. Termination of the **Test** mode can be done by command *TC_Test_Disable*. There are a set of commands named *TC_Test_Function(function)* available in **Test** mode to perform different test operations. The complete list of test commands are provided in the TC list in appendix of the document.

A **Diagnostic** mode is foreseen which can be entered from the **WarmUp** mode. In the **Diagnostic** mode all sub-systems of MERTIS are checked for proper function. This mode is used to check the health and performance of the instrument after longer switch-off time and before starting a new

science session. Starting of a **Diagnostic** mode is possible by the the command *TC_Diagnostic_Enable*. Termination of the Test mode can be done by the command *TC_Diagnostic_Disable*.

In detail the On-board **Diagnostic** can be used to:

- verify the hardware function of all sub-systems which is feasible using the existing hardware design
- verify the optical performance without any external optical targets, using only the internal calibration devices
- provide calibration parameters which have to be determined shortly or each time before MERTIS operation or which are difficult to determine by on-ground data processing/analysis

After activation of the **Diagnostic** mode all instrument sub-systems are tested sequentially and the result (OK/NOK) of each test case is reported by Progress-Events *TM_Event_Progress(DiagnoseStepFinished)* .

In order to check the health condition of each sub-system, science data and/or housekeeping data are acquired and evaluated on-board. In case of not successful performed tests the acquired science data and/or housekeeping data, which were the input of the performed checks, are sent as telemetry for farther on-ground evaluation.

The **Diagnostic** mode can be configured by the command *TC_Diagnostic_Parameter*. Each sub-system test case can be enabled or disabled by means of parameters PAR_DIAG_STEP_ENABLE_X. The debug mode can be activated or deactivated by the parameter PAR_DIAG_DEBUG_ENABLE. In addition the pass/fail criteria can be configured by setting dedicated property parameters in order to tune the **Diagnostic** mode.

In addition to the normal operation the **Diagnostic debug mode** can be activated in order to get the acquired science data and/or housekeeping data in any case sent as telemetry for on-ground evaluation and calibration of the **Diagnostic** mode.

After finishing of the Diagnostic procedure (all steps are performed) the On-Board software leaves the **Diagnostic** mode autonomously and enters the **WarmUp** mode. The user can interrupt the time consuming Diagnostic procedure and enter the **WarmUp** mode explicitly before finishing by the telecommand *TC_Diagnostic_Disable* e.g. in case of not successful checks.

The following **Diagnostic** test steps will be executed in this mode assumed they are enabled:

Diag Step	Content of test	Pass/Fail criteria	Error event
TIS_COMP (1)	TIS data (pattern) are compressed and the compression result is checked	Compression ratio > minimum expected ratio	TM_Event_Error(TIS_COMP Diagnose Failed) EID=43834=EVENT_TIS_COMP_DIAG_FAILED
SHH (2)	Heating function of the sensor head heater is checked	With a certain heating power the temperature increase >= minimum expected increase	TM_Event_Error(SHH Diagnose Failed) EID=43829=EVENT_SHH_DIAG_FAILED
ANALOG_HK (3)	Check of analog HKs (temperatures and voltages)	- standard deviation <= max allowed standard deviation - minimum value >= minimum allowed value - maximum value <= maximum allowed value	TM_Event_Error(ANALOG_HK SHTemp Diagnose Failed) EID=43836=EVENT_ANA_SH_TEMP_DIAG_FAILED TM_Event_Error(ANALOG_HK Temp Diagnose Failed) EID=43821=EVENT_ANA_TEMP_DIAG_FAILED TM_Event_Error(ANALOG_HK Volt Diagnose Failed) EID=43822=EVENT_ANA_VOLT_DIAG_FAILED
POI_SENSOR (4)	Moving the POI to different targets step by step and check the	POI sensor status = expected POI sensor status	TM_Event_Error(POI_SENSOR Diagnose Failed) EID=43805=EVENT_POI_SENSOR_DIAG_FAILED

	expected sensor position status		
POI_ACCURACY (5)	Moving POI several times between targets BB300 and then BB700, correct the BB700 image with the BB300 image, calculate the barycenter and check the accuracy of pointing by checking the expected range of barycentre values	BB7 difference image barycentre <= allowed maximum difference	TM_Event_Error(POI_ACCURACY Diagnose Failed) 43835=EVENT_POI_ACCURACY_DIAG_FAILED
BOL_BEL (6)	Check of Bolometer electronics by calculating the image standard diviation and SNR value	- standard deviation <= max allowed standard deviation - SNR >= minimum expected SNR	TM_Event_Error(BOL_BEL Diagnose Failed) EID=43824=EVENT_BOL_BEL_DIAG_FAILED
BOL_WINDOW (7)	5 different windows are read out in pattern mode and compared with the expected content	Number of pattern failures = 0	TM_Event_Error(BOL_WINOW Diagnose Failed) EID=43825=EVENT_BOL_WINDOW_DIAG_FAILED
TEC_CONTROL (8)	Check function of TEC controller by calculation of standard deviation of BOL chip temperature	Standard deviation BOL chip temperature <= maximum allowed standard deviation	TM_Event_Error(TEC_CONTROL Diagnose Failed) EID=43826=EVENT_TEC_CONTROL_DIAG_FAILED
STS_MOVE (9)	Check opening and closing of the shutter	-Opening and closing times <= allowed maximum - Shutter current <= allowed maximum - Shutter current >= allowed minimum	TM_Event_Error(STS_MOVE Diagnose Failed) EID=43827=EVENT_STS_MOVE_DIAG_FAILED
RAD_REL (10)	Check of radiometer electronics by calculation of the pixel standard deviation	- Pixel standard deviation >= allowed minimum standard deviation - Pixel standard deviation <= allowed maximum standard deviation	TM_Event_Error(RAD_REL Diagnose Failed) EID=43828=EVENT_RAD_REL_DIAG_FAILED

Table 3-11: List of Diagnostic test steps

3.5.9 Science Data Transfer

In order to start science data acquisition the user has to configure and start a **Science** mode. The complete list of all MERTIS modes is provided in table of Appendix 8, where only subsets are **Science** modes. The reached Science mode depends on the Operational parameters set by the user before starting the acquisition.

After entering a **Science** mode MERTIS starts science data acquisition related to the built sub-mode. The built sub-mode depends on the current operational parameter (see mode table). The HK telemetry *TM_OperationDefault_HK* and *TM_OperationExtended_HK* is sent (if enabled). In addition MERTIS starts sending of science telemetry (*TM_Science_TIS_Data, TM_Science_TIR_Data*) every acquisition cycle period (parameter PAR_REPITITION_RATE) and related to the in-flight **calibration cycle**. In addition MERTIS sends quick-look science telemetry (*TM_Science_TIS_Data_QuickLook, TM_Science_TIR_Data_QuickLook*) every quick-look period (parameter PAR_TIS/TIRSCIENCE_QUICKLOOK_PERIOD) if enabled (parameter PAR_PROCESS_ID=63).

Science Mode Configuration

A MERTIS Science mode will be defined by setting the Operation Parameter by *TC_Operation_Parameter* (more details see execution of command). As result of sending the TC the

APS shall build the right mode related to MERTIS mode table (see appendix).

Start and stop of Science mode
The user can start a Science mode by the command *TC_Science_Enable* and stop the science data acquisition by the command *TC_Science_Disable*. Both commands have a parameter PAR_PROCESS_ID to set a defined process identifier (62 or 63). The process ID defines the way for downlinking the science data (62=Ka-band, 63=X-band). Over the Ka-band the data transfer time to ground has a latency of about 3 weeks and over the X-band about 3 days, thus X-band is much faster.
If process ID 62 is enabled MERTIS sends 'nominal' science data by telemetry packets *TM_Science_TIS_Data* and *TM_Science_TIR_Data*. If process ID 63 is enabled MERTIS sends 'quick look' science data by telemetry packets *TM_Science_TIS_Data_QuickLook* and *TM_Science_TIR_Data_QuickLook*.
Note that it is not possible to enable/disable both process IDs 62 and 63 by sending one command *TC_Science_Enable / TC_Science_Disable* if 'nominal' and 'quick look' science shall be used. In that case the user has to send the commands twice, one for process ID 62 and one for process ID 63.

More details about science data processing are provided in chapter 7.6.

3.5.10 Private Packet Services

In addition to the standard packet services MERTIS uses specific private packet services for operating the instrument (see Table 3.5-1). The Table 3.5-2 provides the list of available telecommands to activate private service operations and the related telemetry packets produced as result.

The MERTIS private services are mainly used for instrument configuration (service 180), for idle operations from **StandBy** (service 181), for EPA operation (service 182) and for instrument test and calibration (service 183).

More details are provided in the following chapters.

3.5.10.1 Private Service 180 – Instrument Configuration

The Private Service 180 is used for setting and reading the MERTIS instrument configuration.

The user can read the current on-board software configuration from EEPROM by *TC_EEPROM_Status(180/1)* and change the configuration related to APS boot mode by means of *TC_APS_BootMode(180/10*). As answer on a *TC_EEPROM_Status* the user gets an *TM_EEPROM_Status(180/2*).

In order to get the current HK generation status the user can send a *TC_HK_Configuration_Status(180/8)* command and he gets as answer a *TM_HK_Configuration_Status(180/9).*

The user can configure Operational parameters by *TC_Operation_Parameter(180/3)* and the Functional Configuration parameter by *TC_FunctionConfig_Parameter(180/4)*.
For setting the Diagnostic mode parameters the user can send a *TC_Diagnostic_Parameter (180/11)*.
For setting the Calibration mode parameters the user can send a *TC_Calibration_Parameter (180/12).*

The user can read the currently used parameter values by means of *TC_Parameter_Dump(180/5)* and he gets as answer a *TM_Operation_Parameter(180/6),* a *TM_FunctionConfig_Parameter(180/7)*, a *TM_Diagnostic_Parameter(180/13)* and a *TM_Calibration_Parameter(180/14).*

3.5.10.2 Private Service 181 – Instrument Idle

The Private Service 181 is used for changing the 'idle' modes. These are the modes where no science data telemetry is produced.

For entering the **Safe** mode from any other mode the user can use the command *TC_Safe_Enter(181/1).*This performs a re-boot of the on-board software and starting of the PBS located in PROM.

For entering the **StandBy** mode from any other mode the user can use the command *TC_StandBy_Enter(181/2).* This performs terminating of any science data acquisition and switching-off the power of sub-systems. Note that sending of this command from Safe mode causes a boot of the APS executable which is set as active executable in EEPROM boot mode.

By means of the command *TC_Power_Enable(181/3)* the user can enter the **WarmUp** mode. The power of all sub-systems, configured by *TC_Operation_Parameter(180/3)* will be switched-on in order to reach a thermal stabilization of the instrument.

By means of command *TC_Power_Disable(181/4)* the user can leave the **WarmUp** mode and return to the **StandBy** mode. The power of all sub-systems will be switched-off.

3.5.10.3 Private Service 182 – EPA Operation

The Private Service 182 is used for operating the Emergency Pointing Actuator (EPA) which moves the pointing mirror into the **PlanetView** position if the nominal POI operation doesn't work anymore due to a hardware malfunction.

In order to activate the one-shot mechanism of the EPA the user have to send the commands *TC_EPA_Activate(182/1)* and shortly after the command *TC_EPA_Confirm(182/2*). Note that this operation is not reversible. If the EPA is released the POI mirror stays always in the **PlanetView** position and cannot be moved the other targets anymore.

3.5.10.4 Private Service 183 – Instrument Test/Calibration

The Private Service 183 is used for on-ground test and calibration purpose, but can also be used on-board for problem investigation and solution.

By means of the command *TC_Test_Enable(183/1)* the user can enter the **Test** mode. In this mode all commands of type *TC_Test_Function(name)(183/5)* are available and can be executed.

By means of the command *TC_Test_Disable(183/2)* the user can leave the **Test** mode and enter the **StandBy** mode again.

By means of the command *TC_Diagnostic_Enable(183/3)* the user can enter the **Diagnostic** mode. The **Diagnostic** procedure is started to check the proper function and performance of the MERTIS instrument. This can take about half an hour or more. After finishing the **Diagnostic** procedure MERTIS returns autonomously to the **WarmUp** mode. If the user wants to abort the time-consuming **Diagnostic** procedure before it is finished, he can send the command *TC_Diagnostic_Disable(183/4).*

4. INSTRUMENT OPERATION

4.1. Operating Principle

The general concept for MERTIS flight operation is described in RD5 (MERTIS Flight Operation Plan). Before science operation the MERTIS sensor head has to achieve stable thermal conditions. Therefore after powering-on a Warm-up mode have to be performed which takes minutes up to hours depends on the thermal conditions of the thermal interfaces to the S/C. Starting a science mode MERTIS performs a periodic measurement cycle acquiring data from the planet and the in-flight calibration sources (see chapter 2.3.2).

4.2. Operation Plan per Mission Phase

This section shall provide, for each phase, the following information:
- Purpose and goal of the operations
- Description of the operations to be performed.
o Functional Tests (if any).
o Calibration activities (if any) with duration and periodicity detailed.
o Normal Science Operations
Detailed procedures are to be defined in section 6.x.

4.2.1 NEAR-EARTH COMMISSIONING PHASE (NECP)

Purpose and goal:
During Near-Earth Commissioning no science observation is done by MERTIS.
The goal is to verify the function and science performance by using the in-flight calibration devices and verify their performance.

Description of performed operations:
The following modes have to be performed after switching-on on MERTIS MAIN and REDUNDANT side:

Step	Purpose	Duration [min]	Remark
1	MERTIS Health Check	5	check of default HKs (mode, temperature, voltages, error flags)
2	MERTIS thermal stabilization	60	Mode WarmUp(3) until thermal stability is reached notified by dedicated progress event
3	MERTIS diagnostic	45	verify the sub-system functions and performance in detail by executing mode Diagnostic(25)
4	Check MERTIS science high data rate	30	Execute science high data rate and raw data mode Science_Raw(23)
5	Check MERTIS science nominal data rate with compressed data	30	Execute science nominal data rate and compressed data mode Science_High_Res1(4)
6	Check POI safe position BB3View	5	Check that pointing unit is in safe position BB3View which was used for launch
7	Change POI position to PlanetView	10	Change pointing unit position to PlanetView which is the nominal position in flight
	Total duration NECP	**185**	**Execution time for one side**

Table 12: MERTIS NECP Procedure

Functional tests:
- in Diagnose mode all sub-systems are tested for proper function
- in High data rate mode the interface telemetry interface performance is checked

Calibration activities:
POI into nominal position for flight (PlanetView)

Normal science operations:
Nominal data rate with compressed data

The detailed procedure is described in chapter 6 - INSTRUMENT FLIGHT OPERATION PROCEDURES and [RD5].

4.2.2 INSTRUMENT CHECK-OUT PLAN DURING CRUISE

Purpose and goal:
The instrument check-out procedure is done at least once every 6 month in order to verify the MERTIS proper function and to move the Pointing Unit (POI) as mechanical device do avoid mechanical problems.

Description of performed operations:
All operations as defined for the Near-Earth Commissioning Phase are performed. The POI movement is done during the Diagnostic mode and all nominal science modes as e.g. Science_High_Res_1 (Mode 4).

Functional tests:
- see Near-Earth Commissioning Phase
- check proper function of POI moving (no error event is sent)

Calibration activities:
None - TBC

Normal science operations:
- see Near-Earth Commissioning Phase

The detailed procedure is described in chapter 6 - INSTRUMENT FLIGHT OPERATION PROCEDURES and [RD5].

4.2.3 NEAR MERCURY COMMISSIONING PHASE (MCP)

Purpose and goal:
During the Near Mercury Commissioning Phase (MCP) the instrument functionality and performance is checked and after that a full operational verification is performed.

Description of performed operations:
Commissioning near Mercury consists of two phases, starting with the verification of the instrument functionality and basic instrument performance. This is done with the same operations as for the Near-Earth commissioning using the in-flight calibration devices and verifies their performance. Following this is a full operational verification of the instrument performance.
For the full operational verification of the instrument performance the following modes are activated:

1. Night side operation in mode Science_TIR_Only (Mode 13)
2. Day side operation with nominal low data rate in mode Science_Low_Res3 (Mode 12)
3. Day side operation around pericenter with highest data rate in mode Science_High_Res1 (Mode 14)
4. Day side operation with nominal low data rate in mode Science_Low_Res3 (Mode 12)
5. Night side operation in mode Science_TIR_Only (Mode 13)

Functional tests:
- see Near-Earth Commissioning Phase

- Proper function and performance related to full operation

Calibration activities:
None - TBC

Normal science operations:
- Radiometer only mode Science_TIR_Only (Mode 13)
- Nominal low data rate in mode Science_Low_Res3 (Mode 12)
- Highest data rate in mode Science_High_Res1 (Mode 4)

The detailed procedure is described in chapter 6 - INSTRUMENT FLIGHT OPERATION PROCEDURES.

4.2.4 MERCURY ROUTINE PHASE (MRP)

Purpose and goal:
During the Mercury Routine Phase (MRP) the science observation of Mercury planet is performed.

Description of performed operations:
The following operation procedure is performed during this phase:

1. Night side operation in mode Science_TIR_Only (Mode 13)
2. Day side operation with nominal low data rate in mode Science_Low_Res3 (Mode 12)
3. Day side operation around pericenter with highest data rate in mode Science_High_Res1 (Mode 14)
4. Day side operation with nominal low data rate in mode Science_Low_Res3 (Mode 12)
5. Night side operation in mode Science_TIR_Only (Mode 13)

Functional tests:
- see Near-Earth Commissioning Phase
- Proper function and performance related to full operation

Calibration activities:
see chapter 4.2.4.1

Normal science operations:
- Radiometer only mode Science_TIR_Only (Mode 13)
- Nominal low data rate in mode Science_Low_Res3 (Mode 12)
- Highest data rate in mode Science_High_Res1 (Mode 4)

The detailed procedure is described in chapter 6 - INSTRUMENT FLIGHT OPERATION PROCEDURES.

4.2.4.1 Calibrations in Mercury Orbit

Detailed description of the calibration to be performed during Mercury orbit including information about periodicity, duration and constraints (thermal control, power required, thermal stability, etc)

TBW, ref. to flight operation plan in RD5

4.2.4.2 Mercury Routine Science Phase (MSP)

This section shall provide a high-level input to the long-term science plan being defined by the Science Ground Segment. Detailed information of the MSP shall be included in the IPOD document (SGS Bookkeeper).

TBW, ref. to flight operation plan in RD5

4.3. Instrument Operation Constrains

This section defines ALL constraints applicable to the flight and on-ground operations of the instrument.

4.3.1 Internal Constrains

This section shall identify all constraints placed by the instrument design on the spacecraft data handling interface, e.g. commanding rate, time synchronisation frequency…

The MERTIS internal constrains can be summarized as follows:

4.3.1.1 C1: Pointing Unit in BB3 position while vibration tests, transportation and launch

The position of Pointing Unit in-orbit shall be nominally the planet view position getting science data from the Mercury. But by default on-ground during vibration tests, transportation and launch the pointing unit position is in a safe BB3 position due to the following reasons.

1) The pointing unit has a mechanical limiter at Planet and Space view position in order to achieve a high pointing accuracy. Due to vibration the pointing unit mirror assembly could hit at this limiter(s) and could lead to a blistering, i.e. small particles could contaminate the optics. This can not happen if the mirror stays in the BB3 position. It was shown that during vibration tests the motor and the mirror remain in the BB3 position even if the motor doesn't have any mechanical fixation.
2) Beside the planet baffle, the pointing unit mirror is the first high reflective optical element after the planet baffle aperture and therefore sensitive against contamination. To reduce a contamination as much as possible the pointing mirror shall view to the BB3 during on-ground testing and launch. In this case the optical surface doesn't view to the planet aperture of MERTIS.

This default position, before MERTIS is powered-OFF, has to be commanded as default configuration, so that a special S/C operation isn't needed.

4.3.1.2 C2: Pointing Unit in Planet View position in-orbit operation

While operation in-orbit the default position of Pointing Unit is nominally the planet view position. This is needed to be able to acquire science data without moving the pointing mirror. In case that the motor would fail MERTIS loses the in-flight calibration capabilities but it is not completely lost.

This default position, before MERTIS is powered-OFF, have to be commanded as default configuration, so that a special S/C operation isn't needed.

4.3.1.3 C3: Test of Emergency Pointing Actuator

This constrain is not applicable for nominal operational but for system testing only.
In case of a failure of the Pointing Unit motor an Emergency Pointing Actuator (EPA) is implemented. If it would be activated a fiber is burned and a spring forces the Pointing Mirror to the planet position. This means, activation can be done only once. This avoids a single point failure but MERTIS would loose all in-flight calibration capabilities. Therefore safety aspects have high importance and the EPA functionality can never be tested fully in the FM.
For MERTIS internally a lot of design aspects were considered that a single event, single hardware/software failure or single operational error can not lead to an unwanted release of this EPA.
Nevertheless before and after final assembly or test of MERTIS the EPA assembly and wiring can only be tested by measuring the +28V current thought the EPA burning resistor with a short test pulse, much shorter than for real activation needed. Details are written in [RD3].

Summarized, safety aspects for testing the EPA have high importance.

4.3.2 Environmental Constrains

4.3.2.1 C4: Sensitivity against humidity

The radiometer detector is sensitive against humidity higher than 20%. Therefore handling during tests and calibration as well as purging on S/C level has high importance.

4.3.2.2 C5: Sensor Head temperature

MERTIS can be operated getting data with proper science performance if the sensor head (spectrometer optics) temperature physically connected to the TRP2 is in range of 10 – 40°C and it is thermally stable with ± 0.2 K within > 20sec.

Note: at not nominal operation low temperature condition at TRP2 (e.g. at very low temperature -27°C as test result with FM), the BOL chip temperature control e.g. set to +5°C works properly from about e.g. -12°C BOL housing temperature. That means it must be waited that the sensor head (TRP2) is heated to at least -12°C so that the Bolometer temperature stabilization works properly. Nevertheless the nominal operation shall be at 10 - 40°C sensor head temperature (ref. is the temperature HK_TEMP_OST_BASE_PLATE).

4.3.2.3 C6: Sun illumination

MERTIS does not have a mechanical cover/shutter in front of the aperture that would prevent from direct sun illumination of the FOV. Sun avoidance angle of ~ 10 degrees wrt to the spacecraft +Z axis has to be avoided in order to avoid overheating the Planet baffle and that a high energy illumination happen on the spectrometer and radiometer detector if the Pointing Unit is in Plant View position.

4.3.3 SpaceCraft Operation Constrains

Periodic MERTIS operation (Pointing Unit movement) is needed, e.g. more than once every 6 month POI must be moved.

4.3.4 Interferences with other Instruments

It could be possible that MERMAG can detect the movement of the MERTIS pointing unit motor as AC magnetic field (see RD6).

4.3.5 Orbit Prediction/Reconstruction Accuracy

N/A

4.4. Instrument Failure Detection Isolation and Recovery (FDIR)

This chapter describes the MERTIS instrument FDIR (Failure Detection, Isolation and Recovery). All events issued by the MERTIS On-Board Software are described including the needed recovery action for events of category Warning TM(5,2), Error TM(5,3) and Alarm TM(5,4).

4.4.1 Internal FDIR

This chapter provides the MERTIS internal FDIR. All events of category Warning TM(5,2) and Error TM(5,3) are described where an On-Ground recovery action (Error) or no recovery action (Warning) is needed.

The following table lists these kinds of events with event name, event ID, the reason for occurrence and the possible or needed recovery action.

Event name	EventID	Reason	Recovery Action
Warning Events (5,2)			
EVENT_EEPROM_NO_SEGMENT	42204	No segment found in EEPROM	Check EEPROM configuration
EVENT_EEPROM_NO_APS_EXE	42205	No APS executable found in EEPROM	Check EEPROM configuration
EVENT_EEPROM_NO_APS_CFG	42206	No APS configuration found in EEPROM	Check EEPROM configuration
EVENT_EEPROM_NO_PBS_CFG	42207	No PBS configuration found in EEPROM	Check EEPROM configuration
EVENT_EEPROM_NO_APS_EXE_FLAG	42208	No APS executable flag found in EEPROM	Check and correct auto boot configuration
EVENT_EEPROM_NO_APS_CFG_FLAG	42209	No APS configuration flag found in EEPROM	Check and correct auto boot configuration
EVENT_RAD_BUSY	42212	Radiometer device is busy	Check radiometer configuration
EVENT_WARMUP_TIMEOUT	42213	Timeout occurred during warm-up of instrument	Check thermal conditions (temperature TRP1/TRP2)
EVENT_NO_THERMAL_STABILITY	42214	No thermal stability of instrument	Check thermal conditions (temperature TRP1/TRP2)
EVENT_POI_HOLD_CURRENT_OFF	42215	POI hold current is switched off due to exceeding maximum hold time	Accuracy of pointing mirror position can not be guaranteed anymore, check science calibration cycle, POI is too long at one target
EVENT_COMP_DMA_TIMEOUT	42216	DMA time-out detected by compression hardware	check compression hardware
EVENT_COMP_BUS_ERROR	42217	Compression bus error detected by compression hardware	check compression hardware
EVENT_COMP_BUFFER_OVERFLOW	42218	Compression buffer overflow detected by compression software	check compression hardware
EVENT_BOL_WIN_CONFIG_WRONG	42219	Configuration of Bolometer windowing wrong	Check Bolometer window configuration for overlapping
EVENT_BEL_BUSY	42220	Bolometer electronics is busy to acquire data	Check Bolometer configuration
EVENT_BOL_BUS_ERROR	42221	Bolometer bus error detected	Check Bolometer hardware
EVENT_BOL_LATCHUP_ERROR	42222	Bolometer latchup error detected	Check Bolometer hardware
EVENT_BOL_BURST_TRIGGER_FAILURE	42223	Bolometer burst trigger failure detected	Check Bolometer hardware
EVENT_RAD_DATA_TIME_OUT	42224	Radiometer data timeout detected	Check Radiometer hardware
EVENT_RAD_LATCHUP_ERROR	42225	Radiometer latchup error detected	Check Radiometer hardware
EVENT_TIS_MACRO_PIXEL_OUT_OFF_RANGE	42226	TIS macro pixel value is out of expected range	Check Bolometer configuration
Error Events (5,3)			
EVENT_EEPROM_WRITE_ERROR	43800	EEPROM write error detected	Check EEPROM device
EVENT_APS_BOOT_FAILURE	43801	Failure detected during auto-boot of APS executable	Check EEPROM configuration
EVENT_UNEXPECTED_REBOOT	43802	Unexpected re-boot of the on-board software due to watchdog activation or processor trap	Check boot reason to figure out what the problem was
EVENT_POI_CLOSE_LOOP_DIAG_FAILED	43805	POI diagnose of mode 'Close Loop' failed	Check POI sub-system
EVENT_STS_OPERATION_FAILURE	43806	Shutter (STS) operation failure detected	Check STS sub-system
EVENT_POI_OPERATION_FAILURE	43807	Pointing Unit (POI) operation failure detected	Check POI sub-system in Diagnostic mode
EVENT_RAD_FIFO_NOT_EMPTY	43808	Radiometer FIFO is not empty	Check radiometer configuration
EVENT_RAD_FIFO_OVERFLOW	43809	Radiometer FIFO overflow detected	Check radiometer configuration
EVENT_RAD_ADC_ERROR	43810	Radiometer ADC error detected	Check radiometer hardware
EVENT_BOL_DMA_OVERFLOW	43811	Bolometer DMA overflow detected	Check Bolometer configuration
EVENT_BOL_DMA_TIMEOUT	43812	Bolometer DMA no data received, time-out occurred	Check Bolometer configuration
EVENT_WATCHDOG_FAILURE	43813	Watchdog doesn't work after initialization, counts not down	Disable watchdog function
EVENT_TC_SPW_RX_ERROR	43814	SpaceWire TC receive error detected	Check SpW interface hardware
EVENT_EEPROM_EXE_SEG_COPY_ABORT	43815	SPARC executable segment copy from EEPROM to RAM failed	Check executable in EEPROM
EVENT_EEPROM_EXE_SEG_CRC_WRONG	43816	SPARC executable segment CRC error	Check executable in EEPROM
EVENT_EEPROM_PBS_CFG_SIZE_WRONG	43817	PBS configuration data size wrong in EEPROM	Check configuration in EEPROM
EVENT_WRITING_REGISTER_FAILED	43818	Writng register failed, reading back content provides different result	Hardware failure, switch to redundant system

EVENT_TC_BUFFER_1_FULL	43819	Telecommand buffer 1 is full	Check the commanding rate (max. 10TCs/sec)
EVENT_TC_BUFFER_2_FULL	43820	Telecommand buffer 2 is full	Check the commanding rate (max. 10TCs/sec)
EVENT_ANA_TEMP_DIAG_FAILED	43821	Diagnose of analog temperature HKs failed	Check HK hardware or configuration
EVENT_ANA_VOLT_DIAG_FAILED	43822	Diagnose of analog voltage HKs failed	Check HK hardware or configuration
EVENT_BOL_BEL_DIAG_FAILED	43824	Diagnose of Bolometer electronics failed	Check bolometer hardware or configuration
EVENT_BOL_WINDOW_DIAG_FAILED	43825	Diagnose of Bolometer windowing failed	Check bolometer hardware or configuration
EVENT_BOL_TEC_CONTROL_DIAG_FAILED	43826	Diagnose of Bolometer thermal electrical cooler (TEC) failed	Check TEC hardware or configuration
EVENT_STS_MOVE_DIAG_FAILED	43827	Diagnose of shutter (STS) failed	Check STS hardware
EVENT_RAD_REL_DIAG_FAILED	43828	Diagnose of Radiometer electronics failed	Check radiometer hardware or configuration
EVENT_SHH_DIAG_FAILED	43829	Diagnose of sensor head heater (SHH) failed	Check SHH hardware and thermal conditions
EVENT_OBT_SYNC_FAILED	43830	OBT synchronization failed, SpW-TimeCode received too late	Check time code distribution (expected 1TimeCode/sec)
EVENT_BOL_TEMP_TOO_LOW	43831	TEC Bolometer chip temperature too low	Check TEC controler in Diagnostic mode
EVENT_BOL_TEMP_TOO_HIGH	43832	TEC Bolometer chip temperature too high	Check TEC controler in Diagnostic mode
EVENT_BOL_WINDOW_CONFIG_INVALID	43833	BOL window configuration invalid due to overlapping of windows	Check bolometer window configuration
EVENT_COMP_DIAG_FAILED	43834	Diagnose of TIS compression failed	Check compression module
EVENT_POI_ACCURACY_DIAG_FAILED	43835	Diagnose of POI positioning accuracy failed	Check POI mechanical mechanism
EVENT_ANA_SH_TEMP_DIAG_FAILED	43836	Diagnose of analog SH temperature HKs failed	Check sensor head heater (current)

Table 4-2: Internal FDIR events

4.4.2 External FDIR

This chapter provides the MERTIS external FDIR. All events of category Alarm TM(5,4) are described where an On-Board recovery is needed.

The following table lists this kind of events with event name, event ID, the reason for occurrence and the possible or needed recovery action.

Event name	Event ID	Reason	Recovery Action
EVENT_HK_LIMIT_VIOLATION	43900	HK limits exceeded (see next table)	Switch-off MERTIS

Table 4-14: External FDIR events

The following table list the parameters and there maximum limits. If one ore more housekeeping values exceed the maximum allowed limit MERTIS sends the *TM_Event_Alarm(HK limit violation)*.

Parameter	Max. Limit	Unit	Description
HK_TEMP_ICU	90	degC	Maximum limit of ICU temperature
HK_TEMP_PSU	75	degC	Maximum limit of power supply temperature
HK_VOLT_PSU	4000	mV	Maximum limit of PSU +3.4V supply digital voltage
HK_VOLT_PSU	8000	mV	Maximum limit of PSU +7.2V supply analog voltage

Table 4-15: Maximum HK limits for sending event TM(5,4)

If S/C receives the event *TM_Event_Alarm(HK limit violation)* MERTIS shall be switched of by the emergency switch-off OBCP (see Table 6-3).

In addition to the event *TM_Event_Alarm(HK limit violation)* MERTIS LCL current of the 28V main power lines shall be monitored. If the current is **> 0,75A** MERTIS shall be switched off by the emergency switch-off OBCP. Note that the nominal current of MERTIS in mode StandBy is about 0,19A and the inrush current is about 2,25A (0,22ms).

5. INSTRUMENT OPERATION MODES

5.1. Generals and Mode Transition

MERTIS is operated in several modes. A mode is defined for the case if

- MERTIS requires significant different S/C resources (power, data rate). These operational modes are technically adjusted by a set of parameter, so called Operation Parameter (e.g. science modes)
- MERTIS have to be operated under special safe conditions or detects a severe failure (e.g. the Safe mode)
- MERTIS needs to be tested (e.g. test or diagnostic mode)

The complete list of all MERTIS modes is shown in Appendix 8.

The active MERTIS mode can be obtained by *TM_OperationDefault_HK(HK_STAT_MERTIS_MODE).* There is a not-nominal Mode number 50 (UserDefined) which is detected if an operational parameter combination is commanded where a special mode is not decoded.
Each mode transition is initiated by a dedicated telecommand or automatically in case of failure detection/termination of sequence. This mode transition is notified by sending of a progress event *TM_Event_Progress(Mode Transition)*. The following figure shows MERTIS modes and the possible mode transitions:

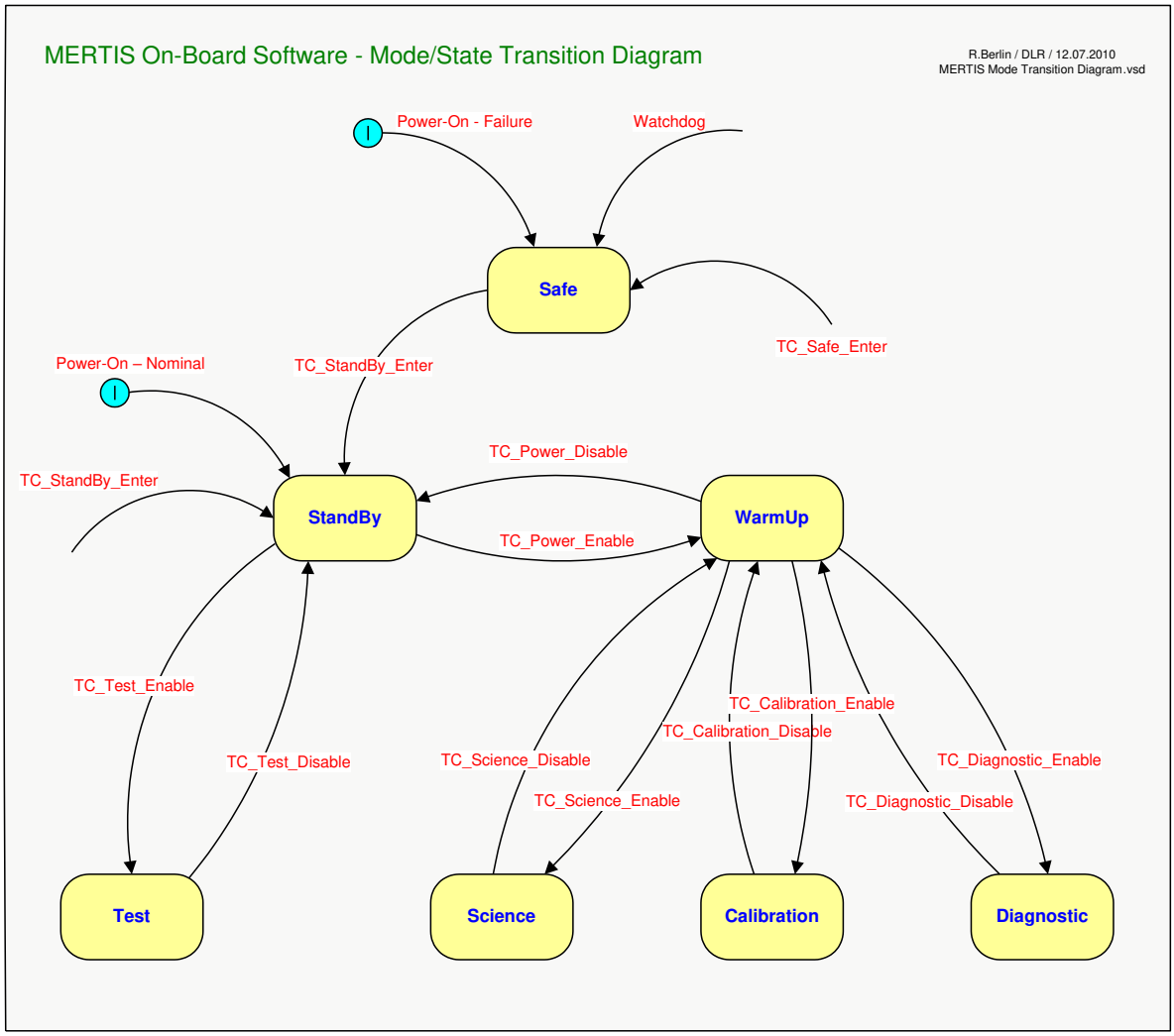


Figure 5-1: Mode Transition Diagram

After **Power-On** MERTIS performs the primary and secondary boot process, initialize the ICU as well as PSU hardware and goes nominally in the **Stand-by** mode without any telecommanding. In case that a failure is detected MERTIS stays in **Safe** mode where all sub-systems are power-off and MERTIS sends a small set of HKs showing the operational status and temperatures of the ICU and PSU.
A main purpose of the **Safe** mode is to perform the memory management service, i.e. uploading the Application Software in EEPROM or checking/downloading the memory in general. Therefore, if MERTIS operates in any mode, the Safe mode can be entered by *TC_Safe_Enter.*

Note, the **Safe** mode is executed by the Primary Boot Software (PBS) stored in PROM, all other modes are operated by the Application Software (APS) which is stored in EEPROM.

The **StandBy** mode is automatically reached after power-on or by *TC_StandBy_Enter* from every other MERTIS mode in order to reduce the number of telecommands for operating MERTIS. Note, in **StandBy** mode every sub-system is switched-off.
In order to enter the **Science**, **Diagnostic** and **Calibration** modes it is nominally needed to get to the **WarmUp** mode before by *TC_Power_Enable*. This is foreseen to ensure that the thermal stabilization of the instrument is reached before starting to acquire science data. The time where MERTIS remains in **WarmUp** mode depends on the thermal environmental conditions and purpose of operation. It can be seconds or for science operation minutes up to hours. The **Science**, **Calibration** and **Diagnostic** modes can be entered from **WarmUp** mode by telecommands *TC_Science_Enable*, *TC_Calibration_Enable* and *TC_Diagnostic_Enable*.

The **Test** mode (foreseen mainly for ground operation) is entered directly from the **StandBy** mode by *TC_Test_Enable*. Dedicated disable commands are used to leave the mode (e.g. *TC_Test_Disable*).
The **Science** mode has 10 nominal “sub-modes” and 13 additional sub-modes for exceptional operational cases. The science sub-mode which is reached after *TC_Science_Enable* depends on the operation parameter configuration (e.g. which sub-system is switched-on). The science sub-mode can be changed without leaving the Science “main-mode” by changing the operation parameter with *TC_Operation_Parameter*.

The following list shows all dedicated telecommands used to enter a defined mode/state:

Mode/State	Telecommand	Other reasons	Remark
Safe	TC_Safe_Enter	Power-on (failure) Watchdog	Instrument **Safe** used for APS maintenance, memory management
StandBy	TC_StandBy_Enter TC_Test_Disable TC_Power_Disable	Power-on (nominal)	**StandBy** used for instrument configuration
WarmUp	TC_Power_Enable TC_Science_Disable TC_Diagnostic_Disable TC_Calibration_Disable		**WarmUp** used to switch-on sub-systems to get thermal stable condition
Test	TC_Test_Enable		**Test** used for development and verification of software and hardware
Diagnostic	TC_Diagnostic_Enable		**Diagnostic** used for health check of the instrument function
Calibration	TC_Calibration_Enable		**Calibration** used for instrument on-board calibration
Science	TC_Science_Enable TC_Operation_Parameter *		**Science** used to perform the scientific data acquisition and processing

*** -> Changes the Science mode by changing the Operational parameters**

Table 5-1: MERTIS mode transition table

Note : no command shall be sent in the immediate 2,5 minutes from the start of execution of MERTIS switch on via OBCP (procedure MR-FCP-001), see also [RD9].

5.2. Modes, Power and Data Rate Resources

The table below shows the power and data rate resources as measurements (1) with FM:

Mode [No.]	Mode [Name]	Science Data Rate Average [kbits/s]	HK Data Rate Average [kbits/s]	Power Average [W] (1)
1	Safe	0	0,02	5,6
2	StandBy	0	0,045	5,6
3	WarmUp	0	0,045	8,9
4	Science_High_Res1 (Def)	242	0,045	9,9
5	Science_High_Res2	90	0,045	9,9
6	Science_High_Res3	42	0,045	9,9
7	Science_Med_Res1	122	0,045	9,9
8	Science_Med_Res2	45	0,045	9,9
9	Science_Med_Res3	22	0,045	9,9
10	Science_Low_Res1	63	0,045	9,9
11	Science_Low_Res2	23	0,045	9,9
12	Science_Low_Res3	11	0,045	9,9
13	Science_TIR_Only	3	0,045	7,9
14	Calibration	32	0,045	9,9
15	WarmUp_Heated	0	0,045	<15,1
16	Pointing_BB3View	0	0,045	<9,9
17	Pointing_PlanetView	0	0,045	<9,9
18	Science_TIS_Only	241	0,045	9,7
19	Science_TIR_Only_Heated	3	0,045	12,0
20	Science_High_Res_UnCompr	481	0,045	9,9
21	Science_High_Res_Heated	242	0,045	12,4
22	Science_Low_Res_Heated	63	0,045	12,4
23	Science_Raw	965	0,045	9,9
24	Science_PlanetView	242	0,045	<9,9
25	Diagnostic	0...959	0,045	<15,1
26	Test	0...959	0,045	<15,1
27	Science_Reduced_Swath_1	129	0,045	9,9
28	Science_Reduced_Swath_2	174	0,045	9,9
29	FullWin_UnCompr	332	0,045	9,9
30	FullWin_Compr	167	0,045	9,9
50	UserDefined	0...959	0,045	<15,1

Table 5-2: Mode vs Power and Data Rates

5.3. Safe Mode

Mode: Safe (1)
Objective
This mode is applicable mainly for memory management or APS upload and is entered in case that a severe failure has been detected.
Services supported by the mode
In this mode the following functions are performed: - Handling the SpaceWire interface, - Receive and check TCs, - Sending TM packets, - Sending periodically Default HK to the S/C (every 20sec as default period), - Synchronizes the on-board time (no auto boot after power-on), - Provides up- and downloading service of memory, - Boots and starts the APS from EEPROM, - Provides the EEPROM status incl. status of stored APS releases and parameter sets
FDIR
Failures are detected and reported by dedicated events for problems with ICU hardware, while performing of memory scrubbing to avoid double failure due to SEU in SDRAM memory. Only a sub-set of MERTIS telecommands are accepted and executed in **Safe** mode.
Resources
Power consumption: **5,6W** HK data rate: **0,02kbits/sec** (cyclic default HK generation) Science Data Rate: **N/A**

5.4. StandBy Mode

Mode: StandBy (2)
Objective
This mode is nominally the first reached mode after MERTIS power-on. MERTIS stays in idle state ready to perform science operation. All sub-systems are switched off.
Services supported by the mode
In this mode the following functions are performed: - Synchronizes the on-board time (auto boot of APS after power-on), - Sending Operation Default HK and Operation Extended HK cyclically (every 20sec as default period) - Set pointing unit into a safe position (PlanetView) - Configuration of a science mode
FDIR
Only commands which are allowed in this mode will be accepted and executed. Instrument configuration is only accepted in allowed parameter ranges.
Resources
Power consumption: **5,6W** HK data rate: **0,045kBits/sec** (cyclic default and extended HK generation) Science Data Rate: **N/A**

5.5. WarmUp Mode

Mode: WarmUp (3)
Objective
This mode is used to reach a thermal stabilization of the MERTIS instrument. For that purpose all sub-units are switched-on.
Services supported by the mode
In this mode the following functions are performed: - Perform thermal stabilization of the instrument (takes minutes up to hours)
FDIR
Only commands which are allowed in this mode will be accepted and executed. If thermal stabilization is reached the event TM_Event_Progress(Thermal stability reached) is sent. If thermal stabilization is not reached in expected time an event Event_Warning(Thermal stability not reached) is sent. In case that thermal stability is left again after a thermal stable condition the event TM_Event_Warning(Thermal stability left) s sent. Note that this FDIR behaviour for themal stability is also applicable for all science modes.
Resources
Power consumption: **8,9W** HK Data rate: **0,045kBits/sec** (cyclic default and extended HK generation) Science Data Rate: **N/A**

5.6. Science_High_Res1 Mode

Mode: Science_High_Res1 (4)
Objective
This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 100msec). This is the MERTIS default mode.
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS and TIR - TIS data reduction is performed by binning (1x2) and lossless compression (factor ½) - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **242kBits/sec** (TIS, TIR, ScienceHK)

5.7. Science_High_Res2 Mode

Mode: Science_High_Res2 (5)

Objective

This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 300msec).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 300msec TIS+ScienceHK, every 2400msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **90kBits/sec** (TIS, TIR, ScienceHK)

5.8. Science_High_Res3 Mode

Mode: Science_High_Res3 (6)

Objective

This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 800msec).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 800msec TIS+ScienceHK, every 6400msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **42kBits/sec** (TIS, TIR, ScienceHK)

5.9. Science_Med_Res1 Mode

Mode: Science_Med_Res1 (7)
Objective
This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a medium resolution science mode for TIS (window 100x80 pixel, binning 2x2, repetition rate 100msec).
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS and TIR - TIS data reduction is performed by binning (2x2) and lossless compression (factor ½) - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **122kBits/sec** (TIS, TIR, ScienceHK)

5.10. Science_Med_Res2 Mode

Mode: Science_Med_Res2 (8)
Objective
This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a medium resolution science mode for TIS (window 100x80 pixel, binning 2x2, repetition rate 300msec).
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS and TIR - TIS data reduction is performed by binning (2x2) and lossless compression (factor ½) - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 300msec TIS+ScienceHK, every 2400msec TIR - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **45kBits/sec** (TIS, TIR, ScienceHK)

5.11. Science_Med_Res3 Mode

Mode: Science_Med_Res3 (9)

Objective

This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a medium resolution science mode for TIS (window 100x80 pixel, binning 2x2, repetition rate 800msec).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (2x2) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 800msec TIS+ScienceHK, every 6400msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **22kBits/sec** (TIS, TIR, ScienceHK)

5.12. Science_Low_Res1 Mode

Mode: Science_Low_Res1 (10)

Objective

This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a low resolution science mode for TIS (window 100x80 pixel, binning 2x4, repetition rate 100msec).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (2x4) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **63kBits/sec** (TIS, TIR, ScienceHK)

5.13. Science_Low_Res2 Mode

Mode: Science_Low_Res2 (11)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a low resolution science mode for TIS (window 100x80 pixel, binning 2x4, repetition rate 300msec).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (2x4) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 300msec TIS+ScienceHK, every 2400msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **23kBits/sec** (TIS, TIR, ScienceHK)

5.14. Science_Low_Res3 Mode

Mode: Science_Low_Res3 (12)
Objective
This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a low resolution science mode for TIS (window 100x80 pixel, binning 2x4, repetition rate 800msec).
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS and TIR - TIS data reduction is performed by binning (2x4) and lossless compression (factor ½) - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 800msec TIS+ScienceHK, every 6400msec TIR - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **11kBits/sec** (TIS, TIR, ScienceHK)

5.15. Science_TIR_Only Mode

Mode: Science_TIR_Only (13)
Objective
This mode is used to perform science data acquisition only with radiometer (TIR). The used repetition rate is 800msec.
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIR - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 800msec TIR+ScienceHK - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **7,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **3kBits/sec** (TIR, ScienceHK)

5.16. Calibration Mode

Mode: Calibration (14)
Objective
This mode is used to perform science data acquisition with the purpose to calibrate the instrument. For that purpose calibration data are acquired at calibration targets BB3View, BB7View, SpaceView and with closed shutter (background).
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS and TIR - TIS full image (160x120pixel) acquired without compression - Calibration data acquired at BB3View, BB7View and SpaceView and with closed shutter - Science data telemetry is sent every 10000msec TIS+TIR+ScienceHK - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,9W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **32kBits/sec** (TIR, ScienceHK)

5.17. WarmUp_Heated Mode

Mode: WarmUp_Heated (15)
Objective
This mode is used to reach a thermal stabilization of the MERTIS instrument. For that purpose all sub-units are switched-on. In addition to **WarmUp** mode the Sensor Head Heater (SHH) is switched on. That means the sensor head is heated if the reference temperature is less than the allowed minimum instrument operation temperature (default = 10°C).
Services supported by the mode
In this mode the following functions are performed: - Perform thermal stabilization of the instrument (takes minutes up to hours)
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **<15,1W** HK Data rate: **0,045kBits/sec** (cyclic default and extended HK generation) Science Data Rate: **0kBits/sec**

5.18. Pointing_BB3View Mode

Mode: Pointing_BB3View (16)
Objective
This mode is used to force the Pointing Unit (POI) to move the pointing mirror to the BB3View **safe** position. For that purpose the parameter PAR_POI_MODE must beset to BB3View(3) before commanding TC_Power_Enable in order to switch-on POI power and move POI to BB3View.
Services supported by the mode
In this mode the following functions are performed: - Moving pointing mirror to BB3View position.
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **<9,9W** HK Data rate: **0,045kBits/sec** (cyclic default and extended HK generation) Science Data Rate: **0kBits/sec**

5.19. Pointing_PlanetView Mode

Mode: Pointing_PlanetView (17)
Objective
This mode is used to force the Pointing Unit (POI) to move the pointing mirror to the PlanetView **default** position. For that purpose the parameter PAR_POI_MODE must beset to PlanetView(2) before commanding TC_Power_Enable in order to switch-on POI power and move POI to PlanetView.
Services supported by the mode
In this mode the following functions are performed: - Moving pointing mirror to PlanetView position.
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **<9,9W** HK Data rate: **0,045kBits/sec** (cyclic default and extended HK generation) Science Data Rate: **0kBits/sec**

5.20. Science_TIS_Only Mode

Mode: Science_TIS_Only (18)
Objective
This mode is used to perform science data acquisition only with the bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 100msec).
Services supported by the mode
In this mode the following functions are performed: - Perform science data acquisition with TIS - TIS data reduction is performed by binning (1x2) and lossless compression (factor ½) - Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView) - Science data telemetry is sent every 100msec TIS+ScienceHK - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **9,7W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **241kBits/sec** (TIS, ScienceHK)

5.21. Science_TIR_Only_Heated Mode

Mode: Science_TIR_Only_Heated (19)

Objective

This mode is used to perform science data acquisition only with radiometer (TIR). The used repetition rate is 800msec. The difference to mode **Science_TIR_Only** is that the Sensor Head Heater (SHH) is switched on. That means the sensor head is heated if the reference temperature is less than the allowed minimum instrument operation temperature (default = 10°C).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIR
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 800msec TIR+ScienceHK
- Operation Default and Operation Extended HK are sent
- Perform heating of optics sensor head

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **12,0W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **3kBits/sec** (TIR, ScienceHK)

5.22. Science_High_Res_UnCompr Mode

Mode: Science_High_Res_UnCompr (20)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 100msec). The difference to mode **Science_High_Res1** is the image date will not be compressed.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2), NO compression
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **481kBits/sec** (TIS, TIR, ScienceHK)

5.23. Science_High_Res_Heated Mode

Mode: Science_High_Res_Heated (21)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 100msec). The difference to mode **Science_High_Res1** is that the Sensor Head Heater (SHH) is switched on. That means the sensor head is heated if the reference temperature is less than the allowed minimum instrument operation temperature (default = 10°C).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2), NO compression
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent
- Perform heating of optics sensor head

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **12,4W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **242kBits/sec** (TIS, TIR, ScienceHK)

5.24. Science_Low_Res_Heated Mode

Mode: Science_Low_Res_Heated (21)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a low resolution science mode for TIS (window 100x80 pixel, binning 2x4, repetition rate 100msec). The difference to mode **Science_Low_Res1** is that the Sensor Head Heater (SHH) is switched on. That means the sensor head is heated if the reference temperature is less than the allowed minimum instrument operation temperature (default = 10°C).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (2x4) and lossless compression (factor ½)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent
- Perform heating of optics sensor head

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **12,4W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **63kBits/sec** (TIS, TIR, ScienceHK)

5.25. Science_Raw Mode

Mode: Science_Raw (23)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a raw data science mode for TIS (window 100x80 pixel, binning 1x1 (no binning), repetition rate 100msec) and no data compression.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- No TIS data reduction is performed (no binning, no compression)
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **959kBits/sec** (TIS, TIR, ScienceHK)

5.26. Science_PlanetView Mode

Mode: Science_PlanetView (24)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 100x80 pixel, binning 1x2, repetition rate 100msec). The difference to mode **Science_High_Res1** is that science data are acquired only from target PlanetView. That means no calibration is performed at targets BB3View,BB7View and SpaceView.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2) and lossless compression (factor ½)
- No calibration cycle is performed, data acquisition only from target PlanetView
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption: **<9,9W**
HK data rate: **0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate: **242kBits/sec** (TIS, TIR, ScienceHK)

5.27. Diagnostic Mode

Mode: Diagnostic (25)
Objective
This mode is used to check the health condition of the MERTIS instrument.
Services supported by the mode
In this mode the following functions are performed: - Check all MERTIS sub-systems for proper function - Sending Progress-Events for each performed diagnose step - Sending of Error-Events if diagnose checks failed - Sending of acquired data which are baseline for checks - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **<15,1W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **0…959kBits/sec** (TIS, TIR, ScienceHK, TestLog-TMs)

5.28. Test Mode

Mode: Test (26)
Objective
This mode is used to perform test activities with the MERTIS instrument. In Test mode the user can perform not nominal operations using special test telecommands.
Services supported by the mode
In this mode the following functions are performed: - Performing test activities - Sending of science data and test data TMs - Operation Default and Operation Extended HK are sent
FDIR
Only commands which are allowed in this mode will be accepted and executed.
Resources
Power consumption: **<15,1W** HK data rate: **0,045kBits/sec** (cyclic default & extended HK) Science Data Rate: **0…959kBits/sec** (TIS, TIR, ScienceHK, TestLog-TMs)

5.29. Science_Reduced_Swath1 Mode

Mode: Science_Reduced_Swath1 (27)

Objective

This mode is used to perform science data acquisition with radiometer (TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 66x80 pixel, binning 1x2, repetition rate 100msec) with a reduced science swath of 66 pixels. The only difference to mode **Science_High_Res1** is the reduced TIS science window.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2) and lossless compression (factor ½) and an reduced science window of 50x80 pixels
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS+ScienceHK, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption:	**9,9W**
HK data rate:	**0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate:	**129kBits/sec** (TIS, TIR)

5.30. Science_Reduced_Swath2 Mode

Mode: Science_Reduced_Swath2 (28)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode is a high resolution science mode for TIS (window 74x80 pixel, binning 1x2, repetition rate 100msec) with a reduced science swath of 74 pixels. The only difference to mode **Science_High_Res1**is the reduced TIS science window.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data reduction is performed by binning (1x2) and lossless compression (factor ½) and an reduced science window of 70x80 pixels
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Resources

Power consumption:	**9,9W**
HK data rate:	**0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate:	**167kBits/sec** (TIS, TIR)

5.31. FullWin_UnCompr Mode

Mode: FullWin_UnCompr (29)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS) without any data reduction, raw date are sent by telemetry. This mode acquires data of TIS full window (160x120pixel), the complete BOL detector size is used. TIS and TIR data are acquired with a repetition rate of 800msec without compression and binning.

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- No TIS data reduction performed, data of TIS full detector (160x120pixel) acquired
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Note (result of a MERTIS in-orbit operation, see [RD8]):
This mode can produce to much TM science data which leads to a loss of image data MERTIS internally. In this case typically one or two events are sent by MERTIS.

- TM Event Warning 42220 (Bolometer electronics is busy to acquire data)
- TM Event Warning 42212 (Radiometer device is busy)

In both cases the reason is that the repetition rate producing TIS data is too short with 100msec (i.e. PAR_REPETITION_RATE = 1) when sending full images (i.e. PAR_TIS_BIN_MODE = 0 (1x1) and PAR_TIS_WIN_SIZE = 3 (160x120pix)).
Instead the repetition rate needs to be set to a longer repletion, i.e. at least 800msec (PAR_REPETITION_RATE = 3).

Resources

Power consumption:	**9,9W**
HK data rate:	**0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate:	< **332kBits/sec** (TIS, TIR)

5.32. FullWin_Compr Mode

Mode: FullWin_Compr (30)

Objective

This mode is used to perform science data acquisition with radiometer(TIR) and bolometer (TIS). This mode acquires data of TIS full window (160x120pixel), the complete BOL detector size is used. TIS and TIR data are acquired with a repetition rate of 800msec without binning, but with lossless compression (the only difference to mode 29).

Services supported by the mode

In this mode the following functions are performed:

- Perform science data acquisition with TIS and TIR
- TIS data of TIS full detector (160x120pixel) acquired and lossless compressed
- Normal calibration cycle is performed (science at PlanetView, calibration at BB3View, BB7View and SpaceView)
- Science data telemetry is sent every 100msec TIS, every 800msec TIR
- Operation Default and Operation Extended HK are sent

FDIR

Only commands which are allowed in this mode will be accepted and executed.

Note (result of a MERTIS in-orbit operation, see [RD8]):
This mode can produce to much TM science data which leads to a loss of image data MERTIS internally. In this case typically one or two events are sent by MERTIS.

- TM Event Warning 42220 (Bolometer electronics is busy to acquire data)
- TM Event Warning 42212 (Radiometer device is busy)

In both cases the reason is that the repetition rate producing TIS data is too short with 100msec (i.e. PAR_REPETITION_RATE = 1) when sending full images (i.e. PAR_TIS_BIN_MODE = 0 (1x1) and PAR_TIS_WIN_SIZE = 3 (160x120pix)).
Instead the repetition rate needs to be set to a longer repletion, i.e. at least 800msec (PAR_REPETITION_RATE = 3).

Resources

Power consumption:	**9,9W**
HK data rate:	**0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate:	< **167kBits/sec** (TIS, TIR)

5.33. UserDefined Mode

Mode: UserDefined (50)

Objective

This mode is entered if the user has commanded operational parameter which doesn't lead to a pre-defined mode (mode number 1…30).

Services supported by the mode

In this mode the following functions are performed:

- Switch-on or -off all MERTIS sub-systems
- Science data acquisition and sending science TMs depends on operation parameters
- Operation Default and Operation Extended HK are sent

FDIR

In mode UserDefined only commands TC_Safe_Enter and TC_StandBy_Enter are allowed in order to come back to a defined status of the instrument.

Note (result of a MERTIS in-orbit operation, see [RD8]):
This mode can produce to much TM science data which leads to a loss of image data MERTIS internally. In this case typically one or two events are sent by MERTIS.

- TM Event Warning 42220 (Bolometer electronics is busy to acquire data)
- TM Event Warning 42212 (Radiometer device is busy)

In both cases the reason is that the repetition rate producing TIS data can be too short with 100msec (i.e. PAR_REPETITION_RATE = 1) when sending full images (i.e. PAR_TIS_BIN_MODE = 0 (1x1) and PAR_TIS_WIN_SIZE = 3 (160x120pix)).
Instead the repetition rate needs to be set to a longer repletion, i.e. at least 800msec (PAR_REPETITION_RATE = 3).

Resources

Power consumption:	**<15,1W**
HK data rate:	**0,045kBits/sec** (cyclic default & extended HK)
Science Data Rate:	**0…959kBits/sec** (TIS, TIR, ScienceHK, TestLog-TMs)

5.34. Typical Operation in a Science Mode (e.g. Science_Raw=23)

In this chapter an example is given how MERTIS is commanded to enter a typical science mode, here mode 23. More details are given in [RD3].

After MERTIS is powered-on a default science mode can be started as follows:

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
1	---	0	Power on +28V
2	---	10	SpeceWire link is connected
3	TM_Event_Progress(APSBootReady)	30	HK_EVENT_PROG_ID:42002 - EVENT_APS_BOOT_READY HK_STAT_SW_VERSION: MERTIS APS v3.3.1498 04/2013 HK_STAT_BOOT_REASON: 0 - power-on HK_STAT_ICU_FPGA_VERSION: 44 HK_STAT_ICU_MAIN_RED: 0 – redundant (or) 1 – main
4	TM_Event_Progress(CFGLoadReady)	30	HK_EVENT_PROG_ID:42009 - EVENT_CFG_LOAD_READY HK_STAT_CFG_VERSION: CFG_Main_R1502 04/2013 (main) CFG_Red_R1502 04/2013 (redundant) HK_STAT_CFG_NUM_PARAMS_LOADED: xx HK_STAT_CFG_NUM_PARAMS_USED: xx
5	TM_OperationDefault_HK	20	Every 20sec, HK_STAT_MERTIS_MODE=2(StandBy)
6	TM_OperationExtented_HK	20	Every 20sec
7	*TC_Time_Update*	N/A	
8	TM_TC_Acceptance_Success	< 0,1	
9	TM_TC_Execution_Success	< 4	
10	TM_OperationDefault_HK	20	
11	TM_OperationExtented_HK	20	
12	*TC_Operation_Parameter*	N/A	Important for Mode=23 setting PAR_REPETITION_RATE = 0 (100msec) PAR_TIS_POWER = 1 (on) PAR_TIR_POWER = 1 (on) PAR_TEC_POWER = 1 (on) PAR_BB7_POWER = 1 (on) PAR_POI_POWER = 1 (on) PAR_STS_POWER = 1 (on) PAR_SHH_POWER = 0 (off) PAR_TIS_BIN_MODE = 0 (1x1) PAR_POI_MODE = 1 (Move) PAR_TIS_COMP_MODE = 0 (no compression) PAR_TIS_WIN_SIZE = 0(100x80pixel) PAR_TIR_REPETITION_FACTOR = 8 Do not influence the mode setting PAR_CALIBRATION_PERIOD = 120 (sec) PAR_TIS_BCK_RATE = 10 (sec) PAR_CALIBRATION_CYCLE_INVERT = 0 (no) PAR_SHH_TEMP = 10 (°C) PAR_TIS_SCIENCE_QUICKLOOK_PERIOD = 60 (sec) PAR_TIR_SCIENCE_QUICKLOOK_PERIOD = 60 (sec) PAR_ SCIENCE_HK_QUICKLOOK_PERIOD = 60 (sec)
13	TM_TC_Acceptance_Success	< 0,1	
14	TM_TC_Execution_Success	< 0,1	
15	*TC_Power_Enable*	N/A	
16	TM_TC_Acceptance_Success	< 0,1	
17	TM_TC_Execution_Success	< 4	
18	TM_Event_Progress(ModeTransition)	< 0,1	HK_EVENT_PROG_ID: 42003 HK_STAT_CURRENT_MODE= 3 (**WarmUp)**

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
			HK_STAT_PREVIOUS_MODE= 2 (StandBy)
19	TM_OperationDefault_HK	20	**HK_STAT_BB3_POWER: 1 - on** **HK_STAT_BB7_POWER: 1 - on** HK_STAT_EEPROM_POWER: 0 - off HK_STAT_EPA_POWER: 0 - off HK_STAT_HK_POWER: 1 - on HK_STAT_ICU_MAIN_RED: 0 - redundant HK_STAT_ICU_NUM_AHB_CORRECTABLE_ERROR: 0 HK_STAT_ICU_NUM_AHB_ERROR: 0 HK_STAT_ICU_PROC_DUTY_CYCLE: 16 HK_STAT_LAST_ERROR_FREQUENCY: 0 HK_STAT_LAST_ERROR_ID: 0 HK_STAT_LAST_SPWLINK_ERROR: 0 - no error **HK_STAT_MERTIS_MODE: 3 - WarmUp** HK_STAT_NUM_TC_EXECUTED: 4 HK_STAT_NUM_TC_RECEIVED: 4 HK_STAT_NUM_TM_SENT: 16 **HK_STAT_POI_POWER: 1 - on** **HK_STAT_SHH_POWER: 0 - off** HK_STAT_SID: 1 - OperationDefaultHK **HK_STAT_STS_POWER: 1 - on** **HK_STAT_TEC_POWER: 1 - on** **HK_STAT_TIR_POWER: 1 - on** **HK_STAT_TIS_POWER: 1 - on** HK_STAT_TM_BUFFER_OVERFLOW: 0 - no HK_STAT_WATCHDOG: 0 - off HK_TEMP_ICU: 32,32 [°C] HK_TEMP_PSU: 33,53 [°C] HK_VOLT_PSU_P34: 3538 [mV] HK_VOLT_PSU_P72: 7207 [mV]
20	TM_OperationExtended_HK	20	HK_STAT_POI_BB3_VIEW: 0 - no HK_STAT_POI_BB7_VIEW: 0 - no HK_STAT_POI_PLANET_VIEW: 1 - yes HK_STAT_POI_SPACE_VIEW: 0 - no HK_STAT_REL_NUM_LATCHUP_ERROR: 0 HK_STAT_STS: 0 - open HK_STAT_TIS_TEC_STABLE: 0 - temp unstable HK_TEMP_BB3: 30 [°C] HK_TEMP_BB7: 390,98 [°C] HK_TEMP_BOL_CHIP: 30,007 [°C] HK_TEMP_BOL_HOUSING: 2,08 [°C] HK_TEMP_EOP_IR_FILTER: 2,03 [°C] HK_TEMP_EOP_TMA: -0,29 [°C] HK_TEMP_ICU: 32,32 [°C] HK_TEMP_OST_BASE_PLATE: 0,08 [°C] HK_TEMP_POI_MIRROR: 27,91 [°C] HK_TEMP_POI_MOTOR: 28,05 [°C] HK_TEMP_PSU: 33,53 [°C] HK_TEMP_RAD_SLIT: 27,86 [°C] HK_TEMP_RBA_BACK: 29,68 [°C] HK_TEMP_RBA_FRONT: 30,28 [°C] HK_TEMP_SOP_GRATING: -1,01 [°C] HK_TEMP_SOP_M1: 5,78 [°C] HK_TEMP_STS: 1,09 [°C]
21	*TC_Science_Enable*	N/A	PAR_PROCESS_ID: 62 - Science Data (X-band downlink)
22	TM_TC_Acceptance_Success	< 0,1	PAR_TC_APID: 972 (0x3CC)
23	TM_Operation_Parameter	< 0,1	See parameter table, parameter as commanded by

#	TC / TM packets	dTime (sec) (1)	Remark, Parameter settings (complete parameter list is shown in Appendix)
			TC_Operation_Parameter
24	TM_FunctionConfig_Parameter	< 0,1	See parameter table
25	TM_OperationExtended_HK	< 0,1	
26	TM_OperationExtended_HK	N/A	Every 20sec
27	TM_OperationDefault_HK	N/A	Every 20sec
28	TM_OperationExtended_HK	< 0,1	
29	TM_Science_TIS_Data	< 0,01	4 x TM_Science_TIS_Data every 100msec
30	TM_Science_TIS_Data	< 0,01	
31	TM_Science_TIS_Data	< 0,01	
32	TM_Science_TIS_Data	< 0,01	
33	TM_Science_TIR_Data	< 0,01	
34	TM_TC_Execution_Success	< 4	
	TM_Event_Progress(ModeTransition)	< 0,1	HK_EVENT_PROG_ID: 42003 HK_STAT_CURRENT_MODE: 23 - **Science_Raw** HK_STAT_PREVIOUS_MODE: 3 - WarmUp
35	---	N/A	Repetion until *TC_Science_Disable* (PAR_PROCESS_ID: 62)
36	TM_Science_TIS_Data	< 0,01	Repetition of 100msec
37	TM_Science_TIS_Data	< 0,01	
38	TM_Science_TIS_Data	< 0,01	
39	TM_Science_TIS_Data	< 0,01	
40	TM_Science_TIR_Data	< 0,1	Repetition of 800msec
41	…		
42	TM_OperationExtended_HK	N/A	Every 20sec
43	TM_OperationDefault_HK	N/A	Every 20sec
44	*TC_Science_Enable*	N/A	PAR_PROCESS_ID: 63 - Science Data (K-band downlink)
45	TM_TC_Acceptance_Success	< 0,1	
	TM_TC_Execution_Success	< 4	
46	---	N/A	Repetion until *TC_Science_Disable* (PAR_PROCESS_ID: 63)
47	TM_Science_TIS_Data_Quicklook	N/A	Repetition of 60sec
48	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
49	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
50	TM_Science_TIS_Data_Quicklook	0	Repetition of 60sec
51	TM_Science_TIR_Data_Quicklook	0	Repetition of 60sec
52	*TC_Science_Disable*	N/A	PAR_PROCESS_ID: 63 - Science Data (K-band downlink)
53	TM_TC_Acceptance_Success	< 0,01	
54	TM_TC_Execution_Success	< 4	
55	*TC_Science_Disable*	N/A	PAR_PROCESS_ID: 62 - Science Data (X-band downlink)
56	TM_TC_Acceptance_Success	< 0,01	PAR_TC_APID: 972 (0x3CC)
57	TM_TC_Execution_Success	< 4	
58	TM_Event_Progress(ModeTransition)	< 0,01	HK_STAT_CURRENT_MODE: 3 - WarmUp HK_STAT_PREVIOUS_MODE: 23 - Science_Raw
59	TM_OperationDefault_HK	20	Every 20sec
60	TM_OperationExtended_HK	20	Every 20sec

(1) "N/A" means a TC can be sent immediately or with a waiting time

Table 5-3: MERTIS Science Default Mode Procedure

5.35. Typical Orbit Operation Scenario

MERTIS operates during one Mercury orbit in 5 different Science modes as maximum (see chapter 2.5 in RD5 for more details). Each mode change is initiated by telecommands. MERTIS can perform these mode changes using a nominal or optimized way. The difference is the number of needed telecommands per Orbit.

The following tables show the needed operation to perform one Mecury orbit session in **nominal** and **optimized** way. It is assumed that the start mode and the end mode of an orbit session is the **StandBy** mode.

The following table lists the needed commands using the **nominal** orbit operation:

Action	Telecommand	TC Num	Remark
Start Science Mode 1	*TC_Power_Enable*	1	Warm-up instrument to get thermal stable condition
	TC_Operation_Parameter	2	Configure Science mode
	TC_Science_Enable	3	Start Science mode
Change to Science Mode 2	*TC_Science_Disable*	4	Stop Science mode
	TC_Operation_Parameter	5	Configure Science mode
	TC_Science_Enable	6	Start Science mode
Change to Science Mode 3	*TC_Science_Disable*	7	Stop Science mode
	TC_Operation_Parameter	8	Configure Science mode
	TC_Science_Enable	9	Start Science mode
Change to Science Mode 4	*TC_Science_Disable*	10	Stop Science mode
	TC_Operation_Parameter	11	Configure Science mode
	TC_Science_Enable	12	Start Science mode
Change to Science Mode 5	*TC_Science_Disable*	13	Stop Science mode
	TC_Operation_Parameter	14	Configure Science mode
	TC_Science_Enable	15	Start Science mode
Stop Science mode	*TC_Science_Disable*	16	Stop Science mode
	TC_Power_Disable	17	Leave WarmUp mode and enter StandBy

Table 5-4: MERTIS Nominal Orbit Operation

The following table lists the needed commands using the **optimized** orbit operation:

Action	Telecommand	TC Num	Remark
Start Science Mode 1	*TC_ Power_Enable*	1	Warm up instrument to get thermal stable condition
	TC_Operation_Parameter	2	Configure Science mode
	TC_Science_Enable	3	Start Science mode
Change to Science Mode 2	*TC_Operation_Parameter*	4	Change Science mode
Change to Science Mode 3	*TC_Operation_Parameter*	5	Change Science mode
Change to Science Mode 4	*TC_Operation_Parameter*	6	Change Science mode
Change to Science Mode 5	*TC_Operation_Parameter*	7	Change Science mode
Stop Science mode	*TC_Science_Disable*	8	Stop Science mode
	TC_ Power_Disable	9	Leave WarmUp mode and enter StandBy

Table 5-5: MERTIS Optimized Orbit Operation

Using the **optimized** way for the orbit operation **9 telecommands** are needed, where the **nominal** orbit operation needs **17 telecommands**. The reason for the less number of telecommands in case of optimized operation is the way that for changing the science mode only the configuration is changed by *TC_Operation_Parameter* but MERTIS doesn't go back to the **WarmUp** mode.

Note that both possibilities can be used for orbit operation without a difference related to the science performance.

6. INSTRUMENT FLIGHT OPERATION PROCEDURES

This section shall define all procedures required for operation of the instrument in-flight.
Procedures defined in this section of the instrument User Manual will be converted by ESOC into procedures as part of the Flight Operations Plan (FOP). The FOP will include a specific volume for each instrument, with the following flight procedures categories:
- nominal flight control procedure (FCP)
- engineering flight control procedure (ENG)
- contingency recovery procedures (CRP)
In addition, for special maintenance / checkout in-flight activities requiring dedicated test procedures to be executed, a specific procedure category has been defined: flight test procedure (TST).
As an introduction (and as part of the Instrument User Manual) a list of instrument procedures shall be provided using the following table:

TBW

Experiment Name
Procedure Number Procedure Title
The procedure naming convention will be defined at a later stage. Procedure numbers shall iterated with ESA.
For each defined procedure, the following information has to be provided:
- procedure number,
- procedure description,
- procedure execution constraints,
- initial conditions: pre-requisite for procedure execution in terms of spacecraft / instrument configuration,
- end condition: description of spacecraft / instrument configuration at the end of the procedure,
- mode transitions: identify the instrument mode at procedure start, during procedure execution and after procedure end. In case the instrument goes through several mode transitions as part of the procedure execution, please provide a detailed profile of the mode transitions,
- procedure resource modelling: for each FCP, please define the procedure duration, power consumption and generated data rate/volume,
- for procedures including logical branching: flow diagram,
- procedure body (detailed template to be provided at a later stage)
The procedure execution constraint shall state whether it is allowed to run the procedure on the Engineering Qualification model of the instrument or not.

This section defines and describes all MERTIS procedures required for operation of the instrument in-flight. Procedures defined in this section of the instrument User Manual are converted by ESOC into procedures as part of the Flight Operations Plan (FOP). The following kinds of operational procedures are defined here:

- Nominal Flight Control Procedure (FCP)
- Engineering Flight Control Procedure (ENG)
- Contingency Recovery Procedures (CRP)
- Flight Test Procedures (FTP)

6.1. Nominal Flight Control Procedures (FCP)

This section shall define all procedures required to perform routine instrument operations. Procedures defined here shall satisfy the following criteria:
- The procedure can be used during the routine phase at Mercury (i.e. plannable via the SGS and executable from the mission timeline). This means that all telecommands included in the procedure have a delta-release time wrt the previous command in the procedure.
- The procedure does not include logical branching (i.e. only straight-forward sequence of commands)
In particular, this section shall include the nominal instrument switch-on, switch-off and all routine mode switching procedures.
The procedures defined in this section are typically going to be requested for execution as part of the routine mission planning cycles.

The following table list the MERTIS Nominal Flight Control Procedures (FCP) which shall be used to perform routine instrument operations.

Procedure Title	Procedure Name	Purpose
MERTIS Switch-on *	KMR04020MRON	Power-on MERTIS and go to StandBy mode
MERTIS Switch-off *	KMR04021MROF	Power-off MERTIS
MERTIS Science	TBW	Performing MERTIS science operation in a predefined mode

* Already defined as OBCP (see MER-DLR-RS-010-OBCP-URD-MERTIS)

Table 6-1: List of MERTIS FCP procedures

6.2. Engineering Flight Control Procedures (ENG)

This section shall define all procedures required to perform flight maintenance instrument operations.
Procedures defined here shall satisfy the following criteria:
- The procedure can be used in any mission phase
- Only for engineering purposes
The procedure defined in this section are scheduled for execution by ESOC upon specific request from and at times defined by the instrument team.
In particular, this section shall include the procedures required to perform on-board software maintenance.
Procedures defined in the previous sections and used or required during maintenance operations do not need to be repeated here (e.g. mode switching, switch-on, switch-off).

The following table list the MERTIS Engineering Flight Control Procedures (ENG) which shall be used to perform flight maintenance instrument operations.

Procedure Title	Procedure Name	Purpose
MERTIS SW Upload	TBW	Performing uploading and installing of a new MERTIS APS executable
MERTIS Diagnostic	TBW	Performing MERTIS instrument diagnostic in order to check the health condition of all sub-systems

Table 6-2: List of MERTIS ENG procedures

6.3. Contingency Recovery Procedures (CRP)

This section shall define all procedures required to react to known instrument contingencies. The procedures defined in this section will normally be executed by ESOC upon detection of an anomalous behaviour and/or upon request from the instrument team.
This section shall include a summary trouble-shooting table, defining for all possible non-nominal telemetry indications provided by the instrument (service 1 telecommand failure message, service 5 non-nominal events, housekeeping parameter out-of-limit) the action to be taken by the ESOC flight control team. Possible actions include: no action, phone PI team, execute contingency recovery procedure x, etc.
Procedures defined in this section shall include:
- switch off instrument redundancies
- manual switch-on / switch-off
- emergency switch-off

The following table list the MERTIS Contingency Recovery Procedures (CRP) which shall be used to

react to known instrument contingencies.

Procedure Title	Procedure Name	Purpose
MERTIS Emergency Off *	KMR04022MREM	Switch-off MERTIS in case of emergency (HK limit violation)
MERTIS Switch Redundant	TBW	Switch-on MERTIS redundant system
MERTIS Correct Boot Config	TBW	Correct auto boot configuration for APS
MERTIS Manual APS boot	TBW	Performing manual boot of MERTIS APS
MERTIS Switch-on to Safe	TBW	Switch-on MERTIS and enter **Safe** mode
MERTIS Go to Safe	TBW	Entering of Safe mode (board reset, PBS boot)

* Already defined as OBCP (see MER-DLR-RS-010-OBCP-URD-MERTIS)

Table 6-3: List of MERTIS CRP procedures

6.4. Flight Test Procedures (FTP)

This section shall define procedures required to perform in-flight tests. As a minimum, this section shall include all procedures specific to the near-Earth commissioning (e.g. initial activation, first light operation, mechanism deployment, first checkout after launch, etc).
These procedures shall be run manually from ground.
Procedures defined in the previous sections and required for maintenance operations do not need to be repeated here (e.g. mode switching, switch-on, switch-off).

The following table list the MERTIS Flight Test Procedures (FTP) which shall be used to perform in-flight tests.

Procedure Title	Procedure Name	Purpose
MERTIS Health Check	TBW	Performing MERTIS instrument health check after a long switch-off time

Table 6-4: List of MERTIS FTP procedures

7. INSTRUMENT INTERNAL FUNCTIONALITY

7.1. ICU Memory Layout

This chapter describes the MERTIS ICU memory layout and format of a SPARC V8 executable.

The following table provides the detailed ICU memory map:

Name	Address Range	Remark
ADDR_PROM	0x00000000…0x00007FFF	32kByte PROM (8bit access)
ADDR_EEPROM	0x20000000…0x201FFFFF	2Mbyte EEPROM (16bit IO access, special driver is needed!)
ADDR_CACHE_EEPROM	0x20200000…0x203FFFFF	Virtual address range to access the eeprom software cache, which is located somewhere in the SDRAM
ADDR_INTERNAL_RAM	0x38000000…0x380003FF	Internal RAM located in the LEON3 FT. The RAM is not cleared during a reset of the LEON3 FT Core.
ADDR_SDRAM	0x40000000…0x47FFFFFF	128MByte SDRAM EDAC protected. The RAM has to be initialized after power on.
ADDR_APBCTRL	0x80000000	Register Bank of the hardware units (see RD4 and RD5 for more information)
ADDR_DSU	0x90000000	Debug Support Unit
PBS_START_ADDR	0x47800000	Start address of PBS in RAM
APS_START_ADDR	0x40000000	Start address of ABS in RAM

Table 7-1: MERTIS ICU memory map

The execution after power on or reset starts at address 0x00000000 (PROM) with the execution of a self extracting PBS image. The PBS image is copied to the address 0x47800000 (SDRAM). An APS image shall start from the address 0x40000000 (SDRAM).

The following figure shows the basic structure of a SPARC V8 executable

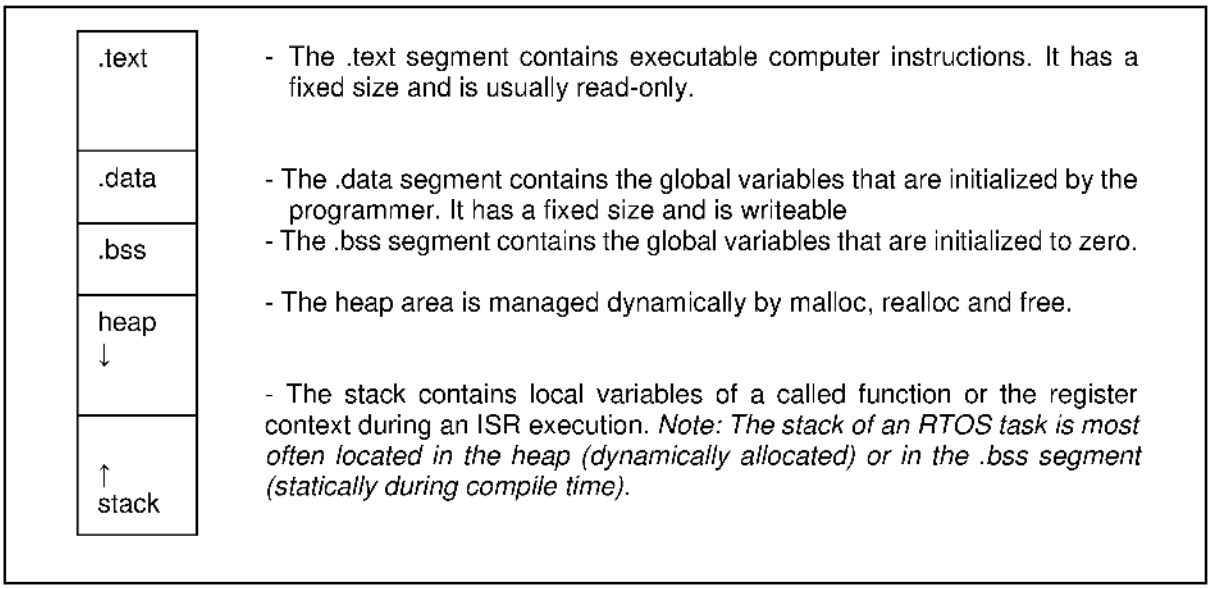


Figure 7-1: Memory layout SPARC V8 executable

The APS use the full range of 128MByte SDRAM memory. During runtime of APS the PBS will be overwritten by the APS stack.
The APS FM release is made of 58 software modules and allocates a .text segment of about 800kByte. Between each software module a gap of 1kByte is included. This could be helpful in case of software modification and patching. The .data segment is about 8kByte. The .text and .data segment together are the executable, which is stored in the EEPROM. During APS start up a .bss segment of about 5Mbyte is generated. Additionally the operating system reserves about 26MByte workspace memory for task stacks and other internal stuff on the heap. Typically 10MByte of the workspace memory will be used during runtime. For the application itself about 96Mbyte memory are available on the heap. During software test a maximal usage of 50% has been observed.

An APS configuration file is about 50kByte and stored in EEPROM. The format is CSV. The APS configuration file is loaded during the boot process to adjust the configuration parameters for the active MERTIS hardware (main or redundant). This is important e.g. to calibrate the temperature sensors of the main or redundant channel.

Note: Floating point values within the configuration file have to be written with '.' and not as usual in German with a ','. Therefore it is not recommended to open and edit the APS configuration file with Excel.

7.2. SpaceWire Interface Initialization and Configuration

The MERTIS instrument spacewire interface will be initialized as follows:

TC node address:	68
TM node address (science):	52
TM node address (non science):	36
Link Auto Start:	Disable
Reception of time code:	Enable
Promiscuous Mode:	Disable
Clock divisor startup:	2 (or 10.5Mhz)
Clock divisor run:	2 (or 10.5Mhz)
6.4 µs timer:	135 (or 6.42µs)
Disconnect:	18 (or 850ns)

All values can be reconfigured in the MERTIS configuration file with the following On-Board property parameters:

OBPAR_SPW_NODE_ADDR_TC
OBPAR_SPW_NODE_ADDR_TM_SCIENCE
OBPAR_SPW_NODE_ADDR_TM_NO_SCIENCE
OBPAR_SPW_PROTOCOL_ID
OBPAR_SPW_GRSPW_CTRL_REG_INIT
OBPAR_SPW_GRSPW_CLOCK_DIV_REG_INIT
OBPAR_SPW_GRSPW1_TIMER_DISCNT_REG_INIT
OBPAR_SPW_GRSPW_DMA1_CTRL_STAT_REG_INIT

Further information is given in the Hardware to Software ICD (RD7) and more detailed in the Gaisler Research spacewire VHDL core documentation.

7.3. Power-on/Boot Process Details

The boot of the MERTIS instrument software is performed in several steps or stages. The execution after power on or reset starts at memory address 0x00000000 (PROM) with the execution of a self extracting Primary Boot Software (PBS) image. The PBS image is copied to the memory address 0x47800000 (SDRAM). An Application Software (APS) image starts from the address 0x40000000 (SDRAM). A detailed description of the memory layout is presented in another chapter of this manual.

Stage 1:

The execution starts at address 0x00000000 with the execution of the self extracting PBS prom image.

- initializing the hardware (memory controller)
- initialize the SDRAM in order to calculate the EDAC checksum (bdinit1)
- decompress and copy the PBS executable to the address 0x47800000 (SDRAM)
- set the stack pointer to the address 0x47FFFFFC
- clear the register window, disable interrupts and jump to address 0x47800000

Note:
Stage 1 uses only a single vector trap!

Stage 2:

Execution starts at address 0x47800000 with the execution of the PBS software

- startup C code and initialize trap table (see SPARC V8 architecture description)
- initialize hardware used within the PBS
- initialize software and read PBS configuration file from EEPROM, if available
- start scheduler and execute tasks

If boot to APS is requested by TC or auto boot is configured

- decompress/copy the APS executable from EEPROM to the address 0x40000000 (SDRAM)
- set the stack pointer to the address 0x47FFFFFC
- clear the register window, disable interrupts and jump to address 0x40000000

Note:
The PBS cannot copy an APS executable behind the start address of the PBS! Usually a SPARC executable is linked at address 0x40000000.

Stage 3:

Execution starts at address 0x40000000 with the execution of the APS software

- startup C code and initialize trap table (see SPARC V8 architecture description)
- initialize all hardware and subunits
- initialize software and read APS configuration file from EEPROM, if available
- start RTEMS and execute tasks

Note:
The APS stack starts at the end of SDRAM and goes down. Therefore the PBS is overwritten. It is not foreseen to exit the APS and return to the PBS. This shall be done with a reset and reboot the ICU.

The PBS can maintain up to six APS executables and up to six APS configuration files within the EEPROM. The active executable and the active configuration are marked with flags. The selection is done by means of a dedicated TC. Additionally the instrument mode after Power On has to be defined. If an APS executable is available, selected and the boot mode is StandBy, the boot process is finished after stage 3 and the MERTIS instrument is in StandBy mode. An activated configuration file is not mandatory, but recommended. If no configuration is selected, a warning event will be generated.
If the EEPROM is empty, corrupted or no executable is selected, the boot process stops after stage 2 with a warning event and the MERTIS instrument remains in Safe mode. In case of receiving a TC within stage 2, the boot process is stopped too. A nominal option to stop the boot process after stage 2 is to define the Safe Mode as start mode after power on. The following table lists typical boot configurations and the Instrument mode after Power On.

Executable	Configuration	Boot Mode	Mode after Power ON	Remark
Not selected	Not selected	Not selected	Safe Mode	The MERTIS instrument stays always in Safe Mode. The TC_StandBy_Enter command cannot be executed. One or more warning events will be generated.
Selected	Not selected	Safe Mode	Safe Mode	After Power On the MERTIS instrument operates in Safe Mode. The TC_StandBy_Enter command can be executed. A warning event related to the missing configuration will be generated.
Selected	Selected	Safe Mode	Safe Mode	After Power On the MERTIS instrument operates in Safe Mode. The TC_StandBy_Enter command can be executed.
Selected	Not selected	Stand By	Stand By	After Power On the MERTIS instrument operates in Stand By Mode. A warning event related to the missing configuration will be generated.
Selected	Selected	Stand By	Stand By	After Power On the MERTIS instrument operates in Stand By Mode. **This is the MERTIS nominal boot configuration.**

Table 7-2: MERTIS boot configuration

As described in another chapter the content of the EEPROM is cached in SDRAM. If the MERTIS instrument operates in Safe Mode, this EEPROM cache is accessible in the address range from 0x20200000 to 0x203FFFFF with memory services. This allows loading an APS image and configuration to the MERTIS instrument and performing a boot (stage 3) directly from RAM. This RAM boot feature can be used to reduce EEPROM write cycle during software development and instrument testing or in case of damaged EEPROM during the instrument operation. A detailed description of the EEPROM data structures is written in another chapter of this document.

7.4. Software configuration files

7.4.1 APS configuration file format

The MERTIS APS works internally with so called on-board parameters. Each on-board parameter is a set of a unique name, a unit string, a short description string, a parameter type field (integer signed or unsigned, float or hex vale) and a 4 Byte value. These on-board parameters allow configuring and changing the behavior of the APS or to observe internal calculations. It is possible to enable or disable features or to change values, e.g. the calculation and calibration of the MERTIS housekeeping's. A subset of these parameters is addressed to MERTIS TCs. All values from the configuration TCs are mapped into the on-board parameters. With some special test TCs all or one on-board parameter(s) can be read or one parameter can be written temporary by the user. It is possible to operate the instrument with these commands in an unusual way. To make changes permanent (e.g. Calibration of analog channels) a configuration file can be generated and uploaded into the EEPROM. The APS configuration file is an excel CSV file with the following format:

```
Configuration: FM_MAIN_CFG $Rev: 1500 $ manual
ItemName;Default;Unit;ItemType;Description
OBPAR_ICU_OPRATION_HK_ENABLE;1; ;UINT32;Enable Operation HK 0=off, 1=on
…
```

The fields Unit, ItemType and Description are optional, because they cannot be overwritten. But they are recommended for better readability of the configuration file. The MERTIS database exports a configuration file with much more information, which are not mandatory.

The table in Appendix 12 gives an overview of all on-board parameters and variables of the actual FM APS release. The table contains only the name and the description and shall give an overview what can be maintained with on-board parameters. Detailed information including actual values are contained in the MERTIS data base.

7.4.2 PBS configuration file format

The PBS is able to overwrite some internal parameters with updated values from a configuration file located in the EEPROM. The PBS configuration is a simple binary file. The following table contains all parameters in their order. The prefix 16 means a 16bit parameter and the prefix 32 means a 32Bit parameter. The parameter has to be stored in the big endian format.

Name	Default	Description
ui32_addr_boot_chache	>0x47800000	start address of the software boot cache; default depends on the compiler
xhk_config_operat_def .ui16_enable	1	Default HK enabled
xhk_config_operat_def .ui16_period	160	HK period 20s (160*125ms)
xhk_config_operat_ext .ui16_enable	0	Extended HK disable
xhk_config_operat_ext .ui16_period	160	HK period 20s (160*125ms)
i32_ICU_P72V_Gain_inverse	2750	Gain and offset values to calibrate the HK conversion. *Note:* *The output is mV and 1/100°C. The Gain and offset parameter must be converted for integer arithmetic. See below.*
i32_ICU_P72V_Offset_by_Gain	0	
i32_ICU_P34V_Gain_inverse	6101	
i32_ICU_P34V_Offset_by_Gain	0	
i32_PSU_Temp_Gain_inverse	712	
i32_PSU_Temp_Offset_by_Gain	-19443594	
i32_ICU_Temp_R1	20020	
i32_ICU_Temp_Re	0	
i32_ICU_DNoff	251470	ADC single ended measurement offset correction of about 16mV. The value is given as DN and is measured during hardware integration.

ui32_eeprom_always_on	FALSE	EEPROM power always on
ui32_hk_latchup_handling	TRUE	Enable HK latchup handling in PBS
ui32_limit_check_on	TRUE	Enable HK limit check
i16_PAR_Temp_ICU_Max	9000	ICU temperature limit of e.g. 90°C
i16_PAR_Temp_PSU_Max	7500	PSU temperature limit of e.g. 75°C
ui16_PAR_Volt_PSU_P34_Max	4000	3.4 voltage limit of 4V
ui16_PAR_Volt_PSU_P72_Max	8000	7.2 voltage limit of 8V

Table 7-3: PBS configuration parameters

In order to calculate the HK values with integer arithmetic the formula

*value = gain * DN + offset*

is changed to

value = (DN + offset_by_gain) / gain_inverse

with

*offset_by_gain = offset * gain*
gain_inverse = 1 / gain

Example for default values:

HK_Volt_PSU_P72 (mV) = 3.6358833-4F * DN + 0.0F
i32_ICU_P72V_Gain_inverse = 1 / 3.6358833-4F = **2750**
i32_ICU_P72V_Offset_by_Gain = (1 / 3.6358833-4F) * 0.0F = **0**

HK_Volt_PSU_P34 (mV) = 1.63912773E-4F * DN + 0.0F
i32_PSU_Temp_Gain_inverse = 1 / 1.63912773E-4F = **6101**
i32_PSU_Temp_Offset_by_Gain = (1/1.63912773E-4F) * -27320.00F = **0**

HK_Temp_PSU (1/100 °C) = 1.40509E-3F * DN - 27320.00F
i32_PSU_Temp_Gain_inverse = 1 / 1.40509E-3F = **712**
i32_PSU_Temp_Offset_by_Gain = (1/1.40509E-3F) * -27320.00F = **-19443594**

The formula for the ICU temperature is:

HK_Temp_ICU (1/100 °C) = (((DN * R1) /(2^{26} – DN)) – Re – 1000) * 26

This is an example of the binary configuration file:

```
00000000h: 44 00 00 00 00 01 00 A0 00 00 00 A0 00 00 0A BE ; D.....P...P...`
00000010h: 00 00 00 00 00 00 17 D5 00 00 00 00 00 00 02 C8 ; ...............È
00000020h: FE D7 50 76 00 00 4E 34 00 00 00 00 00 03 D6 4E ; þ×Pv...È4þ×Pv....
00000030h: 00 00 00 00 00 00 00 01 00 00 00 01 23 28 1D 4C ; ................
00000040h: 0F A0 1F 40                                     ; ....
```

7.5. Periodic Operation Sequence

7.5.1 Science Mode Calibration Cycle

MERTIS performs the Science Mode Calibration cycle by repeating of **in-flight calibration cycles**. Nominally **one** calibration cycle lasts e.g. 20 sec or longer as shown in the following figure . The calibration cycle is structured into four target phases, **Planet**, **BB700**, **BB300**, and **Space**. The targets BB700, BB300, and Space serve as in-flight calibration sources and Planet is the scientific target. The Pointing Unit (POI) moves the optical mirror to each target. After reaching the target, science data acquisition is performed for a defined time and after that moving to the next target is done. If data acquisition from all four targets is done the cycle starts again with the first target (Planet).
The time for data acquisition shall be nominally e.g. 13 sec at Planet target and 1-3 sec at the calibration targets.

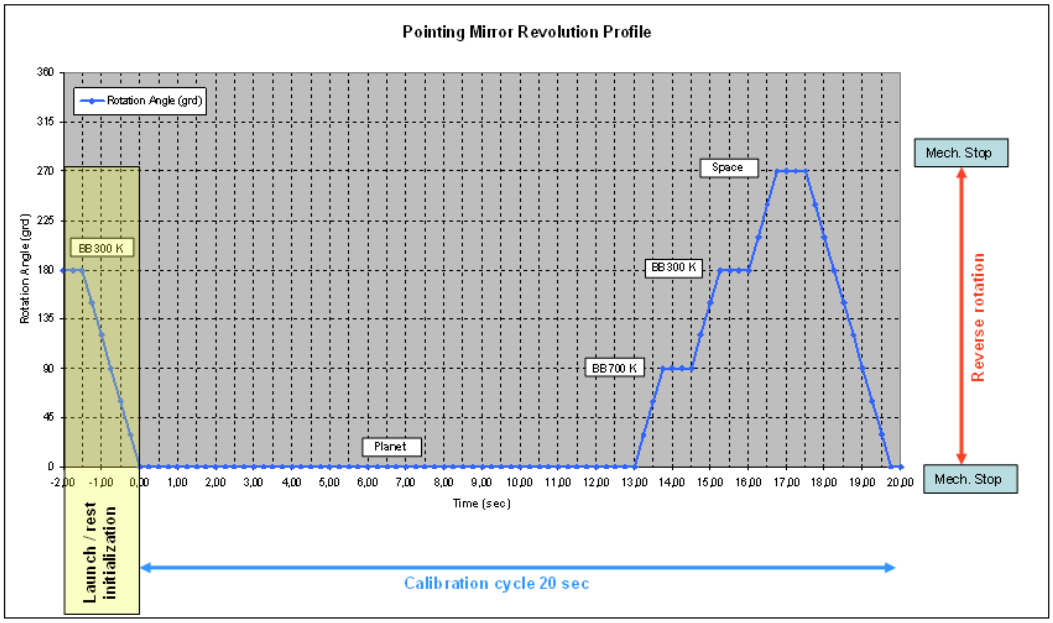


Figure 7-2: MERTIS in-flight calibration cycle scheme

7.5.2 Science Mode Calibration Cycle Timing

The APS maintains separate timing parameter related to the several calibration cycle phases. These parameters are:

PAR_CALIBRATION_PERIOD:	Period of calibration cycle (default 120sec)
PAR_CALIBRATION_TIME_PLANET	Time for Planet science acquisition (default 13sec)
PAR_CALIBRATION_TIME_BB700	Time for BB700 science acquisition (default 1sec)
PAR_CALIBRATION_TIME_BB300	Time for BB300 science acquisition (default 1sec)
PAR_CALIBRATION_TIME_SPACE	Time for Space science acquisition (default 1sec)

PAR_CALIBRATION_PERIOD is adjustable by command *TC_Operation_Parameter*.

7.5.3 POI Mode and Calibration Cycle

Depending on the set POI mode (Parameter PAR_POI_MODE in *TC_Operation_Parameter*) the calibration cycle varies. If PAR_POI_MODE=Move (nominal) the calibration cycle is performed as shown in Figure 7-2PAR_POI_MODE=PlanetView the POI is moved to PlanetView position and stay there the whole calibration cycle. PAR_POI_MODE=BB3View the POI is moved to BB3View position and stay there the whole calibration cycle. In these two cases data acquisition is performed only from one target the whole cycle.

7.5.4 Data Oversampling Mode

It is possible to activate a data oversampling mode in order to increase significantly the SNR of the acquired science data. If the data oversampling mode is enabled (default) MERTIS acquires more than one acquisition (or as much as possible number of acquisitions) in a science data repetition period (parameter PAR_REPETITION_RATE in command *TC_Operation_Parameter*) and calculates the average image data to be sent as science TM packet to ground (*TM_Science_TIS_Data / TM_Science_TIR_Data*).
The user can enable or disable the oversampling mode separately for TIS and TIR by setting the parameter PAR_TIR_OVERSAMP_MODE / PAR_TIR_OVERSAMP_MODE to Yes(1) or No(0) in command *TC_FunctionConfig_Parameter*. By default the oversampling mode is enabled.
The on-board software calculates autonomously the number of oversamplings to be performed related to the current science data repetition period and writes this number as status data into the science TM packets (see parameters HK_STAT_TIS_NUM_OVERSAMP / HK_STAT_TIR_NUM_OVERSAMP in packets *TM_Science_TIS_Data / TM_Science_TIR_Data*).

7.6. Science Data Processing

7.6.1 TIS Science Data Processing

This chapter describes the way how TIS science data processing is performed in order to reduce the spectrometer science data rate during science operation. There are three means performed during on-board data processing to reduce the data amount of TIS bolometer data (raw data are 160x120 pixel) to be sent as science telemetry:

1. Pixel binning
2. TIS science windowing
3. Data compression

TIS Pixel Binning:
A pixel binning is performed during TIS science data processing in range of 1x2 up to 2x4 pixels depending on the MERTIS science mode. This results in a **data reduction of up to 0,125** of the read out data. Note that no binning (no data reduction) is used only for modes Science_Raw, Calibration, Diagnostic and Test which are not nominal modes.

TIS Science Windowing:
Depending on the MERTIS science mode only a defined window area of the full Bolometer detector (160x120 pixels) is read out and used for further data processing. There are differnet TIS window sizes which are used for MERTIS science modes, 100x80 pixels, 66x80 pixels, 74x80 pixels and 160x120 pixels (full detector). The smallest window size (66x80 pixels) results in a **data reduction of up to 0,275** of the detector data.

TIS Data Compression:
A lossless data compression is used to reduce the amount TIS science data. This results in a **data reduction of up to 0,5** (compression factor of about 2…2,5) of the detector data volume. Note that the mode ‘no compression’ is only used for not nominal modes e.g. Calibration, Science_Raw and Science_High_Res_UnCompr.

7.6.2 TIR Science Data Processing

The TIR data will be sent as TM without any processing as raw data received from the REL ADC, but formatted as 32bit unsingned integer data.

The following figure shows how the Radiometer read-out hardware works including data oversampling.

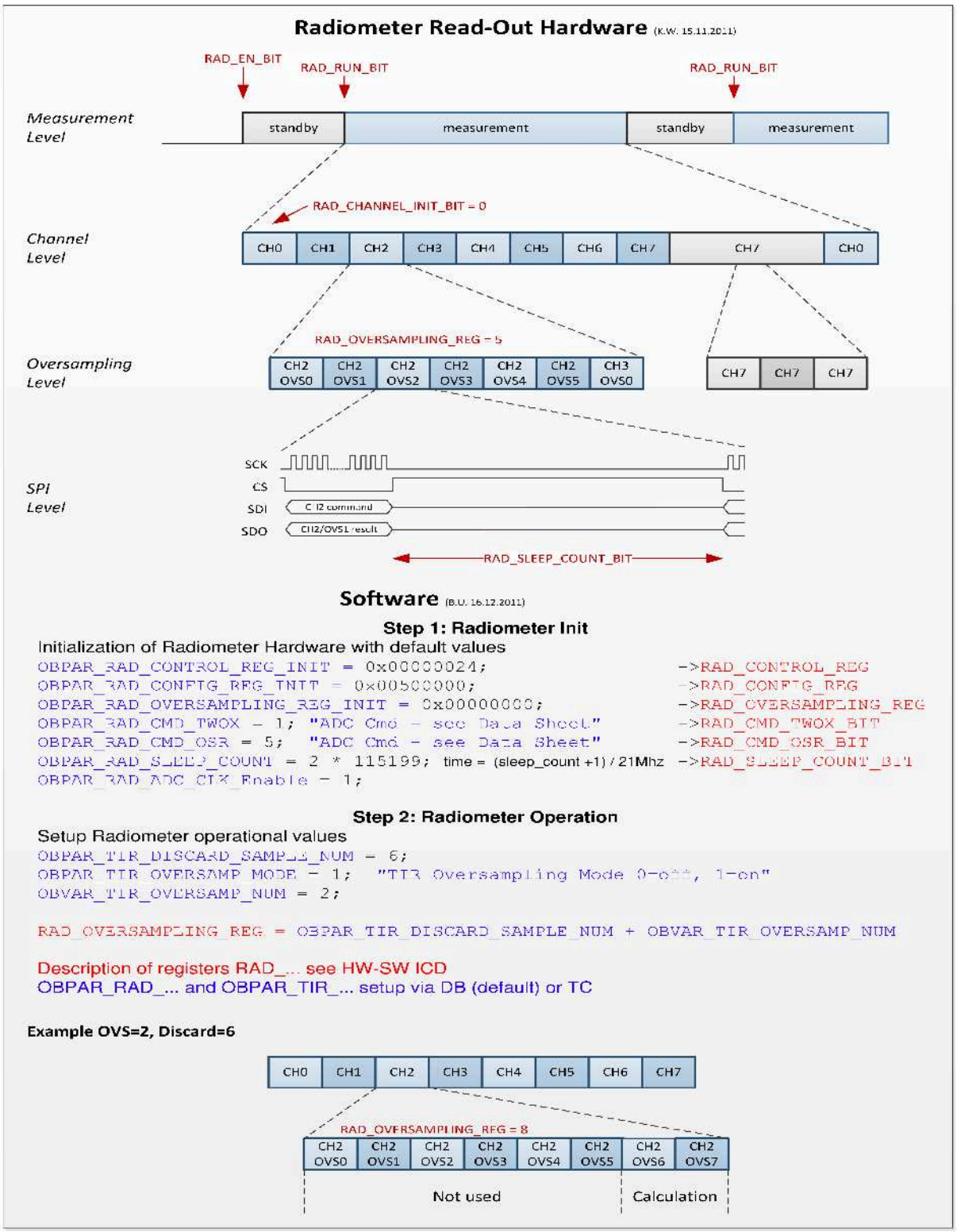


Figure 7-3: REL data read-out scheme

7.7. Science Data Quick Look

This chapter describes the possibility to acquire science data as 'Quick Look'. The 'Quick Look' mechanism can be used for a short period (once a day) to get in addition to the 'normal' science data 'Quick Look' science data. 'Quick Look' science data are much faster linked to ground and provide therefore the possibility to get a kind of 'forecast' of the instrument science performance.

The 'Quick Look' mechanism can be switched on or off by *TC_Science_Enable(PID=63)* or *TC_Science_Disable(PID=63)* and the period sending 'Quick Look' science data can be set (1…255sec, Default=60sec) as Operational parameter (*TC_Operation_Parameter*).

'Quick Look' science data telemetry packets are the same as those for 'normal' science data acquisition. The difference is only the ProcessID of the packet header which marks the packet as 'normal' science data (ProcessID=62/Ka-band downlink) or 'quick look' science data (ProcessID=63/X-band downlink).

7.8. Bolometer Temperature Stabilization

If the Bolometer Electronics and the TEC is powered-on, the bolometer chip is temperature stabilized by a PID controller (implemented by software in APS) to an accuracy of better than 10mK standard deviation.
The temperature to be stabilized is set by a functional parameter (PAR_TIS_BOL_CHIP_TEMP) in manual mode (if PAR_BOL_BIAS_VOLT_SETTING_MODE=0) or automatically (if PAR_BOL_BIAS_VOLT_SETTING_MODE=1) together with the related BIAS voltages depending on the environmental temperature (e.g. HK_TEMP_OST_BASE_PLATE).

Note, that in manual mode (if PAR_BOL_BIAS_VOLT_SETTING_MODE=0) the temperature difference between the bolometer housing (or environment) and the controlled Bolometer chip temperature must be always less than 14K.
Otherwise the PID controller dosn't work correctly and the Bolometer data performance isn't correct.

7.9. Bolometer Operation Control

7.9.1 Bolometer Operation Modes

MERTIS performs setting of the TIS detector BIAS voltages related to the defined mode (Parameter PAR_BOL_BIAS_VOLT_SETTING_MODE=manual/automatic, Default=automatic, command *TC_FunctionConfig_Parameter*). If the mode is set to 'manual' the APS uses the BIAS voltages and BOL chip target temperature as commanded in *TC_FunctionConfig_Parameter* (PAR_BOL_DECT_FIDBIAS_VOLTAGE, PAR_BOL_DECT_VSKIMBIAS_VOLTAGE, PAR_TIS_BOL_CHIP_TEMP). If the mode is set to 'automatic' the APS selects autonomously the optimal BIAS voltages and BOL chip target temperature according to a defined reference temperature.

7.9.2 Bolometer Parameter and Automatic Mode Setting

In order to get the optimal TIS detector performance the APS adapts the Bolometer BIAS voltages and chip temperature related to a defined reference environment temperature (e.g. from optics) if PAR_BOL_BIAS_VOLT_SETTING_MODE is set to 'automatic'. The temperature sensor of the reference temperature measurement is defined by the on-board property parameter OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_SENSOR (default=HK_TEMP_OST_BASE_PLATE). The APS switches autonomously to one of following BIAS voltage parameter sets (parameter set index x=0…10) related to the current reference temperature. If the reference temperature is in range between OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_Tx_MIN and OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_Tx_MAX the APS initialize the Bolometer parameters via Bolometer electronics with the parameter set x consisting of:

OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_x => FID BIAS voltage

OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_x => VSKIM BIAS voltage
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_x => BOL chip target temperature
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_x => Min. macro pixel DN value
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_x => Max. macro pixel DN value

The minimum time for usage of one BIAS voltage parameter set is defined by PAR_BOL_BIAS_VOLT_PARAM_SET_ACTIVE_TIME_MIN (Property parameter, Default=10min). If this time is over and the reference temperature is changed the APS switches to the related parameter set. If the BIAS voltage parameter set was changed the APS sends a *TM_Event_Progress(BIAS voltage changed)* and set the parameter HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET in *TM_OperationExtended_HK* to the index of the active parameter set (0…11).

7.10. Analogue HKs Acquisition and Sample Timing

In general analogue HKs are acquired periodically and sent as telemetry data by default every 20sec after powering-on.

Internally the HK acquisition time is partially shorter depending on the needed sampling interval of HKs für internal control purposes and the oversampling parameter of the ADC.

There is one specific analogue HK (BOL chip temp.) which influences the sampling interval in general. This HK has to be sampled more often than other HKs because it is used for BOL chip temperature stabilization. It is alternately sampled to not BOL chip temperature HKs.

Example:
ADC1 9 x 76+5msec = 729msec (7 x differential + 2 Single ended)
ADC0 15 channels incl. BOL chip temp. (Sampling BOL chip temp. after each Channel) 28 x 76+5msec = 2268msec (5msec = Stabilization time)

Parameter:
TBW

7.11. Sensor Head Heater Temperature Control

The Sensor Head Heater (SHH) controller is implemented as proportional-integral controller. It can control the temperature or a temperature gradient in order to stabilize the sensor head by switch-on or off the sensor head heater.

The SHH controller can be configured with the following On-Board property parameters:

OBPAR_SHH_CONTROL_ENABLE

Enables the SHH controller. 0 means the controller is off and 2 means the controller is on and use an absolute temperature as input. Default value is 2.

OBPAR_SHH_CONTROL_TEMP_REF_SENSOR

Selects the temperature sensor used as reference for the controller:

0=HK_TEMP_RBA_FRONT
1=HK_TEMP_RBA_BACK
2=HK_TEMP_EOP_IR_FILTER
3=HK_TEMP_EOP_TMA
4=HK_TEMP_SOP_GRATING
5=HK_TEMP_OST_BASE_PLATE
6=HK_TEMP_SOP_M1
7=HK_TEMP_BOL_HOUSE
8=HK_TEMP_STS
9=HK_TEMP_ICU
10=HK_TEMP_PSU

Default value is 5.

OBPAR_SHH_CONTROL_PERIOD

Sets the controller period. Default value is 10 seconds.

OBPAR_SHH_CONTROL_TEMP_SETPOINT

Sets the controller setpoint. Default value is 18°C

OBPAR_SHH_PROPORTIONAL_GAIN_TEMPERATURE

Sets the proportional gain of the controller. Default value is 400.

OBPAR_SHH_INTEGRAL_GAIN_TEMPERATURE

Sets the integral gain of the controller. Default value is 0.

7.12. Internal Diagnostic

The On-Board **Diagnostic** mode can be configured (details see chapter 3.5.8) to perform the following diagnostic steps with and without debugging information:

7.12.1 Shutter diagnose

During the shutter diagnose the shutter will be opened and closed several times. The time for opening and closing of the shutter will be measured. Also the two analog shutter housekeeping analog current and analog position will be sampled every one millisecond. All values will be compared with reference values.

7.12.2 TEC Diagnose

During this diagnose step the quality of the bolometer chip temperature will be measured. After a stabilization time of the bolometer several samples of the bolometer chip temperature will be acquired. The standard deviation is calculated and compared with a reference value.

7.12.3 POI Sensor Diagnose

Within the POI sensor diagnose the POI will be moved from planet position to space position and back with single steps. After each step the three POI sensors will be read and compared with a reference table.

7.12.4 BOL Windowing Diagnose

The BOL windowing diagnose checks the bolometer data readout. During this diagnose step four windows with a fix position are defined and one window moves in spectral and spatial direction. This diagnose is done with pattern in order to calculate and check the content of the read windows.

7.12.5 TIS Electronic Noise Diagnose

This step acquires bolometer images, process the images online and calculate the minimum DN, maximum DN, the standard deviation and the SNR. This will be done for different views and different oversampling rates:

Difference between two Planet views
Difference between two BB300 views
Difference between two BB700 views
Difference between two Space views
Shutter corrected Planet view
Shutter corrected BB300 view
Shutter corrected BB700 view
Shutter corrected Space view
BB300 corrected Planet view
BB300 corrected BB300 view
BB300 corrected BB700 view
BB300 corrected Space view

The oversampling rate varies between 1 (means one sample and oversampling is off), 2, 4 and 8. All results will be send within the diagnose telemetry.

7.12.6 TIR diagnose

This step acquires radiometer pixel data. First of all the POI is moved to BB300 position and the

background will be acquired several times. Then the POI will be moved to BB700 (scene). Pixel data will be acquired several times and corrected with the background. The results are sent as TM packets. At the end the standard deviation within a pixel will be calculated. This will be done for all 16 pixels and the results are sent as TM packets.

7.13. Parameter Management

The MERTIS instrument behavior is strongly influenced by the currently used configuration parameters (e.g. Operational parameters). MERTIS maintains three different parameter sets:

- INITIAL PARAMETER
- DEFAULT PARAMETER
- CURRENT PARAMETER

The INITIAL PARAMETER is a fixed parameter set (compiled in the APS executable) and used for initialization after start of the APS. This parameter set is not changeable.

The DEFAULT PARAMETER is a permanently stored parameter set (EEPROM configuration file). After start of the APS the INITIAL PARAMETER set is overwritten by the DEFAULT PARAMETER set if a configuration file is selected and available in EEPROM (see execution of *TC_APS_BootMode* and generating of *TM_EEPROM_Status*). The DEFAULT PARAMETER set is changeable by commands. The DEFAULT PARAMETER set is permanently stored in EEPROM and still available after power-off and power-on again MERTIS.

The CURRENT PARAMETER set is used by the APS for the next (current) MERTIS operation. The CURRENT PARAMETER will be initialized after start of APS by the DEFAULT PARAMETER set or if not available by the INITIAL PARAMETER set. The CURRENT PARAMETER set is changeable by commands. The CURRENT PARAMETER set is temporary stored in RAM and is lost after power-off MERTIS.

7.13.1 Changing of CURRENT parameter file

It is possible to change the CURRENT parameter file by telecommands. Command *TC_Operation_Parameter* changes only the operational parameter set (see execution of *TC_Operation_Parameter*). Command *TC_FunctionConfig_Parameter* changes only the function config parameter set (see execution of *TC_FunctionConfig_Parameter*). By means of TC_Test_Function(SetConfigParam) it is possible to change any on-board configuration property parameter (see execution of *TC_Test_Function(SetPropertyParam)*). Changing of CURRENT parameters is made temporary in RAM. After MERTIS power-off these changes are lost.

7.13.2 Setting DEFAULT parameter file

It is possible to set up a new DEFAULT parameter file in EEPROM by uploading it using memory management service (see execution of *TC_Memory_Load*). A new uploaded DEFAULT parameter file is visible in EEPROM status (see generation of *TM_EEPROM_Status*) and selectable by command (see execution of *TC_APS_BootMode*). A new uploaded DEFAULT parameter file is permanently stored in EEPROM and still available after power-off and power-on again MERTIS.

7.13.3 Selecting DEFAULT parameter file

It is possible to select a DEFAULT parameter file stored in EEPROM by command (see execution of *TC_APS_BootMode*). The selected configuration file will be used after next power-on MERTIS.

7.13.4 Reading CURRENT parameter file

There are several possibilities to read or dump the CURRENT parameter set. By means of command *TC_Parameter_Dump* the user can request the dumping of Operational parameters (see *TM_Operation_Parameter*), of Function Configuration parameters (see

TM_FunctionConfig_Parameter), Diagnostic parameters (see *TM_Diagnostic_Parameter*) and Calibration parameter (see *TM_Calibration_Parameter*).
By means of command *TC_Test_Function(GetPropertyParam)* the user can read a single property parameter (one *TM_TestLog(PropertyParamDef)* is sent). By means of command *TC_Test_Function(GetPropertyParamAll)* the user can read all property parameters (several hundred *TM_TestLog(PropertyParamDef*) are sent).
Note that after starting a Science mode (see command *TC_Science_Enable*) the APS autonomously sents the complete CURRENT parameter file (operation, function configuration, diagnostic, calibration and all property parameters).

The following figure illustrates the concept of MERTIS parameter handling:

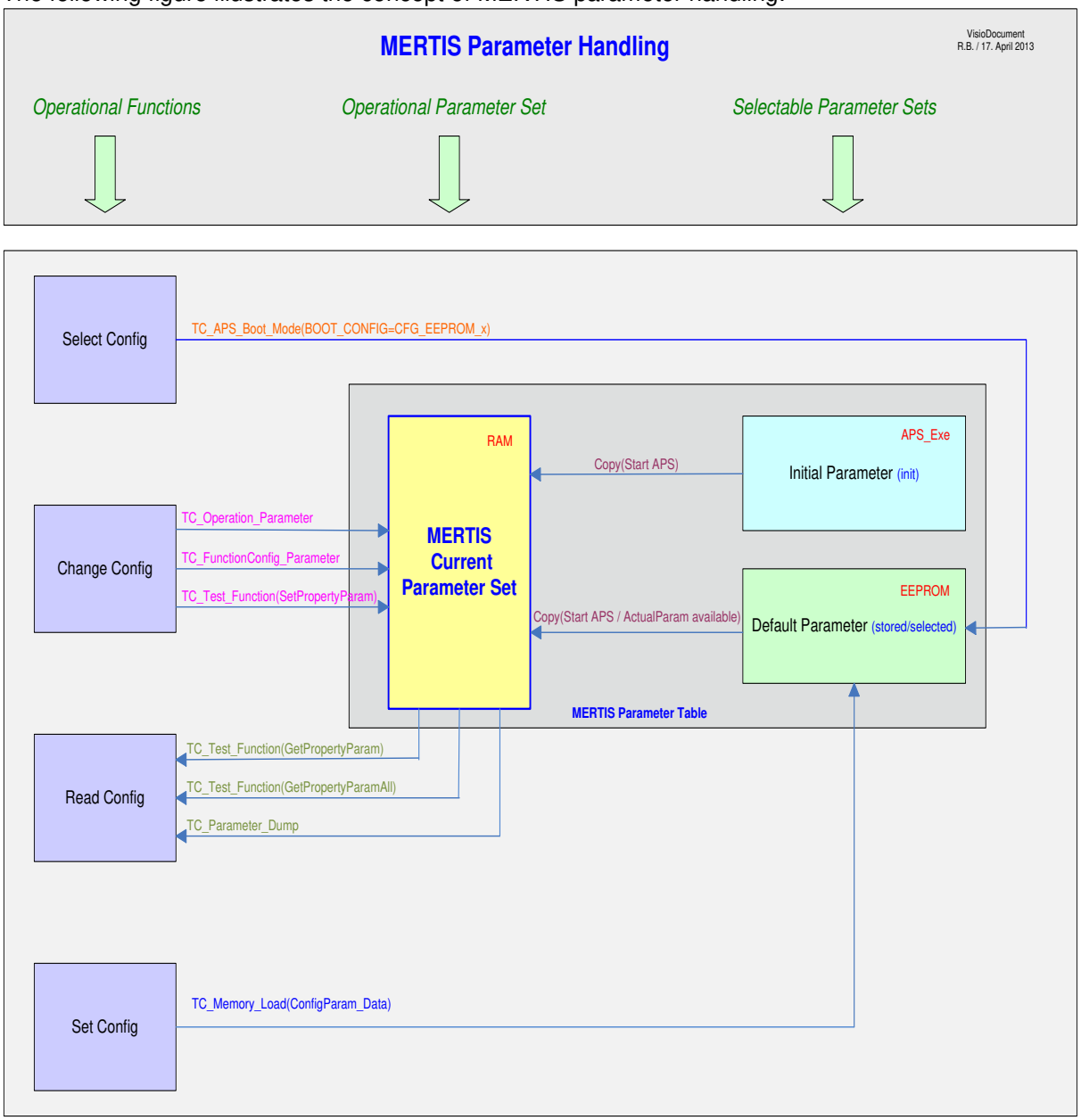


Figure 7-4: MERTIS parameter handling concept

7.13.5 Software and Configuration Parameter Maintenance

As explained in chapter 2.4.3 the application software (APS_EXE) and the configuration parameter file (APS_CFG) are stored in EEPROM with several versions. Depending on the defined auto boot mode each version of software and configuration parameter file can be used to start/boot the APS executable.

Uploading a new APS software or parameter configuration file is performed by Service 6 (Memory Management). By means of command *TC_Memory_Load* the software or configuration file is loaded into EEPROM or RAM. By means of *TC_Memory_Dump* and *TC_Memory_Check* or *TC_EEPROM_Status* the loaded software/configuration file can be verified.

In order to check the current EEPROM configuration the user can send the command *TC_EEPROM_Status*. As a response he gets and *TM_EEPROM_Status* telemetry packet containing the current EEPROM configuration (current APS executable and parameter configuration).
The *TM_EEPROM_Status* telemetry packet provides the following information:

Parameter	Description
HK_STAT_EXE1_VERSION_STRING … HK_STAT_EXE6_VERSION_STRING	Version string of an APS executable EXE1 … EXE6 (e.g. “MERTIS APS v2.0.618 06/2012”) if EXEx is not available this field is empty!!
HK_STAT_EXE1_START_ADDRESS … HK_STAT_EXE6_START_ADDRESS	Start address of executable EXE1 … EXE6 in EEPROM
HK_STAT_EXE1_END_ADDRESS … HK_STAT_EXE6_END_ADDRESS	End address of executable EXE1 … EXE6 in EEPROM
HK_STAT_CONFIG1_VERSION_STRING … HK_STAT_CONFIG6_VERSION_STRING	Version string of an instrument configuration file CONFIG1 … CONFIG6 (e.g. “FM_MAIN_CFG $Rev: 1204”) if CONFIGx is not available this field is empty!!
HK_STAT_CONFIG1_START_ADDRESS … HK_STAT_CONFIG6_START_ADDRESS	Start address of configuration file CONFIG1 … CONFIG6 in EEPROM
HK_STAT_CONFIG1_END_ADDRESS … HK_STAT_CONFIG1_END_ADDRESS	End address of configuration file CONFIG1 … CONFIG6 in EEPROM
PAR_BOOT_EXE	APS executable to be booted after MERTIS power-on: 0=Not_selected 1=EXE_EEPROM1 2=EXE_EEPROM2 3=EXE_EEPROM3 4=EXE_EEPROM4 5=EXE_EEPROM5 6=EXE_EEPROM6
PAR_START_MODE	Start mode after powering-on MERTIS 0=Not_selected 1=Safe **2=StandBy (nominal)** 3=WarmUp 4=Science_High_Res1 25=Diagnostic 29=FullWin_UnCompr
PAR_BOOT_CONFIG	MERTIS configuration file which is used after boot of APS: 0=Not_selected 1=CFG_EEPROM1 2=CFG_EEPROM2 3=CFG_EEPROM3 4=CFG_EEPROM4 5=CFG_EEPROM5 6=CFG_EEPROM6

Table 7-4: EEPROM configuration status

By means of command *TC_APS_BootMode* it is possible to define the version of APS executable and the version of parameter configuration file to be used for the next boot. Note that both together, the software and its configuration file, define the function and behavior of the APS software. The user can set the following parameters for that purpose:

Parameter	Description
PAR_BOOT_EXE *PMR00169*	APS executable to be booted after MERTIS power-on: 0=Not_selected (only PBS is booted, no auto boot of APS) 1=EXE_EEPROM1 2=EXE_EEPROM2 3=EXE_EEPROM3 4=EXE_EEPROM4 5=EXE_EEPROM5 6=EXE_EEPROM6
PAR_START_MODE *PMR00170*	Start mode after powering-on MERTIS: 0=Not_selected 1=Safe **2=StandBy (Default)** 3=WarmUp 4=Science_High_Res1 25=Diagnostic 29=FullWin_UnCompr
PAR_BOOT_CONFIG *PMR00171*	MERTIS configuration (TC/TM and property parameter) which is used after boot of PBS/APS: 0=Not_selected (software defaults are used for parameters) 1=CFG_EEPROM1 2=CFG_EEPROM2 3=CFG_EEPROM3 4=CFG_EEPROM4 5=CFG_EEPROM5 6=CFG_EEPROM6
PAR_POI_START_POSITION *PMR00172*	Defines the start position of the pointing unit (POI) after power-on MERTIS (or start of APS): **0=PlanetView (Default)** 1=BB7View 2=BB3View 3=SpaceView

Table 7-5: APS Boot Mode Parameters

Note that the PAR_POI_START_POSITION have to be set for the launch to **BB3View(2)** which is the POI **safe position** to avoid damaging of the mirror moving mechanism. In flight for the operation at Mercury the parameter PAR_POI_START_POSITION have to be set to **PlanetView(0)** which is the **nominal position** for science data acquisition.

Note that it is also possible to load an APS executable into RAM and boot it from this location. This is foreseen for the case that the EEPROM is damaged and cannot be used anymore.

The MERTIS On-Board Software uses the following memory types:

Memory ID	Address range	Item Size (bits)	Description
RAM (110)	0x4000 0000 ... 0x47FF FFFF	32	RAM for application instructions and data
EEPROM (111)	0x2000 0000 ... 0x201F FFFF	16	EEPROM (storage of MABS)
REGISTER (112	0x8000 0000 ... 0x9FFF FFFF	32	REGISTER for hardware interface register
PROM (113)	0x0000 0000 ... 0x0000 7FFF	8	PROM (storage of PBS)
AHBRAM (114)	0x3800 0000 ... 0x3800 03FF	32	AHBRAM AHB-bus memory
VRAM (115)	0x2020 0000 ... 0x203F FFFF	32	VRAM virtual memory

Table 7-6: MERTIS memory types

All above listed memory types can be used by Service 6 (Memory Management) for loading, dumping or checking a piece of memory. For addressing a certain memory area the user have to consider that the address and the block length shall be consistent with the address range of the memory type. If that is not the case the command will be rejected by the MERTIS On-Board software. For upload/maintenance purpose only the both memory types RAM(110) and EEPROM(111) can be used.

In order to upload a new APS executable/configuration **permanently in EEPROM** and make it to the active boot version the user has to perform the following procedure:

1. Compile a new APS executable/configuration and build the EEPROM image (binary image with start, data and endsegment including CRCs)
2. Build an SRecord file with dedicated EEPROM start address (Optional)
3. Go to SAFE mode by command *TC_Safe_Enter*
4. Check the current EEPROM configuration to find a free memory address for uploading
5. Split the binary image into small pieces and pack them into *TC_Memory_Load* commands using the found EEPROM start address
6. Send all *TC_Memory_Load* commands to MERTIS
7. Check the new EEPROM configuration by sending command *TC_EEPROM_Status* and verify the content of *TM_EEPROM_Status* (new software/configuration must be in the list)
8. Set the new uploaded APS executable/configuration to the actual version used for the next boot by sending command *TC_APS_BootMode.*
9. Check that the new APS executable/configuration is properly activated by sending command *TC_EEPROM_Status* and verify the content of *TM_EEPROM_Status* (new software/configuration must be activated).
10. Boot the new APS executable/configuration by command *TC_Standby_Enter* and verify the correct version of the APS in *TM_Event_Progress(APSBootReady)* and the correct version of the configuration file in *TM_Event_Progress(CFGLoadReady)*

Note: Point 3 and 4 of the procedure has to be performed using a dedicated on-ground EGSE tool (EEPROM_upload.exe) or special upload script (TCMR_MER_MTNC_UPLOAD.tcl).

Note2: After successful upload of software/configuration file (point 5) reading of the EEPROM status (point 6) by command *TC_EEPROM_Status* provides the evidence that new software/configuration file is successful installed in the EEPROM. For that purpose the on-board software scans the content of the EEPROM for valid installed software/configuration files. The found valid software/configuration files are provided in the EEPROM status report (*TM_EEPROM_Status*) with version, start and end address.

Note3: In order to keep the same software configuration on MAIN and REDUNDANT side of MERTIS each upload of software/configuration files has to be performed always on both sides. The EEPROM status report must be identical for MAIN and REDUNDANT.

After the next switch-off and switch-on again of the MERTIS instrument the new APS executable/configuration will be booted which can be verified by the version string in the boot messages (see *TM_Event_Progress(APSBootReady)* and *TM_Event_Progress(CFGLoadReady)*).

For uploading and start of a new APS executable **temporary in RAM** the the user has to perform the following procedure:

1. Compile a new APS executable/configuration and build the RAM image (binary image with start, data and endsegment including CRCs)
2. Build an SRecord file with start address 0x2020 0000 (Optional)
3. Go to SAFE mode by command *TC_Safe_Enter*
4. For uploading in RAM the user has to use the **start address 0x2020 0000 (VRAM start address)**
5. Split the binary image into small pieces and pack them into *TC_Memory_Load* commands using the VRAM start address
6. Send all *TC_Memory_Load* commands to MERTIS

7. Boot the new APS executable from VRAM by command *TC_Standby_Enter* and verify the correct version of the APS in *TM_Event_Progress(APSBootReady)*

Note1: The booted new APS version is only **temporary** loaded into RAM and only available until next MERTIS switch-off.

Note2: If the user want to use the old software configuration from EEPROM again after RAM boot (assumed the EEPROM configuration is correct and not damaged) the user has only to go back into **Safe** mode by command *TC_Safe_Enter* and start the APS again by command *TC_Standby_Enter*. Now the old configuration from EEPROM is used again.

The time to perfom a complete upload of an APS executable depends on the size of the APS image, the number of sent *TC_Memory_Load* commands per second (max. is 10TCs/sec) and whether the sending of acceptance/execution report for each upload command is enabled or not.
Upload of a **240KB APS** par example und 10TCs/sec **without** waiting for acceptance and execution reports takes on MIS about **3 minutes**. Upload of the same APS par example und 10TCs/sec **with** waiting for acceptance and execution report takes on MIS about **30 minutes**.

7.14. Pointing Unit (POI)

The Pointing Unit is managed by the POI unit of the instrument controller without interaction of the on-board software. It drives the stepper motor and read position sensors to verify the POI position. The operation will be controlled and monitored via instrument controller (ICU) registers. A detailed description is given in the hardware to software ICD.
The POI can be configured with the following on-board parameters:

OBPAR_POI_COIL_MODE
This parameter configures the number of coils.
0: coil1 and coil2
1: coil3 and coil4
2: coil2 and coil3
3: coil1 and coil4
4..7: all coils
Note: During POI initialization all coils will be used

OBPAR_POI_INIT_PHASE_REG_INIT
This parameter configures the initial phase of the POI. The value depends on the unit themselves and is different for each unit (see Ref: MER-SRC-SP-061, Issue 1.0, chapter 11 FM POI User Manual).

OBPAR_POI_CALIBRATION_CONTROL_REG_INIT
OBPAR_POI_NOMINAL_SPEED_REG_INIT
OBPAR_POI_LOW_SPEED_REG_INIT
OBPAR_POI_HIGH_SPEED_REG_INIT
OBPAR_POI_TRAPEZOID_REG_INIT
OBPAR_POI_HOLD_START_REG_INIT
OBPAR_POI_HOLD_STOP_REG_INIT
OBPAR_POI_BB_HOLD_TIME_REG_INIT
OBPAR_POI_BB_HOLD_PWM_REG_INIT
These parameters can be used to change the default configuration of all POI calibration registers. If one of the register shall be changed the OBPAR_POI_CALIBRATION_CONTROL_REG_INIT has to be set with the security code to 0xA5F. The OBPAR_POI_BB_HOLD_TIME_REG_INIT can be used to modify the time how long the coils will be powered in BB700 or BB300 position. The time is calculated as follow:

hold_time = value * 16 / sys_clkr

A detailed description of all registers is given in the hardware to software ICD.

OBPAR_POI_DRIVER_MODE (Default = 1, with sensors)
This parameter changes the operation mode of the POI software driver. It can be operated with position sensors (formerly known as closed loop) or without position sensors (formerly known as open loop). The difference between the two modes is finding the planet position and verifying of the commanded position. If all sensors are available, the POI hardware detects the planet view position themselves during the first initialization of the unit. If the mirror is moved to a position, the POI software driver can use the position sensors to verify the correct position. This is the default operation mode of the driver.
If the planet position sensor is not available (maybe damaged), the POI hardware can not find the planet view position during the first initialization of the unit. As a result the mirror moves against the limiter up to 300 times. In order to avoid this behavior, the software driver can operate without sensors (0) and try to find the planet view by software. Starting from the last known position the mirror is moved in SPACE view and then 300 steps back to planet view. The position of a view can not be verified. Only the step counter can be used. But in case of mechanical problems this will be wrong.

OBPAR_POI_START_POSITION
This parameter defines the start position or so called “safe position” of the POI mirror. Always if the POI is switched off or will not be used, the software driver moves the mirror to this position. The meaning of the value is:

0=Planet view
1=BB700 view
2=BB300 view
3=SPACE view

Before launch the value should be BB300 view to avoid damaging the mirror due to vibrations and hitting a limiter (Planet or Space view). After launch the value will be changed to Planet view.

OBPAR_POI_USE_SAFE_POS_FROM_BOOT (Default = 1)
This parameter defines, that the on-board parameter OBPAR_POI_START_POSITION will be overwritten with a value from the APS boot interface. During boot of the application software this value will be read from the EEPROM. This value can be changed easily with the telecommand TC_APS_BootMode. Disable this feature make sense in case of damaged boot interface (AHB RAM) or corrupted damaged EEPROM (RAM boot) or activated EPA..

OBPAR_POI_BB_HOLD_PWM_VALUE (Default = 31)
This value overwrites OBPAR_POI_BB_HOLD_PWM_REG_INIT in any case. It defines the strength of the holding current at BB300 and BB700 view position. It can be changed between 0 and 31.

OBPAR_POI_UNIT_MOVING_TIMEOUT (Default = 7000ms)
This parameter defines the maximum time of a POI operation. Within this time a POI operation shall be finished. If it is not the case, the POI unit will be stopped and an event will be generated.

OBPAR_POI_SENSOR_MASK_PLANET
OBPAR_POI_SENSOR_MASK_BB700
OBPAR_POI_SENSOR_MASK_BB300
OBPAR_POI_SENSOR_MASK_SPACE
These parameters define which sensor shall be used at each POI view position. There are two valid sensors (Bit0 and Bit1) and one position sensor (Bit3). If a sensor is damaged it can be mapped out.

OBPAR_POI_SENSOR_STAT_PLANET
OBPAR_POI_SENSOR_STAT_BB700
OBPAR_POI_SENSOR_STAT_BB300
OBPAR_POI_SENSOR_STAT_SPACE
These parameters define which sensor will be expected at each POI view position. There are two valid sensors (Bit0 and Bit1) and one position sensor (Bit3). Together with the mask a check value for each position is generated and checked by the software driver, if sensors are used (see driver modes).

OBPAR_POI_STEP_STAT_PLANET

OBPAR_POI_STEP_STAT_BB700
OBPAR_POI_STEP_STAT_BB300
OBPAR_POI_STEP_STAT_SPACE
These parameters define the value of the expected value of the step counter at each POI view position.

In case of an unrecoverable malfunction, an emergency actuator (EPA) can be used to bring the mirror in planet position view. The EPA can be used only once. Therefore are some mechanisms installed in order to prevent accidental activation.

OBPAR_PSU_EPA_ENABLE (Default = 0)
This parameter enables the EPA. **Note: Default the EPA is disabled.**

OBPAR_PSU_EPA_ON_TIME (Default = 100ms)
This parameter sets the EPA powering time. **Note: 100ms are not enough to fire the EPA**

OBPAR_PSU_EPA_CONFIRM_TIMEOUT (Default = 10000ms)
The telecommand for EPA activation has to be confirmed with a second telecommand. This parameter defines the maximum time between these two telecommands.

OBPAR_PSU_EPA_ACTIVATED (Default = 0)
This parameter disable the usage of the POI in the application software and should be set after EPA usage.

7.15. EPA Release Management (Safety Critical!)

The Pointing Unit (POI), used to move the optical mirror to the different targets (Planet, Space, BB3, BB7), is a safety critical sub-system. If the POI motor doesn't work anymore, the scientific performance of the instrument is completely lost.

In order to avoid this 'single point failure' MERTIS has an Emergency Pointing Actuator (EPA) on board. The EPA shall be activated if the nominal POI unit fails. The EPA mechanism forces moving of the optical mirror to the Planet target position in order to keep the possibility to acquire science data from the main target. Once released, the optical mirror points to the Planet target forever because the EPA is a 'one shot' device and the moving is not reversible.

Therefore the EPA activation is a safety critical operation and it must be avoided that the EPA is released by chance due to an operator failure.

The following procedure has to be performed for the activation of the EPA:

1. Set EPA powering time to **5000msec** by command *TC_FunctionConfig_Parameter* (parameter PAR_POI_EPA_POWERING_TIME=5000msec, Default=100msec)
2. Send command *TC_EPA_Activate*
3. Send command *TC_EPA_Confirm* (at latest 30sec after *TC_EPA_Activate*)
4. Check EPA status in *TM_OperationExtended_HK (HK_STAT_EPA_STATUS=1/activated)*

Note, if *TC_EPA_Confirm* is sent too late (>30sec) or never the EPA is not released (*HK_STAT_EPA_STATUS=0/not activated*). The user has to repeat the whole procedure.

7.16. Error and Event Handling

7.16.1 Watchdog handling and unexpected reboot

After power-on of the MERTIS instrument the on-board software will be booted and the instrument enters the mode **Safe** (PBS) or **StandBy** (APS), depending on the boot configuration. The PBS or APS boot message, *TM_Event_Progress(PBSBootReady)* or *TM_Event_Progress(APSBootReady),* contains information about the last boot reason within the parameter HK_STAT_BOOT_REASON. In case of a software malfunction a reboot of the instrument will be performed and the instrument goes always into the **Safe** mode. The error event *TM_Event_Error(unexpected re-boot)* with event name EVENT_UNEXPECTED_REBOOT contains the reboot reason HK_STAT_BOOT_REASON and four additional parameters.

In case that HK_STAT_BOOT_REASON is set to BOOT_REASON_PBS_WATCHDOG(3) or BOOT_REASON_PBS_TRAP(5) or BOOT_REASON_APS_TRAP(6) the additional four parameters have the following meaning:

Parameter 1: Processor State Register – PSR (see SPARC V8 Architecture Manual)
Parameter 2: Trap Base Register – TBR (see SPARC V8 Architecture Manual)
Parameter 3: Program Counter – PC
Parameter 4: Instruction at PC

Note:
The bits 4 to 11 of the TBR contain the trap type. An overview of all traps is given in the Appendix 15: ON-BOARD SOFTWARE TRAP TABLE.

In case that HK_STAT_BOOT_REASON is set to BOOT_REASON_APS_WATCHDOG(4) the additional four parameters have the following meaning:

Parameter 1: APS task watchdog mask
Parameter 2: watchdog timer value at last retrigger
Parameter 3: last check time of the watchdog mask in milliseconds after reboot
Parameter 4: last trigger time of the watchdog in milliseconds after reboot

The APS task watchdog mask contains a running flag for each APS task and shows which task is blocked or fails (1=OK, 0=no response):

BIT1: TASK1_TEC_SHH
BIT2: TASK2_SPW_RX
BIT3: TASK2_SPW_TX
BIT4: TASK4_TC_EXEC
BIT5: TASK5_HK
BIT8: TASK8_TIR_PROC
BIT9: TASK9_TIS_PROC

In case of an unexpected reboot the PBS configuration file will be not loaded in order to prevent a deadlock in case of a corrupted PBS configuration file.

In the APS the watchdog can be configured with the two on-board property parameters OBPAR_WDG_ENABLE (0=disabled, 1=enebled, Default = 1) and OBPAR_WDG_TIMEOUT (Default = 90000ms).

7.16.2 Event filtering and limitation

During runtime of PBS and APS TM event reports are generated which contain information about progress, warning, error or alarm events. Appendix 11: EVENT LIST contains a list of all MERTS events. In case of damaged hardware or malfunction (e.g. POI sensors) it could be helpful to reduce the number of repeated events or to suppress an event, so it will not come out as TM Event packet from MERTIS anymore.

Event limiter
To achieve this, an event limiter and an event filter are implemented in the MERTIS APS.
The event limiter can be enabled with the on-board parameter OBPAR_EVT_EVENT_LIMITER_ENABLE (Default=on). The on-board parameter OBPAR_EVT_TIME_LIMIT (Default = 1000ms) configures the minimum elapsed time between two equal events with the same EID.

Event Filter
The event filter can be enabled with the on-board parameter OBPAR_EVT_EVENT_FILTER_ENABLE (Default = on). There are 20 on-board parameters OBPAR_EVT_FILTER_EVENT_ID_0..20 (Default = -1) which contain the event number to be suppressed. The value -1 means that the on-board parameter is free and unused (no event number registered). Alternatively, the *TC_Test_Function(EventEnableDisable)* telecommand can be used to do the same (maybe in a more user-friendly way).

7.17. Analog HK Measurement

The MERTIS instrument controller has two 24bit ADCs with 16 single ended or 8 differential channels. The read out of the ADC devices is managed by the HK unit of the instrument controller without interaction of the on-board software. The results (raw values from ADCs) are provided in instrument controller (ICU) registers for further processing. For understanding of the HK generation it has been taken into account, that the read out of an ADC channel is completely asynchronously related to the read of the ICU result register. The on-board software can not trigger the read out of ADCs, but it has the possibility to configure the hardware in a proper way. The HK unit of the ICU has no default configuration. Therefore a configuration after power-on is mandatory. For HK unit configuration the APS provides on-board parameters to configure each ADC and each analog channel.

7.17.1 ADC device configuration

The ADC devices have to be configured via a set of hardware registers. A detailed description of all registers is given in the Hardware to Software ICD. Each register is accessible via an on-board parameter:

OBPAR_HK_ADC0_COMMAND_REG_INIT
OBPAR_HK_ADC1_COMMAND_REG_INIT
(Default = 0xA0900000)
This is the original ADC command word as described in the ADC data sheet:
Bit31 – always 1
Bit30 – always 0
Bit29 – always 1
Bit28 – SGL 0 (single ended or differential, will be set by the HK unit depending on actual channel)
Bit27 – ODD 0 (change ADC inputs + and -, always 0)
Bit26 – A2 0 (channel address, will be set by the HK unit depending on actual channel)
Bit25 – A1 0 (channel address, will be set by the HK unit depending on actual channel)
Bit24 – A0 0 (channel address, will be set by the HK unit depending on actual channel)
Bit23 – OSR3 1 (over sample ratio)
Bit22 – OSR2 0 (over sample ratio)
Bit21 – OSR1 0 (over sample ratio)
Bit20 – OSR0 1 (over sample ratio)
Bit19 – TW0X 0 (no latency, should be always 0)

The over sample ratio of 16384 (OSR=9) results in a conversion rate of 13.75Hz or 72.7ms conversion time. It is a good choice and gives very stable values without any disturbance from other units (e.g. STS).

OBPAR_HK_ADC0_CONVTIME_REG_INIT (Default = 0x00186A00)
OBPAR_HK_ADC1_CONVTIME_REG_INIT (Default = 0x00186A00)
This is the time between two conversions read out from the ADC. It is given in 21 MHz clock ticks and results in a value of about 76ms. Note: this value has to be greater than the conversion time.

OBPAR_HK_ADC0_STABTIME_REG_INIT (Default = 0x00019A28)
OBPAR_HK_ADC1_STABTIME_REG_INIT (Default = 0x00019A28)
This is an additional wait time after selecting the ADC channel and before starting the conversion. This time is needed to get exact values from the ADC (experience from the radiometer). It is given in 21 MHz clock ticks and results in a value of 5ms.

OBPAR_HK_ADC0_SGLMODE_REG_INIT (Default = 0x0000FC3C)
OBPAR_HK_ADC1_SGLMODE_REG_INIT (Default = 0x00000003)
These values define the single ended or differential measurement mode for each ADC and each channel. A bit=1 means single ended mode and bit=0 means differential mode. In case of differential mode two input lines are needed for one channel. The type of a channel must not be changed, but the information is need to understand the principle of channel numbering.
ADC0 has the following configuration:

Name	ADC channel	Type
Bolometer Chip temperature	CH0 and CH1	Differential
PSU Temperature	CH2	Single
POI mirror temperature	CH3	Single
POI motor temperature	CH4	Single
BB700 temperature	CH5	Single
BB300 temperature	CH6 and CH7	Differential
BB300 reference resistor	CH8 and CH9	Differential
Single ended reference resistor	CH10	Single
STS analog position	CH11	Single
PSU 7.2 voltage	CH12	Single
PSU 3.4 voltage	CH13	Single
ICU temperature	CH14	Single
STS current	CH15	Single

Table 7-7: MERTIS ADC0 HK channels

ADC1 has the following configuration:

Name	ADC channel	Type
RBA front temperature	CH0	Single
RBA back temperature	CH1	Single
EOP IR filter temperature	CH2 and CH3	Differential
EOP TMA temperature	CH4 and CH5	Differential
STS temperature	CH6 and CH7	Differential
SOP grating temperature	CH8 and CH9	Differential
OST base plate temperature	CH10 and CH11	Differential
SOP M1 temperature	CH12 and CH13	Differential
BOL housing temperature	CH14 and CH15	Differential

Table 7-8: MERTIS ADC1 HK channels

The ADC channel numeration will be needed to define the read out sequence.

OBPAR_HK_ADC0_SEQLEN_REG_INIT (Default = 0x0000001F)
OBPAR_HK_ADC0_SEQUENCE0_REG_INIT (Default = 0x060D080E)
OBPAR_HK_ADC0_SEQUENCE1_REG_INIT (Default = 0x060A080C)
OBPAR_HK_ADC0_SEQUENCE2_REG_INIT (Default = 0x06040805)
OBPAR_HK_ADC0_SEQUENCE3_REG_INIT (Default = 0x06020803)

These on-board parameters define the read out order of ADC0 channels. Each channel is defined within one nibble of the four sequence register with this channel number (table above). The maximum length of the sequence is 32 and is defined as 'length – 1' in the length parameter. The sequence starts with the first register and the lowest nibble:

CH14, CH0, CH8, CH0, CH13, CH0, CH6, CH0, CH12, CH0, CH8, CH0, CH10, CH0, CH6, CH0, CH5, CH0, CH8, CH0, CH4, CH0, CH6, CH0, CH3, CH0, CH8, CH0, CH2, CH0, CH6, CH0, …

Together with conversion and stabilization time and following internal HK repetition times are achieved:

Name	Repetition Time	Remark
Bolometer Chip temperature	162ms	2 * (76ms + 5ms)
PSU Temperature	2592ms	32 * (76ms + 5ms)
POI mirror temperature	2592ms	32 * (76ms + 5ms)
POI motor temperature	2592ms	32 * (76ms + 5ms)
BB700 temperature	2592ms	32 * (76ms + 5ms)
BB300 temperature	648ms	8 * (76ms + 5ms)
BB300 reference resistor	648ms	8 * (76ms + 5ms)
Single ended reference resistor	2592ms	32 * (76ms + 5ms)
STS analog position	-	Not part of the sequence
PSU 7.2 voltage	2592ms	32 * (76ms + 5ms)
PSU 3.4 voltage	2592ms	32 * (76ms + 5ms)
ICU temperature	2592ms	32 * (76ms + 5ms)
STS current	-	Not part of the sequence

Table 7-9: MERTIS ADC0 HK repetition times

OBPAR_HK_ADC1_SEQLEN_REG_INIT (Default = 0x00000008)
OBPAR_HK_ADC1_SEQUENCE0_REG_INIT (Default = 0x**CA864210**)
OBPAR_HK_ADC1_SEQUENCE1_REG_INIT (Default = 0x0000000**E**)
OBPAR_HK_ADC1_SEQUENCE2_REG_INIT (Default = 0x00000000)
OBPAR_HK_ADC1_SEQUENCE3_REG_INIT (Default = 0x00000000)
These on-board parameters define the read out order of ADC1 channels. Each channel is defined within one nibble of the four sequence register with this channel number. The length of the ADC1 sequence is 9 and is defined as 'length – 1' in the length parameter. The sequence starts with the first register and the lowest nibble:

CH0, CH1, CH2, CH4, CH6, CH8, CH10, CH12, CH14, …

Together with conversion and stabilization time and following internal HK repetition times are achieved:

Name	Repetition Time	Remark
RBA front temperature	729ms	9 * (76ms + 5ms)
RBA back temperature	729ms	9 * (76ms + 5ms)
EOP IR filter temperature	729ms	9 * (76ms + 5ms)
EOP TMA temperature	729ms	9 * (76ms + 5ms)
STS temperature	729ms	9 * (76ms + 5ms)
SOP grating temperature	729ms	9 * (76ms + 5ms)
OST base plate temperature	729ms	9 * (76ms + 5ms)
SOP M1 temperature	729ms	9 * (76ms + 5ms)
BOL housing temperature	729ms	9 * (76ms + 5ms)

Table 7-10: MERTIS ADC1 HK repetition times

7.17.2 ADC channel conversion and calibration (except BB300)

The mechanism of HK conversion into calibrated real values is equal for all HK channels except the BB300 temperature channel. First of all a conversion type has to be selected with the on-board

parameter OBPAR_HK_xxx_CONVTYPE. Depending on the conversation type of the HK channel up to three additional parameters OBPAR_HK_xxx_CONV1..3 are needed. There are five conversion functions implemented:

0 Linear Single Ended

$$value = (DN + DN_{cor}) * gain + offset$$

The on-board parameter OBPAR_HK_xxx_CONV1 is the gain and OBPAR_HK_xxx_CONV2 is the offset. The output from ADC (DN) is corrected with OBVAR_HK_SE_CORRECTION_VALUE (DN_{cor}) in order to eliminate a systematic measurement error. The correction value is measured during instrument integration or can be measured during runtime of the instrument depending on the on-board parameter OBPAR_HK_SE_CORRECTION_UPDATE_ENABLE with reference channel ADC0/CH10 connected to a known resistor.

1 Linear Differential

$$value = DN * gain + offset$$

This is the same conversion as Linear Single Ended, but without correction of output from the ADC (DN). It is not needed due to the differential measurement method. The meaning of on-board parameter OBPAR_HK_xxx_CONV1 (gain) and OBPAR_HK_xxx_CONV2 (offset) is the same.

2 PT Single ended

$$value = \frac{\frac{(DN + DN_{cor}) * R_1}{2^{26} - DN} - R_e - R_0}{R_0 * \alpha}$$

This is the implemented formula to calculate the temperature for PT100 or PT1000 sensors, where R0 is the calibrated resistance at 0°, R1 the series resistance (depends on channel configuration), Re the harness error resistance measured during instrument integration and Alpha for the linear approximation. The on-board parameter OBPAR_HK_xxx_CONV1 configures resistor value R1, the on-board parameter OBPAR_HK_xxx_CONV2 configures resistor value R0 and the on-board parameter OBPAR_HK_xxx_CONV3 configures resistor value Re. The value Alpha is configured for all channels together with the on-board parameter OBPAR_HK_PT1000_LINEAR_APPROXIMATION_ALPHA. The output from ADC (DN) is corrected in the same way as described for Linear Single Ended conversion.

3 PT Differential

$$value = \frac{\frac{DN * R_1}{2^{26} - DN} - R_e - R_0}{R_0 * \alpha}$$

This is the same conversion as PT Single Ended, but without correction of output from the ADC (DN). It is not needed due to the differential measurement method. The meaning of on-board parameter OBPAR_HK_xxx_CONV1 (R1), OBPAR_HK_xxx_CONV2 (R0) and OBPAR_HK_xxx_CONV2 (Re) is the same.

4 Singel Ended Reference

$$value = \left(DN_{expected} - DN\right) * gain$$

This formula converts the difference between the expected ADC value (DN expected) and the measured ADC value (DN) in a more manageable offset voltage. The on-board parameter OBPAR_HK_SE_REFERENCE_CONV1 contains the gain and OBPAR_HK_SE_REFERENCE_CONV2 contains the expected DN value of the single ended reference channel. More information about the single ended reference measurement is given in a other sub chapter.

7.17.3 ADC single ended reference measurement

Due to the design of the ADC input circuit a small offset error of about 16mV is always present. In case of single ended measurement (differential measurement is not affected) this offset value disturbs the measurement of small voltages. Unfortunately the offset error depends on the environment temperature. In order to accurately determine the offset error, a reference channel is present. This is basically a well known high-precision resistor, which should provide an expected ADC value (DN expected). This value is measured and calculated during instrument integration and provided as on-board parameter OBPAR_HK_SE_REFERENCE_CONV2 to the instrument software. This value is compared with the real measured value of the ADC reference channel. The difference between these two values is stored in the on-board variable OBVAR_HK_SE_CORRECTION_VALUE and is calculated with single ended HK channels.
The on-board parameter OBPAR_HK_SE_CORRECTION_UPDATE_ENABLE can be used to disable the offset correction measurement and to set a fix value in the on-board variable OBVAR_HK_SE_CORRECTION_VALUE. This is mainly for diagnostic purpose and not recommended during normal instrument operation.
The offset correction measurement is performed within the housekeeping task which runs with a period configured in the on-board parameter OBPAR_ICU_HK_INTERNAL_PERIOD (Default 125ms).

7.17.4 BB300 temperature measurement principle and conversion

The measurement and conversion of BB300 temperature is done in a special way to fulfil the accuracy requirement. There is a reference resistor (BB300_REF) and a single switch is implemented into the measurement current line which allows the usage of an offset compensation method (see explanation of J. Knollenberg MERTIS BB300 and h/k-temperature measurements).
The following formula will be used:

$$temperature = \frac{\frac{R_{ref}}{R_0} * \left(\frac{\frac{DN_{BB3}}{2^{26} - DN_{BB3}} - \frac{DN_{BB3,Off}}{2^{26}}}{\frac{DN_{ref}}{2^{26} - DN_{ref}} - \frac{DN_{Ref,Off}}{2^{26}}} \right) - 1}{\alpha}$$

The expected reference resistor value Rref is configured with the on-board parameter OBPAR_HK_TEMP_BB3_REFERENCE_RESISTOR_VALUE. R0 is the calibrated resistance of the PT100 at 0° and is configured with the on-board parameter OBPAR_HK_TEMP_BB3_CONV2. The value Alpha is configured with on-board parameter OBPAR_HK_PT100_LINEAR_APPROXIMATION_ALPHA. The period of offset measurement is configured with the on-board parameter OBPAR_HK_BB3_CORRECTION_UPDATE_PERIOD (Default 10s).

7.17.5 HK measurement loop and ADC latchup handling

The read out and conversion of analog HK channels will be done within the housekeeping task which runs with the period configured in the on-board parameter OBPAR_ICU_HK_INTERNAL_PERIOD

(Default 125ms). Every period or slot one channel from ADC0 and one channel from ADC1 will be read.

Slot	ADC0	ADC1
1	PSU Temperature	RBA front temperature
2	POI mirror temperature	RBA back temperature
3	POI motor temperature	EOP IR filter temperature
4	BB700 temperature	EOP TMA temperature
5	Single ended reference resistor	STS temperature
6	PSU 7.2 voltage	SOP grating temperature
7	PSU 3.4 voltage	OST base plate temperature
8	ICU temperature	SOP M1 temperature
9	-	BOL housing temperature

Table 7-11: MERTIS HK conversion scheme

Therefore housekeeping's will be read, converted and stored every 1125ms (9 * 125ms). Additionally the BB300 and BB300 reference will be read, converted and stored every 750ms. The read and conversion time should be greater than the internal ICU ADC readout time (see chapter above).
The periodic read out and additional storage is needed, if the housekeeping ADCs are automatically switched off in case of latchups. The latchup handling takes about 4s, but the instrument software needs housekeeping values during this time. Missing or invalid housekeeping values would generate error or alarm events.
The latchup handling for the HK ADCs can be configured with the following on-board parameters:

OBPAR_PSU_HK_LATCHUP_SWITCH_ON_ENABLE (Default = On)
This enables the automatic switch on of the HK ADCs. This parameter should be always enabled.

OBPAR_PSU_HK_LATCHUP_SWITCH_OFF_DELAY (Default = 2s)
This parameter defines the delay before the HK power will be switched on.

OBPAR_PSU_HK_LATCHUP_SWITCH_ON_DELAY (Default = 3s)
This parameter defines the delay after the HK power is switched on. This value should be higher then the longest internal ICU ADC readout time of all channels (see chapter above).

7.18. Execution of internal RTEMS commands

Internal commands of the operationg system RTEMS can be executed by the special command *TC_Test_Function(ExecuteCmd)* ID=ZMR00042. It contains a parameter PAR_CMD_STRING ID=PMR00210 which contains the RTEMS command as a string.

Note: **This command for execution of internal RTEMS commands is NOT applicable for nominal operation and only used for development and verification of the internal software function. Therefore the usage must be done very carefully!!!**

This *TC_Test_Function(ExecuteCmd)* sends commands to the internal RTEMS shell. The RTEMS shell checks the command for validity and executes it if this is a known command. A simple command which can be sent is **"help"** to get the list of valid RTEMS shell commands.

The RTEMS shall must be activated before using this command. For this purpose the following setting is needed: OBPAR_ICU_START_SHELL=1(on). Note that the RTEMS shall is disabled per default in flight.

If the parameter OBPAR_ICU_START_SHELL=0(off) the APS accepts the command but is not able to execute it because the shell is not available. In that case the APS sends an execution failure report *TM_TC_Execution_Failure(test.cmd.unknown)* ID=YMR42106 with EID=43957=EVENT_TC_TEST_CMD_UNKNOWN which means the sent RTEMS shell command is unknown because the shell is not there and cannot confirm the validity.

7.19. EEPROM internal storage format

This chapter describes the internal EEPROM storage format for APS executables and configuration files.

7.19.1 Segment list

Every software or configuration image stored in the EEPROM is defined by a contiguous segment list. A segment list can be stored anywhere in EEPROM and is independent from an absolute address. The upload into the EEPRPM will be performed by service 6 telecommands.
A segment list contains of an arbitrary number of segments. A segment list begins with a start segment, have up to 15 data segments and ends with an end segment. Every segment has to start at a 16bit aligned address and every segment has a 2 Byte aligned size.

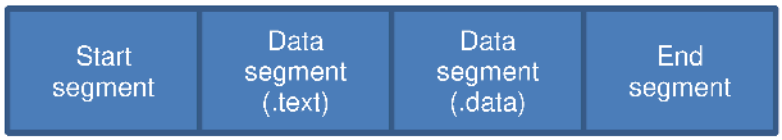


Figure 7-5: Executable segment list in the EEPROM

The following chapters give a description of the different segment types and the internal structures.

7.19.2 Segment Types and Header Structure

Following segment types are defined:

Name	Type	Comment
Start Segment APS Executable	1	Marks beginning of executable segment list
Start Segment APS Configuration	2	Marks beginning of APS configuration segment list
Start Segment PBS Configuration	3	Marks beginning of PB configuration segment list
Data Segment APS Executable	10	Contains data for application executable
Data Segment APS Configuration	11	Contains data for APS configuration
Data Segment PBS Configuration	12	Contains data for PBS configuration
Data Segment Image	14	Optional: binary data for test and diagnose
End Segment	255	Marks end of segment list

Table 7-12: Segment types

Following segment sub-types are defined (only for data and patch segments):

Name	Type	Comment
No Compression	1	No compression
LZSS	2	Compression with LZSS standard

Table 7-13: Segment sub-types

All struct fields segment addresses must be 16bit word aligned (2 bytes). Alignment space must be filled with NULL bytes to guaranty proper checksum validation.

The following data types are used:

Name	Type	Comment
uint32	unsigned int	Native unsigned 32-bit integer
uint16t	unsigned short	Unsigned 16-bit integer
uint8	unsigned char	Unsigned 8-bit integer
char	signed char	Ascii character 8-bit

Table 7-14: Field types

Every segment starts with a segment header. The segment header is unique for all kinds of segments. There are

```
typedef struct SegHeader
{
        uint16_t ui16_segCRC16;     /* Add-16 checksum of the completed segment */
        uint32_t ui32_segMagic;     /* magic number for segment =0x53454730='SEG ' */
        uint16_t ui16_segType;      /* type of the segment, see table 1 */
        uint16_t ui16_segSubType;   /* sub-type of the data segment, 0: no comp, 1: LZSS */
        uint32_t ui32_segSize;      /* size in byte of the segment including header */
}__attribute__((__packed__)) SegHeader_t;
```

segMagic:
This field is fixed to 0x53454730 for all header and defines the beginning of a new segment.

segType:
This field defines the type of the segment. The different types are defined in Table 7-12.

segSubType:
For data segments and patch segments this field defines the kind of compression. The different types are defined in Table 7-13.

segSize:
This field defines the number of bytes in the actual segment. This number has to be a multiply of 4.

segCRC16:
This field defines the 16bit checksum over the complete segment

7.19.3 Start Segments

The start segments describe the beginning of a new program or configuration segment list.

Application Start Segment:

```
typedef struct AppStartSegment
{
        SegHeader_t x_He;                   /* Segment Header */
        uint8_t  ui8_AppVersion[SIZE_OF_APS_VERSION_STRING];
        uint16_t ui16_AppNumDataSegments;   /* num of segments - e.g. 2 (.text and .bss) */
        uint32_t ui32_AppEntryAddress;      /* start address of the Application */
        uint16_t ui16_AppCRC16;             /* CRC of all segments - CRC over .text + .bss */
        uint16_t ui16_AppBootFlag;          /* select this application for boot */
        uint16_t ui16_AppStartMode;         /* select mode after booting (in case of
                                               Safe_Mode the boot will be not performed!) */
        uint16_t ui16_Unused;
}__attribute__((__packed__)) AppStartSegment_t;
```

Configuration Start Segment:

```
typedef struct CfgStartSegment
{
        SegHeader_t x_He;                   /* Segment Header */
        uint8_t  ui8_CfgVersion[SIZE_OF_APS_VERSION_STRING];
        uint16_t ui16_CfgNumDataSegments;   /* num of config segments */
        uint16_t ui16_CfgCRC16;             /* CRC16 of all config Segments */
        uint16_t ui16_CfgBootFlag;          /* select this config as applicable after boot */
}__attribute__((__packed__)) CfgStartSegment_t;
```

7.19.4 Data Segment

The data segment describes a segment which contains code, data or configuration. Depending on the sub-type the data can be compressed or not.

Application Data Segment:

```
typedef struct AppDataSegment
{
        SegHeader_t x_he;                   /* Segment Header */
        uint32_t ui32_DataDstAddress;       /* address of data in the RAM (destination) */
        uint32_t ui32_DataSize;             /* data size (uncompressed) */
        uint16_t ui16_DataCRC16;            /* uncommpressed CRC of data in the segment */
        uint32_t ui32_DataEncodedSize;      /* data size compressed */
        uint32_t ui32_LzssThresh;           /* LZ Parameter */
        uint32_t ui32_LzssWs;
        uint32_t ui32_LzssLhc;
        uint32_t ui32_Data[];               /* data */
}__attribute__((__packed__)) AppDataSegment_t;
```

Configuration Data Segment:

```
typedef struct CfgDataSegment
{
        SegHeader_t x_he;                   /* Segment Header */
        uint32_t ui32_DataSize;             /* data size (uncompressed) */
        uint16_t ui16_DataCRC16;            /* uncommpressed CRC of one CFG Segment */
        uint32_t ui32_DataEncodedSize;      /* data size compressed */
        uint32_t ui32_LzssThresh;           /* LZ Parameter */
        uint32_t ui32_LzssWs;
        uint32_t ui32_LzssLhc;
        uint32_t ui32_Data[];               /* data */
}__attribute__((__packed__)) CfgDataSegment_t;
```

7.19.5 End Segment

The end segment marks the end of a segment list.

```
typedef struct EndSegment
{
        SegHeader_t x_He;
}__attribute__((__packed__)) EndSegment_t;
```

Appendix 1: INSTRUMENT DATA SHEET

Parameter	Unit	Spectrometer	Radiometer
Focal length	F	50 mm	
F – number	F#	2.0	
Optical efficiency	ηopt	0.54	
Spectrometer detector	Type	Bolometer array	Thermopile line array
Detector/pixel size (detector illuminated pixels)	pixels	160 x 120 @ 35 µm (100 spatial, 80 spectral)	2 x 15 @ 250 µm
Spectral range	λ	7 – 14 µm	7 – 40 µm
Spectral channel width	λδ	90 nm / pixel	Line array 1: 7-14µm (filter) Line array 2: 7-40µm
Spectral resolution/ Spectral sampling distance	λ/λδ SSD	78 – 156	-
Detectivity	D*	-	$7*10^{8}$ cm $Hz^{1/2}$ W^{-1}
	NEP	15pW (SNR: 150 - 300)	-
Instantaneous field of view	IFOV	0.7 mrad	5 mrad
Field of view	FOV	4° ACT, 0° ALT	4° ACT, 1° ALT
Ground sample distance Periherm 400 km Apoherm 1500 km	GSD	 280 - 1400 m (M = 1- 5) 1050 m	 2000 m 7500 m
Dwell time Periherm 400 km Apoherm 1500 km	τ	 109 ms 784 ms	 775 ms 5597 ms
Swath width	Width	28 km	
Instrument overall dimensions external baffles	Volume	180 x 180 x 130 mm^3 200 x ø75 & 90 x ø75 mm^3	
Instrument mass	Mass	3.1 kg	
Instrument power consumption (incl. cold case heating)	Power	7,9 – 9,9W (nominal Science operation) < 14W incl. cold case heating	
Instrument data rate	Rate	1 - 1263KBit/s (depends on instrument mode)	

Table A1-15: MERTIS Data Sheet

Appendix 2: ELECTRICAL BLOCK DIAGRAM

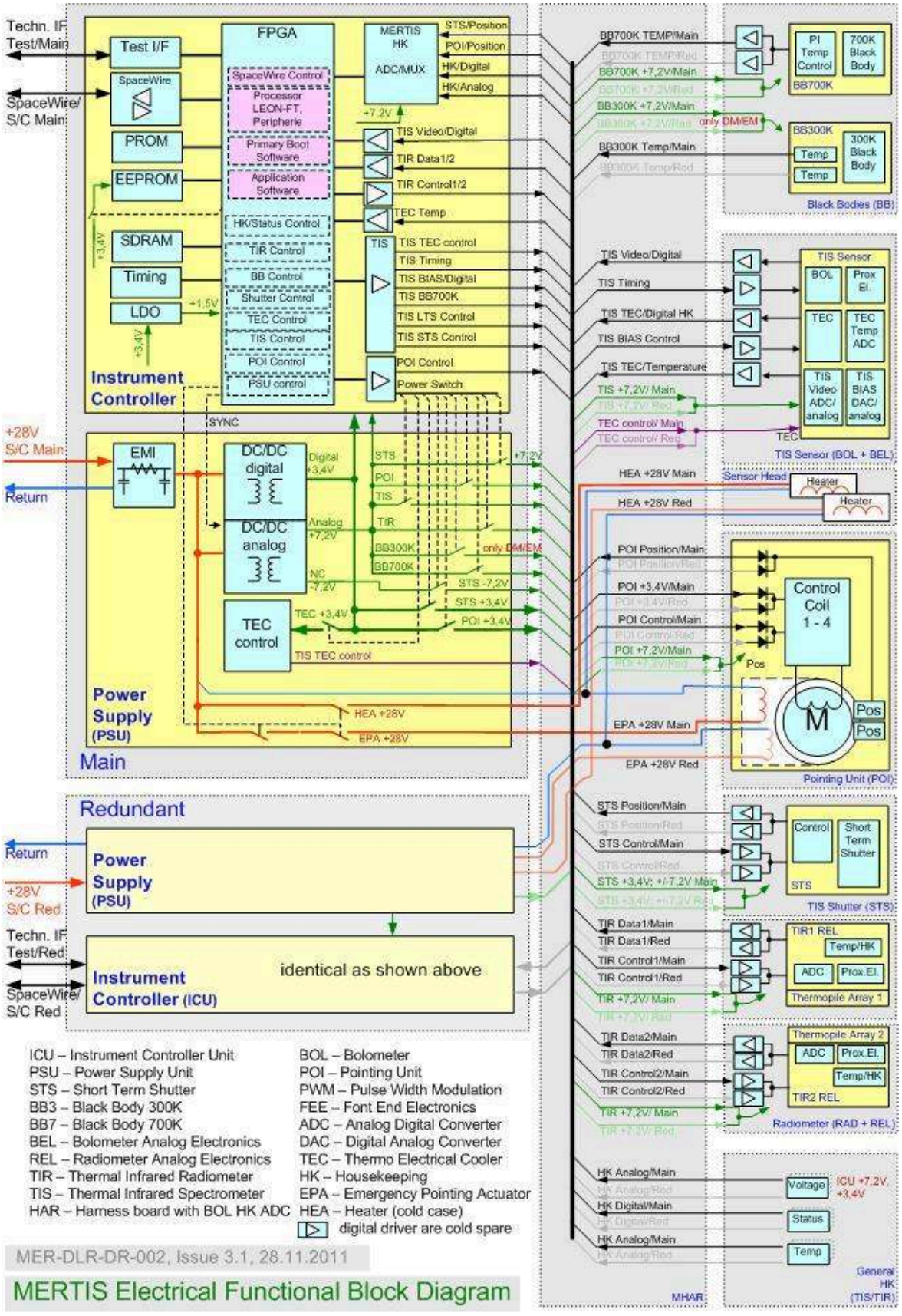


Figure A2-7-6**: MERTIS Electrical Block Diagram**

Appendix 3: MECHANICAL INTERFACE CONTROL DRAWINGS

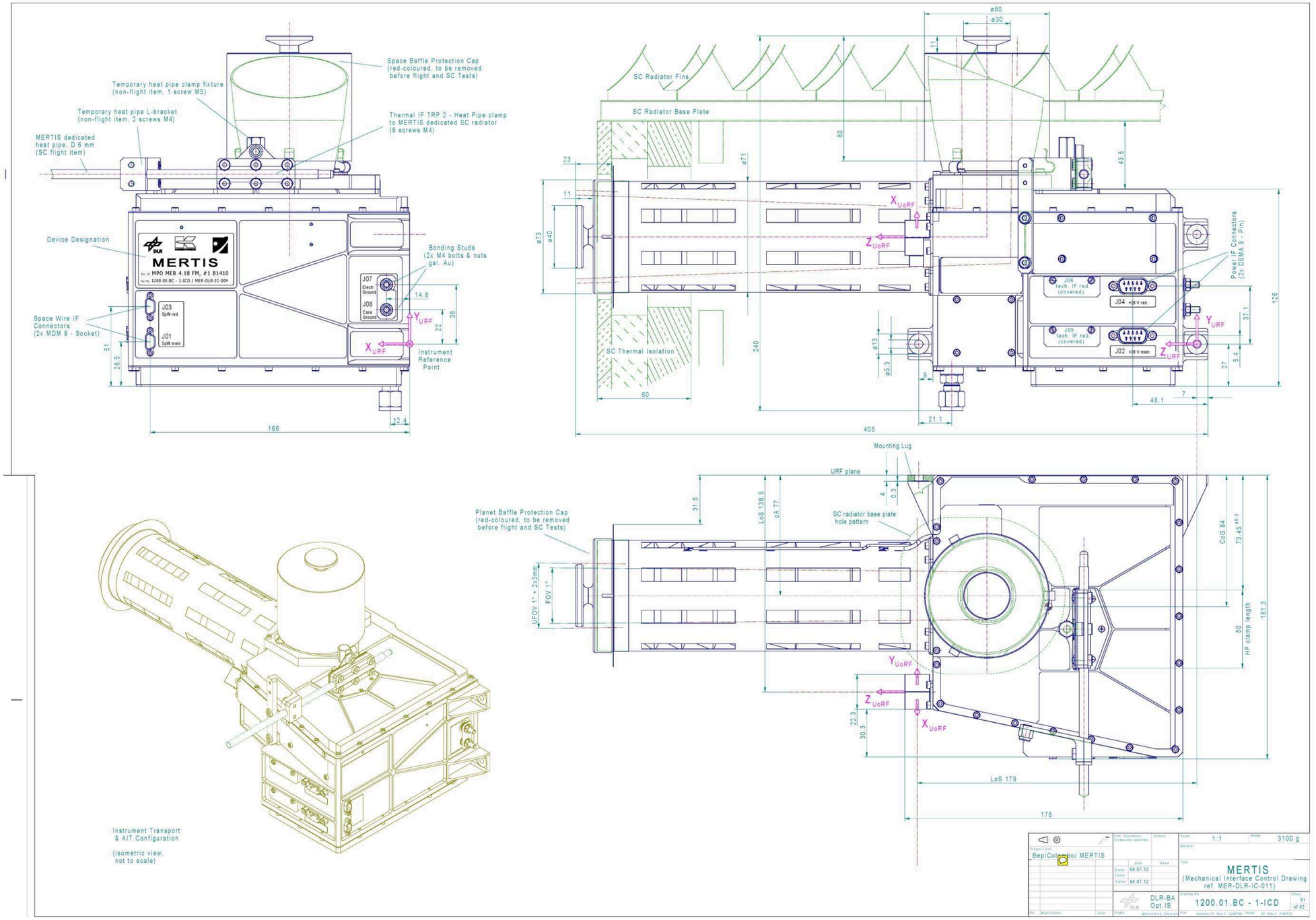


Figure A**3**-7-7: Mechanical Interface Control Drawing (MICD, Part 1)

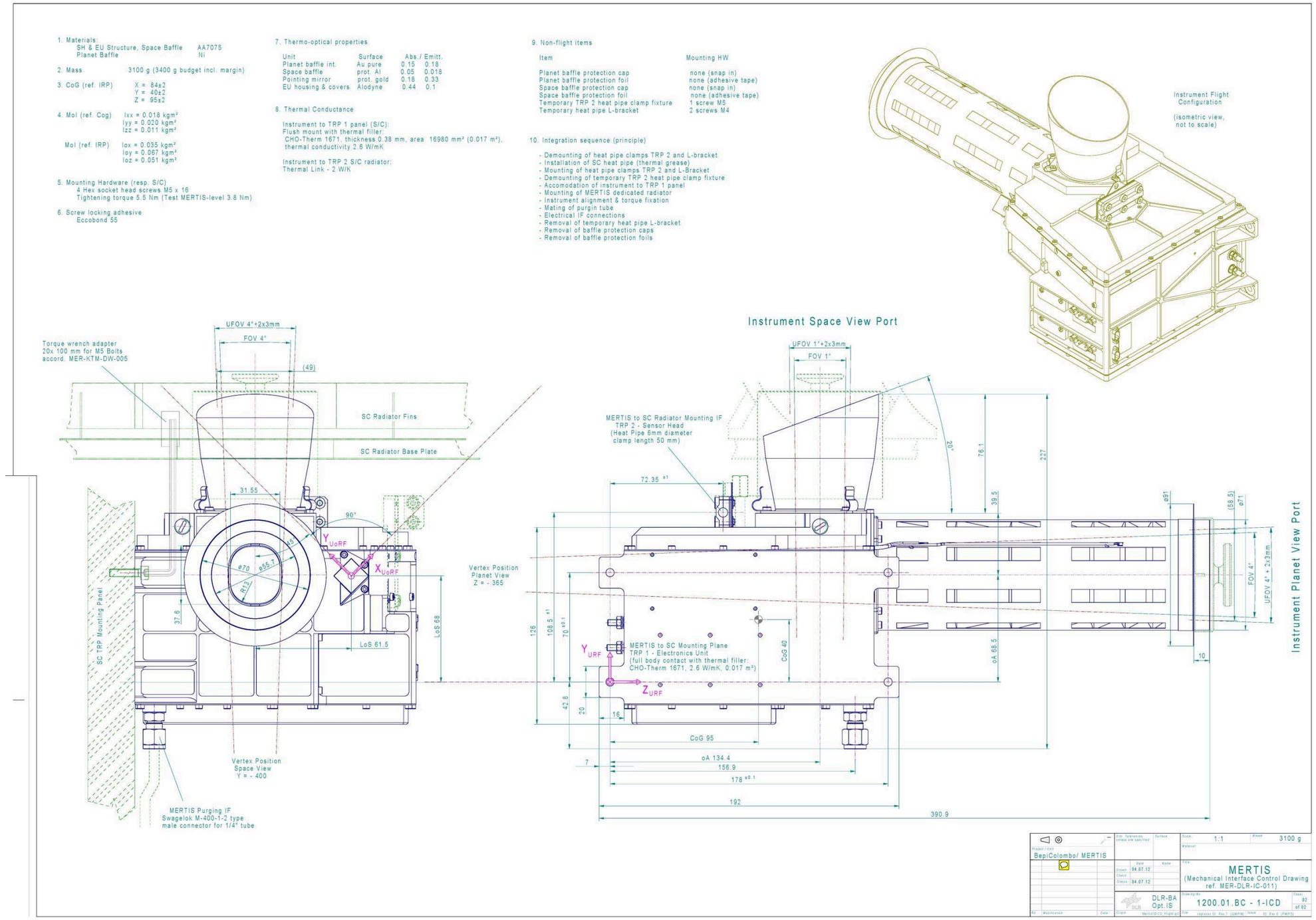


Figure A**3**-7-8: Mechanical Interface Control Drawing (MICD, Part 2)

Appendix 4: THERMAL INTERFACE CONTROL DRAWINGS

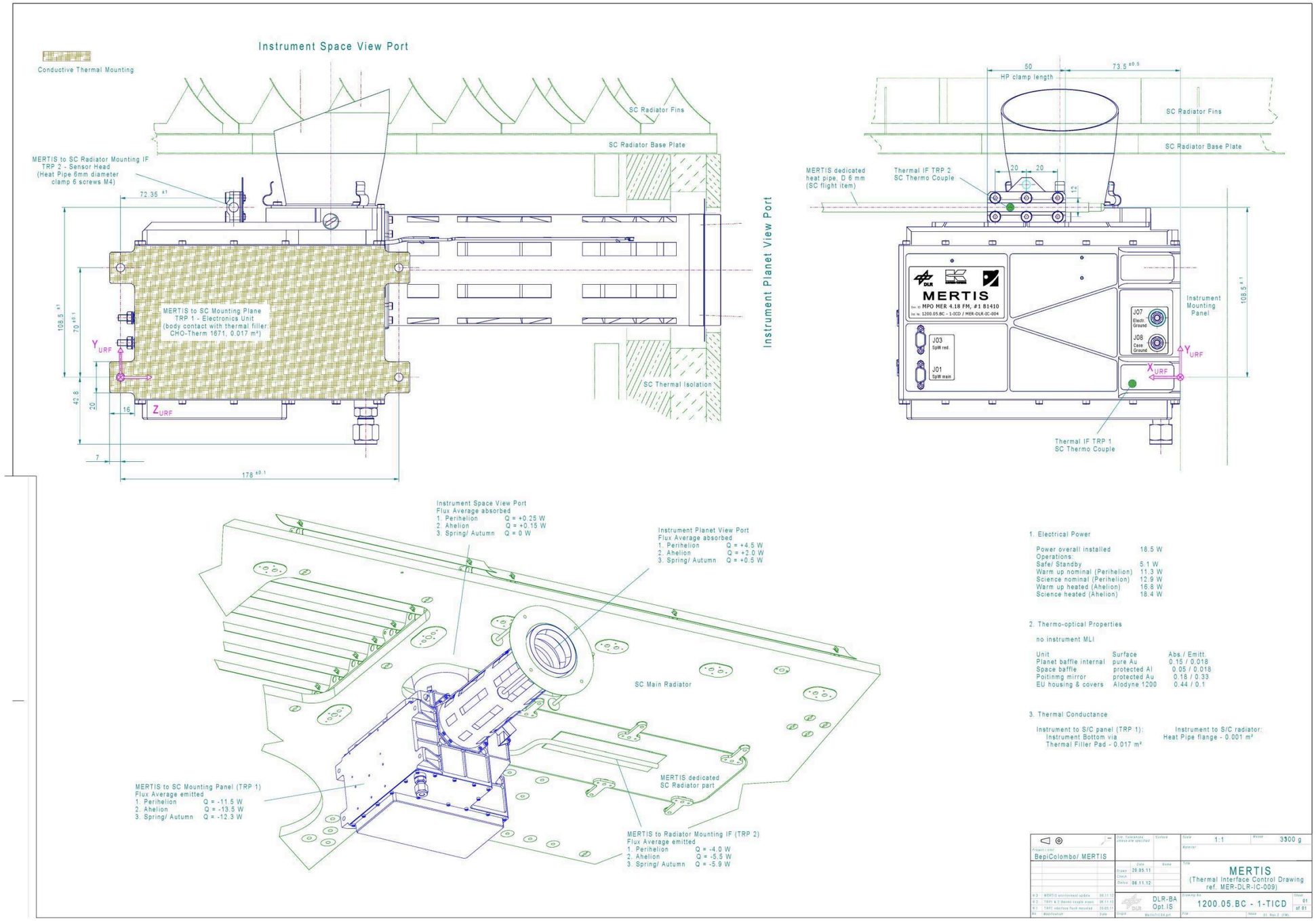


Figure A**4**-7-9: Thermal Interface Control Drawing (TICD)

Appendix 5: SPACEWIRE I/F: Pin allocation and Circuits (J01/Main, J03/Redundant)

SpaceWire Connector Pin Allocation List (Female/Socket)					SpaceWire Connector Contact Identification (Female/Socket)
Unit name	**Conn. name**	**Pin**	**Signal name**	**Remarks**	
MERTIS	J01 or J03	1	Din+		
MERTIS	J01 or J03	2	Sin+		
MERTIS	J01 or J03	3	Inner shield	Connected to internal Signal Ground	
MERTIS	J01 or J03	4	Sout--		
MERTIS	J01 or J03	5	Dout--		
MERTIS	J01 or J03	6	Din--		
MERTIS	J01 or J03	7	Sin--		
MERTIS	J01 or J03	8	Sout+		
MERTIS	J01 or J03	9	Dout+		

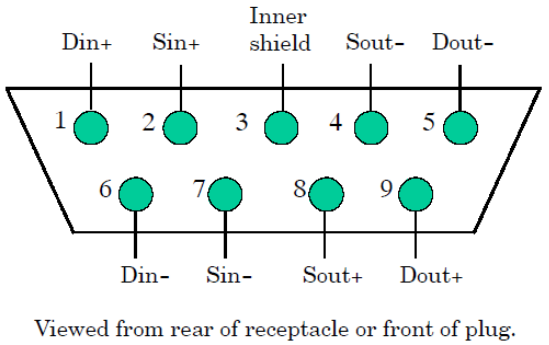


Table A5-1: MERTIS Pin Allocation List, Connector J01 & J03 (SpaceWire)

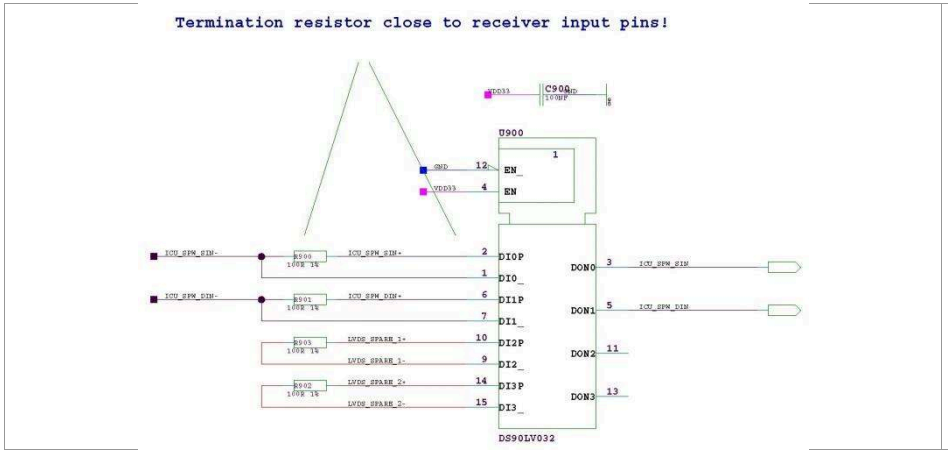


Figure A5-7-10: SpaceWire electrical diagram (receiver on ICU)

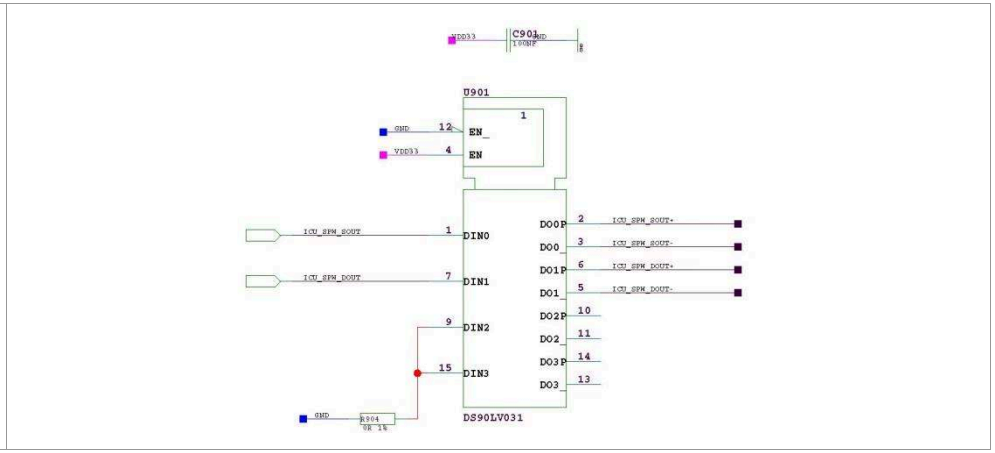
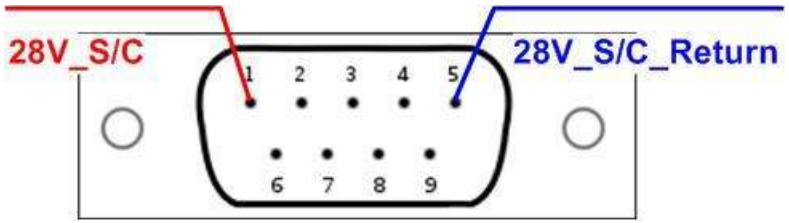


Figure A5-7-11: SpaceWire electrical diagram (transmitter on ICU)

Appendix 6: POWER I/F: Pin Allocation and Circuit Diagram (J02/Main, J04/Redundant)

+28V Power Connector Pin Allocation List (Male/Pin)				
Unit name	**Conn. name**	**Pin**	**Signal name**	**Remarks**
MERTIS	J02 or J04	1	28V_S/C	max. 2A
MERTIS	J02 or J04	2	NC	Not connected
MERTIS	J02 or J04	3	NC	Not connected
MERTIS	J02 or J04	4	NC	Not connected
MERTIS	J02 or J04	5	28V_S/C_Return	max. 2A
MERTIS	J02 or J04	6	NC	Not connected
MERTIS	J02 or J04	7	NC	Not connected
MERTIS	J02 or J04	8	NC	Not connected
MERTIS	J02 or J04	9	NC	Not connected

+28V Power Connector Contact Identification (Male/Pin)



View on the instrument connector J02 or J04

Table A6-1: MERTIS Pin Allocation List, Connector J02 & J04 (+28V Power)

POWER INTERFACE: 28V Interface Circuit Diagram (J02/Main, J04/Redundant)

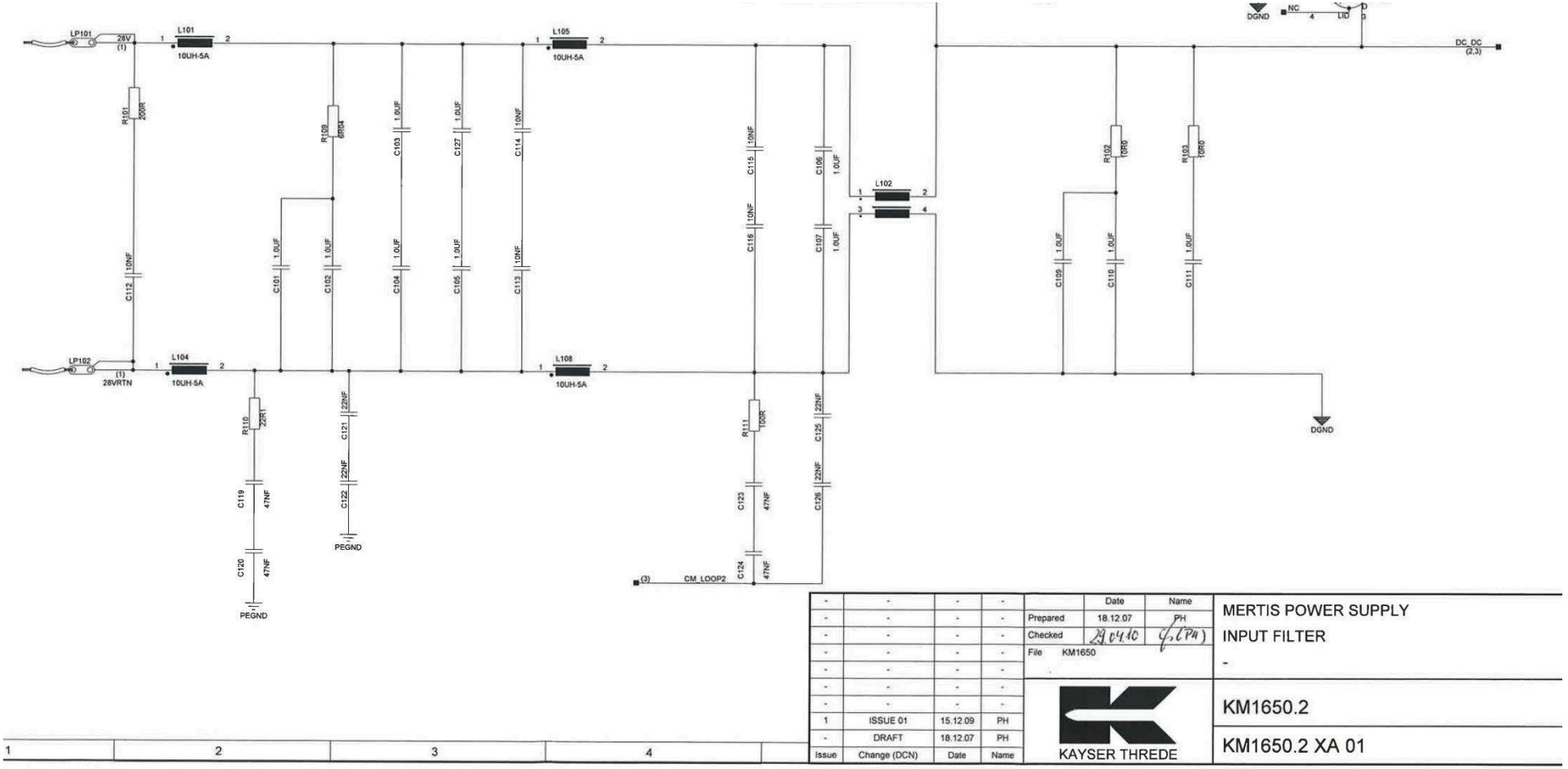
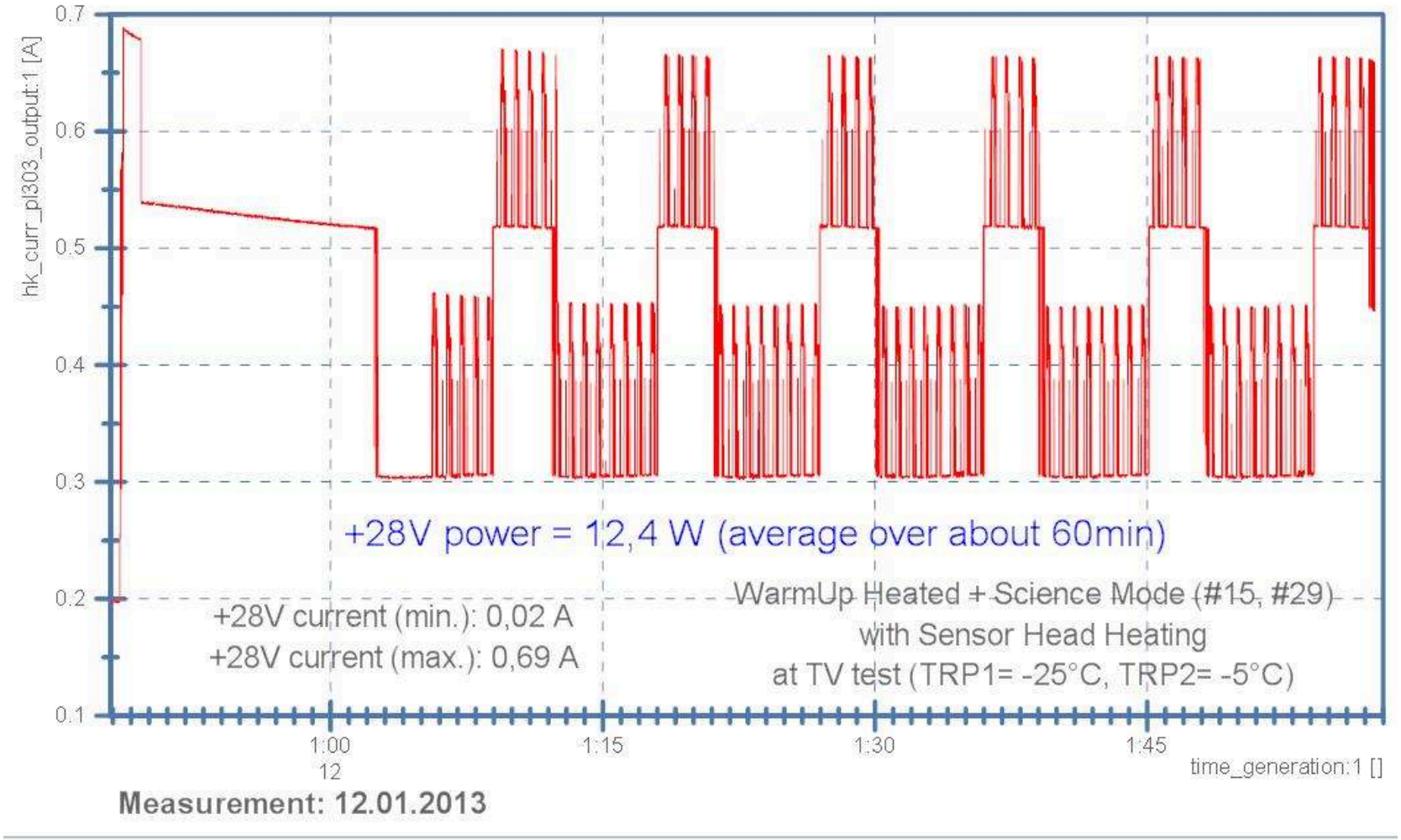


Figure A6-7-12: 28V Interface Circuit Diagram

Appendix 7: FM Power Consumption and Profile: Science Heated mode (cold case)



Appendix 8: OPERATIONAL MODES

Nr	Mode	Unit					Parameter				
		Spectro-meter	Radio-meter	Pointing Unit (Position)	BB7	Sensor Head Heater	TIS Repetition rate	Repetition factor TIR to TIS	TIS Binning spatial x spectral	TIS Com-pression Spectr.	TIS WinSize Spectr. (spatial x spectral)
	Safe/Idle										
1	Safe	OFF	OFF	OFF (All)	OFF	OFF	N/A (No)	N/A	N/A	N/A	N/A
2	StandBy	OFF	OFF	OFF (All)	OFF	OFF	N/A (No)	N/A	N/A	N/A	N/A
3	WarmUp	ON	ON	ON (PlanetView or BB3View)	N/A	OFF	N/A	N/A	N/A	N/A	N/A
		ON	OFF								
		OFF	ON								
	Science										
4	**Science_High_Res1 (Default)**	**ON**	**ON**	**ON (All)**	**ON**	**OFF**	**100msec**	**8**	**1x2**	**Yes**	**100x80**
5	Science_High_Res2	ON	ON	ON (All)	ON	OFF	300msec	8	1x2	Yes	100x80
6	Science_High_Res3	ON	ON	ON (All)	ON	OFF	800msec	8	1x2	Yes	100x80
7	Science_Med_Res1	ON	ON	ON (All)	ON	OFF	100msec	8	2x2	Yes	100x80
8	Science_Med_Res2	ON	ON	ON (All)	ON	OFF	300msec	8	2x2	Yes	100x80
9	Science_Med_Res3	ON	ON	ON (All)	ON	OFF	800msec	8	2x2	Yes	100x80
10	Science_Low_Res1	ON	ON	ON (All)	ON	OFF	100msec	8	2x4	Yes	100x80
11	Science_Low_Res2	ON	ON	ON (All)	ON	OFF	300msec	8	2x4	Yes	100x80
12	Science_Low_Res3	ON	ON	ON (All)	ON	OFF	800msec	8	2x4	Yes	100x80
13	Science_TIR_Only	OFF	ON	ON (All)	OFF	OFF	100msec	8	N/A	N/A	100x80
							800msec	1			
14	Calibration	ON	ON	ON (All)	ON	OFF	N/A	1	1x1	Yes	160x120
	Exception										
15	WarmUp_Heated	ON	ON	ON (PlanetView or BB3View)	ON	ON	N/A	N/A	N/A	N/A	N/A
		ON	OFF								
		OFF	ON								
16	Pointing_BB3View	OFF	OFF	ON (BB3)	OFF	OFF	N/A	N/A	N/A	N/A	100x80
17	Pointing_PlanetView	OFF	OFF	ON (PlanetView)	OFF	OFF	N/A	N/A	N/A	N/A	100x80
18	Science_TIS_Only	ON	OFF	ON (All)	ON	OFF	100msec	N/A	1x2	Yes	100x80
19	Science_TIR_Only_Heated	OFF	ON	ON (All)	OFF	ON	100msec	8	N/A	N/A	100x80
							800msec	1			
20	Science_High_Res_UnCompr	ON	ON	ON (All)	ON	ON	100msec	8	1x2	No	100x80
21	Science_High_Res_Heated	ON	ON	ON (All)	ON	ON	100msec	8	1x2	Yes	100x80
22	Science_Low_Res_Heated	ON	ON	ON (All)	ON	ON	100msec	8	2x4	Yes	100x80
23	Science_Raw	ON	ON	ON (All)	ON	OFF	100msec	8	1x1	No	100x80
24	Science_PlanetView	ON	ON	ON (PlanetView)	OFF	OFF	100msec	8	1x2	Yes	100x80
25	Diagnostic	OFF/ON	OFF/ON	OFF/ON (All)	OFF/ ON	OFF/ ON	>100msec	N/A	1x1, 1x2, 2x4	Yes, No	N/A
26	Test	OFF/ON	OFF/ON	OFF/ON (All)	OFF/ ON	OFF/ ON	>100msec	1…16	1x1, 1x2, 2x4	Yes, No	N/A
27	Science_Reduced_Swath1	ON	ON	ON (All)	ON	OFF	100msec	8	1x2	Yes	50x80
28	Science_Reduced_Swath2	ON	ON	ON (All)	ON	OFF	100msec	8	1x2	Yes	70x80

29	FullWin_UnCompr	ON	ON	ON (All)	ON	N/A	800msec	1	1x1	No	160x120
30	FullWin_Compr	ON	ON	ON (All)	ON	N/A	800msec	1	1x1	Yes	160x120
…											
50	UserDefined	OFF/ON	OFF/ON	OFF/ON (All)	OFF/ ON	OFF/ ON	>100msec	1 …16	1x1, 1x2, 2x4	Yes, No	N/A

Note: POI-Position “All” means: PlanetView or SpaceView or BB3View or BB7View or Unknown (if POI-Power = OFF)

Appendix 9: TELECOMMAND PACKET LIST

Note: *ZMR000xx/PMR000xx=>* **ID of the command/command parameter in SCOS2000 database**

Name: **TC_List**	Model: **FM_Main_V5 (05.05.2015)**	Number Packets: **53**
Description: List of all TC Packets		

Packet Name	Version	APID		Type	Sub-Type	SID / EID	Packet Length (words 16bit)	Description
		PID	PCAT					
TC_HK_Enable *ZMR00001*	3	60	12	3	5	--	7	Enables the cyclic HK generation related to SID parameter (3 kinds)
TC_HK_Disable *ZMR00002*	3	60	12	3	6	--	7	Disables the cyclic HK generation related to SID parameter
TC_HK_Period *ZMR00003*	5	60	12	3	129	--	8	Adjusting the period for HK acquisition (fore one/all SID)
TC_Memory_Load *ZMR00004*	4	60	12	6	2	--	124	Loads a piece of MERTIS ICU memory area
TC_Memory_Dump *ZMR00005*	2.2	60	12	6	5	--	11	Dumps a piece of MERTIS ICU memory area
TC_Memory_Check *ZMR00006*	2.2	60	12	6	9	--	11	Checks a piece of MERTIS ICU memory area
TC_Time_Update *ZMR00007*	2	60	12	9	129	--	9	Contains the S/C time for on-board timer synchronization
TC_Test_Connection *ZMR00008*	1	60	12	17	1	--	6	Requests a connection test to S/C
TC_Test_MaxTcLength *ZMR00009*	2	60	12	17	128	--	124	Test TC with maximum packet length (124 16bit-Words)
TC_Science_Enable *ZMR00010*	3	60	12	21	1	--	7	Enables SCIENCE state (science data sent within a science mode)
TC_Science_Disable *ZMR00011*	3	60	12	21	2	--	7	Disables SCIENCE state (stop sending science data)
TC_Reset_TM_Buffer *ZMR00012*	1.1	60	12	21	128	--	6	Rests the telemetry output buffer
TC_EEPROM_Status	1	60	12	180	1	--	6	Reads the current EEPROM status (stored executables)

ZMR00013								
TC_Operation_Parameter *ZMR00014*	10	60	12	180	3	--	14	Changes the MERTIS Operation Parameter
TC_FunctionConfig_Parameter *ZMR00015*	11	60	12	180	4	--	15	Changes the MERTIS Configuration Parameter
TC_Parameter_Dump *ZMR00016*	2.1	60	12	180	5	--	6	Dumps the MERTIS Functional and Operational Parameter
TC_HK_Configuration_Status *ZMR00017*	1.1	60	12	180	8	--	6	Reads the HK acquisition status (on/off and acquisition period)
TC_APS_BootMode *ZMR00018*	4	60	12	180	10	--	10	Selects an APS executable to be started, the MERTS start mode and the instrument hardware configuration
TC_Diagnostic_Parameter *ZMR00058*	5	60	12	180	11	--	8	TC for configuration of Diagnose mode
TC_Calibration_Parameter *ZMR00022*	2	60	12	180	12	--	11	Changes the MERTIS Calibration Parameter
TC_Safe_Enter *ZMR00023*	2.1	60	12	181	1	--	6	Enters the MERTIS Safe mode by re-starting of the on-board software
TC_StandBy_Enter *ZMR00024*	1	60	12	181	2	--	6	Enters the MERTIS Standby mode
TC_Power_Enable *ZMR00025*	1	60	12	181	3	--	6	Enables WARMUP state (switching-on power of MERTIS sub-systems)
TC_Power_Disable *ZMR00026*	1	60	12	181	4	--	6	Disables WARMUP state (switching-off power of MERTIS sub-systems)
TC_EPA_Activate *ZMR00027*	1	60	12	182	1	--	6	Forces Pointing Unit to position PlanetView in case of POI malfunction
TC_EPA_Confirm *ZMR00028*	1	60	12	182	2	--	6	Confirms the command TC_EPA_Activate in order to execute it
TC_Test_Enable *ZMR00029*	1	60	12	183	1	--	6	Enables TEST state
TC_Test_Disable *ZMR00030*	1	60	12	183	2	--	6	Disables TEST state
TC_Diagnostic_Enable *ZMR00031*	1	60	12	183	3	--	6	Enables the DIAGNOSTIC state
TC_Diagnostic_Disable *ZMR00032*	1	60	12	183	4	--	6	Disables the DIAGNOSTIC state
TC_Test_Function(WatchdogEnableDisable) *ZMR00033*	2	60	12	183	5	1	9	Test function for enabling or disabling the watchdog
TC_Test_Function(SubSystemPower) *ZMR00034*	1	60	12	183	5	2	9	Test function for switching on/off the sub-system power

TC_Test_Function(POIMovePosition) *ZMR00035*	1	60	12	183	5	3	8	Test function for moving the pointing mirror (POI) to Planet, BB7, BB3 or Space position
TC_Test_Function(DataAcquisitionStart) *ZMR00036*	3	60	12	183	5	4	19	Test function for starting a data acquisition for TIR, TIS or both
TC_Test_Function(DataAcquisitionStop) *ZMR00037*	1	60	12	183	5	5	8	Test function to stop a data acquisition for TIR, TIS or both
TC_Test_Function(EventEnableDisable) *ZMR00038*	1	60	12	183	5	6	9	Test function for enabling or disabling of event report generation
TC_Test_Function(WatchdogReset) *ZMR00039*	1	60	12	183	5	7	7	Test function for reset the watchdog
TC_Test_Function(SingleHKRequest) *ZMR00040*	1	60	12	183	5	8	8	Test function for acquiring a single HK packet
TC_Test_Function(SetPropertyParam) *ZMR00041*	2	60	12	183	5	9	124	Test function for setting a property parameter temporary in RAM
TC_Test_Function(ExecuteCmd) *ZMR00042*	2	60	12	183	5	10	124	Test function for executing an internal test command in shape of an command string
TC_Test_Function(SetICURegisterBit) *ZMR00043*	2	60	12	183	5	11	12	Test function for setting or re-setting an ICU register bit
TC_Test_Function(SetPOIMode) *ZMR00044*	2	60	12	183	5	12	9	Test function for setting the mode of pointing unit (POI)
TC_Test_Function(POIMoveSteps) *ZMR00045*	1	60	12	183	5	13	9	Test function for moving the pointing mirror (POI) a defined number of steps
TC_Test_Function(ShutterOpenClose) *ZMR00046*	1	60	12	183	5	14	8	Test function for opening or closing the shutter (STS)
TC_Test_Function(TECDataMeasurement) *ZMR00048*	1	60	12	183	5	16	8	Test function for enabling or disabling the TEC data measurement
TC_Test_Function(RegisterSampling) *ZMR00049*	2	60	12	183	5	17	11	Test function for sampling of ICU registers
TC_Test_Function(DebugOnOff) *ZMR00050*	1	60	12	183	5	18	8	Test function for enabling/disabling sending of debug messages (TestLog-TM)
TC_Test_Function(RADRawDataOnOff) *ZMR00057*	1	60	12	183	5	19	8	Test function for enabling/disabling sending of RAD raw data (TestLog-TM)
TC_Test_Function(GetPropertyParam) *ZMR00059*	1	60	12	183	5	20	124	Test function for reading a property parameter from configuration file in RAM
TC_Test_Function(GetPropertyParamAll) *ZMR00060*	1	60	12	183	5	21	7	Test function for reading ALL property parameters from configuration file in RAM
TC_Test_Function(TECControl) *ZMR00051*	1	60	12	183	5	30	9	Test function for controlling the Thermal Electrical Cooler (TEC)
TC_Calibration_Enable *ZMR00052*	1	60	12	183	7	--	6	Enables the CALIBRATION state

TC_Calibration_Disable *ZMR00053*	1	60	12	183	8	--	6	Disables the CALIBRATION state

Packet Name: **TC_HK_Enable (ZMR00001)**	Version: 3 / 09.09.2011	APID: **972 (0x3CC)**	Service: **3/5**
Packet Description: Enables the cyclic HK generation related to SID parameter (3 kinds) Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	3	5	0		0xB5C1

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_SID_HK *PMR00001*	8	enum: 0=all 1=OperationDefaultHK 2=OperationExtendedHK	0	2	0	none	SID of the HK type to be enabled/disabled or period to be adjusted
PAD	8	unsigned	0	0	0	none	Parameter is used for as filling byte

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_OperationDefault_HK	1	10sec	all	no change	Default generation cycle time
TM_OperationExtended_HK	1	10sec	all	no change	Default generation cycle time (generated all modes except Safe)
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_HK_Disable (ZMR00002)**	Version: 3 / 09.09.2011	APID: **972 (0x3CC)**	Service: **3/6**
Packet Description: Disables the cyclic HK generation related to SID parameter *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	3	6	0		0x2E1D

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_SID_HK *PMR00001*	8	enum: 0=all 1=OperationDefaultHK 2=OperationExtendedHK	0	2	0	none	SID of the HK type to be enabled/disabled or period to be adjusted
PAD	8	unsigned	0	0	0	none	Parameter is used for as filling byte

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_HK_Period (ZMR00003)**	Version: 5 / 09.09.2011	APID: **972 (0x3CC)**	Service: **3/129**
Packet Description: Adjusting the period for HK acquisition (fore one/all SID)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	3	129	0		0x941D

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_SID_HK *PMR00001*	8	enum: 0=all 1=OperationDefaultHK 2=OperationExtendedHK	0	2	0	none	SID of the HK type to be enabled/disabled or period to be adjusted
PAR_HK_PERIOD *PMR00002*	16	unsigned	125	600000	20000	ms	Period of HK status report generation
PAD	8	unsigned	0	0	0	none	Parameter is used for as filling byte

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Memory_Load (ZMR00004)**	Version: 4 / 09.09.2011	APID: **972 (0x3CC)**	Service: **6/2**
Packet Description: Loads a piece of MERTIS ICU memory area			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	241	1	1	6	2	0		0x5F33

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_LOAD *PMR00003*	16	enum: 110=RAM 111=EEPROM 112=REGISTER 114=AHBRAM 115=VRAM	110	115	111	none	Identifier for a MERTIS ICU memory type
PAR_START_ADDRESS_LOAD *PMR00004*	32	unsigned	0	4294967295	0	none	Start address of a memory area to be loaded, dumped, checked
PAR_BLOCK_LENGTH_LOAD *PMR00005*	32	unsigned	1	226	1	byte	Defines the size of a memory block (in bytes) for memory load
PAR_MEM_DATA_BLOCK_LOAD *PMR00006*	8	unsigned	0	255	0	none	Memory load data block

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	1=Safe	no change	TC acceptance report
TM_TC_Execution_Success	1	--	1=Safe	no change	TC execution success report

Packet Name: **TC_Memory_Dump (ZMR00005)**	Version: 2.2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **6/5**
Packet Description: Dumps a piece of MERTIS ICU memory area			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	15	1	1	6	5	0		0x2A4C

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *PMR00003*	16	enum: 110=RAM 111=EEPROM 112=REGISTER 113=PROM 114=AHBRAM 115=VRAM	110	115	111	none	Identifier for a MERTIS ICU memory type
PAR_START_ADDRESS_DUMP *PMR00004*	32	unsigned	0	4294967295	0	none	Start address of a memory area to be loaded, dumped, checked
PAR_BLOCK_LENGTH_DUMP *PMR00007*	32	unsigned	1	4294967295	1	byte	Defines the size of a memory block (in bytes) for memory dump

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_Memory_Dump	1	--	all	no change	Number of packets depends on the requested memory address range
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Memory_Check (ZMR00006)**	Version: 2.2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **6/9**
Packet Description: Checks a piece of MERTIS ICU memory area			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	15	1	1	6	9	0		0x3C30

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_CHECK *PMR00003*	16	enum: 110=RAM 111=EEPROM 112=REGISTER 113=PROM 114=AHBRAM 115=VRAM	110	115	111	none	Identifier for a MERTIS ICU memory type
PAR_START_ADDRESS_CHECK *PMR00004*	32	unsigned	0	4294967295	0	none	Start address of a memory area to be loaded, dumped, checked
PAR_BLOCK_LENGTH_CHECK *PMR00008*	32	unsigned	1	4294967295	1	byte	Defines the size of a memory block (in bytes) for memory check

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_Memory_Check	1	--	all	no change	Memory check report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Time_Update (ZMR00007)**	Version: 2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **9/129**
Packet Description: Contains the S/C time for on-board timer synchronization			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	9	129	0		0xB2EE

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_OBT_SYNC_TIME *PMR00009*	48	unsigned	0	42949 67295	0	s	Parameter contains a time value (CUC format) for synchronization of the On-Board Timer (OBT)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance success report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Test_Connection (ZMR00008)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **17/1**
Packet Description: Requests a connection test to S/C			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	17	1	0		0x3528

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_Test_Connection	1	--	all	no change	Connection test report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Test_MaxTcLength (ZMR00009)**	Version: 2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **17/128**
Packet Description: Test TC with maximum packet length (124 16bit-Words)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	241	1	1	17	128	0		0xC3BE

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TEST_DATA *PMR00010...PMR00127*	16	unsigned	0	65535	167	none	Test data block (118 16bit words)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Science_Enable (ZMR00010)**	Version: 3 / 09.09.2011	APID: **972 (0x3CC)**	Service: **21/1**
Packet Description: Enables SCIENCE state (science data sent within a science mode)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	21	1	0		0x6172

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAD	9	unsigned	0	0	0	none	Parameter is used for as filling byte
PAR_PROCESS_ID *PMR00128*	7	enum: 62=Science Data (Ka-band downlink) 63=Science Data (X-band downlink)	62	63	62	none	Parameter is used to define the source of science data generation

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	3=WarmUp	4=Science_High_Res1	TC acceptance report
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	4=Science_High_Res1	
TM_Science_TIR_Data	1	0,1sec	3=WarmUp	4=Science_High_Res1	
TM_Operation_Parameter	1	--	3=WarmUp	4=Science_High_Res1	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	4=Science_High_Res1	
TM_TC_Acceptance_Success	1	--	3=WarmUp	5=Science_High_Res2	TC acceptance report
TM_Science_TIS_Data	1	0,3sec	3=WarmUp	5=Science_High_Res2	
TM_Science_TIR_Data	1	0,3sec	3=WarmUp	5=Science_High_Res2	
TM_Operation_Parameter	1	--	3=WarmUp	5=Science_High_Res2	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	5=Science_High_Res2	
TM_TC_Acceptance_Success	1	--	3=WarmUp	6=Science_High_Res3	TC acceptance report
TM_Science_TIS_Data	1	0,8sec	3=WarmUp	6=Science_High_Res3	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	6=Science_High_Res3	
TM_Operation_Parameter	1	--	3=WarmUp	6=Science_High_Res3	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	6=Science_High_Res3	
TM_TC_Acceptance_Success	1	--	3=WarmUp	7=Science_Med_Res1	TC acceptance report
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	7=Science_Med_Res1	
TM_Science_TIR_Data	1	0,1sec	3=WarmUp	7=Science_Med_Res1	
TM_Operation_Parameter	1	--	3=WarmUp	7=Science_Med_Res1	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	7=Science_Med_Res1	

TM_TC_Acceptance_Success	1	--	3=WarmUp	8=Science_Med_Res2	TC acceptance report
TM_Science_TIS_Data	1	0,3sec	3=WarmUp	8=Science_Med_Res2	
TM_Science_TIR_Data	1	0,3sec	3=WarmUp	8=Science_Med_Res2	
TM_Operation_Parameter	1	--	3=WarmUp	8=Science_Med_Res2	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	8=Science_Med_Res2	
TM_TC_Acceptance_Success	1	--	3=WarmUp	9=Science_Med_Res3	TC acceptance report
TM_Science_TIS_Data	1	0,8sec	3=WarmUp	9=Science_Med_Res3	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	9=Science_Med_Res3	
TM_Operation_Parameter	1	--	3=WarmUp	9=Science_Med_Res3	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	9=Science_Med_Res3	
TM_TC_Acceptance_Success	1	--	3=WarmUp	10=Science_Low_Res1	TC acceptance report
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	10=Science_Low_Res1	
TM_Science_TIR_Data	1	0,1sec	3=WarmUp	10=Science_Low_Res1	
TM_Operation_Parameter	1	--	3=WarmUp	10=Science_Low_Res1	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	10=Science_Low_Res1	
TM_TC_Acceptance_Success	1	--	3=WarmUp	11=Science_Low_Res2	TC acceptance report
TM_Science_TIS_Data	1	0,3sec	3=WarmUp	11=Science_Low_Res2	
TM_Science_TIR_Data	1	0,3sec	3=WarmUp	11=Science_Low_Res2	
TM_Operation_Parameter	1	--	3=WarmUp	11=Science_Low_Res2	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	11=Science_Low_Res2	
TM_TC_Acceptance_Success	1	--	3=WarmUp	12=Science_Low_Res3	TC acceptance report
TM_Science_TIS_Data	1	0,8sec	3=WarmUp	12=Science_Low_Res3	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	12=Science_Low_Res3	
TM_Operation_Parameter	1	--	3=WarmUp	12=Science_Low_Res3	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	12=Science_Low_Res3	
TM_TC_Acceptance_Success	1	--	3=WarmUp	13=Science_TIR_Only	TC acceptance report
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	13=Science_TIR_Only	
TM_Operation_Parameter	1	--	3=WarmUp	13=Science_TIR_Only	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	13=Science_TIR_Only	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	4=Science_High_Res1	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	4=Science_High_Res1	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	5=Science_High_Res2	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	5=Science_High_Res2	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	6=Science_High_Res3	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	6=Science_High_Res3	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	7=Science_Med_Res1	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	7=Science_Med_Res1	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	8=Science_Med_Res2	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	8=Science_Med_Res2	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	9=Science_Med_Res3	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	9=Science_Med_Res3	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	10=Science_Low_Res1	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	10=Science_Low_Res1	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	11=Science_Low_Res2	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	11=Science_Low_Res2	

TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	12=Science_Low_Res3	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	12=Science_Low_Res3	
TM_Science_TIS_Data_QuickLook	0	60sec	3=WarmUp	13=Science_TIR_Only	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	23=Science_Raw	
TM_Operation_Parameter	1	--	3=WarmUp	23=Science_Raw	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	23=Science_Raw	
TM_Science_TIR_Data_QuickLook	1	60sec	3=WarmUp	23=Science_Raw	
TM_Science_TIS_Data	4	0,1sec	3=WarmUp	23=Science_Raw	
TM_Science_TIS_Data_QuickLook	4	60sec	3=WarmUp	23=Science_Raw	
TM_TC_Acceptance_Success	1	--	3=WarmUp	23=Science_Raw	TC acceptance report
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	27=Science_Reduced_Swath1	
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	28=Science_Reduced_Swath2	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	27=Science_Reduced_Swath1	
TM_Science_TIS_Data_QuickLook	1	60sec	3=WarmUp	28=Science_Reduced_Swath2	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	29=FullWin_UnCompr	
TM_FunctionConfig_Parameter	1	--	3=WarmUp	30=FullWin_Compr	
TM_Operation_Parameter	1	--	3=WarmUp	29=FullWin_UnCompr	
TM_Operation_Parameter	1	--	3=WarmUp	30=FullWin_Compr	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	29=FullWin_UnCompr	
TM_Science_TIR_Data	1	0,8sec	3=WarmUp	30=FullWin_Compr	
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	29=FullWin_UnCompr	
TM_Science_TIS_Data	1	0,1sec	3=WarmUp	30=FullWin_Compr	
TM_TC_Acceptance_Success	1	--	3=WarmUp	29=FullWin_UnCompr	TC acceptance report
TM_TC_Acceptance_Success	1	--	3=WarmUp	30=FullWin_Compr	TC acceptance report
TM_TC_Execution_Success	1	--	3=WarmUp	4=Science_High_Res1	TC execution report for entering Science_High_Res1
TM_TC_Execution_Success	1	--	3=WarmUp	5=Science_High_Res2	TC execution report for entering Science_High_Res2
TM_TC_Execution_Success	1	--	3=WarmUp	6=Science_High_Res3	TC execution report for entering Science_High_Res3
TM_TC_Execution_Success	1	--	3=WarmUp	7=Science_Med_Res1	TC execution report for entering Science_Med_Res1
TM_TC_Execution_Success	1	--	3=WarmUp	8=Science_Med_Res2	TC execution report for entering Science_Med_Res2
TM_TC_Execution_Success	1	--	3=WarmUp	9=Science_Med_Res3	TC execution report for entering Science_Med_Res3
TM_TC_Execution_Success	1	--	3=WarmUp	10=Science_Low_Res1	TC execution report for entering Science_Low_Res1
TM_TC_Execution_Success	1	--	3=WarmUp	11=Science_Low_Res2	TC execution report for entering Science_Low_Res2
TM_TC_Execution_Success	1	--	3=WarmUp	12=Science_Low_Res3	TC execution report for entering Science_Low_Res3
TM_TC_Execution_Success	1	--	3=WarmUp	13=Science_TIR_Only	TC execution report for entering Science_TIR_Only
TM_TC_Execution_Success	1	--	3=WarmUp	23=Science_Raw	TC execution report for

					entering Science_Raw
TM_TC_Execution_Success	1	--	3=WarmUp	29=FullWin_UnCompr	TC execution report for entering FullWin_UnCompr
TM_TC_Execution_Success	1	--	3=WarmUp	30=FullWin_Compr	TC execution report for entering FullWin_Compr

Packet Name: **TC_Science_Disable (ZMR00011)**	Version: 3 / 09.09.2011	APID: **972 (0x3CC)**	Service: **21/2**
Packet Description: Disables SCIENCE state (stop sending science data)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	21	2	0		0xFAAE

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAD	9	unsigned	0	0	0	none	Parameter is used for as filling byte
PAR_PROCESS_ID *PMR00128*	7	enum: 62=Science Data (Ka-band downlink) 63=Science Data (X-band downlink)	62	63	62	none	Parameter is used to define the source of science data generation

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	4=Science_High_Res1	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	5=Science_High_Res2	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	6=Science_High_Res3	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	7=Science_Med_Res1	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	8=Science_Med_Res2	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	9=Science_Med_Res3	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	10=Science_Low_Res1	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	11=Science_Low_Res2	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	12=Science_Low_Res3	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	13=Science_TIR_Only	3=WarmUp	TC acceptance report
TM_TC_Acceptance_Success	1	--	23=Science_Raw	3=WarmUp	TC acceptance report in mode Science_Raw
TM_TC_Acceptance_Success	1	--	29=FullWin_UnCompr	3=WarmUp	TC acceptance report in mode FullWin_UnCompr
TM_TC_Acceptance_Success	1	--	30=FullWin_Compr	3=WarmUp	TC acceptance report in mode FullWin_Compr
TM_TC_Execution_Success	1	--	4=Science_High_Res1	3=WarmUp	TC execution report for leaving Science_High_Res1
TM_TC_Execution_Success	1	--	5=Science_High_Res2	3=WarmUp	TC execution report for leaving Science_High_Res2
TM_TC_Execution_Success	1	--	6=Science_High_Res3	3=WarmUp	TC execution report for leaving Science_High_Res3

TM_TC_Execution_Success	1	--	7=Science_Med_Res1	3=WarmUp	TC execution report for leaving Science_Med_Res1
TM_TC_Execution_Success	1	--	8=Science_Med_Res2	3=WarmUp	TC execution report for leaving Science_Med_Res2
TM_TC_Execution_Success	1	--	9=Science_Med_Res3	3=WarmUp	TC execution report for leaving Science_Med_Res3
TM_TC_Execution_Success	1	--	10=Science_Low_Res1	3=WarmUp	TC execution report for leaving Science_Low_Res1
TM_TC_Execution_Success	1	--	11=Science_Low_Res2	3=WarmUp	TC execution report for leaving Science_Low_Res2
TM_TC_Execution_Success	1	--	12=Science_Low_Res3	3=WarmUp	TC execution report for leaving Science_Low_Res3
TM_TC_Execution_Success	1	--	13=Science_TIR_Only	3=WarmUp	TC execution report for leaving Science_TIR_Only
TM_TC_Execution_Success	1	--	23=Science_Raw	3=WarmUp	TC execution report for leaving Science_Raw
TM_TC_Execution_Success	1	--	29=FullWin_UnCompr	3=WarmUp	TC execution report for leaving FullWin_UnCompr
TM_TC_Execution_Success	1	--	30=FullWin_Compr	3=WarmUp	TC execution report for leaving FullWin_Compr

Packet Name: **TC_Reset_TM_Buffer (ZMR00012)**	Version: 1.1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **21/128**
Packet Description: Rests the telemetry output buffer			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	21	128	0		0xC141

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_EEPROM_Status (ZMR00013)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **180/1**
Packet Description: Reads the current EEPROM status (stored executables)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	180	1	0		0x6344

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
all	1	--	all	no change	EEPROM configuration status report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Operation_Parameter (ZMR00014)**	Version: 10 / 27.06.2014	APID: **972 (0x3CC)**	Service: **180/3**
Packet Description: Changes the MERTIS Operation Parameter			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	21	1	1	180	3	0		0xE974

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_REPETITION_RATE *PMR00129*	16	enum: 1=100msec 2=300msec 3=800msec 4=2000msec 5=10000msec	1	5	1	none	Repetition rate of science data acquisition (Spectrometer and Radiometer data and HKs)
PAR_CALIBRATION_PERIOD *PMR00130*	16	unsigned	20	500	120	s	Calibration period acquiring data from the 3 calibration targets (BB3, BB7 and SpaceView)
PAR_CALIBRATION_CYCLE_INVERT *PMR00277*	8	enum: 0=no 1=yes	0	1	0	none	Inverts the calibration cycle timing, times for observation and calibration exchanged
PAR_STS_POWER *PMR00131*	1	enum: 0=off 1=on	0	1	0	none	Power on/off
PAR_SHH_POWER *PMR00132*	1	enum: 0=off 1=on	0	1	0	none	Power on/off
PAR_UNUSED_POWER *PMR00278*	1	enum: 0=off	0	0	0	none	Not used power switch (off only)
PAR_BB7_POWER *PMR00134*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TIS_POWER *PMR00135*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TIR_POWER *PMR00136*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TEC_POWER *PMR00137*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_POI_POWER *PMR00138*	1	enum: 0=off 1=on	0	1	1	none	Power on/off

PAR_TIS_BCK_RATE *PMR00270*	8	unsigned	1	20	10	acq u	TIS background rate (background acquisition every TIS_BCK_RATE with STS closed)
PAR_POI_MODE *PMR00271*	8	enum: 0=Off 1=Move 2=PlanetView 3=BB3View 4=BB7View 5=SpaceView	0	5	1	non e	Pointing Unit operating mode
PAR_TIS_BIN_MODE *PMR00272*	4	enum: 0=1x1 1=1x2 2=2x2 3=2x4	0	3	1	non e	TIS binning mode (spatial x spectral)
PAR_TIS_WIN_SIZE *PMR00273*	3	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	0	3	0	non e	TIS window size (area on detector used for science data processing)
PAR_TIS_COMP_MODE *PMR00274*	1	enum: 0=no compression 1=lossless	0	1	1	non e	TIS compression mode
PAR_TIR_REPETITION_FACTOR *PMR00297*	8	unsigned	1	16	8	non e	Factor of TIR data repetition rate related to the TIS data repetition rate (TIR-Rate = TIS-Rate * PAR_TIR_REPETITION_FACTOR)
PAR_SHH_TEMP *PMR00143*	16	signed	-50	50	10	deg C	Minimum sensor head and optics temperature for operation
PAR_TIS_SCIENCE_QUICKLOOK_PERIO D *PMR00144*	16	unsigned	1	255	60	s	Parameter defines the period for generating TIS science data quicklook TM packets (PID=63)
PAR_TIR_SCIENCE_QUICKLOOK_PERIO D *PMR00145*	16	unsigned	1	255	60	s	Parameter defines the period for generating TIR science data quicklook TM packets (PID=63)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_FunctionConfig_Parameter (ZMR00015)**	Version: 11 / 27.06.2014	APID: **972 (0x3CC)**	Service: **180/4**
Packet Description: Changes the MERTIS Configuration Parameter			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	23	1	1	180	4	0		0xFCC7

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TIS_BOL_CHIP_TEMP *PMR00147*	16	signed	5	40	30	deg C	BOL chip temperature to be adjusted by TEC
PAR_TIS_DATA_PROC_MODE *PMR00298*	8	enum: 0=Nominal 1=NoBackgroundSubtraction 2=STSBackgroundSubtraction 3=BB3BackgroundSubtraction	0	3	0	none	Parameter changes the TIS data processing
PAR_POI_MOVE_MODE *PMR00148*	8	enum: 0=without_PosSensors 1=with_PosSensors	0	1	1	none	ClosedLoop: controlled by ICU/FPGA (POI module), OpenLoop: controlled by MAPS
PAR_POI_EPA_POWERING_TIME *PMR00149*	16	unsigned	100	7000	100	ms	Time for powering the EPA (for burning the wire of release mechanism)
PAR_BEL_PIXEL_CLOCK_MODE *PMR00168*	5	enum: 1=Nominal frequency 2=Low frequency 3=High frequency	1	3	1	none	Parameter defines the pixel clock mode for the bolemeter electronics (BEL)
PAR_BOL_BIAS_VOLT_SETTING_MODE *PMR00279*	1	enum: 0=manual 1=automatic	0	1	1	none	Defines BIAS voltage setting mode (auto/manual)
PAR_TIR_OVERSAMP_MODE *PMR00150*	1	enum: 0=no 1=yes	0	1	1	none	Oversampling mode yes/no
PAR_TIS_OVERSAMP_MODE *PMR00151*	1	enum: 0=no 1=yes	0	1	1	none	TIS Oversampling mode yes/no
PAR_BOL_DECT_FIDBIAS_VOLTAGE *PMR00165*	16	unsigned	1,5	5	3,5	V	Bolometer Detector FID BIAS voltage
PAR_BOL_DECT_VSKIMBIAS_VOLTAGE *PMR00166*	16	unsigned	3	5,5	5,342	V	Bolometer Detector VSKIMMING BIAS voltage
PAR_TIS_DATA_NOISE_REDUCTION *PMR00299*	8	unsigned	0	4	0	none	Number of bits (LSB) of TIS data pixel set to value zero in order to reduce the data noise

PAR_POI_COIL_MODE *PMR00167*	8	enum: 0=Coil1+2 1=Coil3+4 2=Coil2+3 3=Coil1+4 4=Coil1+2+3+4	0	4	0	none	POI motor coil mode, defines usage of different motor coils
PAR_TIS_WIN0_POS_SPAT *PMR00232*	8	unsigned	0	159	30	pix	Spatial pixel position of TIS window 0 (100x80, 0…159)
PAR_TIS_WIN1_POS_SPAT *PMR00233*	8	unsigned	0	159	47	pix	Spatial pixel position of TIS reduced window 1 (66x80, 0…159)
PAR_TIS_WIN2_POS_SPAT *PMR00234*	8	unsigned	0	159	43	pix	Spatial pixel position of TIS reduced window 2 (74x80, 0…159)
PAR_TIS_WIN_POS_SPECT_7UM *PMR00235*	8	unsigned	0	119	13	pix	Spectra pixel position of TIS windows 0…2 (0…119) related to spectrum 7µm

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: **TC_Parameter_Dump (ZMR00016)**	Version: 2.1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **180/5**
Packet Description: Dumps the MERTIS Functional and Operational Parameter *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	180	5	0		0xAF80

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_Operation_Parameter	1	--	all	no change	Operation parameter report
TM_FunctionConfig_Parameter	1	--	all	no change	Function configuration parameter report
TM_Calibration_Parameter	1	--	all	no change	Calibration parameter report
TM_TC_Execution_Success	1	--	all	no change	TC execution success report
TM_Diagnostic_Parameter	1	--	all	no change	Diagnostic parameter report

Packet Name: **TC_HK_Configuration_Status (ZMR00017)**	Version: 1.1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **180/8**
Packet Description: Reads the HK acquisition status (on/off and acquisition period)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	180	8	0		0xD9DC

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	no change	TC acceptance report
TM_HK_Configuration_Status	1	--	all	no change	Configuration status of HK (period, on/off)
TM_TC_Execution_Success	1	--	all	no change	TC execution success report

Packet Name: TC_APS_BootMode (ZMR00018)	Version: 4 / 10.12.2012	APID: 972 (0x3CC)	Service: 180/10
Packet Description: Selects an APS executable to be started, the MERTS start mode and the instrument hardware configuration Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	13	1	1	180	10	0		0xA939

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_BOOT_EXE *PMR00169*	16	enum: 0=Not_selected 1=EXE_EEPROM1 2=EXE_EEPROM2 3=EXE_EEPROM3 4=EXE_EEPROM4 5=EXE_EEPROM5 6=EXE_EEPROM6	0	6	0	none	MAPS executable to be booted after MERTIS power-on
PAR_START_MODE *PMR00170*	16	enum: 0=Not_selected 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 25=Diagnostic 29=FullWin_UnCompr	0	29	0	none	Start mode after powering-on MERTIS (nominal case)
PAR_BOOT_CONFIG *PMR00171*	16	enum: 0=Not_selected 1=CFG_EEPROM1 2=CFG_EEPROM2 3=CFG_EEPROM3 4=CFG_EEPROM4 5=CFG_EEPROM5 6=CFG_EEPROM6	0	6	0	none	MERTIS configuration (TC/TM and property parameter) which is used after boot of PBS/APS
PAR_POI_START_POSITION *PMR00172*	16	enum: 0=PlanetView 1=BB7View 2=BB3View 3=SpaceView	0	3	0	none	Defines the start position of the pointing unit (POI) after power-on MERTIS (or start of MAPS)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	1=Safe	no change	TC acceptance report

TM_TC_Execution_Success	1	--	1=Safe	no change	TC execution success report

Packet Name: TC_Diagnostic_Parameter (ZMR00058)	Version: 5 / 05.05.2015	APID: 972 (0x3CC)	Service: 180/11
Packet Description: TC for configuration of Diagnose mode			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	180	11	0		0x5D25

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_DIAG_STEP_ENABLE_TIS_COMP *PMR00311*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step TIS_COMP
PAR_DIAG_STEP_ENABLE_SHH *PMR00312*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step SHH
PAR_DIAG_STEP_ENABLE_ANALOG_HK *PMR00282*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step ANALOG_HK
PAR_DIAG_STEP_ENABLE_POI_SENSOR *PMR00300*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step POI_SENSOR
PAR_DIAG_STEP_ENABLE_POI_ACCURACY *PMR00313*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step POI_ACCURACY
PAR_DIAG_STEP_ENABLE_BOL_BEL *PMR00301*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step BOL_BEL
PAR_DIAG_STEP_ENABLE_BOL_WINDOW *PMR00302*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step BOL_WINDOW
PAR_DIAG_STEP_ENABLE_TEC_CONTROL *PMR00303*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step TEC_CONTROL
PAR_DIAG_STEP_ENABLE_STS_MOVE *PMR00304*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step STS_MOVE
PAR_DIAG_STEP_ENABLE_RAD_REL *PMR00305*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step RAD_REL
PAR_DIAG_STEP_ENABLE_11 *PMR00290*	1	enum: 0=disabled 1=enabled	0	1	0	none	Enables or disables diagnose step 11
PAR_DIAG_STEP_ENABLE_12	1	enum:	0	1	0	non	Enables or disables diagnose step 12

PMR00291		0=disabled 1=enabled				e	
PAR_DIAG_STEP_ENABLE_13 *PMR00292*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 13
PAR_DIAG_STEP_ENABLE_14 *PMR00293*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 14
PAR_DIAG_STEP_ENABLE_15 *PMR00294*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 15
PAR_DIAG_STEP_ENABLE_16 *PMR00295*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 16
PAR_DIAG_DEBUG_ENABLE *PMR00296*	16	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose debug mode (raw image/hk data sent)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	no change	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	no change	TC execution success report

Packet Name: **TC_Calibration_Parameter (ZMR00022)**	Version: 2 / 17.11.2014	APID: **972 (0x3CC)**	Service: **180/12**
Packet Description: Changes the MERTIS Calibration Parameter			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	15	1	1	180	12	0		0x09C5

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_CAL_SEQU_NUMBER *PMR00306*	16	unsigned	0	3	0	none	Calibration sequence number to be executed
PAR_CAL_SEQU_NUM_CYCLES *PMR00307*	16	unsigned	1	65535	1	none	Number of repetions of selected calibration sequence
PAR_CAL_SEQU_CYCLE_DELAY *PMR00308*	16	unsigned	0	65535	0	ms	Delay (msec) between repetions of selected calibration sequence
PAR_CAL_SEQU_START_MODE *PMR00309*	16	enum: 0=CAL_SEQU_START_STABLE 1=CAL_SEQU_START_TIME	0	1	0	none	Start mode of selected calibration sequence
PAR_CAL_SEQU_START_TIMEOUT *PMR00310*	16	unsigned	0	65535	60	s	Timeout (sec) or delay (depends on PAR_CAL_SEQU_START_MODE) before starting of selected calibration sequence

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	no change	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	no change	TC execution success report

Packet Name: **TC_Safe_Enter (ZMR00023)**	Version: 2.1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **181/1**
Packet Description: Enters the MERTIS Safe mode by re-starting of the on-board software			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	181	1	0		0x5474

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	1=Safe	TC acceptance report
TM_TC_Execution_Success	1	--	all	1=Safe	TC execution success report

Packet Name: **TC_StandBy_Enter (ZMR00024)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **181/2**
Packet Description: Enters the MERTIS Standby mode			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	181	2	0		0x0127

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	all	2=StandBy	TC acceptance report
TM_TC_Execution_Success	1	--	all	2=StandBy	TC execution success report

Packet Name: **TC_Power_Enable (ZMR00025)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **181/3**
Packet Description: Enables WARMUP state (switching-on power of MERTIS sub-systems)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	181	3	0		0x3216

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	3=WarmUp	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	3=WarmUp	TC execution success report

Packet Name: **TC_Power_Disable (ZMR00026)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **181/4**
Packet Description: Disables WARMUP state (switching-off power of MERTIS sub-systems)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	181	4	0		0xAB81

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	3=WarmUp	2=StandBy	TC acceptance report
TM_TC_Execution_Success	1	--	3=WarmUp	2=StandBy	TC execution success report

Packet Name: **TC_EPA_Activate (ZMR00027)**	Version: 1 / 12.11.2012	APID: **972 (0x3CC)**	Service: **182/1**
Packet Description: Forces Pointing Unit to position PlanetView in case of POI malfunction			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	182	1	0		0x0D24

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	no change	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	no change	TC execution success report

Packet Name: **TC_EPA_Confirm (ZMR00028)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **182/2**
Packet Description: Confirms the command TC_EPA_Activate in order to execute it			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	182	2	0		0x5877

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	no change	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	no change	TC execution success report

Packet Name: **TC_Test_Enable (ZMR00029)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/1**
Packet Description: Enables TEST state			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	1	0		0x3A14

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	2=StandBy	26=Test	TC acceptance report
TM_TC_Execution_Success	1	--	2=StandBy	26=Test	TC execution success report

Packet Name: **TC_Test_Disable (ZMR00030)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/2**
Packet Description: Disables TEST state			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	2	0		0x6F47

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	2=StandBy	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	2=StandBy	TC execution success report

Packet Name: **TC_Diagnostic_Enable (ZMR00031)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/3**
Packet Description: Enables the DIAGNOSTIC state			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	3	0		0x5C76

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	3=WarmUp	25=Diagnostic	TC acceptance report
TM_TC_Execution_Success	1	--	3=WarmUp	25=Diagnostic	TC execution success report

Packet Name: **TC_Diagnostic_Disable (ZMR00032)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/4**
Packet Description: Disables the DIAGNOSTIC state			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	4	0		0xC5E1

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	25=Diagnostic	3=WarmUp	TC acceptance report
TM_TC_Execution_Success	1	--	25=Diagnostic	3=WarmUp	TC execution success report

Packet Name: **TC_Test_Function(WatchdogEnableDisable) (ZMR00033)**	Version: 2 / 07.11.2013	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for enabling or disabling the watchdog			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0x0A3F

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 1=Watchdog_EnableDisable	1	1	1	none	Number of the commanded test function
PAR_WATCHDOG_ENABLE *PMR00189*	16	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables the watchdog function
PAR_WATCHDOG_PERIOD *PMR00190*	16	unsigned	10	240000	90000	ms	Trigger period for the watchdog (watchdog counter value)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(SubSystemPower) (ZMR00034)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for switching on/off the sub-system power			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0x2C67

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 2=SubSystemPower	2	2	2	none	Number of the commanded test function
PAR_SUB_SYSTEM *PMR00191*	16	enum: 0=all 1=TIS 2=TIR 3=BB3 4=BB7 5=TEC 6=POI 7=SHH 8=STS	0	8	0	none	Defines the MERTIS sub-system (e.g. TIR)
PAR_POWER_ON_OFF *PMR00192*	16	enum: 0=off 1=on	0	1	1	none	Defines power switching action (on/off)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(POIMovePosition) (ZMR00035)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for moving the pointing mirror (POI) to Planet, BB7, BB3 or Space position Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x2121

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 3=POIMovePosition	3	3	3	none	Number of the commanded test function
PAR_POI_POSITION *PMR00193*	16	enum: 0=PlanetView 1=BB7View 2=BB3View 3=SpaceView	0	3	1	none	POI Position to be moved

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(DataAcquisitionStart) (ZMR00036)**	Version: 3 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for starting a data acquisition for TIR, TIS or both			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	31	1	1	183	5	0		0x61AB

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 4=DataAcquisitionStart	4	4	4	none	Number of the commanded test function
PAR_DAT_ACQ_CHANNEL *PMR00194*	16	enum: 0=all 1=Bolometer 2=Radiometer	0	2	0	none	MERTIS channel (TIR/TIS) for data acquisition
PAR_REPETITION_CYCLE *PMR00195*	16	unsigned	90	65535	1000	ms	Repetition cycle of science data acquisition (Spectrometer and Radiometer data and HKs) for test purpose
PAR_TIS_NUM_OVERSAMP *PMR00196*	16	unsigned	0	150	0	samp	Number of TIS oversamplings to be performed for data acquisition
PAR_TIR_NUM_OVERSAMP *PMR00197*	16	unsigned	0	1000	0	samp	Number of TIR oversamplings to be performed for data acquisition
PAR_TIS_NUM_ACQUISITIONS *PMR00198*	16	unsigned	0	65535	100	acqu	Number of TIS acquisitions to be performed
PAR_TIR_NUM_ACQUISITIONS *PMR00199*	16	unsigned	0	65535	100	acqu	Number of TIR acquisitions to be performed
PAR_TIS_NUM_ACQ_STS_OPEN *PMR00227*	16	unsigned	0	65535	1	acqu	Number of TIS acquisitions with open shutter STS
PAR_TIS_NUM_ACQ_STS_CLOSE *PMR00228*	16	unsigned	0	65535	0	acqu	Number of TIS acquisitions with closed shutter STS
PAR_TIS_BOL_STABILIZATION_TIME *PMR00229*	16	unsigned	0	65535	16	ms	Shutter STS stabilization time, to be wait before acquirering data
PAR_TIS_DATA_ACQ_TYPE *PMR00203*	16	enum: 0=Science 1=FullWindow	0	1	1	none	Type of TIS science data
PAR_TIS_WIN_POS_X *PMR00161*	8	unsigned	1	60	30	pix	TIS image data position x inside detector of 160x120pixels
PAR_TIS_WIN_POS_Y *PMR00162*	8	unsigned	1	40	20	pix	TIS image data position y inside detector of 160x120pixels
PAR_TIS_DARK_SUBTRACTION *PMR00230*	16	enum: 0=off 1=on	0	1	0	none	Dark subtraction from image data yes/no

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_Science_TIR_Data	2	0,1sec	26=Test	no change	TIR science data report (channel A and B each one packet)
TM_Science_TIS_Data	10	0,1sec	26=Test	no change	TIS science data report , full detector (160x120pixel), 2035 pixel each packet
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(DataAcquisitionStop) (ZMR00037)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function to stop a data acquisition for TIR, TIS or both			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x83A0

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 5=DataAcquisitionStop	5	5	5	none	Number of the commanded test function
PAR_DAT_ACQ_CHANNEL *PMR00194*	16	enum: 0=all 1=Bolometer 2=Radiometer	0	2	0	none	MERTIS channel (TIR/TIS) for data acquisition

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(EventEnableDisable) (ZMR00038)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for enabling or disabling of event report generation			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0x41FB

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 6=Event_EnableDisable	6	6	6	none	Number of the commanded test function
PAR_EVENT_ENABLE_DISABLE *PMR00204*	16	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables the generation of events (yes/no)
PAR_EVENT_ID *PMR00205*	16	unsigned	42000	43999	42000	none	Defines the event identifier to be enabled or disabled

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(WatchdogReset) (ZMR00039)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for reset the watchdog			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	183	5	0		0x621E

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 7=WatchdogReset	7	7	7	none	Number of the commanded test function

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(SingleHKRequest) (ZMR00040)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for acquiring a single HK packet			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0xC1F1

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 8=SingleHKRequest	8	8	8	none	Number of the commanded test function
PAR_HK_TYPE *PMR00206*	16	enum: 0=all 1=OperationDefaultHK 2=OperationExtendedHK	0	2	0	none	Defines the kind of HK to be acquired

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_OperationDefault_HK	1	--	26=Test	no change	Operation default HK report
TM_OperationExtended_HK	1	--	26=Test	no change	Operation extended HK report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(SetPropertyParam) (ZMR00041)**	Version: 2 / 06.03.2014	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for setting a property parameter temporary in RAM			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	241	1	1	183	5	0		0x73DE

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 9=SetPropertyParameter	9	9	9	none	Number of the commanded test function
PAR_PROP_PARAM_STR_LENGTH *PMR00207*	16	unsigned	1	232	1	none	Number of characters in configuration string for property parameter
PAR_PROP_PARAM_STR *PMR00208*	8	string	0	255	0	none	Configuration string for property parameter

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(ExecuteCmd) (ZMR00042)**	Version: 2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for executing an internal test command in shape of an command string *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	241	1	1	183	5	0		0xD3A9

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 10=ExecuteCmd	10	10	10	none	Number of the commanded test function
PAR_CMD_STRING_LENGTH *PMR00209*	16	unsigned	1	232	1	none	Contains the number of characters stored in array of test command string
PAR_CMD_STRING *PMR00210*	8	string	0	255	0	none	Test command string (array of characters)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report, other telemetry depends on the kind of command
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(SetICURegisterBit) (ZMR00043)**	Version: 2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for setting or re-setting an ICU register bit			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	17	1	1	183	5	0		0xB7D0

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 11=SetICURegisterBit	11	11	11	none	Number of the commanded test function
PAR_REG_ADDRESS *PMR00211*	32	unsigned	0	4294967295	0	none	Register address
PAR_REG_BIT_POSITION *PMR00212*	16	unsigned	1	32	1	none	Bit position (1…32) for register operation
PAR_REG_NUM_BITS *PMR00213*	16	unsigned	1	32	1	none	Number of bits (1…32) include for register operation
PAR_REG_FUNCTION *PMR00214*	16	enum: 0=clear 1=set 2=toggle	0	2	1	none	Kind ofregister operation (clear / set / toggle)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(SetPOIMode) (ZMR00044)**	Version: 2 / 25.10.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for setting the mode of pointing unit (POI)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0xF3EE

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 12=SetPOIMode	12	12	12	none	Number of the commanded test function
PAR_POI_COIL_MODE *PMR00167*	8	enum: 0=Coil1+2 1=Coil3+4 2=Coil2+3 3=Coil1+4 4=Coil1+2+3+4	0	4	0	none	POI motor coil mode, defines usage of different motor coils
PAR_POI_SPEED_MODE *PMR00215*	8	enum: 0=nominal 1=low 2=high	0	2	0	none	POI speed mode (nominal/low/high)
PAR_POI_INIT_PHASE *PMR00216*	16	unsigned	0	7	0	none	POI motor start phase at initialization

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(POIMoveSteps) (ZMR00045)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for moving the pointing mirror (POI) a defined number of steps			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0x499E

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 13=POIMoveSteps	13	13	13	none	Number of the commanded test function
PAR_POI_MOVING_DIRECTION *PMR00217*	16	enum: 0=right 1=left	0	1	0	none	Direction of POI moving (left/right)
PAR_POI_NUMBER_STEPS *PMR00218*	16	unsigned	0	300	1	step	Number of steps POI to be moved

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(ShutterOpenClose) (ZMR00046)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for opening or closing the shutter (STS) *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x7351

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 14=ShutterOpenClose	14	14	14	none	Number of the commanded test function
PAR_STS_MOVE *PMR00219*	16	enum: 0=open 1=closed	0	1	0	none	Kind of shutter moving operation (open/close)

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(TECDataMeasurement) (ZMR00048)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for enabling or disabling the TEC data measurement			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x3B12

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 16=TECDataMeasurement	16	16	16	none	Number of the commanded test function
PAR_TEC_MEASURE_ON_OFF *PMR00221*	16	enum: 0=off 1=on	0	1	1	none	TEC internal data measurement on/off

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TestLog(TECInternalData)	1	0,1sec	26=Test	no change	Test log telemetry if PAR_TEC_MEASURE_ON_OFF=On
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(RegisterSampling) (ZMR00049)**	Version: 2 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for sampling of ICU registers			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	15	1	1	183	5	0		0xBD9D

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 17=RegisterSampling	17	17	17	none	Number of the commanded test function
PAR_REG_SAMPLING_ON_OFF *PMR00222*	16	enum: 0=off 1=on	0	1	1	none	Register sampling on/off
PAR_REG_ADDRESS *PMR00211*	32	unsigned	0	4294967295	0	none	Register address
PAR_REG_SAMPLE_RATE *PMR00223*	16	unsigned	0	65535	100	ms	Contains the sample rate of the HK register

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TestLog(HKRegisterData)	1	0,1sec	26=Test	no change	Test log telemetry if PAR_REG_SAMPLING_ON_OFF=On and 1021 register max. (1 packet)
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(DebugOnOff) (ZMR00050)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for enabling/disabling sending of debug messages (TestLog-TM)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x4553

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 18=DebugOnOff	18	18	18	none	Number of the commanded test function
PAR_DEBUG_ON_OFF *PMR00224*	16	enum: 0=off 1=on	0	1	0	none	Enables or disables sending of debug mesages

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TestLog(DebugMessage)	1	--	26=Test	no change	Debug message (number of packets depends on number of debugging points)
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Test_Function(RADRawDataOnOff) (ZMR00057)**	Version: 1 / 27.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for enabling/disabling sending of RAD raw data (TestLog-TM)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	9	1	1	183	5	0		0x6242

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 19=RADRawDataOnOff	19	19	19	none	Number of the commanded test function
PAR_RAD_RAW_DATA_ON_OFF *PMR00276*	16	enum: 0=off 1=on	0	1	1	none	Enables or disables sending of RAD raw data

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report
TM_TestLog(RADRawData)	1	0,01sec	26=Test	no change	TM packet containing Radiometer raw data

Packet Name: **TC_Test_Function(GetPropertyParam) (ZMR00059)**	Version: 1 / 21.03.2014	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for reading a property parameter from configuration file in RAM *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	241	1	1	183	5	0		0xD07B

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 20=GetPropertyParameter	20	20	20	none	Number of the commanded test function
PAR_PROP_PARAM_STR_LENGTH *PMR00207*	16	unsigned	1	232	1	none	Number of characters in configuration string for property parameter
PAR_PROP_PARAM_STR *PMR00208*	8	string	0	255	0	none	Configuration string for property parameter

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report
TM_TestLog(PropertyParamDef)	1	--	26=Test	no change	TM packet containing the requested property parameter definition

Packet Name: **TC_Test_Function(GetPropertyParamAll) (ZMR00060)**	Version: 1 / 22.12.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for reading ALL property parameters from configuration file in RAM			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	7	1	1	183	5	0		0x506D

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 21=GetPropertyParameterAll	21	21	21	none	Number of the commanded test function

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report
TM_TestLog(PropertyParamDef)	100	0,01sec	26=Test	no change	TM packet containing the requested property parameter definition (number depends on number of property parameters)

Packet Name: **TC_Test_Function(TECControl) (ZMR00051)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/5**
Packet Description: Test function for controlling the Thermal Electrical Cooler (TEC)			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	11	1	1	183	5	0		0x8407

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_FUNCTION_NUM *PMR00188*	16	enum: 30=TEC_Control	30	30	30	none	Number of the commanded test function
PAR_TEC_CONTROL_MODE *PMR00225*	16	enum: 0=OpenLoop 1=ClosedLoop	0	1	1	none	Defines the TEC control mode (OpenLoop/ClosedLoop)
PAR_TEC_PWM_VALUE *PMR00226*	16	signed	-255	255	0	none	PWM-Value used for TEC control in mode OpenLoop with range of -255…+255, negative values cause HEATING, positive values cause COOLING

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	26=Test	no change	TC acceptance report
TM_TC_Execution_Success	1	--	26=Test	no change	TC execution success report

Packet Name: **TC_Calibration_Enable (ZMR00052)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/7**
Packet Description: Enables the CALIBRATION state			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	7	0		0x90B2

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	3=WarmUp	14=Calibration	TC acceptance report
TM_TC_Execution_Success	1	--	3=WarmUp	14=Calibration	TC execution success report

Packet Name: **TC_Calibration_Disable (ZMR00053)**	Version: 1 / 09.09.2011	APID: **972 (0x3CC)**	Service: **183/8**
Packet Description: Disables the CALIBRATION state			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Exec Ack	Accept Ack	Service Type	Service SubType	Source ID	AppData	CRC
60	12	3	0	5	1	1	183	8	0		0x808C

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

Telemetry packets as response on TC request	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TC is allowed	Reached mode	Remarks
TM_TC_Acceptance_Success	1	--	14=Calibration	3=WarmUp	TC acceptance report
TM_TC_Execution_Success	1	--	14=Calibration	3=WarmUp	TC execution success report

Appendix 10: TELEMETRY PACKET LIST

Note: *YMR000xx/NMR000xx=>* **ID of the telemetry packet/parameter in SCOS2000 database**

Name: **TM_List**	Model: **FM_Main_V5 (05.05.2015)**	Number Packets: **115**
Description: List of all TM Packets		

Packet Name	Version	APID		Type	Sub-Type	SID / EID	Packet Length (words 16bit)	Description
		PID	PCAT					
TM_TC_Acceptance_Success *YMR42001*	3	61	1	1	1	--	10	Contains an TC acceptance success report
TM_TC_Acceptance_Failure(wrong APID) *YMR42002*	2	61	1	1	2	0	12	Contains an TC acceptance failure report for wrong APID
TM_TC_Acceptance_Failure(incomplete) *YMR42003*	2	61	1	1	2	1	12	Contains an TC acceptance failure report for incomplete packet or wrong packet length
TM_TC_Acceptance_Failure(wrong CRC) *YMR42004*	2	61	1	1	2	2	14	Contains an TC acceptance failure report for a wrong CRC
TM_TC_Acceptance_Failure(wrong Type) *YMR42005*	2	61	1	1	2	3	12	Contains an TC acceptance failure report for a wrong TC-Type
TM_TC_Acceptance_Failure(wrong SubType) *YMR42006*	2	61	1	1	2	4	12	Contains an TC acceptance failure report for a wrong TC-Sub-Type
TM_TC_Acceptance_Failure(wrong SourceID) *YMR42007*	2	61	1	1	2	43950	13	Contains an TC acceptance failure report for a wrong Source ID
TM_TC_Execution_Success *YMR42008*	3	61	1	1	7	--	10	Contains an TC execution success report
TM_TC_Execution_Failure(inconsistent) *YMR42009*	2	61	1	1	8	5	13	Contains an TC execution failure report for wrong or inconsistent data field
TM_TC_Execution_Failure(wrong CommandCode) *YMR42010*	2	61	1	1	8	6	14	Contains an TC execution failure report for wrong command code
TM_TC_Execution_Failure(not executable) *YMR42011*	5	61	1	1	8	7	13	Contains an TC execution failure report, TC can not be executed at this time
TM_TC_Execution_Failure(not	2	61	1	1	8	4395	12	Contains an TC execution failure report because the execution functionality is not implemented yet

implemented yet) *YMR42012*						1		
TM_TC_Execution_Failure(test function unknown) *YMR42013*	2	61	1	1	8	43952	13	Contains an TC execution failure report because the test function number is unknown
TM_TC_Execution_Failure(common execution error) *YMR42014*	1	61	1	1	8	43953	12	Contains an TC execution failure report because a malfunction is detected, warning/error event will be issued with details
TM_TC_Execution_Failure(EPA activation failed) *YMR42103*	1	61	1	1	8	43954	12	Activation of Emergency Pointing Actuator (EPA) failed
TM_TC_Execution_Failure(wrong property param) *YMR42133*	1	61	1	1	8	43955	12	Wrong property parameter name and/or value sent by TC_Test_Function(SetConfigParam) or TC_Test_Function(GetConfigParam)
TM_TC_Execution_Failure(reg setting failed) *YMR42105*	1	61	1	1	8	43956	12	Setting of register value sent by TC_Test_Function(SetICURegisterBit) failed because bit position and value size doesn't fit to a 32bit register
TM_TC_Execution_Failure(test cmd unknown) *YMR42106*	1	61	1	1	8	43957	12	Name of test command sent by TC_Test_Function(ExecuteCmd) is unknown
TM_TC_Execution_Failure(STS moving failed) *YMR42107*	1	61	1	1	8	43958	12	Moving of the shutter (STS) into open or closed position failed because shutter status (open/closed) is wrong
TM_OperationDefault_HK *YMR42015*	13	61	4	3	25	1	25	Contains the MERTIS operational default housekeepings
TM_OperationExtended_HK *YMR42016*	15	61	4	3	25	2	41	Contains the MERTIS operation extended housekeepings
TM_Event_Progress(PBSBootReady) *YMR42017*	6	61	7	5	1	42001	27	Contains boot readiness report of the MPBS
TM_Event_Progress(APSBootReady) *YMR42018*	6	61	7	5	1	42002	27	Contains boot readiness report of the MAPS
TM_Event_Progress(ModeTransition) *YMR42019*	5	61	7	5	1	42003	11	Contains a Progress Event for Mode Transition
TM_Event_Progress(DiagnoseStepFinished) *YMR42108*	3	61	7	5	1	42004	11	Contains a Progress Event for termination of diagnose step including test result OK/NOK
TM_Event_Progress(BIASVoltageChanged) *YMR42109*	1	61	7	5	1	42007	10	Contains a Progress Event for changing the TIS BIAS voltage
TM_Event_Progress(Thermal stability reached)	2	61	7	5	1	42008	9	Contains a Progress Event for reaching the instrument thermal stabilty

YMR42110								
TM_Event_Progress(CFGLoadReady) *YMR42125*	2	61	7	5	1	42009	27	Contains load readiness report of the MAPS configuration including the version string
TM_Event_Warning(EEPROM no segment) *YMR42027*	1	61	7	5	2	42204	9	Contains a Warning Event 'No segment found in EEPROM'
TM_Event_Warning(EEPROM no APS exe) *YMR42028*	1	61	7	5	2	42205	9	Contains a Warning Event 'No APS executable found in EEPROM'
TM_Event_Warning(EEPROM no APS config) *YMR42029*	1	61	7	5	2	42206	9	Contains a Warning Event 'No APS configuration found in EEPROM'
TM_Event_Warning(EEPROM no PBS config) *YMR42030*	1	61	7	5	2	42207	9	Contains a Warning Event 'No PBS configuration found in EEPROM'
TM_Event_Warning(EEPROM no APS exe flag) *YMR42031*	1	61	7	5	2	42208	9	Contains a Warning Event 'No APS executable flag found in EEPROM'
TM_Event_Warning(EEPROM no APS config flag) *YMR42032*	1	61	7	5	2	42209	9	Contains a Warning Event 'No APS configuration flag found in EEPROM'
TM_Event_Warning(RAD is busy) *YMR42035*	1	61	7	5	2	42212	11	Contains a Warning Event for 'Radiometer device is busy'
TM_Event_Warning(Thermal stability not reached) *YMR42111*	2	61	7	5	2	42213	12	Timeout occurred during warm-up of the instrument in mode WarmUp, thermal stability was not reached in expected time
TM_Event_Warning(Thermal stability left) *YMR42112*	2	61	7	5	2	42214	11	No thermal stability condition of the instrument at the moment
TM_Event_Warning(POI Hold Current Off) *YMR42038*	1	61	7	5	2	42215	11	Contains a Warning Event 'POI Hold Current Off' which means that the POI hold current at a target is switched off due to exceeding the max hold time
TM_Event_Warning(Compression DMA timeout) *YMR42039*	1	61	7	5	2	42216	11	DMA time-out detected by compression hardware, current acquisition discarded
TM_Event_Warning(Compression bus error) *YMR42040*	1	61	7	5	2	42217	11	Compression bus error detected by compression hardware, current acquisition discarded
TM_Event_Warning(Compression buffer overflow) *YMR42041*	1	61	7	5	2	42218	11	Compression buffer overflow detected by compression software, current acquisition discarded
TM_Event_Warning(Bolometer window config wrong) *YMR42042*	1	61	7	5	2	42219	10	Configuration of Bolometer windowing wrong, one or more windows overlap each other
TM_Event_Warning(Bolometer busy)	1	61	7	5	2	4222	11	Bolometer electronics is busy to acquire data, current acquisition is lost

YMR42043						0		
TM_Event_Warning(Bolometer bus error) *YMR42044*	1	61	7	5	2	42221	11	Bolometer bus error detected, current acquisition discarded
TM_Event_Warning(Bolometer latchup error) *YMR42126*	1	61	7	5	2	42222	11	Bolometer latchup error detected. Current acquisition discarded
TM_Event_Warning(Bolometer burst trigger error) *YMR42127*	1	61	7	5	2	42223	11	Bolometer burst trigger failure detected. Current acquisitions discarded
TM_Event_Warning(Radiometer data timeout) *YMR42128*	1	61	7	5	2	42224	11	Radiometer data timeout detected, current acquisition is lost
TM_Event_Warning(Radiometer latchup error) *YMR42129*	1	61	7	5	2	42225	11	Radiometer latchup error detected. Current acquisition discarded
TM_Event_Warning(TIS macro pixel wrong) *YMR42136*	1	61	7	5	2	42226	15	TIS macro pixel value is out of range or wrong
TM_Event_Error(EEPROM write error) *YMR42045*	1	61	7	5	3	43800	9	Contains a Warning Event 'EEPROM write error'
TM_Event_Error(Auto-boot failure) *YMR42046*	1	61	7	5	3	43801	9	Contains a Warning Event 'Auto-boot failure'
TM_Event_Error(unexpected re-boot) *YMR42047*	1	61	7	5	3	43802	18	Contains a Warning Event 'unexpected re-boot' of on-board software due to watchdog activation or processor trap occurance
TM_Event_Error(POI_SENSOR_Diagnose Failed) *YMR42050*	3	61	7	5	3	43805	12	Diagnose of POI position sensors (Test Case 4) not successful
TM_Event_Error(STS Operation Failure) *YMR42051*	1	61	7	5	3	43806	10	Contains an Error Event for a shutter (STS) operation failure
TM_Event_Error(POI Operation Failure) *YMR42052*	3	61	7	5	3	43807	12	Contains an Error Event for a pointing unit (POI) operation failure
TM_Event_Error(RAD FIFO not empty) *YMR42053*	1	61	7	5	3	43808	11	Contains a Warning Event 'Radiometer FIFO not empty'
TM_Event_Error(RAD FIFO overflow) *YMR42054*	1	61	7	5	3	43809	11	Contains a Warning Event 'Radiometer FIFO overflow detected'
TM_Event_Error(RAD ADC error) *YMR42134*	1	61	7	5	3	43810	10	Contains an Error Event 'Radiometer ADC Error'
TM_Event_Error(BOL DMA overflow) *YMR42056*	1	61	7	5	3	43811	11	Contains a Warning Event 'Bolometer DMA overflow detected'
TM_Event_Error(BOL_DMA_no_data received) *YMR42057*	1	61	7	5	3	43812	11	Contains a Warning Event 'Bolometer DMA no data received'

TM_Event_Error(watchdog failure) *YMR42085*	1	61	7	5	3	43813	13	Contains an Error Event 'Watchdog failure'
TM_Event_Error(SpW Error) *YMR42086*	1	61	7	5	3	43814	10	Contains an Error Event 'SpaceWire receive Error'
TM_Event_Error(EEPROM Exe copy abort) *YMR42087*	1	61	7	5	3	43815	9	Contains an Error Event 'Copy abort EEPROM EXE detected'
TM_Event_Error(EEPROM_EXE_seg_CRC wrong) *YMR42088*	1	61	7	5	3	43816	9	Contains an Error Event 'Wrong segment CRC in EEPROM EXE detected'
TM_Event_Error(PBS CFG size wrong) *YMR42089*	1	61	7	5	3	43817	11	Contains an Error Event 'PBS CFG size wrong''
TM_Event_Error(Reg writing wrong) *YMR42090*	1	61	7	5	3	43818	15	Contains an Error Event 'Reg writing wrong'
TM_Event_Error(TC Buffer1 full) *YMR42091*	1	61	7	5	3	43819	9	Contains an Error Event 'TC buffer1 full'
TM_Event_Error(TC buffer2 full) *YMR42092*	1	61	7	5	3	43820	9	Contains an Error Event 'TC buffer2 full'
TM_Event_Error(ANALOG_HK_Temp Diagnose Failed) *YMR42113*	2	61	7	5	3	43821	28	Diagnose of analog temperature HKs (Test Case 3) not successful
TM_Event_Error(ANALOG_HK_Volt Diagnose Failed) *YMR42114*	2	61	7	5	3	43822	23	Diagnose of analog voltage HKs (Test Case 3) not successful
TM_Event_Error(BOL_BEL_Diagnose Failed) *YMR42116*	2	61	7	5	3	43824	25	Diagnose of Bolometer electronics (Test Case 6) not successful
TM_Event_Error(BOL_WINOW_Diagnose Failed) *YMR42117*	2	61	7	5	3	43825	10	Diagnose of Bolometer windowing (Test Case 7) not successful
TM_Event_Error(TEC_CONTROL Diagnose Failed) *YMR42118*	2	61	7	5	3	43826	22	Diagnose of TEC controller of Bolometer (Test Case 8) not successful
TM_Event_Error(STS_MOVE_Diagnose Failed) *YMR42119*	1	61	7	5	3	43827	19	Diagnose of STS movement (Test Case 9) not successful
TM_Event_Error(RAD_REL_Diagnose Failed) *YMR42120*	2	61	7	5	3	43828	24	Diagnose of Radiometer electronics (Test Case 10) not successful
TM_Event_Error(SHH Diagnose Failed) *YMR42121*	2	61	7	5	3	43829	16	Diagnose of SHH (Test Case 11) not successful
TM_Event_Error(OBT_Synchronization	1	61	7	5	3	4383	14	Synchronization of On-Board Timer (OBT) failed, SpW-TimeCode received too late

Failed) *YMR42130*						0		
TM_Event_Error(TEC BOL temp too low) *YMR42131*	1	61	7	5	3	43831	10	TEC Bolometer chip temperature too low, controller suspended
TM_Event_Error(TEC BOL temp too high) *YMR42132*	1	61	7	5	3	43832	10	TEC Bolometer chip temperature too high, controller suspended
TM_Event_Error(BOL WindowConfig Invalid) *YMR42135*	1	61	7	5	3	43833	9	TIS BOL Window configuration is invalid due to overlapping of windows
TM_Event_Error(TIS_COMP Diagnose Failed) *YMR42137*	1	61	7	5	3	43834	14	Diagnose of TIS compression (Test Case TIS_COMP/12) not successful
TM_Event_Error(POI_ACCURACY Diagnose Failed) *YMR42138*	1	61	7	5	3	43835	22	Diagnose of POI position accuracy (Test Case 5) not successful
TM_Event_Error(ANALOG_HK SHTemp Diagnose Failed) *YMR42139*	1	61	7	5	3	43836	21	Diagnose of analog sensor head temperature HKs (Test Case 3) not successful
TM_Event_Alarm(HK limit violation) *YMR42093*	1	61	7	5	4	43900	17	Contains an Alarm Event 'HK limit violation' (Maximum limit of PSU/ICU temperature, PSU voltages)
TM_Memory_Dump(RAM) *YMR42058*	1	61	9	6	6	110	2056	Contains memory dump data from RAM
TM_Memory_Dump(EEPROM) *YMR42059*	1	61	9	6	6	111	2056	Contains memory dump data from EEPROM
TM_Memory_Dump(REGISTER) *YMR42060*	1	61	9	6	6	112	2056	Contains memory dump data from REGISTER
TM_Memory_Dump(PROM) *YMR42061*	1	61	9	6	6	113	2056	Contains memory dump data from PROM
TM_Memory_Dump(AHBRAM) *YMR42062*	1	61	9	6	6	114	2056	Contains memory dump data from AHBRAM
TM_Memory_Dump(VRAM) *YMR42063*	1	61	9	6	6	115	2056	Contains memory dump data from VRAM
TM_Memory_Check *YMR42064*	3	61	9	6	10	--	14	Contains the CRC16 value calculated for the memory data block
TM_Test_Connection *YMR42065*	4	60	7	17	2	--	8	Contains a connection test report
TM_Science_TIS_Data_QuickLook *YMR42067*	14	63	12	21	3	--	2056	Contains TIS science data including some status data for QuickLook
TM_Science_TIS_Data *YMR42066*	13	62	12	21	3	--	2056	Contains TIS science data including some status data

TM_Science_TIR_Data_QuickLook *YMR42069*	11	63	12	21	129	--	95	Contains TIR science data including some status data for QuickLook
TM_Science_TIR_Data *YMR42068*	10	62	12	21	129	--	95	Contains TIR science data including some status data
TM_EEPROM_Status *YMR42072*	6	61	3	180	2	--	271	Contains an EEPROM configuration status report
TM_Operation_Parameter *YMR42073*	10	61	3	180	6	--	16	Contains the MERTIS Operation Parameter
TM_FunctionConfig_Parameter *YMR42074*	11	61	3	180	7	--	17	Contains the MERTIS Function Configuration Parameter
TM_HK_Configuration_Status *YMR42075*	4	61	3	180	9	--	11	Contains the configuration status of cyclic HK generation
TM_Diagnostic_Parameter *YMR42122*	5	61	3	180	13	--	10	Contains the MERTIS Diagnostic Parameter
TM_Calibration_Parameter *YMR42079*	2	61	3	180	14	--	13	Contains the MERTIS Calibration Parameter
TM_TestLog(TECInternalData) *YMR42080*	2	61	4	183	6	1	18	Telemetry packet contains TEC internal status data
TM_TestLog(HKRegisterData) *YMR42081*	2	61	4	183	6	2	2055	Packet contains HK register raw values
TM_TestLog(RADRawData) *YMR42082*	3	61	4	183	6	3	2055	Packet contains RAD raw data
TM_TestLog(DIAG STS_MOVE) *YMR42083*	4	61	4	183	6	4	244	Packet contains STS analog data (voltage/current) acquired during Diagnose step STS_MOVE
TM_TestLog(DebugMessage) *YMR42084*	1	61	4	183	6	5	2056	Telemetry packet contains a debug message (string)
TM_TestLog(DIAG ANALOG_HK) *YMR42123*	3	61	4	183	6	6	47	Telemetry packet contains analog HK values acquired in Diagnostic debug mode during step ANALOG_HK
TM_TestLog(PropertyParamDef) *YMR42124*	1	61	4	183	6	7	2056	Telemetry packet contains the definition of a property parameter read from configuration file in RAM
TM_TestLog(DIAG POI_SENSOR) *YMR42140*	1	61	4	183	6	8	11	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step POI_SENSOR
TM_TestLog(DIAG POI_ACCURACY) *YMR42141*	1	61	4	183	6	9	16	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step POI_ACCURACY
TM_TestLog(DIAG BOL_BEL) *YMR42142*	1	61	4	183	6	10	19	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step BOL_BEL
TM_TestLog(DIAG RAD_REL) *YMR42143*	1	61	4	183	6	11	76	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step RAD_REL
TM_TestLog(DIAG SHH) *YMR42144*	1	61	4	183	6	12	14	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step SHH

TM_TestLog(DIAG TEC_CONTROL) *YMR42145*	1	61	4	183	6	13	14	Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step TEC_CONTROL

Packet Name: **TM_TC_Acceptance_Success (YMR42001)**	Version: 3 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/1**
Packet Description: Contains an TC acceptance success report			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	13	1	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: **TM_TC_Acceptance_Failure(wrong APID) (YMR42002)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/2**
Packet Description: Contains an TC acceptance failure report for wrong APID			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 0=EVENT_TC_WRONG_APID	0	0	0	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	

Packet Name: **TM_TC_Acceptance_Failure(incomplete) (YMR42003)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/2**
Packet Description: Contains an TC acceptance failure report for incomplete packet or wrong packet length *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 1=EVENT_TC_INCOMPLETE	1	1	1	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: **TM_TC_Acceptance_Failure(wrong CRC) (YMR42004)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/2**
Packet Description: Contains an TC acceptance failure report for a wrong CRC *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	21	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 2=EVENT_TC_WRONG_CRC	2	2	2	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
PAR_RECEIVED_CRC *NMR00006*	16	unsigned	0	65535	0	none	Recieved CRC within a telecommand which was wrong
HK_STAT_CALCULATED_CRC *NMR00007*	16	unsigned	0	65535	0	none	Calculated CRC of a memory area

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: **TM_TC_Acceptance_Failure(wrong Type) (YMR42005)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/2**
Packet Description: Contains an TC acceptance failure report for a wrong TC-Type			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 3=EVENT_TC_WRONG_TYPE	3	3	3	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: TM_TC_Acceptance_Failure(wrong SubType) (YMR42006)	Version: 2 / 11.05.2011	APID: 977 (0x3D1)	Service: 1/2
Packet Description: Contains an TC acceptance failure report for a wrong TC-Sub-Type			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 4=EVENT_TC_WRONG_SUBTYPE	4	4	4	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: **TM_TC_Acceptance_Failure(wrong SourceID) (YMR42007)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/2**
Packet Description: Contains an TC acceptance failure report for a wrong Source ID Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	19	1	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43950=EVENT_TC_WRONG_SOURCE_ID	43950	43950	43950	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
PAD *NMR00008*	8	unsigned	0	0	0	none	Parameter is used for as filling byte
PAR_TC_SOURCE_ID *NMR00009*	8	unsigned	0	255	0	none	SourceID of an non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if AcceptAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Success (YMR42008)**	Version: 3 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/7**
Packet Description: Contains an TC execution success report			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	13	1	7	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(inconsistent) (YMR42009)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report for wrong or inconsistent data field Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	19	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 5=EVENT_TC_WRONG_PARAM	5	5	5	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
PAR_BYTE_POSITION *NMR00010*	8	unsigned	0	255	0	none	Byte position of wrong parameter (0…n) in application data field
PAR_RECEIVED_VALUE *NMR00011*	8	unsigned	0	255	0	none	Recieved parameter value in a telecommand which was wrong

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(wrong CommandCode) (YMR42010)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report for wrong command code			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	21	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 6=EVENT_TC_WRONG_COMMAND_CODE	6	6	6	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
Spare1 *NMR00012*	16	unsigned	0	255	0	none	Packet spares
Spare2 *NMR00013*	16	unsigned	0	255	0	none	Packet spares

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(not executable) (YMR42011)**	Version: 5 / 26.03.2015	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report, TC can not be executed at this time			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	19	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 7=EVENT_TC_NOT_EXECUTABLE_AT_TIME	7	7	7	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
HK_STAT_MERTIS_MODE *NMR00014*	16	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr	1	50	1	none	MERTIS operation mode

		21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined					

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(not implemented yet) (YMR42012)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report because the execution functionality is not implemented yet *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43951=EVENT_TC_EXEC_NO_FUNC_INSTALLED	43951	43951	43951	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(test function unknown) (YMR42013)**	Version: 2 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report because the test function number is unknown *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	19	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43952=EVENT_TC_EXEC_UNKNOWN_TEST_FUNCTION	43952	43952	43952	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand
PAR_TC_FUNCTION_NUM *NMR00015*	16	unsigned	0	65535	0	none	Test function number of received TC_Test_Function

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(common execution error) (YMR42014)**	Version: 1 / 11.05.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Contains an TC execution failure report because a malfunction is detected, warning/error event will be issued with details *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43953=EVENT_TC_EXEC_COMMON_ERROR	43953	43953	43953	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Sent only if ExecAck-Flag is set in telecommand

Packet Name: **TM_TC_Execution_Failure(EPA activation failed) (YMR42103)**	Version: 1 / 21.12.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Activation of Emergency Pointing Actuator (EPA) failed			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43954=EVENT_TC_EPA_ACTIVATION_FAILED	43954	43954	43954	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_EPA_Activate	1	--	1=Safe	Command activates the POI EPA, TM is issued if no confirmation TC is sent in time
TC_EPA_Confirm	1	--	1=Safe	Command confirms POI EPA activation, TM is issued if no activation TC is sent in time before

Packet Name: **TM_TC_Execution_Failure(wrong property param) (YMR42133)**	Version: 1 / 04.02.2013	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Wrong property parameter name and/or value sent by TC_Test_Function(SetConfigParam) or TC_Test_Function(GetConfigParam) *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43955=EVENT_WRONG_PROPERTY_PARAM	43955	43955	43955	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(SetPropertyParam)	1	--	all	Sent if property parameter name or value is wrong in command
TC_Test_Function(GetPropertyParam)	1	--	all	Sent if property parameter name is wrong in command

Packet Name: **TM_TC_Execution_Failure(reg setting failed) (YMR42105)**	Version: 1 / 21.12.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Setting of register value sent by TC_Test_Function(SetICURegisterBit) failed because bit position and value size doesn't fit to a 32bit register *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43956=EVENT_TC_REG_SETTING_FAILED	43956	43956	43956	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(SetICURegisterBit)	1	--	26=Test	Command requests setting of a register and this action failed

Packet Name: **TM_TC_Execution_Failure(test cmd unknown) (YMR42106)**	Version: 1 / 21.12.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Name of test command sent by TC_Test_Function(ExecuteCmd) is unknown *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43957=EVENT_TC_TEST_CMD_UNKNOWN	43957	43957	43957	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	26=Test	A wrong or unknown test command causes this TM

Packet Name: **TM_TC_Execution_Failure(STS moving failed) (YMR42107)**	Version: 1 / 21.12.2011	APID: **977 (0x3D1)**	Service: **1/8**
Packet Description: Moving of the shutter (STS) into open or closed position failed because shutter status (open/closed) is wrong *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	1	3	0	17	1	8	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TC_APID *NMR00001*	16	unsigned	0	65535	0	none	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT *NMR00002*	16	unsigned	0	65535	0	none	Sequence counter of an accepted or non accepted telecommand
HK_FAILURE_TC_VERIFY_ID *NMR00003*	16	enum: 43958=EVENT_TC_STS_MOVING_FAILED	43958	43958	43958	none	Identifier for an detected TC acceptance or execution failure
PAR_TC_TYPE *NMR00004*	8	unsigned	0	255	0	none	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE *NMR00005*	8	unsigned	0	255	0	none	Sub-Type of an accepted or non accepted telecommand

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	3=WarmUp	Command enters science mode, but STS moving depends on science mode
TC_Test_Function(DataAcquisitionStart)	1	--	26=Test	Command starts a data acquisition, STS moving depends on parameters

Packet Name: **TM_OperationDefault_HK (YMR42015)**	Version: 13 / 18.11.2014	APID: **980 (0x3D4)**	Service: **3/25**
Packet Description: Contains the MERTIS operational default housekeepings			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	43	3	25	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_SID *NMR00016*	8	enum: 1=OperationDefaultHK	1	1	1	none	Structure Identifier for HK packets
PAD *NMR00008*	8	unsigned	0	0	0	none	Parameter is used for as filling byte
HK_STAT_MERTIS_MODE *NMR00014*	16	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test	1	50	1	none	MERTIS operation mode

		27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined					
HK_STAT_EEPROM_POWER *NMRD0583*	1	enum: 0=off 1=on	0	1	0	none	On/off status of EEPROM power
HK_STAT_EPA_POWER *NMRD0584*	1	enum: 0=off 1=on	0	1	0	none	On/off status of Emergency Pointing Actuator (EPA) power
HK_STAT_HK_POWER *NMRD0585*	1	enum: 0=off 1=on	0	1	0	none	On/off status of Housekeeping (HK) power
HK_STAT_STS_POWER *NMRD0587*	1	enum: 0=off 1=on	0	1	0	none	On/off status of shutter (STS) power
HK_STAT_SHH_POWER *NMRD0588*	1	enum: 0=off 1=on	0	1	0	none	On/off status of SHH power
HK_STAT_UNUSED_POWER *NMRD0589*	1	enum: 0=off 1=on	0	1	0	none	On/off status of unused power line
HK_STAT_BB7_POWER *NMRD0590*	1	enum: 0=off 1=on	0	1	0	none	On/off status of BB7 power
HK_STAT_TIS_POWER *NMRD0591*	1	enum: 0=off	0	1	0	none	On/off status of TIS power

		1=on					
HK_STAT_TIR_POWER *NMRD0592*	1	enum: 0=off 1=on	0	1	0	none	On/off status of TIR power
HK_STAT_TEC_POWER *NMRD0593*	1	enum: 0=off 1=on	0	1	0	none	On/off status of TEC power
HK_STAT_POI_POWER *NMRD0594*	1	enum: 0=off 1=on	0	1	0	none	On/off status of POI power
HK_STAT_TM_BUFFER_OVERFLOW *NMRD0597*	1	enum: 0=no 1=yes	0	1	0	none	Flag for TM-Buffer overflow
HK_STAT_ICU_MAIN_RED *NMRD0598*	1	enum: 0=redundant 1=main	0	1	1	none	Main/Red ICU Status, which ICU is powered
HK_STAT_WATCHDOG *NMRD0599*	1	enum: 0=off 1=on	0	1	0	none	Status of the watchdog function (enabled/disabled)
HK_STAT_LAST_SPWLINK_ERROR *NMRD0600*	2	enum: 0=no error 1=disconnect error 2=parity error 3=EEP error	0	3	0	none	Last occurred error of SpaceWire link
HK_VOLT_PSU_P34 *NMR00034*	16	unsigned	2500	4500	3400	mV	PSU +3.4V supply digital voltage
HK_VOLT_PSU_P72 *NMR00035*	16	unsigned	6000	8000	7200	mV	PSU +7.2V supply analog voltage
HK_TEMP_ICU *NMR00036*	16	signed	-30	80	20	deg C	ICU temperature
HK_TEMP_PSU *NMR00037*	16	signed	-30	85	20	deg C	Power supply temperature
HK_STAT_LAST_ERROR_ID *NMR00038*	16	unsigned	0	65535	0	none	Identifier of the last occurred error
HK_STAT_LAST_ERROR_FREQUENCY *NMR00039*	16	unsigned	0	65535	0	none	Frequency (number of occurancies) of last error
HK_STAT_NUM_TC_RECEIVED *NMR00040*	16	unsigned	0	65535	0	none	Number of received TCs
HK_STAT_NUM_TC_EXECUTED *NMR00041*	16	unsigned	0	65535	0	none	Number of executed TCs
HK_STAT_NUM_TM_SENT *NMR00042*	16	unsigned	0	65535	0	none	Number of TM packets sent
HK_STAT_ICU_PROC_DUTY_CYCLE *NMR00043*	16	unsigned	0	100	0	o/o	Duty cycle of the LEON processor (in %)
HK_STAT_ICU_NUM_AHB_ERROR *NMR00044*	16	unsigned	0	65535	0	none	Contains the number of detected access errors on ICU AHB bus (double errors SDRAM acces included)

HK_STAT_ICU_NUM_AHB_CORRECTABLE_ERROR *NMR00045*	16	unsigned	0	65535	0	none	Contains the number of detected correctable access errors on ICU AHB bus (single errors SDRAM acces)
HK_STAT_HK_NUM_LATCHUP_ERROR *NMR00399*	16	unsigned	0	65535	0	none	Contains the number of detected HK latch-up errors

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_HK_Enable	1	20000msec	all	Default generation cycle time

Packet Name: **TM_OperationExtended_HK (YMR42016)**	Version: 15 / 27.01.2015	APID: **980 (0x3D4)**	Service: **3/25**
Packet Description: Contains the MERTIS operation extended housekeepings			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	75	3	25	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_SID *NMR00016*	8	enum: 2=OperationExtendedHK	2	2	2	none	Structure Identifier for HK packets
PAD *NMR00008*	8	unsigned	0	0	0	none	Parameter is used for as filling byte
HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET *NMR01547*	8	unsigned	0	11	1	none	Currently used BIAS voltage parameter set (0…11, 0=manual mode)
HK_STAT_SH_REF_TEMP_STABLE *NMRD1549*	2	enum: 0=temp unstable 1=temp stable	0	1	1	none	Reference temperature for the Sensor Head (SH) ist stable/unstable
HK_STAT_TIS_TEC_STABLE *NMRD1550*	4	enum: 0=temp unstable 1=temp stable	0	1	1	none	Status of the BOL chip temperature (stable/unstable) controlled by TEC
HK_STAT_EPA_STATUS *NMRD1551*	2	enum: 0=not activated 1=activated	0	1	0	none	Status (activated/not activated) of the Emergency Pointing Cover Actuator (EPA)
HK_STAT_POI_BB3_VIEW *NMRD0561*	1	enum: 0=no 1=yes	0	1	0	none	Status POI position BB3 view (yes/no)
HK_STAT_POI_BB7_VIEW *NMRD0562*	1	enum: 0=no 1=yes	0	1	0	none	Status POI position BB7 view (yes/no)
HK_STAT_POI_PLANET_VIEW *NMRD0563*	1	enum: 0=no 1=yes	0	1	0	none	Status POI position Planet view (yes/no)
HK_STAT_POI_SPACE_VIEW *NMRD0564*	1	enum: 0=no 1=yes	0	1	0	none	Status POI position Space view (yes/no)
HK_STAT_STS *NMR00052*	16	enum: 0=open 1=closed	0	1	0	none	Shutter status (open/closed)
HK_TEMP_BB3 *NMR00053*	32	signed	-40	60	26,85	deg C	BB300 temperature sensor
HK_TEMP_BB7	16	unsigned	327	527	426,75	deg	BB700 temperature sensor emitter electronics

NMR00054						C	
HK_TEMP_EOP_TMA *NMR00055*	16	signed	-50	70	20	deg C	Entrance Optics/TMA temperature
HK_TEMP_SOP_GRATING *NMR00056*	16	signed	-40	60	20	deg C	Spectrometer Optics grating temperature
HK_TEMP_SOP_M1 *NMR00057*	16	signed	-40	60	20	deg C	Spectrometer Optics / mirror M1 temperature
HK_TEMP_OST_BASE_PLATE *NMR00058*	32	signed	-50	70	20	deg C	Optics structure / Base Plate temperature
HK_TEMP_BOL_CHIP *NMR00059*	16	unsigned	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled)
HK_TEMP_BOL_HOUSING *NMR00060*	32	signed	-40	60	20	deg C	Bolometer housing temperature
HK_TEMP_STS *NMR00061*	32	signed	-50	80	20	deg C	Shutter temperature
HK_TEMP_POI_MOTOR *NMR00062*	16	signed	-50	110	20	deg C	POI motor temperature
HK_TEMP_POI_MIRROR *NMR00063*	16	signed	-40	100	20	deg C	POI mirror temperature
HK_TEMP_RBA_FRONT *NMR00064*	16	signed	-50	300	25	deg C	Baffle front temperature
HK_TEMP_RBA_BACK *NMR00065*	16	signed	-40	70	20	deg C	Baffle back temperature
HK_VOLT_REF_DELTA_SINGLE_ENDED *NMR00630*	16	signed	-327,68	327,67	0	mV	Reference HK channel delta voltage (used for single-ended HK channels), measured against the expected value for a 1000Ohm resistor
HK_TEMP_EOP_IR_FILTER *NMR00067*	16	signed	-40	60	20	deg C	Entrance optics IR-Window temperature
HK_STAT_REL_NUM_LATCHUP_ERROR *NMR00068*	16	unsigned	0	65535	0	none	Contains the number of detected Latch-Up errors of the REL ADC
HK_STAT_BEL_NUM_LATCHUP_ERROR *NMR02002*	16	unsigned	0	65535	0	none	Contains the number of detected Latch-Up errors of the BEL ADC
HK_TEMP_BB3_REF *NMR01832*	32	signed	-40	60	26,85	deg C	BB300 temperature reference sensor (100Ohm resistor compatible with Pt100)
HK_STAT_OBTIME_SYNC_DELTA *NMR02049*	16	signed	-32768	32767	0	ms	Delta between On-Board time and last received SpW time code for timer synchronization
HK_STAT_NUM_SPW_ERR_CREDIT *NMR02050*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Credit Error (CE)
HK_STAT_NUM_SPW_ERR_ESCAPE *NMR02051*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Escape Error (ER)
HK_STAT_NUM_SPW_ERR_DISCONNECT *NMR02052*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Disconnect Error (DE)
HK_STAT_NUM_SPW_ERR_PARITY *NMR02053*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Parity Error (PE)
HK_STAT_NUM_SPW_ERR_WRITESYNC *NMR02054*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Write Sync Error (WE)

HK_STAT_NUM_SPW_ERR_INVALIDADDRESS *NMR02055*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Invalid Address (IA)
HK_STAT_NUM_SPW_ERR_EOPEEP *NMR02056*	8	unsigned	0	255	0	none	Number of detected SpW errors of type Early EOP/EEP (EE)
HK_STAT_NUM_SPW_ERR_RXAHB *NMR02057*	8	unsigned	0	255	0	none	Number of detected SpW errors of type RX AHB Error (RA)
HK_STAT_NUM_SPW_ERR_TXAHB *NMR02058*	8	unsigned	0	255	0	none	Number of detected SpW errors of type TX AHB Error (TA)
HK_STAT_NUM_SPW_ERR_TXBLOCKED *NMR02059*	8	unsigned	0	255	0	none	Number of detected SpW errors of type TX Blocked (TB)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	100msec	4=Science_High_Res1	
TC_Science_Enable	1	300msec	5=Science_High_Res2	
TC_Science_Enable	1	800msec	6=Science_High_Res3	
TC_Science_Enable	1	100msec	7=Science_Med_Res1	
TC_Science_Enable	1	300msec	8=Science_Med_Res2	
TC_Science_Enable	1	800msec	9=Science_Med_Res3	
TC_Science_Enable	1	100msec	10=Science_Low_Res1	
TC_Science_Enable	1	300msec	11=Science_Low_Res2	
TC_Science_Enable	1	800msec	12=Science_Low_Res3	
TC_Science_Enable	1	800msec	13=Science_TIR_Only	
TC_Science_Enable	1	800msec	14=Calibration	Generation cycle depends on calibration sequence
TC_HK_Enable	1	20000msec	all	Default generation cycle time

Packet Name: **TM_Event_Progress(PBSBootReady) (YMR42017)**	Version: 6 / 16.05.2012	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains boot readiness report of the MPBS			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	47	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42001=EVENT_PBS_BOOT_READY	42001	42001	42001	none	Identifier of an progress event
HK_STAT_SW_VERSION *NMR00070*	8	string	0	255	0	none	Software version string which is booted (32 characters)
HK_STAT_BOOT_REASON *NMR00073*	16	enum: 0=power-on or unknown 1=PBS reset 2=APS reset 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap 7=APS boot by TC	0	7	0	none	Reason for boot of the MPBS or MAPS
HK_STAT_ICU_FPGA_VERSION *NMR00075*	8	unsigned	0	255	1	none	Version number of the FPGA installed on ICU
HK_STAT_ICU_MAIN_REDUNDANT *NMR00076*	8	enum: 0=redundant 1=main	0	1	0	none	Main/Red ICU Status, which ICU is powered

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Safe_Enter	1	--	1=Safe	After MERTIS power-on without request

Packet Name: **TM_Event_Progress(APSBootReady) (YMR42018)**	Version: 6 / 16.05.2012	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains boot readiness report of the MAPS			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	47	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42002=EVENT_APS_BOOT_READY	42002	42002	42002	none	Identifier of an progress event
HK_STAT_SW_VERSION *NMR00070*	8	string	0	255	0	none	Software version string which is booted (32 characters)
HK_STAT_BOOT_REASON *NMR00073*	16	enum: 0=power-on or unknown 1=PBS reset 2=APS reset 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap 7=APS boot by TC	0	7	0	none	Reason for boot of the MPBS or MAPS
HK_STAT_ICU_FPGA_VERSION *NMR00075*	8	unsigned	0	255	1	none	Version number of the FPGA installed on ICU
HK_STAT_ICU_MAIN_REDUNDANT *NMR00076*	8	enum: 0=redundant 1=main	0	1	0	none	Main/Red ICU Status, which ICU is powered

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	2=StandBy	After MERTIS power-on without request (nominal), with TC from Safe mode (not nominal)

Packet Name: **TM_Event_Progress(ModeTransition) (YMR42019)**	Version: 5 / 18.11.2014	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains a Progress Event for Mode Transition			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42003=EVENT_MODE_TRANSITION	42003	42003	42003	none	Identifier of an progress event
HK_STAT_PREVIOUS_MODE *NMR00077*	16	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Sw	1	50	1	none	Previous MERTIS mode number related to a mode transition

		ath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined					
HK_STAT_CURRENT_MODE *NMR00078*	16	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_H	1	50	1	none	Current MERTIS mode number related to a mode transition

		eated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined					

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	25=Diagnostic	Command causes entering of Diagnostic mode
TC_Diagnostic_Disable	1	--	3=WarmUp	Command causes leaving of Diagnostic mode and entering of WarmUp mode
TC_Power_Enable	1	--	3=WarmUp	Command causes entering of WarmUp mode
TC_Power_Disable	1	--	2=StandBy	Command causes leaving of WarmUp mode and entering of Standby mode
TC_Test_Enable	1	--	26=Test	Command causes entering of Test mode
TC_Test_Disable	1	--	2=StandBy	Command causes leaving of Test mode and entering of StandBy mode
TC_StandBy_Enter	1	--	2=StandBy	Command causes entering of StandBy mode
TC_Safe_Enter	1	--	1=Safe	Command causes entering of Safe mode

TC_Science_Disable	1	--	3=WarmUp	Command causes entering of WarmUp mode
TC_Science_Enable	1	--	10=Science_Low_Res1	Command causes entering of a Science mode

Packet Name: **TM_Event_Progress(DiagnoseStepFinished) (YMR42108)**	Version: 3 / 29.04.2015	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains a Progress Event for termination of diagnose step including test result OK/NOK *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42004=EVENT_DIAGNOSE_STEP_FINISHED	42004	42004	42004	none	Identifier of an progress event
HK_STAT_DIAG_STEP *NMR00631*	16	enum: 1=TIS_COMP 2=SHH 3=ANALOG_HK 4=POI_SENSOR 5=POI_ACCURACY 6=BOL_BEL 7=BOL_WINDOW 8=TEC_CONTROL 9=STS_MOVE 10=RAD_REL	1	10	1	none	Diagnostic step
HK_STAT_DIAG_STEP_RESULT *NMR00632*	16	enum: 0=OK 1=NOK	0	1	0	none	Diagnostic step result (OK or NOK)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	3=WarmUp	Command starts the Diagnostic mode, if a diagnostic step is finished the TM is generated

Packet Name: **TM_Event_Progress(BIASVoltageChanged) (YMR42109)**	Version: 1 / 21.03.2013	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains a Progress Event for changing the TIS BIAS voltage			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42007=EVENT_BIAS_VOLTAGE_CHANGED	42007	42007	42007	none	Identifier of an progress event
HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET *NMR01547*	8	unsigned	0	11	1	none	Currently used BIAS voltage parameter set (0…11, 0=manual mode)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_FunctionConfig_Parameter	1	--	all	Command changes BIAS voltages in mode 'manual', in 'automatic' mode no command request

Packet Name: **TM_Event_Progress(Thermal stability reached) (YMR42110)**	Version: 2 / 05.05.2015	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains a Progress Event for reaching the instrument thermal stabilty *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42008=EVENT_THERMAL_STABILITY	42008	42008	42008	none	Identifier of an progress event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Power_Enable	1	--	3=WarmUp	Command enters WarmUp mode where progress event is generated

Packet Name: **TM_Event_Progress(CFGLoadReady) (YMR42125)**	Version: 2 / 20.03.2013	APID: **983 (0x3D7)**	Service: **5/1**
Packet Description: Contains load readiness report of the MAPS configuration including the version string *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	47	5	1	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_PROG_ID *NMR00069*	16	enum: 42009=EVENT_CFG_LOAD_READY	42009	42009	42009	none	Identifier of an progress event
HK_STAT_CFG_VERSION *NMR01833*	8	string	0	255	0	none	Configuration version string which is loaded (32 characters)
HK_STAT_CFG_NUM_PARAMS_LOADED *NMR02060*	16	unsigned	0	255	0	none	Number of parameters loaded from configuration file
HK_STAT_CFG_NUM_PARAMS_USED *NMR02061*	16	unsigned	0	255	0	none	Number of used parameters from configuration file to overwrite software default values

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	2=StandBy	After MERTIS power-on without request (nominal), with TC from Safe mode (not nominal)

Packet Name: **TM_Event_Warning(EEPROM no segment) (YMR42027)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No segment found in EEPROM'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42204=EVENT_EEPROM_NO_SEGMENT	42204	42204	42204	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	No EEPROM APS executable avilable for secondary boot

Packet Name: **TM_Event_Warning(EEPROM no APS exe) (YMR42028)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No APS executable found in EEPROM'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42205=EVENT_EEPROM_NO_APS_EXE	42205	42205	42205	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	No EEPROM APS executable avilable for secondary boot

Packet Name: **TM_Event_Warning(EEPROM no APS config) (YMR42029)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No APS configuration found in EEPROM' *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42206=EVENT_EEPROM_NO_APS_CFG	42206	42206	42206	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	Maually secondary boot per command (start of APS)

Packet Name: **TM_Event_Warning(EEPROM no PBS config) (YMR42030)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No PBS configuration found in EEPROM' Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42207=EVENT_EEPROM_NO_PBS_CFG	42207	42207	42207	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	Maually secondary boot per command (start of APS)

Packet Name: **TM_Event_Warning(EEPROM no APS exe flag) (YMR42031)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No APS executable flag found in EEPROM' *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42208=EVENT_EEPROM_NO_APS_EXE_FLAG	42208	42208	42208	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	Maually secondary boot per command (start of APS)

Packet Name: **TM_Event_Warning(EEPROM no APS config flag) (YMR42032)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'No APS configuration flag found in EEPROM'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42209=EVENT_EEPROM_NO_APS_CFG_FLAG	42209	42209	42209	none	Identifier of a warning event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	Maually secondary boot per command (start of APS)

Packet Name: **TM_Event_Warning(RAD is busy) (YMR42035)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event for 'Radiometer device is busy' Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42212=EVENT_RAD_BUSY	42212	42212	42212	none	Identifier of a warning event
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	13=Science_TIR_Only	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	4=Science_High_Res1	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	5=Science_High_Res2	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	6=Science_High_Res3	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	7=Science_Med_Res1	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	8=Science_Med_Res2	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	9=Science_Med_Res3	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	10=Science_Low_Res1	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	11=Science_Low_Res2	Produced when RAD is busy, no data can be acquired
TC_Science_Enable	1	--	12=Science_Low_Res3	Produced when RAD is busy, no data can be acquired

Packet Name: **TM_Event_Warning(Thermal stability not reached) (YMR42111)**	Version: 2 / 05.05.2015	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Timeout occurred during warm-up of the instrument in mode WarmUp, thermal stability was not reached in expected time *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	17	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42213=EVENT_WARMUP_TIMEOUT	42213	42213	42213	none	Identifier of a warning event
PAR_SH_THERMAL_STABILITY_MAX_TIME *NMR02003*	16	unsigned	0	240	60	min	Maximum expected time to reach thermal stability of MERTIS sensor head
PAR_SH_THERMAL_STABILITY_CRITERIA *NMR02004*	16	unsigned	1	10	1	K/s	Maximum temperature gradient for condition 'thermal stability' of sensor head
HK_STAT_SH_THERMAL_STABILITY *NMR02007*	16	unsigned	1	10	1	K/s	Measured temperature gradient of MERTIS sensor head

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Power_Enable	1	--	all	Command to enter the WarmUp mode which starts monitoring of thermal stability

Packet Name: **TM_Event_Warning(Thermal stability left) (YMR42112)**	Version: 2 / 05.05.2015	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: No thermal stability condition of the instrument at the moment			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42214=EVENT_NO_THERMAL_STABILITY	42214	42214	42214	none	Identifier of a warning event
PAR_SH_THERMAL_STABILITY_CRITERIA *NMR02004*	16	unsigned	1	10	1	K/s	Maximum temperature gradient for condition 'thermal stability' of sensor head
HK_STAT_SH_THERMAL_STABILITY *NMR02007*	16	unsigned	1	10	1	K/s	Measured temperature gradient of MERTIS sensor head

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with nominally thermal stable condition for sensor head

Packet Name: **TM_Event_Warning(POI Hold Current Off) (YMR42038)**	Version: 1 / 07.06.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Contains a Warning Event 'POI Hold Current Off' which means that the POI hold current at a target is switched off due to exceeding the max hold time *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42215=EVENT_POI_HOLD_CURRENT_OFF	42215	42215	42215	none	Identifier of a warning event
HK_STAT_POI_HOLD_CURRENT_TIME *NMR02008*	32	unsigned	0	4294967295	60000	ms	Maximum time where POI hold current is switched on at a target

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer
TC_Power_Enable	1	--	all	Command to start WarmUp mode where the POI can be switched-on and moved

Packet Name: **TM_Event_Warning(Compression DMA timeout) (YMR42039)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: DMA time-out detected by compression hardware, current acquisition discarded *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42216=EVENT_COMP_DMA_TIMEOUT	42216	42216	42216	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Compression bus error) (YMR42040)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Compression bus error detected by compression hardware, current acquisition discarded *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42217=EVENT_COMP_BUS_ERROR	42217	42217	42217	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00490*	32	unsigned	0	4294967295	1	none	Acquisition number, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Compression buffer overflow) (YMR42041)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Compression buffer overflow detected by compression software, current acquisition discarded Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42218=EVENT_COMP_BUFFER_OVERFLOW	42218	42218	42218	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Bolometer window config wrong) (YMR42042)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Configuration of Bolometer windowing wrong, one or more windows overlap each other *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42219=EVENT_BOL_WIN_CONFIG_WRONG	42219	42219	42219	none	Identifier of a warning event
HK_STAT_TIS_WIN_TYPE *NMR02009*	16	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	0	3	0	none	TIS window type related to size (area on detector used for science data processing)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Bolometer busy) (YMR42043)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Bolometer electronics is busy to acquire data, current acquisition is lost *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42220=EVENT_BEL_BUSY	42220	42220	42220	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Bolometer bus error) (YMR42044)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Bolometer bus error detected, current acquisition discarded Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42221=EVENT_BOL_BUS_ERROR	42221	42221	42221	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Bolometer latchup error) (YMR42126)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Bolometer latchup error detected. Current acquisition discarded			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42222=EVENT_BOL_LATCHUP_ERROR	42222	42222	42222	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Bolometer burst trigger error) (YMR42127)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Bolometer burst trigger failure detected. Current acquisitions discarded *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42223=EVENT_BOL_BURST_TRIGGER_FAILURE	42223	42223	42223	none	Identifier of a warning event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Warning(Radiometer data timeout) (YMR42128)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Radiometer data timeout detected, current acquisition is lost *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42224=EVENT_RAD_DATA_TIME_OUT	42224	42224	42224	none	Identifier of a warning event
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Radiometer

Packet Name: **TM_Event_Warning(Radiometer latchup error) (YMR42129)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: Radiometer latchup error detected. Current acquisition discarded *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42225=EVENT_RAD_LATCHUP_ERROR	42225	42225	42225	none	Identifier of a warning event
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Radiometer

Packet Name: **TM_Event_Warning(TIS macro pixel wrong) (YMR42136)**	Version: 1 / 04.04.2013	APID: **983 (0x3D7)**	Service: **5/2**
Packet Description: TIS macro pixel value is out of range or wrong			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	23	5	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_WAR_ID *NMR00101*	16	enum: 42226=EVENT_TIS_MACRO_PIXEL_OUT_OFF_RANGE	42226	42226	42226	none	Identifier of a warning event
HK_STAT_TIS_MACRO_PIXEL_CURR_VAL *NMR02128*	32	unsigned	0	4294967295	0	none	Calculated current TIS macro pixel value
PAR_TIS_MACRO_PIXEL_MAX_VAL *NMR02129*	32	unsigned	0	4294967295	4294967295	none	Maximum expected TIS macro pixel value
PAR_TIS_MACRO_PIXEL_MIN_VAL *NMR02130*	32	unsigned	0	4294967295	0	none	Minimum expected TIS macro pixel value

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation

Packet Name: **TM_Event_Error(EEPROM write error) (YMR42045)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'EEPROM write error'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43800=EVENT_EEPROM_WRITE_ERROR	43800	43800	43800	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Load	1	--	1=Safe	Loading EEPROM memory with write error causes this event

Packet Name: **TM_Event_Error(Auto-boot failure) (YMR42046)**	Version: 1 / 01.04.2014	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'Auto-boot failure'			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43801=EVENT_APS_BOOT_FAILURE	43801	43801	43801	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_StandBy_Enter	1	--	1=Safe	Failuere during auto-boot without request (power-on MERTIS) or with command can cause this event

Packet Name: **TM_Event_Error(unexpected re-boot) (YMR42047)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'unexpected re-boot' of on-board software due to watchdog activation or processor trap occurance Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	29	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43802=EVENT_UNEXPECTED_REBOOT	43802	43802	43802	none	Identifier of an error event
HK_STAT_BOOT_REASON *NMR00073*	16	enum: 0=power-on or unknown 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap	0	6	3	none	Reason for boot of the MPBS or MAPS
HK_STAT_REG_PROC_STATUS *NMR00105*	32	unsigned	0	4294967295	0	none	Content of the processor status register PSR
HK_STAT_REG_PROC_TRAP_BASE *NMR00106*	32	unsigned	0	0	0	none	Content of the processor trap base register TBR
HK_STAT_REG_PROC_PROGRAMM_COUNT *NMR00107*	32	unsigned	0	0	0	none	Content of the processor program counter register PC
HK_STAT_REG_PROC_PROGRAMM_INSTRUCT *NMR00108*	32	unsigned	0	0	0	none	Content of the processor instruction register [PC] where the program counter points to

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Each command can cause sending this event

Packet Name: **TM_Event_Error(POI_SENSOR Diagnose Failed) (YMR42050)**	Version: 3 / 20.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of POI position sensors (Test Case 4) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	17	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43805=EVENT_POI_SENSOR_DIAG_FAILED	43805	43805	43805	none	Identifier of an error event
PAR_DIAG_POISENS_POI_COIL_MODE *NMR00642*	16	enum: 0=Coil1+2 1=Coil3+4 2=Coil2+3 3=Coil1+4 4=Coil1+2+3+4	0	4	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": POI motor coil mode, defines usage of different motor coils
PAR_DIAG_POISENS_SENSOR1_EXPECTED *NMRD2496*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR1
PAR_DIAG_POISENS_SENSOR2_EXPECTED *NMRD2497*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR2
PAR_DIAG_POISENS_SENSOR3_EXPECTED *NMRD2498*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR3
HK_STAT_DIAG_POISENS_SENSOR1 *NMRD2499*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR1
HK_STAT_DIAG_POISENS_SENSOR2 *NMRD2500*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR2
HK_STAT_DIAG_POISENS_SENSOR3 *NMRD2501*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR3
HK_STAT_DIAG_POISENS_STEP_NUM_FAILED *NMR02502*	16	unsigned	0	3000	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": POI motor step number where the failure was detected

TC which initiated generation of TM	Num TM packets	Generation Cycle	Modes where TM is generated	Remarks

	per cycle	(in sec)		
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(STS Operation Failure) (YMR42051)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event for a shutter (STS) operation failure			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43806=EVENT_STS_OPERATION_FAILURE	43806	43806	43806	none	Identifier of an error event
HK_STAT_STS_EXPECTED *NMRD0603*	1	enum: 0=open 1=closed	0	1	0	none	Shutter status (open/closed) as expected
HK_STAT_STS_READ *NMRD0604*	1	enum: 0=open 1=closed	0	1	0	none	Shutter status (open/closed) as read from I/F

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Description for the new Request/Response-Relationship ..

Packet Name: **TM_Event_Error(POI Operation Failure) (YMR42052)**	Version: 3 / 16.05.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event for a pointing unit (POI) operation failure			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	17	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43807=EVENT_POI_OPERATION_FAILURE	43807	43807	43807	none	Identifier of an error event
HK_STAT_POI_POSITION_EXPECTED *NMR00112*	16	enum: 0=PlanetView 1=BB7View 2=BB3View 3=SpaceView	0	3	0	none	POI Position Status
HK_STAT_POI_SENSOR3 *NMRD0607*	1	enum: 0=off 1=on	0	1	0	none	POI status position sensor 3
HK_STAT_POI_SENSOR2 *NMRD0608*	1	enum: 0=off 1=on	0	1	0	none	POI status position sensor 2
HK_STAT_POI_SENSOR1 *NMRD0609*	1	enum: 0=off 1=on	0	1	0	none	POI status position sensor 1
HK_STAT_POI_STEP_COUNTER *NMR01834*	16	unsigned	0	300	0	none	POI step counter value (0…300steps), provides information about POI mirror position: 0=PlanetView, 100=BB7View, 200=BB3View, 300=SpaceView

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Description for the new Request/Response-Relationship ..

Packet Name: **TM_Event_Error(RAD FIFO not empty) (YMR42053)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'Radiometer FIFO not empty'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43808=EVENT_RAD_FIFO_NOT_EMPTY	43808	43808	43808	none	Identifier of an error event
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for Rdiometer FIFO not empty

Packet Name: **TM_Event_Error(RAD FIFO overflow) (YMR42054)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'Radiometer FIFO overflow detected'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43809=EVENT_RAD_FIFO_OVERFLOW	43809	43809	43809	none	Identifier of an error event
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for Radiometer FIFO overflow

Packet Name: **TM_Event_Error(RAD ADC error) (YMR42134)**	Version: 1 / 10.12.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'Radiometer ADC Error'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43810=EVENT_RAD_ADC_ERROR	43810	43810	43810	none	Identifier of an error event
HK_STAT_RAD_ADC_ERROR_STATUS *NMR02016*	16	unsigned	0	65535	0	none	ADC error status word (16Bits)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for Rdiometer ADC error

Packet Name: **TM_Event_Error(BOL DMA overflow) (YMR42056)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'Bolometer DMA overflow detected'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43811=EVENT_BOL_DMA_OVERFLOW	43811	43811	43811	none	Identifier of an error event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Description for the new Request/Response-Relationship ..

Packet Name: **TM_Event_Error(BOL DMA no data received) (YMR42057)**	Version: 1 / 17.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains a Warning Event 'Bolometer DMA no data received' Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43812=EVENT_BOL_DMA_TIMEOUT	43812	43812	43812	none	Identifier of an error event
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Description for the new Request/Response-Relationship ..

Packet Name: **TM_Event_Error(watchdog failure) (YMR42085)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'Watchdog failure'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	19	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43813=EVENT_WATCHDOG_FAILURE	43813	43813	43813	none	Identifier of an error event
HK_STAT_WATCHDOG_TIMER_VALUE_SET *NMR00397*	32	unsigned	0	4294967295	315000000	none	Parameter contains the timer value used for initialization of the watchdog timer
HK_STAT_WATCHDOG_TIMER_VALUE_READ *NMR00398*	32	unsigned	0	4294967295	315000000	none	Parameter contains the watchdog timer value read back after initialization

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for watchdog hardware failure

Packet Name: **TM_Event_Error(SpW Error) (YMR42086)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'SpaceWire receive Error'			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43814=EVENT_TC_SPW_RX_ERROR	43814	43814	43814	none	Identifier of an error event
HK_STAT_SPW_RECEIVE_ERROR *NMR00102*	16	enum: 0=EEP error 1=Truncated packet 2=SpW packet invalid	0	2	0	none	Parameter contains the detected SpaceWire receive error

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for SpaceWire error

Packet Name: **TM_Event_Error(EEPROM Exe copy abort) (YMR42087)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'Copy abort EEPROM EXE detected'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43815=EVENT_EEPROM_EXE_SEG_COPY_ABORT	43815	43815	43815	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for SpaceWire error

Packet Name: **TM_Event_Error(EEPROM EXE seg CRC wrong) (YMR42088)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'Wrong segment CRC in EEPROM EXE detected' Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43816=EVENT_EEPROM_EXE_SEG_CRC_WRONG	43816	43816	43816	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for SpaceWire error

Packet Name: **TM_Event_Error(PBS CFG size wrong) (YMR42089)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'PBS CFG size wrong"			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	15	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43817=EVENT_EEPROM_PBS_CFG_SIZE_WRONG	43817	43817	43817	none	Identifier of an error event
HK_STAT_PBS_CFG_SIZE_EXPECTED *NMR00400*	16	unsigned	0	65535	52	none	Parameter contains the expected size of PBS configuration segment in EEPROM
HK_STAT_PBS_CFG_SIZE_READ *NMR00401*	16	unsigned	0	65535	52	none	Parameter contains the read size of PBS configuration segment in EEPROM

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for SpaceWire error

Packet Name: **TM_Event_Error(Reg writing wrong) (YMR42090)**	Version: 1 / 11.05.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'Reg writing wrong'			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	23	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43818=EVENT_WRITING_REGISTER_FAILED	43818	43818	43818	none	Identifier of an error event
HK_STAT_REG_ADDRESS *NMR00402*	32	unsigned	0	4294967295	0	none	Parameter contains the register address for writing
HK_STAT_REG_VALUE_WRITTEN *NMR00403*	32	unsigned	0	4294967295	0	none	Parameter contains the value written into a register for configuration
HK_STAT_REG_VALUE_READ *NMR00404*	32	unsigned	0	4294967295	0	none	Parameter contains the value read back from a register after writing it

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for SpaceWire error

Packet Name: **TM_Event_Error(TC Buffer1 full) (YMR42091)**	Version: 1 / 16.06.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'TC buffer1 full'			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43819=EVENT_TC_BUFFER_1_FULL	43819	43819	43819	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for TC buffer

Packet Name: **TM_Event_Error(TC buffer2 full) (YMR42092)**	Version: 1 / 16.06.2011	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Contains an Error Event 'TC buffer2 full'			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43820=EVENT_TC_BUFFER_2_FULL	43820	43820	43820	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for TC buffer

Packet Name: **TM_Event_Error(ANALOG_HK Temp Diagnose Failed) (YMR42113)**	Version: 2 / 05.05.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of analog temperature HKs (Test Case 3) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	49	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43821=EVENT_ANA_TEMP_DIAG_FAILED	43821	43821	43821	none	Identifier of an error event
PAR_DIAG_HK_ANA_NUM_SAMPLES *NMR00643*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD *NMR00644*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_HK_TEMP_MIN *NMR00645*	32	signed	-50	600	60	degC	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed temperature
PAR_DIAG_HK_TEMP_MAX *NMR00646*	32	signed	-50	600	100	degC	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed temperature
HK_STAT_DIAG_HK_TEMP_MIN *NMR00649*	32	signed	-50	600	60	degC	Diagnose status TestCase 3 "AnalogHK": Minimum measured temperature
HK_STAT_DIAG_HK_TEMP_MAX *NMR00650*	32	signed	-50	600	100	degC	Diagnose status TestCase 3 "AnalogHK": Maximum measured temperature
HK_STAT_DIAG_HK_TEMP_AVERAGE *NMR00652*	32	signed	-50	600	60	degC	Diagnose status TestCase 3 "AnalogHK": Measured average temperature
PAR_DIAG_HK_TEMP_STANDDEV_MIN *NMR00647*	32	float	0	15	1	degC	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of temperature
PAR_DIAG_HK_TEMP_STANDDEV_MAX *NMR00648*	32	float	1	500	100	degC	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of temperature
HK_STAT_DIAG_HK_TEMP_STANDDEV *NMR00651*	32	float	1	500	100	degC	Diagnose status TestCase 3 "AnalogHK": measured standard deviation of temperature
HK_STAT_DIAG_ANA_TEMP_REF_SENSOR *NMR02503*	8	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATI	0	14	0	none	Diagnose parameter TestCase 3 "ANALOG_HK": Temperature reference sensor

		NG 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3					
HK_STAT_DIAG_ANA_SH_REF_TEMP_STABLE *NMR02867*	8	enum: 0=temp unstable 1=temp stable	0	1	1	none	DIAG step ANALOG_HK: Reference temperature for the Sensor Head (SH) ist stable/unstable

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(ANALOG_HK Volt Diagnose Failed) (YMR42114)**	Version: 2 / 22.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of analog voltage HKs (Test Case 3) not successful			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	39	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43822=EVENT_ANA_VOLT_DIAG_FAILED	43822	43822	43822	none	Identifier of an error event
PAR_DIAG_HK_ANA_NUM_SAMPLES *NMR00643*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD *NMR00644*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_HK_VOLT_MIN *NMR00654*	16	unsigned	2000	8000	5000	mV	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed voltage
PAR_DIAG_HK_VOLT_MAX *NMR00653*	16	unsigned	2000	8000	5000	mV	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed voltage
HK_STAT_DIAG_HK_VOLT_MIN *NMR00657*	16	unsigned	2000	8000	5000	mV	Diagnose status TestCase 3 "AnalogHK": Minimum measured voltage
HK_STAT_DIAG_HK_VOLT_MAX *NMR00658*	16	unsigned	2000	8000	6000	mV	Diagnose status TestCase 3 "AnalogHK": Maximum measure voltage
HK_STAT_DIAG_HK_VOLT_AVERAGE *NMR00660*	16	unsigned	2000	8000	5500	mV	Diagnose status TestCase 3 "AnalogHK": Measure average voltage
PAR_DIAG_HK_VOLT_STANDDEV_MIN *NMR00655*	32	float	0	15	1	mV	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of voltage
PAR_DIAG_HK_VOLT_STANDDEV_MAX *NMR00656*	32	float	1	500	100	mV	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of voltage
HK_STAT_DIAG_HK_VOLT_STANDDEV *NMR00659*	32	float	1	500	100	mV	Diagnose status TestCase 3 "AnalogHK": Measured standard deviation of voltage
HK_STAT_DIAG_HK_VOLT_SOURCE *NMR02506*	16	enum: 0=+3,4V 1=+7,2V	0	1	0	none	Diagnose status TestCase 3 "AnalogHK": Voltage source of the failure packet

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends

				on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(BOL_BEL Diagnose Failed) (YMR42116)**	Version: 2 / 04.05.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of Bolometer electronics (Test Case 6) not successful Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	43	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43824=EVENT_BOL_BEL_DIAG_FAILED	43824	43824	43824	none	Identifier of an error event
PAR_DIAG_BOLBEL_IMG_STANDDEV_MIN *NMR00677*	32	float	0	15	1	DN	Diagnose parameter TestCase 6 "BOLBEL": Minimum allowed standard deviation of BOL image
PAR_DIAG_BOLBEL_IMG_STANDDEV_MAX *NMR00678*	32	float	0	15	1	DN	Diagnose parameter TestCase 6 "BOLBEL": Maximum allowed standard deviation of BOL image
HK_STAT_DIAG_BOLBEL_IMG_STANDDEV *NMR00679*	32	float	0	15	1	DN	Diagnose status TestCase 6 "BOLBEL": Measured standard deviation of BOL image
PAR_BOL_DECT_VSKIMBIAS_VOLTAGE *NMR00257*	16	unsigned	3	5,5	5,342	V	Bolometer Detector VSKIMMING BIAS voltage
PAR_BOL_DECT_FIDBIAS_VOLTAGE *NMR00256*	16	unsigned	1,5	5	3,5	V	Bolometer Detector FID BIAS voltage
PAR_TIS_BOL_CHIP_TEMP *NMR00238*	16	signed	5	40	30	degC	BOL chip temperature to be adjusted by TEC
PAR_DIAG_BOLBEL_IMG_SNR_MIN *NMR02507*	16	unsigned	1	500	200	none	Diagnose parameter TestCase 6 "BOLBEL": Minimum allowed SNR of BOL image
HK_STAT_DIAG_BOLBEL_IMG_SNR *NMR02508*	16	unsigned	1	500	200	none	Diagnose parameter TestCase 6 "BOLBEL": Calculated SNR of BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MIN *NMR02509*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Minimum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MAX *NMR02510*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Maximum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_AVERAGE *NMR02511*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Average DN value in BOL image
HK_STAT_DIAG_BOLBEL_METHOD *NMRD2513*	4	enum: 0=DIFF_IMAGE 1=BB3_CORRECTED_IMAGE	0	1	0	none	Diagnose parameter TestCase 6 "BOLBEL": Method used for BOL image acquisition

HK_STAT_DIAG_BOLBEL_TARGET *NMRD2514*	4	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	0	15	0	none	Diagnose parameter TestCase 6 "BOLBEL": Target used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_OVS *NMR02831*	8	unsigned	1	255	1	none	Diagnose parameter TestCase 6 "BOLBEL": Number of oversamplings used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_SH_REF_TEMP_STABLE *NMR02868*	8	enum: 0=temp unstable 1=temp stable	0	1	1	none	DIAG step BOL_BEL: Reference temperature for the Sensor Head (SH) ist stable/unstable
HK_STAT_ DIAG_BOLBEL_TIS_TEC_STABLE *NMR02869*	8	enum: 0=temp unstable 1=temp stable	0	1	1	none	DIAG step BOL_BEL: Status of the BOL chip temperature (stable/unstable) controlled by TEC

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(BOL_WINOW Diagnose Failed) (YMR42117)**	Version: 2 / 21.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of Bolometer windowing (Test Case 7) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43825=EVENT_BOL_WINDOW_DIAG_FAILED	43825	43825	43825	none	Identifier of an error event
HK_STAT_DIAG_BOLIMG_NUM_PATTERN_ERRORS *NMR02517*	16	unsigned	0	19200	0	pix	Diagnose status TestCase 7 "BOLIMG": Number of detected pattern errors (recieved data are different from expected pattern)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(TEC_CONTROL Diagnose Failed) (YMR42118)**	Version: 2 / 28.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of TEC controller of Bolometer (Test Case 8) not successful			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	37	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43826=EVENT_TEC_CONTROL_DIAG_FAILED	43826	43826	43826	none	Identifier of an error event
PAR_DIAG_BOLTEC_NUM_SAMPLES *NMR00689*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 8 "BOLTEC": Number of repetitions of BOL TEC tests
PAR_DIAG_BOLTEC_REPETITION_PERIOD *NMR00690*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 8 "BOLTEC": Time between two BOL TEC tests
PAR_DIAG_BOLTEC_TEMP_BOL_CHIP *NMR00691*	16	signed	5	40	30	degC	Diagnose parameter TestCase 8 "BOLTEC": Target BOL chip temperature
PAR_DIAG_BOLTEC_TEMP_BOL_CHIP_STANDDEV_MAX *NMR00692*	32	float	0	15	1	mK	Diagnose parameter TestCase 8 "BOLTEC": Maximum allowed standard deviation of BOL chip temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP_AVERAGE *NMR00693*	32	float	5	40	30	degC	Diagnose status TestCase 8 "BOLTEC": Calculated average BOL chip temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP_STANDDEV *NMR00694*	32	float	0	15	1	mK	Diagnose statu TestCase 8 "BOLTEC": Calculated standard deviation of measured BOL chip temperature samples
HK_STAT_DIAG_BOLTEC_TEMP_BOL_HOUSING *NMR00695*	32	float	-40	60	20	degC	Diagnose status TestCase 8 "BOLTEC": Measured BOL housing temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP *NMR02518*	32	float	-10	55	20	degC	Diagnose status TestCase 8 "BOLTEC": Current Bolometer chip temperature (TEC controlled)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(STS_MOVE Diagnose Failed) (YMR42119)**	Version: 1 / 24.06.2013	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of STS movement (Test Case 9) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	31	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43827=EVENT_STS_MOVE_DIAG_FAILED	43827	43827	43827	none	Identifier of an error event
PAR_DIAG_STS_NUM_OPEN_CLOSE_CYCLES *NMR00696*	16	unsigned	1	500	20	none	Diagnose parameter TestCase 9 "STS": Number of open/close cycles for shutter tests
PAR_DIAG_STS_OPEN_CLOSE_PERIOD *NMR00697*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 9 "STS": Open/close period for shutter tests
PAR_DIAG_STS_CLOSED_TIME *NMR00698*	16	unsigned	1	100	16	ms	Diagnose parameterTestCase 9 "STS": Time with closed shutter per period
PAR_DIAG_STS_OPEN_TIME_MAX *NMR00699*	16	unsigned	0	50	16	ms	Diagnose parameterTestCase 9 "STS": Maximal expected shutter opening time
PAR_DIAG_STS_CLOSE_TIME_MAX *NMR00700*	16	unsigned	0	50	8	ms	Diagnose parameterTestCase 9 "STS": Maximum expected shutter closing time
PAR_DIAG_STS_CURRENT_MEAN_MIN *NMR00701*	16	unsigned	0	500	206,4	mA	Diagnose parameterTestCase 9 "STS": Minimum expected shutter current average value
PAR_DIAG_STS_CURRENT_MEAN_MAX *NMR00702*	16	unsigned	0	500	246,4	mA	Diagnose parameterTestCase 9 "STS":Maximum expected shutter current average value
HK_STAT_DIAG_STS_CURRENT_MEAN *NMR00703*	16	unsigned	0	1000	200	mA	STS diagnostic analog currents mean value
HK_STAT_DIAG_STS_NUM_OPEN_FAILED *NMR00704*	16	unsigned	0	100	8	none	Diagnose statusTestCase 9 "STS": Number of shutter opening failed (longer than expected)
HK_STAT_DIAG_STS_NUM_CLOSE_FAILED *NMR00705*	16	unsigned	0	100	8	none	Diagnose statusTestCase 9 "STS": Number of shutter closing failed (longer than expected)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends

				on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(RAD_REL Diagnose Failed) (YMR42120)**	Version: 2 / 27.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of Radiometer electronics (Test Case 10) not successful			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	41	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43828=EVENT_RAD_REL_DIAG_FAILED	43828	43828	43828	none	Identifier of an error event
PAR_DIAG_RADREL_NUM_SAMPLES *NMR00706*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 10 "RADREL": Number of repetitions of RAD REL tests
PAR_DIAG_RADREL_REPETITION_PERIOD *NMR00707*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 10 "RADREL": Time between two RAD image acquisitions
PAR_DIAG_RADREL_PIX_STANDDEV_MIN *NMR00710*	32	float	0	15	1	DN	Diagnose parameter TestCase 10 "RADREL": Minimum allowed standard deviation of radiometer pixels and temperature
PAR_DIAG_RADREL_PIX_STANDDEV_MAX *NMR00711*	32	float	0	15	1	DN	Diagnose parameter TestCase 10 "RADREL": Maximum allowed standard deviation of radiometer pixels and temperature
HK_STAT_DIAG_RADREL_PIX_STANDDEV *NMR00712*	32	float	0	15	1	DN	Diagnose status TestCase 10 "RADREL": Measured standard deviation of radiometer pixels and temperature
HK_STAT_DIAG_RADREL_TARGET *NMR02519*	8	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	0	15	0	none	Diagnose parameter TestCase 10 "RADREL": Target used to acquire RAD data
HK_STAT_DIAG_RADREL_CHANNEL *NMR02520*	8	enum: 0=A1 1=A2	0	31	0	none	Diagnose parameter TestCase 10 "RADREL": RAD channel where the failure were detected

		2=A3 3=A4 4=A5 5=A6 6=A7 7=A8 8=A9 9=A10 10=A11 11=A12 12=A13 13=A14 14=A15 15=A16 16=B1 17=B2 18=B3 19=B4 20=B5 21=B6 22=B7 23=B8 24=B9 25=B10 26=B11 27=B12 28=B13 29=B14 30=B15 31=B16					
HK_STAT_DIAG_RADREL_PIX_DN_MIN *NMR02521*	32	unsigned	0	15	1	DN	Diagnose status TestCase 10 "RADREL": Minimum measured channel DN value
HK_STAT_DIAG_RADREL_PIX_DN_MAX *NMR02522*	32	unsigned	0	15	1	DN	Diagnose status TestCase 10 "RADREL": Maximum measured channel DN value
HK_STAT_DIAG_RADREL_PIX_DN_AVERAGE *NMR02523*	32	unsigned	0	15	1	DN	Diagnose status TestCase 10 "RADREL": Average channel DN value

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(SHH Diagnose Failed) (YMR42121)**	Version: 2 / 04.05.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of SHH (Test Case 11) not successful			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	25	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43829=EVENT_SHH_DIAG_FAILED	43829	43829	43829	none	Identifier of an error event
PAR_DIAG_SHH_HEAT_UP_TIME *NMR00715*	16	unsigned	1	1000	60	s	Diagnose parameter TestCase 11 "SHH": Sensor head heat-up time to get thermal stable condition
PAR_DIAG_SHH_TEMP_DIFF_MIN *NMR00716*	16	unsigned	1	100	10	deg C	Diagnose parameter TestCase 11 "SHH": Minimum allowed difference of sensor head temperature after heating-up time
PAR_DIAG_SHH_TEMP_MAX *NMR00717*	16	unsigned	1	100	20	deg C	Diagnose parameter TestCase 11 "SHH": Maximum allowed sensor head temperature while heating-up
HK_STAT_DIAG_SHH_TEMP_BEFORE_HEATING *NMR00718*	16	unsigned	1	100	20	deg C	Diagnose parameter TestCase 11 "SHH": Sensor head temperature before heating-up
HK_STAT_DIAG_SHH_TEMP_ACTUAL *NMR02524*	16	unsigned	1	100	20	deg C	Diagnose parameter TestCase 11 "SHH": Sensor head temperature after heating-up
PAR_DIAG_SHH_HEATING_POWER *NMR02525*	16	unsigned	0	100	50	%	Diagnose parameter TestCase 11 "SHH": Sensor head heating power (0...100%)
PAR_DIAG_SHH_REF_SENSOR *NMR02526*	16	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU	0	10	5	none	Diagnose parameter TestCase 11 "SHH": Sensor head temperature reference sensor

		10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3					

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(OBT Synchronization Failed) (YMR42130)**	Version: 1 / 10.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Synchronization of On-Board Timer (OBT) failed, SpW-TimeCode received too late *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	21	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43830=EVENT_OBT_SYNC_FAILED	43830	43830	43830	none	Identifier of an error event
PAR_OBT_SYNC_TIME *NMR02010*	48	unsigned	0	4294967295	0	s	Parameter contains a time value (CUC format) for synchronization of the On-Board Timer (OBT)
PAR_MAX_DELAY_SPW_TIME_CODE *NMR02011*	16	unsigned	0	65535	1000	ms	Maximum allowed delay for receiving SpW-TimeCode after a received TC_Time_Update command
HK_STAT_DELAY_SPW_TIME_CODE *NMR02012*	16	unsigned	0	65535	500	ms	Delay after recieving TC_Time_Update until next got SpW-TimeCode

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Time_Update	1	--	all	Command which sends the new OBT time to be synchronized with next SpW time code

Packet Name: **TM_Event_Error(TEC BOL temp too low) (YMR42131)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: TEC Bolometer chip temperature too low, controller suspended			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43831=EVENT_BOL_TEMP_TOO_LOW	43831	43831	43831	none	Identifier of an error event
HK_TEMP_BOL_CHIP *NMR00059*	16	unsigned	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Error(TEC BOL temp too high) (YMR42132)**	Version: 1 / 15.08.2012	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: TEC Bolometer chip temperature too high, controller suspended			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	13	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43832=EVENT_BOL_TEMP_TOO_HIGH	43832	43832	43832	none	Identifier of an error event
HK_TEMP_BOL_CHIP *NMR00059*	16	unsigned	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	all	Command to start science operation with Bolometer

Packet Name: **TM_Event_Error(BOL WindowConfig Invalid) (YMR42135)**	Version: 1 / 20.03.2013	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: TIS BOL Window configuration is invalid due to overlapping of windows *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	11	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43833=EVENT_BOL_WINDOW_CONFIG_INVALID	43833	43833	43833	none	Identifier of an error event

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous error event for invalid BOL window configuration

Packet Name: **TM_Event_Error(TIS_COMP Diagnose Failed) (YMR42137)**	Version: 1 / 27.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of TIS compression (Test Case TIS_COMP/12) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	21	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43834=EVENT_TIS_COMP_DIAG_FAILED	43834	43834	43834	none	Identifier of an error event
HK_STAT_DIAG_COMP_INPUT_DATA_SIZE *NMR02527*	16	unsigned	5280	19200	8000	none	Diagnose status TestCase 12 TIS_COMP: Size of compression input data block
HK_STAT_DIAG_COMP_OUTPUT_DATA_SIZE *NMR02528*	16	unsigned	1	19200	4000	none	Diagnose status TestCase 12 TIS_COMP: Size of compression output data block
HK_STAT_DIAG_COMP_RATIO *NMR02529*	16	unsigned	0	20	2	none	Diagnose status TestCase 12 TIS_COMP: Achieved compression ratio (input size/output size)
PAR_DIAG_COMP_RATIO_MIN_EXPECTED *NMR02530*	16	unsigned	0	20	2	none	Diagnose status TestCase 12 TIS_COMP: Minimum expected compression ratio (input size/output size)
HK_STAT_DIAG_COMP_METHOD *NMR02531*	8	enum: 0=COMP_METHOD_1 1=COMP_METHOD_2 2=COMP_METHOD_3 3=COMP_METHOD_4 4=COMP_METHOD_5	0	4	0	none	Used compression method
HK_STAT_DIAG_COMP_TARGET *NMR02532*	8	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	0	15	0	none	Used target to acquire data for compression diagnose

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(POI_ACCURACY Diagnose Failed) (YMR42138)**	Version: 1 / 20.04.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of POI position accuracy (Test Case 5) not successful			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	37	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43835=EVENT_POI_ACCURACY_DIAG_FAILED	43835	43835	43835	none	Identifier of an error event
PAR_DIAG_POIACUR_NUM_IMAGES *NMR02533*	16	unsigned	0	100	5	none	DIAG test case POI_ACCURACY: Number of images acquired for this test
PAR_DIAG_POIACUR_BARYCENTER_SPECT_MIN *NMR02534*	32	float	1	120	50	none	DIAG test case POI_ACCURACY: Minimum allowed value of barycenter position in spectral direction
PAR_DIAG_POIACUR_BARYCENTER_SPECT_MAX *NMR02535*	32	float	1	120	50	none	DIAG test case POI_ACCURACY: Maximum allowed value of barycenter position in spectral direction
PAR_DIAG_POIACUR_BARYCENTER_SPAT_MIN *NMR02536*	32	float	1	160	60	none	DIAG test case POI_ACCURACY: Minimum allowed value of barycenter position in spatial direction
PAR_DIAG_POIACUR_BARYCENTER_SPAT_MAX *NMR02537*	32	float	1	160	60	none	DIAG test case POI_ACCURACY: Maximum allowed value of barycenter position in spatial direction
HK_STAT_DIAG_POIACUR_BARYCENTER_SPECT *NMR02538*	32	float	1	120	50	none	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spectral direction
HK_STAT_DIAG_POIACUR_BARYCENTER_SPAT *NMR02539*	32	float	1	160	60	none	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spatial direction

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Error(ANALOG_HK SHTemp Diagnose Failed) (YMR42139)**	Version: 1 / 05.05.2015	APID: **983 (0x3D7)**	Service: **5/3**
Packet Description: Diagnose of analog sensor head temperature HKs (Test Case 3) not successful *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	35	5	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ERR_ID *NMR00104*	16	enum: 43836=EVENT_ANA_SH_TEMP_DIAG_FAILED	43836	43836	43836	none	Identifier of an error event
PAR_DIAG_HK_ANA_NUM_SAMPLES *NMR00643*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD *NMR00644*	16	unsigned	1	1000	100	ms	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_SHTEMP_DIFF_STDDEV_MIN *NMR02540*	32	float	0	15	1	deg C	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of SH temperature
PAR_DIAG_SHTEMP_DIFF_STDDEV_MAX *NMR02541*	32	float	0	15	1	deg C	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of SH temperature
HK_STAT_DIAG_SHTEMP_DIFF_MIN *NMR02542*	16	signed	-30	30	0	deg C	Diagnose parameter TestCase 3 "AnalogHK": Minimum detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_MAX *NMR02543*	16	signed	-30	30	0	deg C	Diagnose parameter TestCase 3 "AnalogHK": Maximum detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_AVERAGE *NMR02544*	16	signed	-30	30	0	deg C	Diagnose parameter TestCase 3 "AnalogHK": Average detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_STANDDEV *NMR02545*	32	float	0	15	1	deg C	Diagnose parameter TestCase 3 "AnalogHK": Calculated standard deviation of SH temperature
HK_STAT_DIAG_SHTEMP_SENSOR1 *NMR02546*	8	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_	0	14	0	none	Diagnose parameter TestCase 3 "ANALOG_HK": SH temperature reference sensor 1

		PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3					
HK_STAT_DIAG_SHTEMP_SENSOR2 *NMR02547*	8	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	0	14	0	none	Diagnose parameter TestCase 3 "ANALOG_HK": SH temperature reference sensor 2

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_Event_Alarm(HK limit violation) (YMR42093)**	Version: 1 / 20.06.2011	APID: **983 (0x3D7)**	Service: **5/4**
Packet Description: Contains an Alarm Event 'HK limit violation' (Maximum limit of PSU/ICU temperature, PSU voltages) Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	7	3	0	27	5	4	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_EVENT_ALA_ID *NMR00411*	16	enum: 43900=EVENT_HK_LIMIT_VIOLATION	43900	43900	43900	none	Identifier of an alarm event
HK_TEMP_ICU *NMR00036*	16	signed	-30	80	20	deg C	ICU temperature
HK_TEMP_PSU *NMR00037*	16	signed	-30	85	20	deg C	Power supply temperature
HK_VOLT_PSU_P34 *NMR00034*	16	unsigned	2500	4500	3400	mV	PSU +3.4V supply digital voltage
HK_VOLT_PSU_P72 *NMR00035*	16	unsigned	6000	8000	7200	mV	PSU +7.2V supply analog voltage
PAR_TEMP_ICU_MAX *NMR00412*	16	signed	50	130	70	deg C	Maximum limit of ICU temperature
PAR_TEMP_PSU_MAX *NMR00413*	16	signed	50	130	80	deg C	Maximum limit of power supply temperature
PAR_VOLT_PSU_P34_MAX *NMR00414*	16	unsigned	3600	5000	3900	mV	Maximum limit of PSU +3.4V supply digital voltage
PAR_VOLT_PSU_P72_MAX *NMR00415*	16	unsigned	7400	8500	7500	mV	Maximum limit of PSU +7.2V supply analog voltage

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
All_Commands	1	--	all	Asynchronous alarm event for HK limit violation

Packet Name: **TM_Memory_Dump(RAM) (YMR42058)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from RAM			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 110=RAM	110	110	110	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Dump(EEPROM) (YMR42059)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from EEPROM			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 111=EEPROM	111	111	111	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Dump(REGISTER) (YMR42060)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from REGISTER			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 112=REGISTER	112	112	112	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Dump(PROM) (YMR42061)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from PROM			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 113=PROM	113	113	113	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Dump(AHBRAM) (YMR42062)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from AHBRAM			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 114=AHBRAM	114	114	114	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Dump(VRAM) (YMR42063)**	Version: 1 / 27.09.2010	APID: **985 (0x3D9)**	Service: **6/6**
Packet Description: Contains memory dump data from VRAM			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	4105	6	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_DUMP *NMR00117*	16	enum: 115=VRAM	115	115	115	none	Identifier for a MERTIS ICU memory type
DAT_MEM_START_ADDRESS_DUMP *NMR00118*	32	unsigned	0	4294967295	0	none	Defines the start address of a dumped memory block
DAT_MEM_BLOCK_LENGTH_DUMP *NMR00119*	32	unsigned	1	4086	4086	byte	Defines the size of a memory block (in bytes) of dumped memory data block
DAT_MEM_BLOCK_DUMP *NMR00120*	8	unsigned	0	255	0	none	Memory dump data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Dump	1	--	all	Memory dump request command, number of TM-packets depends on the size of memory area to be dumped

Packet Name: **TM_Memory_Check (YMR42064)**	Version: 3 / 28.04.2010	APID: **985 (0x3D9)**	Service: **6/10**
Packet Description: Contains the CRC16 value calculated for the memory data block			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	9	3	0	21	6	10	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_MEMORY_ID_CHECK *NMR00117*	16	enum: 110=RAM 111=EEPROM 112=REGISTER 113=PROM 114=AHBRAM 115=VRAM	110	115	111	none	Identifier for a MERTIS ICU memory type
PAR_START_ADDRESS_CHECK *NMR00121*	32	unsigned	0	4294967295	0	none	Start address of a memory area to be loaded, dumped, checked
PAR_BLOCK_LENGTH_CHECK *NMR00122*	32	unsigned	1	4294967295	1	byte	Defines the size of a memory block (in bytes) for memory check
DAT_MEM_CRC_CHECK *NMR00123*	16	unsigned	0	65535	0	none	CRC re-calculated for a defined memory area

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Memory_Check	1	--	all	Request command for memory check

Packet Name: **TM_Test_Connection (YMR42065)**	Version: 4 / 01.08.2013	APID: **967 (0x3C7)**	Service: **17/2**
Packet Description: Contains a connection test report			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
60	7	3	0	9	17	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Connection	1	--	all	Request command for connection test report

Packet Name: TM_Science_TIS_Data_QuickLook (YMR42067)	Version: 14 / 28.01.2015	APID: 1020 (0x3FC)	Service: 21/3
Packet Description: Contains TIS science data including some status data for QuickLook			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
63	12	3	0	4105	21	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product
HK_STAT_TIS_DATA_ACQ_TYPE *NMRD2063*	4	enum: 0=Sci_Raw 1=Sci_Subtracted_Raw 2=Sci_Subtracted_STS 3=Sci_Subtracted_BB3 4=Diag_Corrected_STS 5=Diag_Corrected_BB3 6=Diag_Difference 7=Sci_Subtracted_BB7 8=Sci_Subtracted_Space	0	8	0	none	Type of TIS science data
HK_STAT_TIS_DATA_ACQ_TARGET *NMRD2064*	4	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	0	15	0	none	Target of TIS science data acquisition
HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET *NMR01547*	8	unsigned	0	11	1	none	Currently used BIAS voltage parameter set (0…11, 0=manual mode)
HK_STAT_TIS_DATA_ACQ_TIME *NMR00127*	48	unsigned	0	4294967295	0	s	TIS data time stamp at first acquisition (CUC format)
PAR_TIS_BIN_MODE *NMRD0566*	4	enum: 0=1x1 1=1x2 2=2x2	0	3	1	none	TIS binning mode (spatial x spectral)

		3=2x4					
PAR_TIS_WIN_SIZE *NMRD0567*	3	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	0	3	0	none	TIS window size (area on detector used for science data processing)
PAR_TIS_COMP_MODE *NMRD0568*	1	enum: 0=no compression 1=lossless	0	1	1	none	TIS compression mode
HK_STAT_TIS_COMP_VERSION *NMRD0570*	4	unsigned	0	15	1	none	TIS compression version number
HK_STAT_TIS_COMP_RICE_K_VALUE *NMRD0571*	4	unsigned	0	15	1	none	Start value used for rice encoder/decoder of TIS compression
HK_STAT_TIS_COMP_INPUT_LENGTH *NMR00531*	16	unsigned	1	19200	100	none	Length of a compression unit used for TIS compression
HK_STAT_TIS_COMP_NUM_BANDS *NMR00532*	8	unsigned	1	150	5	none	Number of sub-bands for TIS compression
HK_STAT_TIS_NUM_OVERSAMP *NMR00131*	8	unsigned	1	80	1	none	Number of oversamplings performed
HK_TEMP_BOL_CHIP *NMR00059*	16	unsigned	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled)
DAT_TIS_OFFSET_MACRO_PIXEL *NMR01835*	32	unsigned	0	4294967295	0	none	Sum of selected offset pixels outside of scene area (TIS window)
HK_TEMP_BOL_HOUSING *NMR00060*	32	signed	-40	60	20	deg C	Bolometer housing temperature
HK_TEMP_OST_BASE_PLATE *NMR00058*	32	signed	-50	70	20	deg C	Optics structure / Base Plate temperature
PAR_TIS_DATA_NOISE_REDUCTION *NMR01897*	8	unsigned	0	4	0	none	Number of bits (LSB) of TIS data pixel set to value zero in order to reduce the data noise
HK_STAT_TIS_TOTAL_PACKET_NUM *NMRD2014*	4	unsigned	1	10	4	none	Total number of TIS science data packets belonging to one acquisition
HK_STAT_TIS_CURRENT_PACKET_NUM *NMRD2015*	4	unsigned	1	10	1	none	Current number of TIS science data packet belonging to one acquisition
HK_STAT_TIS_NUM_DATA_WORDS *NMR00134*	16	unsigned	0	2030	2030	none	Number of TIS science data words stored in the current packet
DAT_TIS_SCIENCE_BLOCK *NMR00135*	16	unsigned	0	65535	0	none	TIS science data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	60000msec	all	Command to enter Science mode

Packet Name: **TM_Science_TIS_Data (YMR42066)**	Version: 13 / 28.01.2015	APID: **1004 (0x3EC)**	Service: **21/3**
Packet Description: Contains TIS science data including some status data *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
62	12	3	0	4105	21	3	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product
HK_STAT_TIS_DATA_ACQ_TYPE *NMRD2063*	4	enum: 0=Sci_Raw 1=Sci_Subtracted_Raw 2=Sci_Subtracted_STS 3=Sci_Subtracted_BB3 4=Diag_Corrected_STS 5=Diag_Corrected_BB3 6=Diag_Difference 7=Sci_Subtracted_BB7 8=Sci_Subtracted_Space	0	8	0	none	Type of TIS science data
HK_STAT_TIS_DATA_ACQ_TARGET *NMRD2064*	4	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	0	15	0	none	Target of TIS science data acquisition
HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET *NMR01547*	8	unsigned	0	11	1	none	Currently used BIAS voltage parameter set (0…11, 0=manual mode)
HK_STAT_TIS_DATA_ACQ_TIME *NMR00127*	48	unsigned	0	4294967295	0	s	TIS data time stamp at first acquisition (CUC format)
PAR_TIS_BIN_MODE *NMRD0566*	4	enum: 0=1x1 1=1x2 2=2x2	0	3	1	none	TIS binning mode (spatial x spectral)

		3=2x4					
PAR_TIS_WIN_SIZE *NMRD0567*	3	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	0	3	0	none	TIS window size (area on detector used for science data processing)
PAR_TIS_COMP_MODE *NMRD0568*	1	enum: 0=no compression 1=lossless	0	1	1	none	TIS compression mode
HK_STAT_TIS_COMP_VERSION *NMRD0570*	4	unsigned	0	15	1	none	TIS compression version number
HK_STAT_TIS_COMP_RICE_K_VALUE *NMRD0571*	4	unsigned	0	15	1	none	Start value used for rice encoder/decoder of TIS compression
HK_STAT_TIS_COMP_INPUT_LENGTH *NMR00531*	16	unsigned	1	19200	100	none	Length of a compression unit used for TIS compression
HK_STAT_TIS_COMP_NUM_BANDS *NMR00532*	8	unsigned	1	150	5	none	Number of sub-bands for TIS compression
HK_STAT_TIS_NUM_OVERSAMP *NMR00131*	8	unsigned	1	80	1	none	Number of oversamplings performed
HK_TEMP_BOL_CHIP *NMR00059*	16	unsigned	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled)
DAT_TIS_OFFSET_MACRO_PIXEL *NMR01835*	32	unsigned	0	4294967295	0	none	Sum of selected offset pixels outside of scene area (TIS window)
HK_TEMP_BOL_HOUSING *NMR00060*	32	signed	-40	60	20	deg C	Bolometer housing temperature
HK_TEMP_OST_BASE_PLATE *NMR00058*	32	signed	-50	70	20	deg C	Optics structure / Base Plate temperature
PAR_TIS_DATA_NOISE_REDUCTION *NMR01897*	8	unsigned	0	4	0	none	Number of bits (LSB) of TIS data pixel set to value zero in order to reduce the data noise
HK_STAT_TIS_TOTAL_PACKET_NUM *NMRD2014*	4	unsigned	1	10	4	none	Total number of TIS science data packets belonging to one acquisition
HK_STAT_TIS_CURRENT_PACKET_NUM *NMRD2015*	4	unsigned	1	10	1	none	Current number of TIS science data packet belonging to one acquisition
HK_STAT_TIS_NUM_DATA_WORDS *NMR00134*	16	unsigned	0	2030	2030	none	Number of TIS science data words stored in the current packet
DAT_TIS_SCIENCE_BLOCK *NMR00135*	16	unsigned	0	65535	0	none	TIS science data block

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	300msec	5=Science_High_Res2	Command to enter Science mode
TC_Science_Enable	1	800msec	6=Science_High_Res3	Command to enter Science mode
TC_Science_Enable	1	800msec	9=Science_Med_Res3	Command to enter Science mode
TC_Science_Enable	1	300msec	11=Science_Low_Res2	Command to enter Science mode
TC_Science_Enable	1	800msec	12=Science_Low_Res3	Command to enter Science mode

TC_Science_Enable	0	800msec	13=Science_TIR_Only	Command to enter Science mode
TC_Science_Enable	1	100msec	4=Science_High_Res1	Command to enter Science mode
TC_Science_Enable	1	100msec	7=Science_Med_Res1	Command to enter Science mode
TC_Science_Enable	1	300msec	8=Science_Med_Res2	Command to enter Science mode
TC_Science_Enable	1	100msec	10=Science_Low_Res1	Command to enter Science mode
TC_Science_Enable	10	800msec	29=FullWin_UnCompr	Command to enter Science mode
TC_Science_Enable	4	100msec	23=Science_Raw	Command to enter Science mode
TC_Science_Enable	5	800msec	30=FullWin_Compr	Command to enter Science mode

Packet Name: **TM_Science_TIR_Data_QuickLook (YMR42069)**	Version: 11 / 28.01.2015	APID: **1020 (0x3FC)**	Service: **21/129**
Packet Description: Contains TIR science data including some status data for QuickLook *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
63	12	3	0	183	21	129	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product
HK_STAT_TIR_DATA_ACQ_TYPE *NMR00137*	8	enum: 0=Sci_Raw 1=Diag_BB3_Mean 2=Diag_BB7_Subtracted_BB3_Mean	0	2	0	none	Type of TIR science data
HK_STAT_TIR_DATA_ACQ_TARGET *NMR00138*	8	enum: 0=Planet 1=Space 2=N/A 3=BB7 4=BB3	0	4	0	none	Target of TIR science data acquisition
HK_STAT_TIR_DATA_ACQ_TIME *NMR02131*	48	unsigned	0	4294967295	0	s	TIR data time stamp at first acquisition (CUC format)
HK_STAT_TIR_NUM_OVERSAMP *NMR00139*	16	unsigned	0	65535	1	none	Number of oversamplings performed
DAT_TIR_SCIENCE_BLOCK_CHA *NMR00140...NMR00154*	32	unsigned	0	4294967295	0	none	TIR science data block channel A
HK_TEMP_RAD_CHA *NMR00155*	32	unsigned	0	4294967295	0	none	Radiometer temperature obtained by science data acquisition channel A
DAT_TIR_SCIENCE_BLOCK_CHB *NMR00156...NMR00170*	32	unsigned	0	4294967295	0	none	TIR science data block channel B
HK_TEMP_RAD_CHB *NMR00171*	32	unsigned	0	4294967295	0	none	Radiometer temperature obtained by science data acquisition channel B
HK_STAT_TIR_DAT_OUT_OF_RANGE_CHA *NMR00172*	16	unsigned	0	65535	0	none	TIR data channel A out of range 0x00000000 … 0xFFFFFFFF, Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_STAT_TIR_DAT_PROC_ERROR_CHA *NMR00173*	16	unsigned	0	1	0	none	TIR data channel A processing error (less data used for oversampling), Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_STAT_TIR_DAT_OUT_OF_RANGE_CHB *NMR00174*	16	unsigned	0	65535	0	none	TIR data channel B out of range 0x00000000 … 0xFFFFFFFF, Bit0…Bit15=Pix1…Pix16, 0=no/1=yes

HK_STAT_TIR_DAT_PROC_ERROR_CHB *NMR00175*	16	unsigned	0	1	0	none	TIR data channel B processing error (less data used for oversampling), Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_TEMP_BB3_RAW *NMR02045*	32	unsigned	0	4294967295	0	DN	BB300 temperature sensor raw value
HK_TEMP_BB3_REF_RAW *NMR02046*	32	unsigned	0	4294967295	0	DN	BB300 reference temperature sensor raw value
HK_TEMP_BB3_OFFSET_RAW *NMR02047*	32	unsigned	0	4294967295	0	DN	BB300 temperature sensor offset raw value
HK_TEMP_BB3_REF_OFFSET_RAW *NMR02048*	32	unsigned	0	4294967295	0	DN	BB300 reference temperature sensor offset raw value
HK_TEMP_STS *NMR00061*	32	signed	-50	80	20	deg C	Shutter temperature
HK_TEMP_OST_BASE_PLATE *NMR00058*	32	signed	-50	70	20	deg C	Optics structure / Base Plate temperature

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	60000msec	all	Command to enter Science mode

Packet Name: **TM_Science_TIR_Data (YMR42068)**	Version: 10 / 28.01.2015	APID: **1004 (0x3EC)**	Service: **21/129**
Packet Description: Contains TIR science data including some status data			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
62	12	3	0	183	21	129	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product
HK_STAT_TIR_DATA_ACQ_TYPE *NMR00137*	8	enum: 0=Sci_Raw 1=Diag_BB3_Mean 2=Diag_BB7_Subtracted_BB3_Mean	0	2	0	none	Type of TIR science data
HK_STAT_TIR_DATA_ACQ_TARGET *NMR00138*	8	enum: 0=Planet 1=Space 2=N/A 3=BB7 4=BB3	0	4	0	none	Target of TIR science data acquisition
HK_STAT_TIR_DATA_ACQ_TIME *NMR02131*	48	unsigned	0	4294967295	0	s	TIR data time stamp at first acquisition (CUC format)
HK_STAT_TIR_NUM_OVERSAMP *NMR00139*	16	unsigned	0	65535	1	none	Number of oversamplings performed
DAT_TIR_SCIENCE_BLOCK_CHA *NMR00140...NMR00154*	32	unsigned	0	4294967295	0	DN	TIR science data block channel A
HK_TEMP_RAD_CHA *NMR00155*	32	unsigned	0	4294967295	0	DN	Radiometer temperature obtained by science data acquisition channel A
DAT_TIR_SCIENCE_BLOCK_CHB *NMR00156...NMR00170*	32	unsigned	0	4294967295	0	DN	TIR science data block channel B
HK_TEMP_RAD_CHB *NMR00171*	32	unsigned	0	4294967295	0	DN	Radiometer temperature obtained by science data acquisition channel B
HK_STAT_TIR_DAT_OUT_OF_RANGE_CHA *NMR00172*	16	unsigned	0	65535	0	none	TIR data channel A out of range 0x00000000 … 0xFFFFFFFF, Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_STAT_TIR_DAT_PROC_ERROR_CHA *NMR00173*	16	unsigned	0	1	0	none	TIR data channel A processing error (less data used for oversampling), Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_STAT_TIR_DAT_OUT_OF_RANGE_CHB *NMR00174*	16	unsigned	0	65535	0	none	TIR data channel B out of range 0x00000000 … 0xFFFFFFFF, Bit0…Bit15=Pix1…Pix16, 0=no/1=yes

HK_STAT_TIR_DAT_PROC_ERROR_CHB *NMR00175*	16	unsigned	0	1	0	none	TIR data channel B processing error (less data used for oversampling), Bit0…Bit15=Pix1…Pix16, 0=no/1=yes
HK_TEMP_BB3_RAW *NMR02045*	32	unsigned	0	4294967295	0	DN	BB300 temperature sensor raw value
HK_TEMP_BB3_REF_RAW *NMR02046*	32	unsigned	0	4294967295	0	DN	BB300 reference temperature sensor raw value
HK_TEMP_BB3_OFFSET_RAW *NMR02047*	32	unsigned	0	4294967295	0	DN	BB300 temperature sensor offset raw value
HK_TEMP_BB3_REF_OFFSET_RAW *NMR02048*	32	unsigned	0	4294967295	0	DN	BB300 reference temperature sensor offset raw value
HK_TEMP_STS *NMR00061*	32	signed	-50	80	20	deg C	Shutter temperature
HK_TEMP_OST_BASE_PLATE *NMR00058*	32	signed	-50	70	20	deg C	Optics structure / Base Plate temperature

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	800msec	4=Science_High_Res1	Command to enter Science mode
TC_Science_Enable	1	2400msec	5=Science_High_Res2	Command to enter Science mode
TC_Science_Enable	1	6400msec	6=Science_High_Res3	Command to enter Science mode
TC_Science_Enable	1	800msec	7=Science_Med_Res1	Command to enter Science mode
TC_Science_Enable	1	2400msec	8=Science_Med_Res2	Command to enter Science mode
TC_Science_Enable	1	6400msec	9=Science_Med_Res3	Command to enter Science mode
TC_Science_Enable	1	800msec	10=Science_Low_Res1	Command to enter Science mode
TC_Science_Enable	1	2400msec	11=Science_Low_Res2	Command to enter Science mode
TC_Science_Enable	1	6400msec	12=Science_Low_Res3	Command to enter Science mode
TC_Science_Enable	1	800msec	13=Science_TIR_Only	Command to enter Science mode
TC_Science_Enable	1	800msec	23=Science_Raw	Command to enter Science mode
TC_Science_Enable	1	800msec	29=FullWin_UnCompr	Command to enter Science mode
TC_Science_Enable	1	800msec	30=FullWin_Compr	Command to enter Science mode

Packet Name: **TM_EEPROM_Status (YMR42072)**	Version: 6 / 10.12.2012	APID: **979 (0x3D3)**	Service: **180/2**
Packet Description: Contains an EEPROM configuration status report			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	535	180	2	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_EXE1_VERSION_STRING *NMR00178*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE1
HK_STAT_EXE1_START_ADDRESS *NMR00179*	32	unsigned	0	4294967295	0	none	End address of executable 1 in EEPROM
HK_STAT_EXE1_END_ADDRESS *NMR00180*	32	unsigned	0	4294967295	0	none	Start address of executable 1 in EEPROM
HK_STAT_EXE2_VERSION_STRING *NMR00181*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE2
HK_STAT_EXE2_START_ADDRESS *NMR00182*	32	unsigned	0	4294967295	0	none	End address of executable 2 in EEPROM
HK_STAT_EXE2_END_ADDRESS *NMR00183*	32	unsigned	0	4294967295	0	none	Start address of executable 2 in EEPROM
HK_STAT_EXE3_VERSION_STRING *NMR00184*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE3
HK_STAT_EXE3_START_ADDRESS *NMR00185*	32	unsigned	0	4294967295	0	none	End address of executable 3 in EEPROM
HK_STAT_EXE3_END_ADDRESS *NMR00186*	32	unsigned	0	4294967295	0	none	Start address of executable 3 in EEPROM
HK_STAT_EXE4_VERSION_STRING *NMR00187*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE4
HK_STAT_EXE4_START_ADDRESS *NMR00188*	32	unsigned	0	4294967295	0	none	End address of executable 4 in EEPROM
HK_STAT_EXE4_END_ADDRESS *NMR00189*	32	unsigned	0	4294967295	0	none	Start address of executable 4 in EEPROM
HK_STAT_EXE5_VERSION_STRING *NMR00190*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE5
HK_STAT_EXE5_START_ADDRESS *NMR00191*	32	unsigned	0	4294967295	0	none	End address of executable 5 in EEPROM
HK_STAT_EXE5_END_ADDRESS *NMR00192*	32	unsigned	0	4294967295	0	none	Start address of executable 5 in EEPROM
HK_STAT_EXE6_VERSION_STRING *NMR00193*	8	string	0	255	0	none	Version string of an APS executable (32 Characters) EXE6
HK_STAT_EXE6_START_ADDRESS	32	unsigned	0	42949	0	non	End address of executable 6 in EEPROM

NMR00194				67295		e	
HK_STAT_EXE6_END_ADDRESS *NMR00195*	32	unsigned	0	42949 67295	0	non e	Start address of executable 6 in EEPROM
HK_STAT_CONFIG1_VERSION_STRING *NMR00196*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG1
HK_STAT_CONFIG1_START_ADDRESS *NMR00197*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG1 file in EEPROM
HK_STAT_CONFIG1_END_ADDRESS *NMR00198*	32	unsigned	0	42949 67295	0	non e	End address of configuration file in EEPROM
HK_STAT_CONFIG2_VERSION_STRING *NMR00199*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG2
HK_STAT_CONFIG2_START_ADDRESS *NMR00200*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG2 file in EEPROM
HK_STAT_CONFIG2_END_ADDRESS *NMR00201*	32	unsigned	0	42949 67295	0	non e	End address of configuration CONFIG2 file in EEPROM
HK_STAT_CONFIG3_VERSION_STRING *NMR00202*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG3
HK_STAT_CONFIG3_START_ADDRESS *NMR00203*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG3 file in EEPROM
HK_STAT_CONFIG3_END_ADDRESS *NMR00204*	32	unsigned	0	42949 67295	0	non e	End address of configuration CONFIG3 file in EEPROM
HK_STAT_CONFIG4_VERSION_STRING *NMR00205*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG4
HK_STAT_CONFIG4_START_ADDRESS *NMR00206*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG4 file in EEPROM
HK_STAT_CONFIG4_END_ADDRESS *NMR00207*	32	unsigned	0	42949 67295	0	non e	End address of configuration CONFIG4 file in EEPROM
HK_STAT_CONFIG5_VERSION_STRING *NMR00208*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG5
HK_STAT_CONFIG5_START_ADDRESS *NMR00209*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG5 file in EEPROM
HK_STAT_CONFIG5_END_ADDRESS *NMR00210*	32	unsigned	0	42949 67295	0	non e	End address of configuration CONFIG5 file in EEPROM
HK_STAT_CONFIG6_VERSION_STRING *NMR00211*	8	string	0	255	0	non e	Version string of an instrument configuration file (32 Characters) CONFIG6
HK_STAT_CONFIG6_START_ADDRESS *NMR00212*	32	unsigned	0	42949 67295	0	non e	Start address of configuration CONFIG6 file in EEPROM
HK_STAT_CONFIG6_END_ADDRESS *NMR00213*	32	unsigned	0	42949 67295	0	non e	End address of configuration CONFIG6 file in EEPROM
HK_STAT_CONFIG_PBS_VERSION_STRING *NMR00214*	8	string	0	255	0	non e	Version string of an PBS configuration file (32 Characters)
HK_STAT_CONFIG_PBS_START_ADDRESS *NMR00215*	32	unsigned	0	42949 67295	0	non e	Start address of PBS configuration file in EEPROM
HK_STAT_CONFIG_PBS_END_ADDRESS *NMR00216*	32	unsigned	0	42949 67295	0	non e	End address of PBS configuration file in EEPROM

PAR_BOOT_EXE *NMR00217*	16	enum: 0=Not_selected 1=EXE_EEPROM1 2=EXE_EEPROM2 3=EXE_EEPROM3 4=EXE_EEPROM4 5=EXE_EEPROM5 6=EXE_EEPROM6	0	6	0	none	MAPS executable to be booted after MERTIS power-on
PAR_START_MODE *NMR00218*	16	enum: 0=Not_selected 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 25=Diagnostic 29=FullWin_UnCompr	0	29	0	none	Start mode after powering-on MERTIS (nominal case)
PAR_BOOT_CONFIG *NMR00074*	16	enum: 0=Not_selected 1=CFG_EEPROM1 2=CFG_EEPROM2 3=CFG_EEPROM3 4=CFG_EEPROM4 5=CFG_EEPROM5 6=CFG_EEPROM6	0	6	0	none	MERTIS configuration (TC/TM and property parameter) which is used after boot of PBS/APS

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_EEPROM_Status	1	--	all	Command request for generating EEPROM status report

Packet Name: **TM_Operation_Parameter (YMR42073)**	Version: 10 / 27.06.2014	APID: **979 (0x3D3)**	Service: **180/6**
Packet Description: Contains the MERTIS Operation Parameter			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	25	180	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_REPETITION_RATE *NMR00219*	16	enum: 1=100msec 2=300msec 3=800msec 4=2000msec 5=10000msec	1	5	1	none	Repetition rate of science data acquisition (Spectrometer and Radiometer data and HKs)
PAR_CALIBRATION_PERIOD *NMR00220*	16	unsigned	20	500	120	s	Calibration period acquiring data from the 3 calibration targets (BB3, BB7 and SpaceView)
PAR_CALIBRATION_CYCLE_INVERT *NMR00719*	8	enum: 0=no 1=yes	0	1	0	none	Inverts the calibration cycle timing, times for observation and calibration exchanged
PAR_STS_POWER *NMRD0573*	1	enum: 0=off 1=on	0	1	0	none	Power on/off
PAR_SHH_POWER *NMRD0574*	1	enum: 0=off 1=on	0	1	0	none	Power on/off
PAR_UNUSED_POWER *NMRD0720*	1	enum: 0=off	0	0	0	none	Not used power switch (off only)
PAR_BB7_POWER *NMRD0576*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TIS_POWER *NMRD0577*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TIR_POWER *NMRD0578*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_TEC_POWER *NMRD0579*	1	enum: 0=off 1=on	0	1	1	none	Power on/off
PAR_POI_POWER *NMRD0580*	1	enum: 0=off 1=on	0	1	1	none	Power on/off

PAR_TIS_BCK_RATE *NMR00533*	8	unsigned	1	20	1	acq u	TIS background rate (background acquisition every TIS_BCK_RATE with STS closed)
PAR_POI_MODE *NMR00534*	8	enum: 0=Off 1=Move 2=PlanetView 3=BB3View 4=BB7View 5=SpaceView	0	5	1	non e	Pointing Unit operating mode
PAR_TIS_BIN_MODE *NMRD0566*	4	enum: 0=1x1 1=1x2 2=2x2 3=2x4	0	3	1	non e	TIS binning mode (spatial x spectral)
PAR_TIS_WIN_SIZE *NMRD0567*	3	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	0	3	0	non e	TIS window size (area on detector used for science data processing)
PAR_TIS_COMP_MODE *NMRD0568*	1	enum: 0=no compression 1=lossless	0	1	1	non e	TIS compression mode
PAR_TIR_REPETITION_FACTOR *NMR01892*	8	unsigned	1	16	8	non e	Factor of TIR data repetition rate related to the TIS data repetition rate (TIR-Rate = TIS-Rate * PAR_TIR_REPETITION_FACTOR)
PAR_SHH_TEMP *NMR00234*	16	signed	-50	50	10	deg C	Minimum sensor head and optics temperature for operation
PAR_TIS_SCIENCE_QUICKLOOK_PERIOD *NMR00235*	16	unsigned	1	255	60	s	Parameter defines the period for generating TIS science data quicklook TM packets (PID=63)
PAR_TIR_SCIENCE_QUICKLOOK_PERIOD *NMR00236*	16	unsigned	1	255	60	s	Parameter defines the period for generating TIR science data quicklook TM packets (PID=63)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Science_Enable	1	--	4=Science_High_Res1	
TC_Science_Enable	1	--	5=Science_High_Res2	
TC_Science_Enable	1	--	6=Science_High_Res3	
TC_Science_Enable	1	--	7=Science_Med_Res1	
TC_Science_Enable	1	--	8=Science_Med_Res2	
TC_Science_Enable	1	--	9=Science_Med_Res3	
TC_Science_Enable	1	--	10=Science_Low_Res1	
TC_Science_Enable	1	--	11=Science_Low_Res2	
TC_Science_Enable	1	--	12=Science_Low_Res3	
TC_Science_Enable	1	--	13=Science_TIR_Only	

TC_Science_Enable	1	--	14=Calibration	
TC_Parameter_Dump	1	--	all	Command request sending of TM packet

Packet Name: **TM_FunctionConfig_Parameter (YMR42074)**	Version: 11 / 27.06.2014	APID: **979 (0x3D3)**	Service: **180/7**
Packet Description: Contains the MERTIS Function Configuration Parameter			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	27	180	7	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_TIS_BOL_CHIP_TEMP *NMR00238*	16	signed	5	40	30	deg C	BOL chip temperature to be adjusted by TEC
PAR_TIS_DATA_PROC_MODE *NMR01893*	8	enum: 0=Nominal 1=NoBackgroundSubtraction 2=STSBackgroundSubtraction 3=BB3BackgroundSubtraction	0	3	0	none	Parameter changes the TIS data processing
PAR_POI_MOVE_MODE *NMR01894*	8	enum: 0=without_PosSensors 1=with_PosSensors	0	1	1	none	ClosedLoop: controlled by ICU/FPGA (POI module), OpenLoop: controlled by MAPS
PAR_POI_EPA_POWERING_TIME *NMR00241*	16	unsigned	100	7000	100	ms	Time for powering the EPA (for burning the wire of release mechanism)
PAR_BEL_PIXEL_CLOCK_MODE *NMRD2001*	5	enum: 1=Nominal frequency 2=Low frequency 3=High frequency	1	3	1	none	Parameter defines the pixel clock mode for the bolemeter electronics (BEL)
PAR_BOL_BIAS_VOLT_SETTING_MODE *NMRD0721*	1	enum: 0=manual 1=automatic	0	1	1	none	Defines BIAS voltage setting mode (auto/manual)
PAR_TIR_OVERSAMP_MODE *NMRD0615*	1	enum: 0=no 1=yes	0	1	1	none	Oversampling mode yes/no
PAR_TIS_OVERSAMP_MODE *NMRD0616*	1	enum: 0=no 1=yes	0	1	1	none	TIS Oversampling mode yes/no
PAR_BOL_DECT_FIDBIAS_VOLTAGE *NMR00256*	16	unsigned	1,5	5	3,5	V	Bolometer Detector FID BIAS voltage
PAR_BOL_DECT_VSKIMBIAS_VOLTAGE *NMR00257*	16	unsigned	3	5,5	5,342	V	Bolometer Detector VSKIMMING BIAS voltage
PAR_TIS_DATA_NOISE_REDUCTION *NMR01897*	8	unsigned	0	4	0	none	Number of bits (LSB) of TIS data pixel set to value zero in order to reduce the data noise

PAR_POI_COIL_MODE *NMR00258*	8	enum: 0=Coil1+2 1=Coil3+4 2=Coil2+3 3=Coil1+4 4=Coil1+2+3+4	0	4	0	none	POI motor coil mode, defines usage of different motor coils
PAR_TIS_WIN0_POS_SPAT *NMR00407*	8	unsigned	0	159	30	pix	Spatial pixel position of TIS window 0 (100x80, 0…159)
PAR_TIS_WIN1_POS_SPAT *NMR00408*	8	unsigned	0	159	47	pix	Spatial pixel position of TIS reduced window 1 (66x80, 0…159)
PAR_TIS_WIN2_POS_SPAT *NMR00409*	8	unsigned	0	159	43	pix	Spatial pixel position of TIS reduced window 2 (74x80, 0…159)
PAR_TIS_WIN_POS_SPECT_7UM *NMR00410*	8	unsigned	0	119	13	pix	Spectra pixel position of TIS windows 0…2 (0…119) related to spectrum 7µm

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Parameter_Dump	1	--	all	Command request sending of TM packet
TC_Science_Enable	1	--	4=Science_High_Res1	
TC_Science_Enable	1	--	5=Science_High_Res2	
TC_Science_Enable	1	--	6=Science_High_Res3	
TC_Science_Enable	1	--	7=Science_Med_Res1	
TC_Science_Enable	1	--	8=Science_Med_Res2	
TC_Science_Enable	1	--	9=Science_Med_Res3	
TC_Science_Enable	1	--	10=Science_Low_Res1	
TC_Science_Enable	1	--	11=Science_Low_Res2	
TC_Science_Enable	1	--	12=Science_Low_Res3	
TC_Science_Enable	1	--	13=Science_TIR_Only	
TC_Science_Enable	1	--	14=Calibration	

Packet Name: **TM_HK_Configuration_Status (YMR42075)**	Version: 4 / 25.11.2010	APID: **979 (0x3D3)**	Service: **180/9**
Packet Description: Contains the configuration status of cyclic HK generation			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	15	180	9	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_ENABLE_SID1 *NMRD0620*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enable/Disable status HK generation SID1
HK_STAT_ENABLE_SID2 *NMRD0621*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enable/Disable status HK generation SID2
HK_STAT_PERIOD_SID1 *NMR00263*	16	unsigned	125	600000	10000	ms	Period of HK generation SID1
HK_STAT_PERIOD_SID2 *NMR00264*	16	unsigned	125	600000	10000	ms	Period of HK generation SID2

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_HK_Configuration_Status	1	--	all	Command cause sending of this TM packet

Packet Name: **TM_Diagnostic_Parameter (YMR42122)**	Version: 5 / 05.05.2015	APID: **979 (0x3D3)**	Service: **180/13**
Packet Description: Contains the MERTIS Diagnostic Parameter			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	13	180	13	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_DIAG_STEP_ENABLE_TIS_COMP *NMRD2493*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step TIS_COMP
PAR_DIAG_STEP_ENABLE_SHH *NMRD2604*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step SHH
PAR_DIAG_STEP_ENABLE_ANALOG_HK *NMRD0725*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step ANALOG_HK
PAR_DIAG_STEP_ENABLE_POI_SENSOR *NMRD2121*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step POI_SENSOR
PAR_DIAG_STEP_ENABLE_POI_ACCURACY *NMRD2605*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step POI_ACCURACY
PAR_DIAG_STEP_ENABLE_BOL_BEL *NMRD2122*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step BOL_BEL
PAR_DIAG_STEP_ENABLE_BOL_WINDOW *NMRD2123*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step BOL_WINDOW
PAR_DIAG_STEP_ENABLE_TEC_CONTROL *NMRD2124*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step TEC_CONTROL
PAR_DIAG_STEP_ENABLE_STS_MOVE *NMRD2126*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step STS_MOVE
PAR_DIAG_STEP_ENABLE_RAD_REL *NMRD2127*	1	enum: 0=disabled 1=enabled	0	1	1	none	Enables or disables diagnose step RAD_REL
PAR_DIAG_STEP_ENABLE_11 *NMRD0734*	1	enum: 0=disabled 1=enabled	0	1	0	none	Enables or disables diagnose step 11
PAR_DIAG_STEP_ENABLE_12	1	enum:	0	1	0	non	Enables or disables diagnose step 12

NMRD0735		0=disabled 1=enabled				e	
PAR_DIAG_STEP_ENABLE_13 *NMRD0736*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 13
PAR_DIAG_STEP_ENABLE_14 *NMRD0737*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 14
PAR_DIAG_STEP_ENABLE_15 *NMRD0738*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 15
PAR_DIAG_STEP_ENABLE_16 *NMRD0739*	1	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose step 16
PAR_DIAG_DEBUG_ENABLE *NMR00740*	16	enum: 0=disabled 1=enabled	0	1	0	non e	Enables or disables diagnose debug mode (raw image/hk data sent)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Parameter_Dump	1	--	all	Request for dumping the calibration parameter

Packet Name: **TM_Calibration_Parameter (YMR42079)**	Version: 2 / 17.11.2014	APID: **979 (0x3D3)**	Service: **180/14**
Packet Description: Contains the MERTIS Calibration Parameter			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	3	3	0	19	180	14	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
PAR_CAL_SEQU_NUMBER *NMR02190*	16	unsigned	0	3	0	none	Calibration sequence number to be executed
PAR_CAL_SEQU_NUM_CYCLES *NMR02191*	16	unsigned	1	65535	1	none	Number of repetions of selected calibration sequence
PAR_CAL_SEQU_CYCLE_DELAY *NMR02192*	16	unsigned	0	65535	0	ms	Delay (msec) between repetions of selected calibration sequence
PAR_CAL_SEQU_START_MODE *NMR02193*	16	enum: 0=CAL_SEQU_START_STABLE 1=CAL_SEQU_START_TIME	0	1	0	none	Start mode of selected calibration sequence
PAR_CAL_SEQU_START_TIMEOUT *NMR02194*	16	unsigned	0	65535	60	s	Timeout (sec) or delay (depends on PAR_CAL_SEQU_START_MODE) before starting of selected calibration sequence

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Parameter_Dump	1	--	all	Request for dumping the calibration parameter

Packet Name: **TM_TestLog(TECInternalData) (YMR42080)**	Version: 2 / 24.05.2012	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains TEC internal status data			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	29	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 1=TEC internal status data	1	1	1	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_TEC_TEMP_RAW *NMR00269*	32	float	-30	60	20	deg C	Contain the raw value of the TEC temperature
HK_STAT_TEC_TEMP_AVR *NMR00270*	32	float	-30	60	20	deg C	Contain the average value of the TEC temperature
HK_STAT_TEC_TEMP_RAW_DN *NMR00271*	32	unsigned	0	4294967295	0	none	Contain the raw DN-value of the TEC temperature
HK_STAT_TEC_Y_PWM *NMR00272*	16	signed	-32768	32767	0	none	Contain the DN-value of the current PWM-value
HK_STAT_TEC_ERROR *NMR00273*	32	signed	-2147483648	2147483647	0	none	Contain the DN-value of the TEC error

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(TECDataMeasurement)	1	200msec	26=Test	Test function number 16 (TECDataMeasurement)

Packet Name: **TM_TestLog(HKRegisterData) (YMR42081)**	Version: 2 / 28.04.2010	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Packet contains HK register raw values			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	4103	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 2=HK register raw values	2	2	2	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
PAR_REG_ADDRESS_MSW *NMR00274*	16	unsigned	0	65535	0	none	MSW of a register address
PAR_REG_ADDRESS_LSW *NMR00275*	16	unsigned	0	65535	0	none	LSW of a register address
PAR_REG_SAMPLE_RATE *NMR00276*	16	unsigned	0	65535	100	ms	Contains the sample rate of the HK register
HK_STAT_REG_SAMPLE_NUM *NMR00277*	16	unsigned	1	1021	1021	none	Contains the number of samples of the HK register in this packet
HK_STAT_REG_SAMPLE_DATA *NMR00278*	32	unsigned	0	4294967295	0	none	Contains the sample data block of the HK register

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(RegisterSampling)	1	200msec	26=Test	Test function number 17 (RegisterSampling)

Packet Name: **TM_TestLog(RADRawData) (YMR42082)**	Version: 3 / 08.02.2012	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Packet contains RAD raw data			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	4103	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 3=RAD raw data	3	3	3	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
PAR_TIR_NUM_OVERSAMP *NMR00279*	16	unsigned	0	1000	1	samp	Number of TIR oversamplings to be performed for data acquisition
HK_STAT_RAD_FIFO_NUM_VALUES *NMR00280*	16	unsigned	0	1022	1022	none	Number of RAD pixels (32bit) stored in this packet
HK_STAT_RAD_FIFO_VALUES *NMR00281*	32	unsigned	0	4294967295	0	none	RAD raw data values read from FIFO (Array of 32 values)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(DataAcquisitionStart)	1	200msec	26=Test	Test function number 4 (DataAcquisitionStart)

Packet Name: **TM_TestLog(DIAG STS_MOVE) (YMR42083)**	Version: 4 / 22.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Packet contains STS analog data (voltage/current) acquired during Diagnose step STS_MOVE			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	481	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 4=STS analog values	4	4	4	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_STS_ANA_SAMPLE_RATE *NMR00313*	16	unsigned	1	500	10	ms	Sample rate for measuring STS voltages and currents
HK_STAT_STS_ANA_NUM_SAMPLES *NMR00741*	16	unsigned	1	112	112	samp	Number of samples stored in this packet
HK_STAT_STS_ANA_POSITIONS *NMR00860...NMR00971*	16	unsigned	0	20	0,8	mm	STS analog positions of shutter
HK_STAT_STS_ANA_CURRENTS *NMR00972...NMR01083*	16	unsigned	0	1000	200	mA	STS analog currents
HK_STAT_STS_DIG_OPEN_CLOSE *NMRD1831...NMRD1955*	1	enum: 0=open 1=closed	0	1	0	none	Shutter status digital (open/closed)
HK_STAT_STS_ANA_POSITIONS_MEAN *NMR01321*	16	unsigned	0	20	0,8	mm	STS analog positions mean value of shutter
HK_STAT_STS_ANA_CURRENTS_MEAN *NMR01322*	16	unsigned	0	1000	200	mA	STS analog currents mean value

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DebugMessage) (YMR42084)**	Version: 1 / 06.03.2014	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains a debug message (string)			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	4105	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 5=Debug message	5	5	5	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DEBUG_MESSAGE_LENGTH *NMR00374*	16	unsigned	0	4092	1	none	Length in characters of the debug message string
HK_STAT_DEBUG_MESSAGE *NMR00375*	8	string	0	255	0	none	Debug message string

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(DebugOnOff)	1	--	all	Test function number 18 (DebugMessageOnOff)

Packet Name: **TM_TestLog(DIAG ANALOG_HK) (YMR42123)**	Version: 3 / 22.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains analog HK values acquired in Diagnostic debug mode during step ANALOG_HK Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	87	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 6=DIAG ANALOG_HK	6	6	6	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_TEMP_PSU_F *NMR02417*	32	float	-30	85	20	deg C	Power supply temperature (float)
HK_TEMP_ICU_F *NMR02418*	32	float	-30	80	20	deg C	ICU temperature (float)
HK_TEMP_POI_MOTOR_F *NMR02419*	32	float	-50	110	20	deg C	POI motor temperature (float)
HK_TEMP_POI_MIRROR_F *NMR02420*	32	float	-40	100	20	deg C	POI mirror temperature (float)
HK_TEMP_BB3_F *NMR02421*	32	float	-40	60	26,85	deg C	BB300 temperature sensor (float)
HK_TEMP_BB7_F *NMR02422*	32	float	327	527	426,75	deg C	BB700 temperature sensor emitter electronics (float)
HK_VOLT_REF_DELTA_SINGLE_ENDED_F *NMR02423*	32	float	-5000	5000	0	mV	Reference HK channel delta voltage (used for single-ended HK channels), measured against the expected value for a 1000Ohm resistor (float)
HK_TEMP_RBA_FRONT_F *NMR02424*	32	float	-50	300	25	deg C	Baffle front temperature (float)
HK_TEMP_RBA_BACK_F *NMR02425*	32	float	-40	70	20	deg C	Baffle back temperature (float)
HK_TEMP_EOP_IR_FILTER_F *NMR02426*	32	float	-40	60	20	deg C	Entrance optics IR-Window temperature (float)
HK_TEMP_EOP_TMA_F *NMR02427*	32	float	-50	70	20	deg C	Entrance Optics/TMA temperature (float)
HK_TEMP_STS_F *NMR02428*	32	float	-50	80	20	deg C	Shutter temperature (float)
HK_TEMP_SOP_GRATING_F *NMR02429*	32	float	-40	60	20	deg C	Spectrometer Optics grating temperature (float)
HK_TEMP_OST_BASE_PLATE_F *NMR02430*	32	float	-50	70	20	deg C	Optics structure / Base Plate temperature (float)
HK_TEMP_SOP_M1_F *NMR02431*	32	float	-40	60	20	deg C	Spectrometer Optics / mirror M1 temperature (float)

HK_TEMP_BOL_CHIP_F *NMR02432*	32	float	-10	55	20	deg C	Current Bolometer chip temperature (TEC controlled) (float)
HK_TEMP_BOL_HOUSING_F *NMR02433*	32	float	-40	60	20	deg C	Bolometer housing temperature (float)
HK_VOLT_PSU_P34_F *NMR02434*	32	float	3000	3600	3300	mV	PSU +3.4V supply digital voltage (float)
HK_VOLT_PSU_P72_F *NMR02435*	32	float	6000	7000	6500	mV	PSU +7.2V supply analog voltage (float)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	25=Diagnostic	Request command for enabling Diagnostic mode

Packet Name: **TM_TestLog(PropertyParamDef) (YMR42124)**	Version: 1 / 06.03.2014	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains the definition of a property parameter read from configuration file in RAM *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	4105	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 7=Property parameter	7	7	7	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_PROP_PARAM_LENGTH *NMR00858*	16	unsigned	0	4092	1	none	Length in characters of the property parameter definition string
HK_STAT_PROP_PARAM *NMR00859*	8	string	0	255	0	none	Property parameter definition string with format: ItemName;CompName;ParPurpose;UsageArea;Min;Max;Default;Unit;DispMode;ItemType;LSB;Offset;Description

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Test_Function(GetPropertyParam)	1	--	26=Test	Request command for reading one property parameter definition
TC_Test_Function(GetPropertyParamAll)	1	--	26=Test	Request command for reading ALL property parameter definitions

Packet Name: **TM_TestLog(DIAG POI_SENSOR) (YMR42140)**	Version: 1 / 22.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step POI_SENSOR			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	15	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 8=DIAG POI_SENSOR	8	8	8	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
PAR_DIAG_POISENS_SENSOR1_EXPECTED *NMRD2496*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR1
PAR_DIAG_POISENS_SENSOR2_EXPECTED *NMRD2497*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR2
PAR_DIAG_POISENS_SENSOR3_EXPECTED *NMRD2498*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR3
HK_STAT_DIAG_POISENS_SENSOR1 *NMRD2499*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR1
HK_STAT_DIAG_POISENS_SENSOR2 *NMRD2500*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR2
HK_STAT_DIAG_POISENS_SENSOR3 *NMRD2501*	1	enum: 0=no 1=yes	0	1	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR3
HK_STAT_DIAG_POISENS_STEP_COUNTER *NMR02828*	16	unsigned	0	3000	0	none	Diagnose parameter TestCase 4 "POI_SENSOR": POI motor step counter number

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DIAG POI_ACCURACY) (YMR42141)**	Version: 1 / 22.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step POI_ACCURACY *Back to List ...*			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	25	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 9=DIAG POI_ACCURACY	9	9	9	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DIAG_POIACUR_IMAGE_NUM *NMR02829*	16	unsigned	0	100	5	none	DIAG test case POI_ACCURACY: Current image number
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product
HK_STAT_DIAG_POIACUR_BARYCENTER_SPECT *NMR02538*	32	float	1	120	50	none	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spectral direction
HK_STAT_DIAG_POIACUR_BARYCENTER_SPAT *NMR02539*	32	float	1	160	60	none	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spatial direction

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DIAG BOL_BEL) (YMR42142)**	Version: 1 / 27.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step BOL_BEL			*Back to List ...*

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	31	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 10=DIAG BOL_BEL	10	10	10	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DIAG_BOLBEL_IMAGE_NUM *NMR02830*	16	unsigned	0	100	1	none	DIAG test case BOL_BEL: Current image number
HK_STAT_TIS_DATA_ACQ_ID *NMR00124*	32	unsigned	0	4294967295	1	none	Acquisition number TIS, incremented for each data product
HK_STAT_DIAG_BOLBEL_IMG_STANDDEV *NMR00679*	32	float	0	15	1	DN	Diagnose status TestCase 6 "BOLBEL": Measured standard deviation of BOL image
HK_STAT_DIAG_BOLBEL_IMG_SNR *NMR02508*	16	unsigned	1	500	200	none	Diagnose parameter TestCase 6 "BOLBEL": Calculated SNR of BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MIN *NMR02509*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Minimum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MAX *NMR02510*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Maximum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_AVERAGE *NMR02511*	16	unsigned	0	65535	500	DN	Diagnose parameter TestCase 6 "BOLBEL": Average DN value in BOL image
HK_STAT_DIAG_BOLBEL_METHOD *NMRD2513*	4	enum: 0=DIFF_IMAGE 1=BB3_CORRECTED_IMAGE	0	1	0	none	Diagnose parameter TestCase 6 "BOLBEL": Method used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_TARGET *NMRD2514*	4	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3	0	15	0	none	Diagnose parameter TestCase 6 "BOLBEL": Target used for BOL image acquisition

		14=Simulation 15=Invalid					
HK_STAT_DIAG_BOLBEL_OVS *NMR02831*	8	unsigned	1	255	1	none	Diagnose parameter TestCase 6 "BOLBEL": Number of oversamplings used for BOL image acquisition

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DIAG RAD_REL) (YMR42143)**	Version: 1 / 22.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step RAD_REL			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	145	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 11=DIAG RAD_REL	11	11	11	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DIAG_RADREL_SAMPLE_NUM *NMR02832*	16	unsigned	1	1000	1	none	Diagnose parameter TestCase 10 "RADREL": Current sample number of RAD REL tests
HK_STAT_TIR_DATA_ACQ_ID *NMR00136*	32	unsigned	0	4294967295	1	none	Acquisition number TIR, incremented for each data product
DAT_TIR_SCIENCE_BLOCK_CHA *NMR00140...NMR00154*	32	unsigned	0	4294967295	0	DN	TIR science data block channel A
HK_TEMP_RAD_CHA *NMR00155*	32	unsigned	0	4294967295	0	DN	Radiometer temperature obtained by science data acquisition channel A
DAT_TIR_SCIENCE_BLOCK_CHB *NMR00156...NMR00170*	32	unsigned	0	4294967295	0	DN	TIR science data block channel B
HK_TEMP_RAD_CHB *NMR00171*	32	unsigned	0	4294967295	0	DN	Radiometer temperature obtained by science data acquisition channel B

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DIAG SHH) (YMR42144)**	Version: 1 / 05.05.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step SHH			Back to List ...

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	21	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 12=DIAG SHH	12	12	12	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DIAG_SHH_HEATING_POWER *NMR02861*	16	unsigned	0	100	50	%	Diagnose parameter TestCase 11 "SHH": Sensor head heating power (0...100%)
HK_STAT_DIAG_SHH_TEMP_BEFORE_HEATING *NMR00718*	16	unsigned	1	100	20	deg C	Diagnose parameter TestCase 11 "SHH": Sensor head temperature before heating-up
HK_STAT_DIAG_SHH_TEMP_ACTUAL *NMR02524*	16	unsigned	1	100	20	deg C	Diagnose parameter TestCase 11 "SHH": Sensor head temperature after heating-up
HK_STAT_DIAG_SHH_HEAT_UP_TIME *NMR02862*	16	unsigned	1	1000	60	s	Diagnose parameter TestCase 11 "SHH": Sensor head heat-up time
HK_STAT_DIAG_SHH_TEMP_REF_SENSOR *NMR02863*	16	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	0	14	0	none	Diagnose parameter TestCase 11 "SHH": Sensor head temperature reference sensor

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Packet Name: **TM_TestLog(DIAG TEC_CONTROL) (YMR42145)**	Version: 1 / 27.04.2015	APID: **980 (0x3D4)**	Service: **183/6**
Packet Description: Telemetry packet contains POI sensor data acquired in Diagnostic debug mode during step TEC_CONTROL Back to List ...			

PID	CAT	GroupFlags	Sequ Count	Packet Length	Service Type	Service SubType	Destination ID	SCET	AppData
61	4	3	0	21	183	6	0	0	

Parameter	Bit Size	Type	Min	Max	Default (Unit)	Unit	Description
HK_STAT_TLID *NMR00268*	16	enum: 13=DIAG TEC_CONTROL	13	13	13	none	Parameter is used as Identifier for test logs (TLID) in order to distinguish between kind of test logs
HK_STAT_DIAG_BOLTEC_SAMPLE_NUM *NMR02864*	16	unsigned	1	1000	10	none	Diagnose parameter TestCase 8 "BOLTEC": Sample number
HK_STAT_DIAG_BOLTEC_TEMP_BOL_HOUSING *NMR00695*	32	float	-40	60	20	deg C	Diagnose status TestCase 8 "BOLTEC": Measured BOL housing temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP *NMR02518*	32	float	-10	55	20	deg C	Diagnose status TestCase 8 "BOLTEC": Current Bolometer chip temperature (TEC controlled)

TC which initiated generation of TM	Num TM packets per cycle	Generation Cycle (in sec)	Modes where TM is generated	Remarks
TC_Diagnostic_Enable	1	--	all	Request for starting diagnose mode, but depends on operation parameter if test case is enabled

Appendix 11: EVENT LIST

Export Data: 07.05.2015 - 15:01:48	Source: MERTIS_Configuration.mdb	
Name: **Event_List**	Model: **FM_Main_V5 (05.05.2015)**	Number Events: **80**
Description: List of all events defined for configuration FM_Main_V5 for packets of type 'TM'		

Progress Events:

EVENT_PBS_BOOT_READY	**42001**	**Boot message MPBS**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_SW_VERSION	0	255	0	none	string	Software version string which is booted (32 characters)
HK_STAT_BOOT_REASON	0	7	0	none	enum: 0=power-on or unknown 1=PBS reset 2=APS reset 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap 7=APS boot by TC	Reason for boot of the MPBS or MAPS
HK_STAT_ICU_FPGA_VERSION	0	255	1	none	unsigned	Version number of the FPGA installed on ICU
HK_STAT_ICU_MAIN_REDUNDANT	0	1	0	none	enum: 0=redundant 1=main	Main/Red ICU Status, which ICU is powered

EVENT_APS_BOOT_READY	**42002**	**Boot message MAPS**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_SW_VERSION	0	255	0	none	string	Software version string which is booted (32 characters)
HK_STAT_BOOT_REASON	0	7	0	none	enum: 0=power-on or unknown 1=PBS reset 2=APS reset 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap 7=APS boot by TC	Reason for boot of the MPBS or MAPS
HK_STAT_ICU_FPGA_VERSION	0	255	1	none	unsigned	Version number of the FPGA installed on ICU
HK_STAT_ICU_MAIN_REDUNDANT	0	1	0	none	enum: 0=redundant 1=main	Main/Red ICU Status, which ICU is powered

EVENT_MODE_TRANSITION	**42003**	**Mode transition event**

Parameter	Min	Max	Default	Unit	Type	Description
HK_STAT_PREVIOUS_MODE	1	50	1	none	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined	Previous MERTIS mode number related to a mode transition
HK_STAT_CURRENT_MODE	1	50	1	none	enum: 1=Safe 2=StandBy 3=WarmUp	Current MERTIS mode number related to a mode transition

					4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated 33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined	

EVENT_DIAGNOSE_STEP_FINISHED	**42004**	**Event diagnose test step finished**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_DIAG_STEP	1	10	1	none	enum: 1=TIS_COMP 2=SHH 3=ANALOG_HK 4=POI_SENSOR	Diagnostic step

					5=POI_ACCURACY 6=BOL_BEL 7=BOL_WINDOW 8=TEC_CONTROL 9=STS_MOVE 10=RAD_REL	
HK_STAT_DIAG_STEP_RESULT	0	1	0	none	enum: 0=OK 1=NOK	Diagnostic step result (OK or NOK)

EVENT_BIAS_VOLTAGE_CHANGED	**42007**	**TIS BIAS voltage changed**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET	0	11	1	none	unsigned	Currently used BIAS voltage parameter set (0…11, 0=manual mode)

EVENT_THERMAL_STABILITY	42008	Thermal stability reached for instrument sensor head				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_CFG_LOAD_READY	42009	APS configuration successful loaded				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_CFG_VERSION	0	255	0	none	string	Configuration version string which is loaded (32 characters)
HK_STAT_CFG_NUM_PARAMS_LOADED	0	255	0	none	unsigned	Number of parameters loaded from configuration file
HK_STAT_CFG_NUM_PARAMS_USED	0	255	0	none	unsigned	Number of used parameters from configuration file to overwrite software default values

Warning Events:

EVENT_EEPROM_NO_SEGMENT	42204	No segment found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_NO_APS_EXE	42205	No APS executable found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_NO_APS_CFG	42206	No APS configuration found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_NO_PBS_CFG	42207	No PBS configuration found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_NO_APS_EXE_FLAG	42208	No APS executable flag found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_NO_APS_CFG_FLAG	42209	No APS configuration flag found in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_RAD_BUSY	42212	Radiometer device is busy				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIR_DATA_ACQ_ID	0	429496729	1	none	unsigned	Acquisition number TIR, incremented for each data product

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EVENT_WARMUP_TIMEOUT	42213	Timeout occurred during warm-up of instrument				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_SH_THERMAL_STABILITY_MAX_TIME	0	240	60	min	unsigned	Maximum expected time to reach thermal stability of MERTIS sensor head
PAR_SH_THERMAL_STABILITY_CRITERIA	1	10	1	K/s	unsigned	Maximum temperature gradient for condition 'thermal stability' of sensor head
HK_STAT_SH_THERMAL_STABILITY	1	10	1	K/s	unsigned	Measured temperature gradient of MERTIS sensor head

EVENT_NO_THERMAL_STABILITY	42214	No thermal stability of instrument				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_SH_THERMAL_STABILITY_CRITERIA	1	10	1	K/s	unsigned	Maximum temperature gradient for condition 'thermal stability' of sensor head
HK_STAT_SH_THERMAL_STABILITY	1	10	1	K/s	unsigned	Measured temperature gradient of MERTIS sensor head

EVENT_POI_HOLD_CURRENT_OFF	42215	POI hold current is switched off due to exceeding maximum hold time				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_POI_HOLD_CURRENT_TIME	0	4294967295	60000	ms	unsigned	Maximum time where POI hold current is switched on at a target

EVENT_COMP_DMA_TIMEOUT	42216	DMA time-out detected by compression hardware				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_COMP_BUS_ERROR	42217	Compression bus error detected by compression hardware				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number, incremented for each data product

EVENT_COMP_BUFFER_OVERFLOW	42218	Compression buffer overflow detected by compression software				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_BOL_WIN_CONFIG_WRONG	42219	Configuration of Bolometer windowing wrong				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_WIN_TYPE	0	3	0	none	enum: 0=100x80pixel 1=66x80pixel 2=74x80pixel 3=160x120pixel	TIS window type related to size (area on detector used for science data processing)

EVENT_BEL_BUSY	42220	Bolometer electronics is busy to acquire data

Parameter	Min	Max	Default	Unit	Type	Description
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_BOL_BUS_ERROR	42221	Bolometer bus error detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_BOL_LATCHUP_ERROR	42222	Bolometer latchup error detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_BOL_BURST_TRIGGER_FAILURE	42223	Bolometer burst trigger failure detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_RAD_DATA_TIME_OUT	42224	Radiometer data timeout detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIR_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIR, incremented for each data product

EVENT_RAD_LATCHUP_ERROR	42225	Radiometer latchup error detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIR_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIR, incremented for each data product

EVENT_TIS_MACRO_PIXEL_OUT_OFF_RANGE	42226	TIS macro pixel value is out of expected range				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_MACRO_PIXEL_CURR_VAL	0	4294967295	0	none	unsigned	Calculated current TIS macro pixel value
PAR_TIS_MACRO_PIXEL_MAX_VAL	0	4294967295	4294967295	none	unsigned	Maximum expected TIS macro pixel value
PAR_TIS_MACRO_PIXEL_MIN_VAL	0	4294967295	0	none	unsigned	Minimum expected TIS macro pixel value

Error Events:

EVENT_EEPROM_WRITE_ERROR	43800	EEPROM write error detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_APS_BOOT_FAILURE	43801	Failure detected during auto-boot of APS executable				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_UNEXPECTED_REBOOT	43802	Unexpected re-boot of the on-board software due to watchdog activation or processor trap				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_BOOT_REASON	0	6	3	none	enum: 0=power-on or unknown 3=PBS watchdog 4=APS watchdog 5=PBS trap 6=APS trap	Reason for boot of the MPBS or MAPS
HK_STAT_REG_PROC_STATUS	0	4294967295	0	none	unsigned	Content of the processor status register PSR
HK_STAT_REG_PROC_TRAP_BASE	0	0	0	none	unsigned	Content of the processor trap base register TBR
HK_STAT_REG_PROC_PROGRAMM_COUNT	0	0	0	none	unsigned	Content of the processor program counter register PC
HK_STAT_REG_PROC_PROGRAMM_INSTRUCT	0	0	0	none	unsigned	Content of the processor instruction register [PC] where the program counter points to

EVENT_POI_SENSOR_DIAG_FAILED	43805	POI diagnose of mode 'Close Loop' failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_POISENS_POI_COIL_MODE	0	4	0	none	enum: 0=Coil1+2 1=Coil3+4 2=Coil2+3 3=Coil1+4 4=Coil1+2+3+4	Diagnose parameter TestCase 4 "POI_SENSOR": POI motor coil mode, defines usage of different motor coils
PAR_DIAG_POISENS_SENSOR1_EXPECTED	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR1
PAR_DIAG_POISENS_SENSOR2_EXPECTED	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR2
PAR_DIAG_POISENS_SENSOR3_EXPECTED	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Expected position of SENSOR3
HK_STAT_DIAG_POISENS_SENSOR1	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR1
HK_STAT_DIAG_POISENS_SENSOR2	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR2
HK_STAT_DIAG_POISENS_SENSOR3	0	1	0	none	enum: 0=no 1=yes	Diagnose parameter TestCase 4 "POI_SENSOR": Detected position status of SENSOR3
HK_STAT_DIAG_POISENS_STEP_NUM_FAILED	0	3000	0	none	unsigned	Diagnose parameter TestCase 4 "POI_SENSOR": POI motor step number where the failure was detected

EVENT_STS_OPERATION_FAILURE	43806	Shutter (STS) operation failure detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_STS_EXPECTED	0	1	0	none	enum: 0=open 1=closed	Shutter status (open/closed) as expected
HK_STAT_STS_READ	0	1	0	none	enum: 0=open 1=closed	Shutter status (open/closed) as read from I/F

EVENT_POI_OPERATION_FAILURE	43807	Pointing Unit (POI) operation failure detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_POI_POSITION_EXPECTED	0	3	0	none	enum: 0=PlanetView 1=BB7View 2=BB3View	POI Position Status

					3=SpaceView	
HK_STAT_POI_SENSOR3	0	1	0	none	enum: 0=off 1=on	POI status position sensor 3
HK_STAT_POI_SENSOR2	0	1	0	none	enum: 0=off 1=on	POI status position sensor 2
HK_STAT_POI_SENSOR1	0	1	0	none	enum: 0=off 1=on	POI status position sensor 1
HK_STAT_POI_STEP_COUNTER	0	300	0	none	unsigned	POI step counter value (0…300steps), provides information about POI mirror position: 0=PlanetView, 100=BB7View, 200=BB3View, 300=SpaceView

EVENT_RAD_FIFO_NOT_EMPTY	**43808**	**Radiometer FIFO is not empty**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIR_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIR, incremented for each data product

EVENT_RAD_FIFO_OVERFLOW	**43809**	**Radiometer FIFO overflow detected**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIR_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIR, incremented for each data product

EVENT_RAD_ADC_ERROR	**43810**	**Radiometer ADC error detected**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_RAD_ADC_ERROR_STATUS	0	65535	0	none	unsigned	ADC error status word (16Bits)

EVENT_BOL_DMA_OVERFLOW	**43811**	**Bolometer DMA overflow detected**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_BOL_DMA_TIMEOUT	**43812**	**Bolometer DMA no data received, time-out occurred**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_TIS_DATA_ACQ_ID	0	4294967295	1	none	unsigned	Acquisition number TIS, incremented for each data product

EVENT_WATCHDOG_FAILURE	**43813**	**Watchdog doesn't work after initialization, counts not down**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_WATCHDOG_TIMER_VALUE_SET	0	4294967295	315000000	none	unsigned	Parameter contains the timer value used for initialization of the watchdog timer
HK_STAT_WATCHDOG_TIMER_VALUE_READ	0	4294967295	315000000	none	unsigned	Parameter contains the watchdog timer value read back after initialization

EVENT_TC_SPW_RX_ERROR	43814	SpaceWire TC receive error detected				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_SPW_RECEIVE_ERROR	0	2	0	none	enum: 0=EEP error 1=Truncated packet 2=SpW packet invalid	Parameter contains the detected SpaceWire receive error

EVENT_EEPROM_EXE_SEG_COPY_ABORT	43815	SPARC executable segment copy from EEPROM to RAM failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_EXE_SEG_CRC_WRONG	43816	SPARC executable segment CRC error				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_EEPROM_PBS_CFG_SIZE_WRONG	43817	PBS configuration data size wrong in EEPROM				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_PBS_CFG_SIZE_EXPECTED	0	65535	52	none	unsigned	Parameter contains the expected size of PBS configuration segment in EEPROM
HK_STAT_PBS_CFG_SIZE_READ	0	65535	52	none	unsigned	Parameter contains the read size of PBS configuration segment in EEPROM

EVENT_WRITING_REGISTER_FAILED	43818	Writng register failed, reading back content provides different result				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_REG_ADDRESS	0	4294967295	0	none	unsigned	Parameter contains the register address for writing
HK_STAT_REG_VALUE_WRITTEN	0	4294967295	0	none	unsigned	Parameter contains the value written into a register for configuration
HK_STAT_REG_VALUE_READ	0	4294967295	0	none	unsigned	Parameter contains the value read back from a register after writing it

EVENT_TC_BUFFER_1_FULL	43819	Telecommand buffer 1 is full				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_TC_BUFFER_2_FULL	43820	Telecommand buffer 2 is full				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_ANA_TEMP_DIAG_FAILED	43821	Diagnose of analog temperature HKs failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_HK_ANA_NUM_SAMPLES	1	1000	10	none	unsigned	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_HK_TEMP_MIN	-50	600	60	degC	signed	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed temperature
PAR_DIAG_HK_TEMP_MAX	-50	600	100	degC	signed	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed temperature
HK_STAT_DIAG_HK_TEMP_MIN	-50	600	60	degC	signed	Diagnose status TestCase 3 "AnalogHK": Minimum measured temperature
HK_STAT_DIAG_HK_TEMP_MAX	-50	600	100	degC	signed	Diagnose status TestCase 3 "AnalogHK": Maximum measured temperature
HK_STAT_DIAG_HK_TEMP_AVERAGE	-50	600	60	degC	signed	Diagnose status TestCase 3 "AnalogHK": Measured average temperature
PAR_DIAG_HK_TEMP_STANDDEV_MIN	0	15	1	degC	float	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of temperature
PAR_DIAG_HK_TEMP_STANDDEV_MAX	1	500	100	degC	float	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of temperature

HK_STAT_DIAG_HK_TEMP_STANDDEV	1	500	100	degC	float	Diagnose status TestCase 3 "AnalogHK": measured standard deviation of temperature
HK_STAT_DIAG_ANA_TEMP_REF_SENSOR	0	14	0	none	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	Diagnose parameter TestCase 3 "ANALOG_HK": Temperature reference sensor
HK_STAT_DIAG_ANA_SH_REF_TEMP_STABLE	0	1	1	none	enum: 0=temp unstable 1=temp stable	DIAG step ANALOG_HK: Reference temperature for the Sensor Head (SH) ist stable/unstable

EVENT_ANA_VOLT_DIAG_FAILED	**43822**	**Diagnose of analog voltage HKs failed**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_HK_ANA_NUM_SAMPLES	1	1000	10	none	unsigned	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_HK_VOLT_MIN	2000	8000	5000	mV	unsigned	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed voltage
PAR_DIAG_HK_VOLT_MAX	2000	8000	5000	mV	unsigned	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed voltage
HK_STAT_DIAG_HK_VOLT_MIN	2000	8000	5000	mV	unsigned	Diagnose status TestCase 3 "AnalogHK": Minimum measured voltage
HK_STAT_DIAG_HK_VOLT_MAX	2000	8000	6000	mV	unsigned	Diagnose status TestCase 3 "AnalogHK": Maximum measure voltage
HK_STAT_DIAG_HK_VOLT_AVERAGE	2000	8000	5500	mV	unsigned	Diagnose status TestCase 3 "AnalogHK": Measure average voltage
PAR_DIAG_HK_VOLT_STANDDEV_MIN	0	15	1	mV	float	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of voltage
PAR_DIAG_HK_VOLT_STANDDEV_MAX	1	500	100	mV	float	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of voltage
HK_STAT_DIAG_HK_VOLT_STANDDEV	1	500	100	mV	float	Diagnose status TestCase 3 "AnalogHK": Measured standard deviation of voltage
HK_STAT_DIAG_HK_VOLT_SOURCE	0	1	0	none	enum: 0=+3,4V 1=+7,2V	Diagnose status TestCase 3 "AnalogHK": Voltage source of the failure packet

EVENT_BOL_BEL_DIAG_FAILED	**43824**	**Diagnose of Bolometer electronics failed**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

PAR_DIAG_BOLBEL_IMG_STANDDEV_MIN	0	15	1	DN	float	Diagnose parameter TestCase 6 "BOLBEL": Minimum allowed standard deviation of BOL image
PAR_DIAG_BOLBEL_IMG_STANDDEV_MAX	0	15	1	DN	float	Diagnose parameter TestCase 6 "BOLBEL": Maximum allowed standard deviation of BOL image
HK_STAT_DIAG_BOLBEL_IMG_STANDDEV	0	15	1	DN	float	Diagnose status TestCase 6 "BOLBEL": Measured standard deviation of BOL image
PAR_BOL_DECT_VSKIMBIAS_VOLTAGE	3	5,5	5,342	V	unsigned	Bolometer Detector VSKIMMING BIAS voltage
PAR_BOL_DECT_FIDBIAS_VOLTAGE	1,5	5	3,5	V	unsigned	Bolometer Detector FID BIAS voltage
PAR_TIS_BOL_CHIP_TEMP	5	40	30	degC	signed	BOL chip temperature to be adjusted by TEC
PAR_DIAG_BOLBEL_IMG_SNR_MIN	1	500	200	none	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Minimum allowed SNR of BOL image
HK_STAT_DIAG_BOLBEL_IMG_SNR	1	500	200	none	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Calculated SNR of BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MIN	0	65535	500	DN	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Minimum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_MAX	0	65535	500	DN	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Maximum DN value in BOL image
HK_STAT_DIAG_BOLBEL_IMG_DN_AVERAGE	0	65535	500	DN	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Average DN value in BOL image
HK_STAT_DIAG_BOLBEL_METHOD	0	1	0	none	enum: 0=DIFF_IMAGE 1=BB3_CORRECTED_IMAGE	Diagnose parameter TestCase 6 "BOLBEL": Method used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_TARGET	0	15	0	none	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	Diagnose parameter TestCase 6 "BOLBEL": Target used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_OVS	1	255	1	none	unsigned	Diagnose parameter TestCase 6 "BOLBEL": Number of oversamplings used for BOL image acquisition
HK_STAT_DIAG_BOLBEL_SH_REF_TEMP_STABLE	0	1	1	none	enum: 0=temp unstable 1=temp stable	DIAG step BOL_BEL: Reference temperature for the Sensor Head (SH) ist stable/unstable
HK_STAT_ DIAG_BOLBEL_TIS_TEC_STABLE	0	1	1	none	enum: 0=temp unstable 1=temp stable	DIAG step BOL_BEL: Status of the BOL chip temperature (stable/unstable) controlled by TEC

EVENT_BOL_WINDOW_DIAG_FAILED	**43825**	**Diagnose of Bolometer image failed**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_DIAG_BOLIMG_NUM_PATTERN_ERRORS	0	19200	0	pix	unsigned	Diagnose status TestCase 7 "BOLIMG": Number of detected pattern errors (recieved data are different from expected pattern)

EVENT_TEC_CONTROL_DIAG_FAILED	**43826**	**Diagnose of Bolometer thermal electrical cooler (TEC) failed**

Parameter	Min	Max	Default	Unit	Type	Description
PAR_DIAG_BOLTEC_NUM_SAMPLES	1	1000	10	none	unsigned	Diagnose parameter TestCase 8 "BOLTEC": Number of repetitions of BOL TEC tests
PAR_DIAG_BOLTEC_REPETITION_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 8 "BOLTEC": Time between two BOL TEC tests
PAR_DIAG_BOLTEC_TEMP_BOL_CHIP	5	40	30	degC	signed	Diagnose parameter TestCase 8 "BOLTEC": Target BOL chip temperature
PAR_DIAG_BOLTEC_TEMP_BOL_CHIP_STANDDEV_MAX	0	15	1	mK	float	Diagnose parameter TestCase 8 "BOLTEC": Maximum allowed standard deviation of BOL chip temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP_AVERAGE	5	40	30	degC	float	Diagnose status TestCase 8 "BOLTEC": Calculated average BOL chip temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP_STANDDEV	0	15	1	mK	float	Diagnose statu TestCase 8 "BOLTEC": Calculated standard deviation of measured BOL chip temperature samples
HK_STAT_DIAG_BOLTEC_TEMP_BOL_HOUSING	-40	60	20	degC	float	Diagnose status TestCase 8 "BOLTEC": Measured BOL housing temperature
HK_STAT_DIAG_BOLTEC_TEMP_BOL_CHIP	-10	55	20	degC	float	Diagnose status TestCase 8 "BOLTEC": Current Bolometer chip temperature (TEC controlled)

EVENT_STS_MOVE_DIAG_FAILED	43827	Diagnose of shutter (STS) failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_STS_NUM_OPEN_CLOSE_CYCLES	1	500	20	none	unsigned	Diagnose parameter TestCase 9 "STS": Number of open/close cycles for shutter tests
PAR_DIAG_STS_OPEN_CLOSE_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 9 "STS": Open/close period for shutter tests
PAR_DIAG_STS_CLOSED_TIME	1	100	16	ms	unsigned	Diagnose parameterTestCase 9 "STS": Time with closed shutter per period
PAR_DIAG_STS_OPEN_TIME_MAX	0	50	16	ms	unsigned	Diagnose parameterTestCase 9 "STS": Maximal expected shutter opening time
PAR_DIAG_STS_CLOSE_TIME_MAX	0	50	8	ms	unsigned	Diagnose parameterTestCase 9 "STS": Maximum expected shutter closing time
PAR_DIAG_STS_CURRENT_MEAN_MIN	0	500	206,4	mA	unsigned	Diagnose parameterTestCase 9 "STS": Minimum expected shutter current average value
PAR_DIAG_STS_CURRENT_MEAN_MAX	0	500	246,4	mA	unsigned	Diagnose parameterTestCase 9 "STS":Maximum expected shutter current average value
HK_STAT_DIAG_STS_CURRENT_MEAN	0	1000	200	mA	unsigned	STS diagnostic analog currents mean value
HK_STAT_DIAG_STS_NUM_OPEN_FAILED	0	100	8	none	unsigned	Diagnose statusTestCase 9 "STS": Number of shutter opening failed (longer than expected)
HK_STAT_DIAG_STS_NUM_CLOSE_FAILED	0	100	8	none	unsigned	Diagnose statusTestCase 9 "STS": Number of shutter closing failed (longer than expected)

EVENT_RAD_REL_DIAG_FAILED	43828	Diagnose of Radiometer electronics failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_RADREL_NUM_SAMPLES	1	1000	10	none	unsigned	Diagnose parameter TestCase 10 "RADREL": Number of repetitions of RAD REL tests
PAR_DIAG_RADREL_REPETITION_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 10 "RADREL": Time between two RAD image acquisitions
PAR_DIAG_RADREL_PIX_STANDDEV_MIN	0	15	1	DN	float	Diagnose parameter TestCase 10 "RADREL": Minimum allowed standard deviation of radiometer pixels and temperature
PAR_DIAG_RADREL_PIX_STANDDEV_MAX	0	15	1	DN	float	Diagnose parameter TestCase 10 "RADREL": Maximum allowed standard deviation of radiometer pixels and temperature
HK_STAT_DIAG_RADREL_PIX_STANDDEV	0	15	1	DN	float	Diagnose status TestCase 10 "RADREL": Measured standard deviation of radiometer pixels and temperature
HK_STAT_DIAG_RADREL_TARGET	0	15	0	none	enum:	Diagnose parameter TestCase 10 "RADREL": Target used to acquire RAD data

					0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	
HK_STAT_DIAG_RADREL_CHANNEL	0	31	0	none	enum: 0=A1 1=A2 2=A3 3=A4 4=A5 5=A6 6=A7 7=A8 8=A9 9=A10 10=A11 11=A12 12=A13 13=A14 14=A15 15=A16 16=B1 17=B2 18=B3 19=B4 20=B5 21=B6 22=B7 23=B8 24=B9 25=B10 26=B11 27=B12 28=B13 29=B14 30=B15 31=B16	Diagnose parameter TestCase 10 "RADREL": RAD channel where the failure were detected
HK_STAT_DIAG_RADREL_PIX_DN_MIN	0	15	1	DN	unsigned	Diagnose status TestCase 10 "RADREL": Minimum measured channel DN value
HK_STAT_DIAG_RADREL_PIX_DN_MAX	0	15	1	DN	unsigned	Diagnose status TestCase 10 "RADREL": Maximum measured channel DN

						value
HK_STAT_DIAG_RADREL_PIX_DN_AVERAGE	0	15	1	DN	unsigned	Diagnose status TestCase 10 "RADREL": Average channel DN value

EVENT_SHH_DIAG_FAILED	43829	Diagnose of sensor head heater (SHH) failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_SHH_HEAT_UP_TIME	1	1000	60	s	unsigned	Diagnose parameter TestCase 11 "SHH": Sensor head heat-up time to get thermal stable condition
PAR_DIAG_SHH_TEMP_DIFF_MIN	1	100	10	degC	unsigned	Diagnose parameter TestCase 11 "SHH": Minimum allowed difference of sensor head temperature after heating-up time
PAR_DIAG_SHH_TEMP_MAX	1	100	20	degC	unsigned	Diagnose parameter TestCase 11 "SHH": Maximum allowed sensor head temperature while heating-up
HK_STAT_DIAG_SHH_TEMP_BEFORE_HEATING	1	100	20	degC	unsigned	Diagnose parameter TestCase 11 "SHH": Sensor head temperature before heating-up
HK_STAT_DIAG_SHH_TEMP_ACTUAL	1	100	20	degC	unsigned	Diagnose parameter TestCase 11 "SHH": Sensor head temperature after heating-up
PAR_DIAG_SHH_HEATING_POWER	0	100	50	%	unsigned	Diagnose parameter TestCase 11 "SHH": Sensor head heating power (0...100%)
PAR_DIAG_SHH_REF_SENSOR	0	10	5	none	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	Diagnose parameter TestCase 11 "SHH": Sensor head temperature reference sensor

EVENT_OBT_SYNC_FAILED	43830	OBT synchronization failed, SpW-TimeCode received too late				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_OBT_SYNC_TIME	0	4294967295	0	s	unsigned	Parameter contains a time value (CUC format) for synchronization of the On-Board Timer (OBT)
PAR_MAX_DELAY_SPW_TIME_CODE	0	65535	1000	ms	unsigned	Maximum allowed delay for receiving SpW-TimeCode after a received TC_Time_Update command
HK_STAT_DELAY_SPW_TIME_CODE	0	65535	500	ms	unsigned	Delay after recieving TC_Time_Update until next got SpW-TimeCode

EVENT_BOL_TEMP_TOO_LOW	43831	TEC Bolometer chip temperature too low				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_TEMP_BOL_CHIP	-10	55	20	degC	unsigned	Current Bolometer chip temperature (TEC controlled)

EVENT_BOL_TEMP_TOO_HIGH	43832	TEC Bolometer chip temperature too high				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_TEMP_BOL_CHIP	-10	55	20	degC	unsigned	Current Bolometer chip temperature (TEC controlled)

EVENT_BOL_WINDOW_CONFIG_INVALID	43833	BOL window configuration invalid due to overlapping of windows				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

EVENT_TIS_COMP_DIAG_FAILED	43834	Diagnose of TIS compression failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_STAT_DIAG_COMP_INPUT_DATA_SIZE	5280	19200	8000	none	unsigned	Diagnose status TestCase 12 TIS_COMP: Size of compression input data block
HK_STAT_DIAG_COMP_OUTPUT_DATA_SIZE	1	19200	4000	none	unsigned	Diagnose status TestCase 12 TIS_COMP: Size of compression output data block
HK_STAT_DIAG_COMP_RATIO	0	20	2	none	unsigned	Diagnose status TestCase 12 TIS_COMP: Achieved compression ratio (input size/output size)
PAR_DIAG_COMP_RATIO_MIN_EXPECTED	0	20	2	none	unsigned	Diagnose status TestCase 12 TIS_COMP: Minimum expected compression ratio (input size/output size)
HK_STAT_DIAG_COMP_METHOD	0	4	0	none	enum: 0=COMP_METHOD_1 1=COMP_METHOD_2 2=COMP_METHOD_3 3=COMP_METHOD_4 4=COMP_METHOD_5	Used compression method
HK_STAT_DIAG_COMP_TARGET	0	15	0	none	enum: 0=Planet 1=Space 2=Background 3=BB7 4=BB3 8=Pattern Planet 9=Pattern Space 10=Pattern Background 11=Pattern BB7 12=Pattern BB3 14=Simulation 15=Invalid	Used target to acquire data for compression diagnose

EVENT_POI_ACCURACY_DIAG_FAILED	43835	Diagnose of POI position accuracy failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_POIACUR_NUM_IMAGES	0	100	5	none	unsigned	DIAG test case POI_ACCURACY: Number of images acquired for this test
PAR_DIAG_POIACUR_BARYCENTER_SPECT_MIN	1	120	50	none	float	DIAG test case POI_ACCURACY: Minimum allowed value of barycenter position in spectral direction
PAR_DIAG_POIACUR_BARYCENTER_SPECT_MAX	1	120	50	none	float	DIAG test case POI_ACCURACY: Maximum allowed value of barycenter

						position in spectral direction
PAR_DIAG_POIACUR_BARYCENTER_SPAT_MIN	1	160	60	none	float	DIAG test case POI_ACCURACY: Minimum allowed value of barycenter position in spatial direction
PAR_DIAG_POIACUR_BARYCENTER_SPAT_MAX	1	160	60	none	float	DIAG test case POI_ACCURACY: Maximum allowed value of barycenter position in spatial direction
HK_STAT_DIAG_POIACUR_BARYCENTER_SPECT	1	120	50	none	float	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spectral direction
HK_STAT_DIAG_POIACUR_BARYCENTER_SPAT	1	160	60	none	float	DIAG test case POI_ACCURACY: Calculated value of barycenter position in spatial direction

EVENT_ANA_SH_TEMP_DIAG_FAILED	**43836**	**Diagnose of analog SH temperature HKs failed**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_DIAG_HK_ANA_NUM_SAMPLES	1	1000	10	none	unsigned	Diagnose parameter TestCase 3 "Analog HK": Number of samples to be acquired
PAR_DIAG_HK_ANA_REPITITION_PERIOD	1	1000	100	ms	unsigned	Diagnose parameter TestCase 3 "Analog HK": Repitition period of measurements
PAR_DIAG_SHTEMP_DIFF_STDDEV_MIN	0	15	1	degC	float	Diagnose parameter TestCase 3 "AnalogHK": Minimum allowed standard deviation of SH temperature
PAR_DIAG_SHTEMP_DIFF_STDDEV_MAX	0	15	1	degC	float	Diagnose parameter TestCase 3 "AnalogHK": Maximum allowed standard deviation of SH temperature
HK_STAT_DIAG_SHTEMP_DIFF_MIN	-30	30	0	degC	signed	Diagnose parameter TestCase 3 "AnalogHK": Minimum detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_MAX	-30	30	0	degC	signed	Diagnose parameter TestCase 3 "AnalogHK": Maximum detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_AVERAGE	-30	30	0	degC	signed	Diagnose parameter TestCase 3 "AnalogHK": Average detected SH difference temperature
HK_STAT_DIAG_SHTEMP_DIFF_STANDDEV	0	15	1	degC	float	Diagnose parameter TestCase 3 "AnalogHK": Calculated standard deviation of SH temperature
HK_STAT_DIAG_SHTEMP_SENSOR1	0	14	0	none	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK 2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	Diagnose parameter TestCase 3 "ANALOG_HK": SH temperature reference sensor 1
HK_STAT_DIAG_SHTEMP_SENSOR2	0	14	0	none	enum: 0=HK_TEMP_RBA_FRONT 1=HK_TEMP_RBA_BACK	Diagnose parameter TestCase 3 "ANALOG_HK": SH temperature reference sensor 2

					2=HK_TEMP_EOP_IR_FILTER 3=HK_TEMP_EOP_TMA 4=HK_TEMP_SOP_GRATING 5=HK_TEMP_OST_BASE_PLATE 6=HK_TEMP_SOP_M1 7=HK_TEMP_BOL_HOUSING 8=HK_TEMP_STS 9=HK_TEMP_ICU 10=HK_TEMP_PSU 11=HK_TEMP_POI_MOTOR 12=HK_TEMP_POI_MIRROR 13=HK_TEMP_BB7 14=HK_TEMP_BB3	

Alarm Events:

EVENT_HK_LIMIT_VIOLATION	43900	HK limits exceeded				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
HK_TEMP_ICU	-30	80	20	degC	signed	ICU temperature
HK_TEMP_PSU	-30	85	20	degC	signed	Power supply temperature
HK_VOLT_PSU_P34	2500	4500	3400	mV	unsigned	PSU +3.4V supply digital voltage
HK_VOLT_PSU_P72	6000	8000	7200	mV	unsigned	PSU +7.2V supply analog voltage
PAR_TEMP_ICU_MAX	50	130	70	degC	signed	Maximum limit of ICU temperature
PAR_TEMP_PSU_MAX	50	130	80	degC	signed	Maximum limit of power supply temperature
PAR_VOLT_PSU_P34_MAX	3600	5000	3900	mV	unsigned	Maximum limit of PSU +3.4V supply digital voltage
PAR_VOLT_PSU_P72_MAX	7400	8500	7500	mV	unsigned	Maximum limit of PSU +7.2V supply analog voltage

TC Acceptance Failure Events:

EVENT_TC_WRONG_APID	0	TC acceptance failure 'wrong APID'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_INCOMPLETE	1	TC acceptance failure ' incomplete packet or wrong packet length'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_WRONG_CRC	2	TC acceptance failure 'wrong CRC'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
PAR_RECEIVED_CRC	0	65535	0	none	unsigned	Recieved CRC within a telecommand which was wrong
HK_STAT_CALCULATED_CRC	0	65535	0	none	unsigned	Calculated CRC of a memory area

EVENT_TC_WRONG_TYPE	**3**	**TC acceptance failure 'wrong TC-Type'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_WRONG_SUBTYPE	**4**	**TC acceptance failure 'wrong TC-SubType'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_WRONG_SOURCE_ID	**43950**	**TC acceptance failure 'wrong SourceID'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
PAD	0	0	0	none	unsigned	Parameter is used for as filling byte
PAR_TC_SOURCE_ID	0	255	0	none	unsigned	SourceID of an non accepted telecommand

TC Execution Failure Events:

EVENT_TC_WRONG_PARAM	**5**	**TC execution failure 'wrong or inconsistent data field'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
PAR_BYTE_POSITION	0	255	0	none	unsigned	Byte position of wrong parameter (0…n) in application data field
PAR_RECEIVED_VALUE	0	255	0	none	unsigned	Recieved parameter value in a telecommand which was wrong

EVENT_TC_WRONG_COMMAND_CODE	**6**	**TC execution failure 'wrong command code'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**

PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
Spare1	0	255	0	none	unsigned	Packet spares
Spare2	0	255	0	none	unsigned	Packet spares

EVENT_TC_NOT_EXECUTABLE_AT_TIME	**7**	**TC execution failure 'TC can not be executed at this time'**				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
HK_STAT_MERTIS_MODE	1	50	1	none	enum: 1=Safe 2=StandBy 3=WarmUp 4=Science_High_Res1 5=Science_High_Res2 6=Science_High_Res3 7=Science_Med_Res1 8=Science_Med_Res2 9=Science_Med_Res3 10=Science_Low_Res1 11=Science_Low_Res2 12=Science_Low_Res3 13=Science_TIR_Only 14=Calibration 15=WarmUp_Heated 16=Pointing_BB3View 17=Pointing_PlanetView 18=Science_TIS_Only 19=Science_TIR_Only_Heated 20=Science_High_Res1_UnCompr 21=Science_High_Res1_Heated 22=Science_Low_Res1_Heated 23=Science_Raw 24=Science_PlanetView 25=Diagnostic 26=Test 27=Science_Reduced_Swath1 28=Science_Reduced_Swath2 29=FullWin_UnCompr 30=FullWin_Compr 31=Science_High_Res2_Heated 32=Science_High_Res3_Heated	MERTIS operation mode

					33=Science_Med_Res1_Heated 34=Science_Med_Res2_Heated 35=Science_Med_Res3_Heated 36=Science_Low_Res2_Heated 37=Science_Low_Res3_Heated 38=Science_Raw_Heated 39=Science_TIS_Only_Heated 40=Science_PlanetView_Heated 50=UserDefined	

EVENT_TC_EXEC_NO_FUNC_INSTALLED	43951	TC execution failure 'execution functionality not installed yet'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_EXEC_UNKNOWN_TEST_FUNCTION	43952	TC execution failure 'Function number of received test command is unknown'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand
PAR_TC_FUNCTION_NUM	0	65535	0	none	unsigned	Test function number of received TC_Test_Function

EVENT_TC_EXEC_COMMON_ERROR	43953	TC execution failure 'Common error detected during execution'				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_EPA_ACTIVATION_FAILED	43954	Activation of EPA device failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_WRONG_PROPERTY_PARAM	43955	Wrong property param/value in setting/getting command				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand

PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_REG_SETTING_FAILED	43956	Setting a ICU register value failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_TEST_CMD_UNKNOWN	43957	Test command name is unknown				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

EVENT_TC_STS_MOVING_FAILED	43958	Moving of shutter (STS) to open or closed position failed				
Parameter	**Min**	**Max**	**Default**	**Unit**	**Type**	**Description**
PAR_TC_APID	0	65535	0	none	unsigned	APID of an accepted or non accepted telecommand
PAR_TC_SEQUENCE_COUNT	0	65535	0	none	unsigned	Sequence counter of an accepted or non accepted telecommand
PAR_TC_TYPE	0	255	0	none	unsigned	Type of an accepted or non accepted telecommand
PAR_TC_SUB_TYPE	0	255	0	none	unsigned	Sub-Type of an accepted or non accepted telecommand

Appendix 12: CONFIGURATION PARAMETER LIST - MAIN

Configuration Parameter MERTIS APS v3.5.2394 02/2016 MAIN

Export Date: 08.05.2017 - 16:28:16	Source DB: MERTIS_Configuration.mdb	
Name: **SW Parameter List - APS V3.5.2394, 02/2016**	Source Configuration: **FM_Main_V5/05.05.2015 - MER_SW_OBPAR/V1/08.05.2017**	Number Parameter: **833**
Description: List of on-board software parameters (OBPARs) definition and setting defined for configuration FM_Main_V5 of APS V3.5.2394, 02/2016		

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SELECT_BY_OFFSET_DEAD_COUNT	0		Bias voltage and chip temperature select by macro pixel dead counter
OBPAR_BOL_BIAS_VOLT_SELECT_BY_OFFSET_ENABLE	0	none	Bias voltage and chip temperature select by macro pixel offsetr 0=off, 1=on
OBPAR_BOL_BIAS_VOLT_SELECT_BY_TEMPERATURE_ENABLE	1	none	Bias voltage and chip temperature select by temperature sensor 0=off, 1=on
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_0	5	°C	Range 0 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_1	15	°C	Range 1 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_10	35	°C	Range 10 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_2	15	°C	Range 2 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_3	25	°C	Range 3 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_4	25	°C	Range 4 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_5	25	°C	Range 5 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_6	35	°C	Range 6 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_7	35	°C	Range 7 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_8	35	°C	Range 8 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_9	35	°C	Range 9 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_0	10116	DN	Maximum value of macro pixel for Range 0
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_1	9721	DN	Maximum value of macro pixel for Range 1
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_10	0	DN	Maximum value of macro pixel for Range 10
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_2	9490	DN	Maximum value of macro pixel for Range 2
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_3	9110	DN	Maximum value of macro pixel for Range 3
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_4	8918	DN	Maximum value of macro pixel for Range 4
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_5	8741	DN	Maximum value of macro pixel for Range 5
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_6	8365	DN	Maximum value of macro pixel for Range 6
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_7	8243	DN	Maximum value of macro pixel for Range 7
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_8	8149	DN	Maximum value of macro pixel for Range 8

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_9	8070	DN	Maximum value of macro pixel for Range 9
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_0	2740	DN	Minimum value of macro pixel for Range 0
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_1	3685	DN	Minimum value of macro pixel for Range 1
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_10	0	DN	Minimum value of macro pixel for Range 10
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_2	3351	DN	Minimum value of macro pixel for Range 2
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_3	3422	DN	Minimum value of macro pixel for Range 3
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_4	3405	DN	Minimum value of macro pixel for Range 4
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_5	3556	DN	Minimum value of macro pixel for Range 5
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_6	3882	DN	Minimum value of macro pixel for Range 6
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_7	4037	DN	Minimum value of macro pixel for Range 7
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_8	3884	DN	Minimum value of macro pixel for Range 8
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_9	4147	DN	Minimum value of macro pixel for Range 9
OBPAR_BOL_BIAS_VOLT_SETTING_MODE	1	none	Bias voltage and chip temperature setting mode 0=manual, 1=auto
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_SENSOR	5		Reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TEMP_
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T0_MAX	8,88	°C	Maximum temperature of range 0 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T0_MIN	-50	°C	Minimum temperature of range 0 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T1_MAX	14,74	°C	Maximum temperature of range 1 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T1_MIN	9,8	°C	Minimum temperature of range 1 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T10_MAX	100	°C	Maximum temperature of range 10 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T10_MIN	100	°C	Minimum temperature of range 10 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MAX	20,54	°C	Maximum temperature of range 2 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MIN	15,92	°C	Minimum temperature of range 2 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MAX	24,8	°C	Maximum temperature of range 3 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MIN	21,4	°C	Minimum temperature of range 3 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MAX	28,41	°C	Maximum temperature of range 4 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MIN	25,67	°C	Minimum temperature of range 4 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T5_MAX	31,52	°C	Maximum temperature of range 5 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T5_MIN	29,47	°C	Minimum temperature of range 5 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T6_MAX	33,64	°C	Maximum temperature of range 6 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T6_MIN	32,62	°C	Minimum temperature of range 6 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T7_MAX	35,46	°C	Maximum temperature of range 7 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T7_MIN	34,65	°C	Minimum temperature of range 7 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T8_MAX	37,35	°C	Maximum temperature of range 8 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T8_MIN	36,5	°C	Minimum temperature of range 8 (°C)

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T9_MAX	100	°C	Maximum temperature of range 9 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T9_MIN	38,29	°C	Minimum temperature of range 9 (°C)
OBPAR_BOL_CLK_PRESCALER_REG_INIT_HIGH	0x00000004		Init value of register
OBPAR_BOL_CLK_PRESCALER_REG_INIT_LOW	0x00000004		Init value of register
OBPAR_BOL_CLK_PRESCALER_REG_INIT_NOMINAL	0x00000004		Init value of register
OBPAR_BOL_CLOCK_MODE_SELECT	1		Select Clock Timing 1=Nominal (Tint=123.8us Rout=17ms), 2=Low (Tint=83.8us Rout=12ms), 3=Lowest (Tint=82.38us Rout=11ms)
OBPAR_BOL_CONTROL_REG_INIT	0x00001000		Init value of register
OBPAR_BOL_DAC_CONTINOUS_MODE	1		Bias DAC is load continuously 0=Off 1=On
OBPAR_BOL_DATA_DELAY_REG_INIT	0x00000002		Init value of register (Pixel Data Delay)
OBPAR_BOL_DECT_FIDBIAS_DAC_GAIN	0,0000709803	V/DN	DAC gain for Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_DAC_OFFSET	0	V	DAC offset for Detector FID bias voltage (V)
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE	3,971	V	Detector FID bias voltage (V)
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_0	3,971	V	Range 1 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_1	3,971	V	Range 1 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_10	3,971	V	Range 10 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_2	3,971	V	Range 2 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_3	3,971	V	Range 3 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_4	3,971	V	Range 4 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_5	3,971	V	Range 5 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_6	3,971	V	Range 6 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_7	3,971	V	Range 7 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_8	3,971	V	Range 8 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_9	3,971	V	Range 9 Detector FID bias voltage
OBPAR_BOL_DECT_SIZE_X	160	pix x	Bolometer detector size (pixel) - Max 160!
OBPAR_BOL_DECT_SIZE_Y	120	pix y	Bolometer detector size (pixel) - Max 120!
OBPAR_BOL_DECT_VSKIMBIAS_DAC_GAIN	0,0000783943	V/DN	DAC gain for Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_DAC_OFFSET	0	V	DAC offset for Detector VSKIM bias voltage (V)
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE	4,435	V	Detector VSKIM bias voltage (V)
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_0	4,397	V	Range 1 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_1	4,403	V	Range 1 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_10	4,501	V	Range 10 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_2	4,435	V	Range 2 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_3	4,435	V	Range 3 Detector VSKIM bias voltage

Parameter Name	Value	Unit	Description
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_4	4,458	V	Range 4 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_5	4,478	V	Range 5 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_6	4,469	V	Range 6 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_7	4,48	V	Range 7 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_8	4,491	V	Range 8 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_9	4,501	V	Range 9 Detector VSKIM bias voltage
OBPAR_BOL_ENABLE_SYNTHETIC_DATA	0		Enable generation of synthetic data 0=Off, 1=Pattern, 2=Simu
OBPAR_BOL_LATCHUP_HANDLING_ENABLE	1		Enable handling of Bolometer Latchup 0=Off, 1=On
OBPAR_BOL_LATCHUP_IRQ_ENABLE	0	none	Enable generation of Bolometer Latchup IRQ 0=Off, 1=On
OBPAR_BOL_LATCHUP_RECOVERY_DELAY	2000	none	Switch off-on delay in case of latchup (ms)
OBPAR_BOL_LINES_PER_IMAGE_REG_INIT	0x00000077		Init value of register (number of data lines per image minus 1)
OBPAR_BOL_P165_COUNTER_REG_INIT	0x000000A4		Init value of register (length of line in pixel clocks)
OBPAR_BOL_PIXEL_PER_LINE_REG_INIT	0x0000009F		Init value of register (number of data pixel per line minus 1)
OBPAR_BOL_T1_COUNTER_REG_INIT_HIGH	0x000000B4		Init value of register
OBPAR_BOL_T1_COUNTER_REG_INIT_LOW	0x000000BA		Init value of register
OBPAR_BOL_T1_COUNTER_REG_INIT_NOMINAL	0x00000122		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_HIGH	0x00000001		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_LOW	0x00000003		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_NOMINAL	0x00000003		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_LOW	0x00000004		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_NOMINAL	0x00000004		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_LOW	0x00000005		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_NOMINAL	0x00000059		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_HIGH	0x00000006		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_LOW	0x00000009		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_NOMINAL	0x00000009		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_LOW	0x000008C1		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_NOMINAL	0x0000066D		Init value of register
OBPAR_CPR_CHARACTERISTICAL_CHANNELS	1		Compression Channel Delta
OBPAR_CPR_CONTROL_REG_INIT	0x00000500		Init value of register
OBPAR_CPR_K_BIT	8		K Bit initial value
OBPAR_CPR_NSUBBANDS	5		Compression SubBands

Parameter Name	Value	Unit	Description
OBPAR_CPR_TIME_OUT	10	ms	Compression time out (ms)
OBPAR_CPR_UNSIGNED_INPUT_VALUES	0		Signed or Unsigned input values 0 = signed, 1 = unsigned
OBPAR_CPR_VERSION	1		Compression Version - select the preprocessing
OBPAR_DIAG_ANALOG_HK_ENABLE	1	none	Enable diagnose of TIR 0=off, 1=on
OBPAR_DIAG_ANALOG_HK_PAR_DIFF_TEMP_STD_MAX	0,1	K	Maximum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_DIFF_TEMP_STD_MIN	0,0001	K	Minimum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_MAX	450	V	Maximum temperature expected (°C)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_MIN	-20	°C	Minimum temperature expected (°C)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_STD_MAX	0,2	K	Maximum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_STD_MIN	0,0001	K	Minimum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT_STD_MAX	0,1	V	Maximum standard deviation expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT_STD_MIN	0,000001	V	Minimum standard deviation expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT34_MAX	3,6	V	Maximum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT34_MIN	3,2	V	Minimum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT72_MAX	7,4	V	Maximum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT72_MIN	7	V	Minimum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_SAMPLE_DELAY	1000	ms	Delay between two HK Samples in (ms). Note: Less than 800ms make no sense.
OBPAR_DIAG_ANALOG_HK_SAMPLE_NUM	60	none	Number of HK samples. Maximum is 1000!
OBPAR_DIAG_ANALOG_HK_TEMP_REF_SENSOR_1	5	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_ANALOG_HK_TEMP_REF_SENSOR_2	7	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_ANALOG_STAB_TIME	600000	ms	Stabilization time before start the step
OBPAR_DIAG_BOL_BEL_BOL_STAB_TIME	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_BOL_BEL_ENABLE	1	none	Enable diagnose of TIS electronic noise 0=off, 1=on
OBPAR_DIAG_BOL_BEL_OVS_NUM_1	2	none	Number of oversampling (1)
OBPAR_DIAG_BOL_BEL_OVS_NUM_2	4	none	Number of oversampling (2)
OBPAR_DIAG_BOL_BEL_OVS_NUM_3	8	none	Number of oversampling (3)
OBPAR_DIAG_BOL_BEL_OVS_NUM_4	16	none	Number of oversampling (4)
OBPAR_DIAG_BOL_BEL_SEND_IMAGE_AS_DEBUG	1	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_BOL_BEL_SH_STAB_TIMEOUT	300000	ms	Sensor head temperature staibilization time out (ms)
OBPAR_DIAG_BOL_BEL_SNR_MIN	180	none	Expected signal to noise minimum
OBPAR_DIAG_BOL_BEL_SNR_SAMPLE_NUM	40	none	Number of BB700 samples during SNR measurement. Max=40
OBPAR_DIAG_BOL_BEL_STD_DEV_MAX	20	none	Expected standard deviation maximum
OBPAR_DIAG_BOL_BEL_STD_DEV_MIN	1	none	Expected standard deviation minimum

Parameter Name	Value	Unit	Description
OBPAR_DIAG_BOL_WINDOWING_ENABLE	1	none	Enable diagnose of bolometer windowing 0=off, 1=on
OBPAR_DIAG_BOL_WINDOWING_SEND_IMAGE_AS_DEBUG	0	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_DATA_COMPRESSION_ENABLE	1	none	Enable compression of TIS diagnose data 0=off, 1=on
OBPAR_DIAG_DEBUG_LEVEL	0	none	Set the debug level of OnBoard Diagnose 0=off, 1=maximum
OBPAR_DIAG_DIAGNOSE_MODE_ENABLE	0	none	Enable the OnBoard Diagnose Mode 0=off, 1=on
OBPAR_DIAG_DISABLE_TIME_OUT	16000	ms	Estimated time until TC diag disable is executed and task 6 is suspended (ms)
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPATIAL_MAX	50,76	none	Expected barycenter spatial maximum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPATIAL_MIN	46,76	none	Expected barycenter spatial minimum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPECTRAL_MAX	54,65	none	Expected barycenter spectral maximum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPECTRAL_MIN	50,65	none	Expected barycenter spectral minimum
OBPAR_DIAG_POI_ACCURACY_BB7_ADD_STEPS	0	steps	Move POI a number of steps from BB700 position
OBPAR_DIAG_POI_ACCURACY_ENABLE	1	none	Enable diagnose of pointing repeatability sensors 0=off, 1=on
OBPAR_DIAG_POI_ACCURACY_OVS_NUM	64	none	Number of oversampling
OBPAR_DIAG_POI_ACCURACY_SAMPLE_NUM	20	none	Number of samples (max. 128)
OBPAR_DIAG_POI_ACCURACY_SEND_IMAGE_AS_DEBUG	1	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_POI_ACCURACY_SH_STAB_TIMEOUT	300000	ms	Sensor head temperature staibilization time out (ms)
OBPAR_DIAG_POI_ACCURACY_TEC_STAB_TIMEOUT	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_POI_SENSOR_ENABLE	1	none	Enable diagnose of pointing unit sensors 0=off, 1=on
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB3_POST	0x00003333	none	Sensor status after BB3 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB3_PRE	0x33333333	none	Sensor status before BB3 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB7_POST	0x00000333	none	Sensor status after BB7 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB7_PRE	0x33333300	none	Sensor status before BB7 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_COMPARE_MODE	1	none	Sensor compare mode 0=off, 1=at_least, 2=exact
OBPAR_DIAG_POI_SINGLE_STEP_STAT_PLANET_POST	0x00007777	none	Sensor status after planet position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_SPACE_PRE	0x03333333	none	Sensor status before space position. Each nibble is one POI step
OBPAR_DIAG_POI_START_STEPS_NUM	10	none	Number of steps to leave the magnetic field of Planet and Space position. Should be at least 7
OBPAR_DIAG_RAD_REL_ENABLE	1	none	Enable diagnose of TIR 0=off, 1=on
OBPAR_DIAG_RAD_REL_OVS_NUM	230	none	Number of oversampling for radiometer aquisition. Should be 230
OBPAR_DIAG_RAD_REL_SAMPLE_NUM	20	none	Number of acquisitions for diagnose. Maximum is 256
OBPAR_DIAG_RAD_REL_STD_DEV_MAX	10000	none	Standard deviation maximum.
OBPAR_DIAG_RAD_REL_STD_DEV_MIN	10	none	Standard deviation minimum.
OBPAR_DIAG_RAD_REL_TARGET	3	none	Diagnose target type 0=planet, 1=space, 2=background, 3=BB7, 4=BB3
OBPAR_DIAG_SHH_CONTROL_TEMP_REF_SENSOR	5	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_SHH_ENABLE	1	none	Enable diagnose of SHH 0=off, 1=on

Parameter Name	Value	Unit	Description
OBPAR_DIAG_SHH_HEATING_POWER	75	%	Set SHH heating power during diagnose
OBPAR_DIAG_SHH_HEATUP_TIME	600000	ms	Set SH heat up time. Default 10min.
OBPAR_DIAG_SHH_TEMPERATURE_MAX	40	°C	Set maximum temperature during SH diagnose.
OBPAR_DIAG_STS_ADC0_COMMAND_REG	0xA0100000	none	ADC cmd word OSR=1 (about 0.284ms conversation time)
OBPAR_DIAG_STS_ADC0_CONVTIME_REG	0x00001900	tck	21Mhz ticks conversation wait time (about 0.285ms)
OBPAR_DIAG_STS_ADC0_SEQLEN_REG	0x00000003	none	ADC channel polling sequence length (number of steps - 1)
OBPAR_DIAG_STS_ADC0_SEQUENCE0_REG	0x0000FFBB	none	STS HK polling sequence including the reference channel
OBPAR_DIAG_STS_ADC0_STABTIME_REG	0x00001900	tck	21Mhz ticks stabilization time - should be at least conversation time or 0
OBPAR_DIAG_STS_CURRENT_MEAN_MAX	0,17	A	Check Value: maximum mean current within one period
OBPAR_DIAG_STS_CURRENT_MEAN_MIN	0,12	A	Check Value: minimum mean current within one period
OBPAR_DIAG_STS_CYCLES_DELAY	1000	ms	Delay between two shutter Close/Open cycles
OBPAR_DIAG_STS_HK_ADC_RECONFIGURE_DELAY	1000	ms	Waiting time after reconfiguration of HK ADC0 (ms)
OBPAR_DIAG_STS_HK_SAMPLE_RATE	1	ms	Sample rate of shutter HK (minimum 1ms)
OBPAR_DIAG_STS_MEASUREMENT_PERIOD	112	ms	Measurement time of one shutter Close/Open cycles (ms) Plz Note: 'measurement period' divided by 'sample rate'should be equal to 112. In case of less
OBPAR_DIAG_STS_MOVE_ENABLE	1	none	Enable diagnose of shutter 0=off, 1=on
OBPAR_DIAG_STS_NUM_CYCLES	20	none	Number of shutter Close/Open cycles
OBPAR_DIAG_STS_OPEN_TRIGGERED_BY_HW	1	none	shutter open trigger: by software = 0, by hardware = 1
OBPAR_DIAG_STS_SHUTTER_CLOSE_TIME_MAX	7	ms	Check Value: Maximum time to close the shutter (ms)
OBPAR_DIAG_STS_SHUTTER_CLOSED_TIME	24	ms	Time which the shutter is commanded 'close' (ms)- max. value is 700ms!
OBPAR_DIAG_STS_SHUTTER_OPEN_TIME_MAX	12	ms	Check Value: Maximum time to open the shutter (ms)
OBPAR_DIAG_TEC_BOL_CHIP_STANDDEV_MAX	0,05	K	
OBPAR_DIAG_TEC_BOL_STAB_TIMEOUT	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_TEC_CONTROL_ENABLE	1	none	Enable diagnose of TEC 0=off, 1=on
OBPAR_DIAG_TEC_NUM_REPETITIONS	300	none	Number of Bolometer chip temperature samples
OBPAR_DIAG_TEC_REPETITION_PERIOD	400	ms	Time between Bolometer chip temperature samples. Note: Time has to be greater then HK generation time and depends on the HK ADC configuration. Some no
OBPAR_DIAG_TEC_TEMP_BOL_CHIP	30	°C	Bolometer chip temperature (°C) during diagnose
OBPAR_DIAG_TEC_USE_ACTUAL_TEMP_BOL_CHIP	1	none	Use actual bolometer chip temperature during diagnose of TEC 0=off, 1=on
OBPAR_DIAG_TEMPERATURE_DIFF_MIN	1	K	Expected minimum temperature change during diagnose
OBPAR_DIAG_TIS_COMP_ENABLE	1	none	Enable diagnose of compression unit 0=off, 1=on
OBPAR_DIAG_WAIT_BEFORE_START	10000	ms	Wait before start a step. It is a additional wait after configure the hardware (ms)
OBPAR_EEPROM_ALWAYS_ON	0		EEPROM always powered and never switched off 0=disable, 1=enable
OBPAR_EEPROM_AUTO_SWITCH_OFF_DELAY	10000	ms	Automatic switch off of eeprom power (ms)
OBPAR_EEPROM_REUSE_PBS_CACHE	1		Reuse the eeprom cache from PBS 0=off, 1=0n

Parameter Name	Value	Unit	Description
OBPAR_EEPROM_SWITCH_DELAY	100	ms	Switch delay after eeprom power on/off (ms)
OBPAR_EVT_EVENT_FILTER_ENABLE	1	none	Enable the event filter list 0=off, 1=on
OBPAR_EVT_EVENT_LIMITER_ENABLE	1	none	Enable the event limiter list 0=off, 1=on
OBPAR_EVT_FILTER_EVENT_ID_0	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_1	42226		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_10	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_11	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_12	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_13	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_14	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_15	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_16	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_17	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_18	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_19	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_2	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_3	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_4	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_5	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_6	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_7	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_8	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_9	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_TIME_LIMIT	1000	ms	Minimum time between two equal events (ms)
OBPAR_HK_ADC0_COMMAND_REG_INIT	0xA0900000		ADC0 cmd register - OSR 16384 / 13,75Hz
OBPAR_HK_ADC0_CONVTIME_REG_INIT	0x00186A00		ADC0 conversation time: 76ms
OBPAR_HK_ADC0_SEQLEN_REG_INIT	0x0000001F		ADC0 length of sequence
OBPAR_HK_ADC0_SEQUENCE0_REG_INIT	0x060D080E		ADC0 sequence 1/4
OBPAR_HK_ADC0_SEQUENCE1_REG_INIT	0x060A080C		ADC0 sequence 2/4
OBPAR_HK_ADC0_SEQUENCE2_REG_INIT	0x06040805		ADC0 sequence 3/4
OBPAR_HK_ADC0_SEQUENCE3_REG_INIT	0x06020803		ADC0 sequence 4/4
OBPAR_HK_ADC0_SGLMODE_REG_INIT	0x0000FC3C		ADC0 channel mode (single or differential)
OBPAR_HK_ADC0_STABTIME_REG_INIT	0x00019A28		ADC0 stabilization time: 5ms
OBPAR_HK_ADC1_COMMAND_REG_INIT	0xA0900000		ADC1 cmd register - OSR 16384 / 13,75Hz
OBPAR_HK_ADC1_CONVTIME_REG_INIT	0x00186A00		ADC1 conversation time: 76ms

Parameter Name	Value	Unit	Description
OBPAR_HK_ADC1_SEQLEN_REG_INIT	0x00000008		ADC1 length of sequence
OBPAR_HK_ADC1_SEQUENCE0_REG_INIT	0xCA864210		ADC1 sequence 1/4
OBPAR_HK_ADC1_SEQUENCE1_REG_INIT	0x0000000E		ADC1 sequence 2/4
OBPAR_HK_ADC1_SEQUENCE2_REG_INIT	0x00000000		ADC1 sequence 3/4
OBPAR_HK_ADC1_SEQUENCE3_REG_INIT	0x00000000		ADC1 sequence 4/4
OBPAR_HK_ADC1_SGLMODE_REG_INIT	0x00000003		ADC1 channel mode (single or differential)
OBPAR_HK_ADC1_STABTIME_REG_INIT	0x00019A28		ADC1 stabilization time: 5ms
OBPAR_HK_BB3_CORRECTION_DEBUG_ENABLE	0	none	Debugging of BB3 correction value, 0=Off 1=On
OBPAR_HK_BB3_CORRECTION_UPDATE_PERIOD	10000	ms	Measurement period of BB3 correction value. 0ms means measurement is of. Note: should be at least 18 * (ADC1 conv time + ADC1 stab time)
OBPAR_HK_BOLOMETER_OFFLINE_TEMP_SENSOR	7	none	BOL offline alternative HK temperature. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=IND
OBPAR_HK_CONTROL_REG_INIT	0x00000404		Init value of control register
OBPAR_HK_CUR_ANA_STS_CONV1	0,00000011	A/DN	Shutter current analog conversion gain
OBPAR_HK_CUR_ANA_STS_CONV2	-0,005		Not applicable
OBPAR_HK_CUR_ANA_STS_CONV3	0		Not applicable
OBPAR_HK_CUR_ANA_STS_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_CUR_ANA_STS_HW_ADDRESS	0x80000C4C		Address of HK hardware register
OBPAR_HK_ICU_TEMP_MAX	70	°C	ICU temperature maximum (°C)
OBPAR_HK_LIMIT_CHECK_ENABLE	1	none	Enable limit check of 3.4V, 7.2V, ICU and PSU temperatures 0=off, 1=on
OBPAR_HK_POS_ANA_STS_CONV1	0,00000006	mm/DN	Shutter position analog conversion gain
OBPAR_HK_POS_ANA_STS_CONV2	-0,3		Not applicable
OBPAR_HK_POS_ANA_STS_CONV3	0		Not applicable
OBPAR_HK_POS_ANA_STS_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_POS_ANA_STS_HW_ADDRESS	0x80000C3C		Address of HK hardware register
OBPAR_HK_PSU_TEMP_MAX	80	°C	PSU temperature maximum (°C)
OBPAR_HK_PSU_VOLT_34_MAX	3,9	V	PSU 3.4 voltage maximum (V)
OBPAR_HK_PSU_VOLT_72_MAX	7,5	V	PSU 7.2 voltage maximum (V)
OBPAR_HK_PT100_LINEAR_APPROXIMATION_ALPHA	0,0038853	1/K	Alpha for linear approximation of PT100 temperature measurement (0..50°C).
OBPAR_HK_PT1000_LINEAR_APPROXIMATION_ALPHA	0,0038794	1/K	Alpha for linear approximation of PT1000 temperature measurement (0..50°C).
OBPAR_HK_SE_CORRECTION_UPDATE_ENABLE	1	none	Measurement and update of single ended correction value, 0=Off 1=On
OBPAR_HK_SE_REFERENCE_CONV1	0,000000065 75286	V/DN	Single Ended Reference conversion gain
OBPAR_HK_SE_REFERENCE_CONV2	3037130	DN	Expected Single Ended Reference DN value
OBPAR_HK_SE_REFERENCE_CONV3	0	none	Not applicable

Parameter Name	Value	Unit	Description
OBPAR_HK_SE_REFERENCE_CONVTYPE	4	none	Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_SE_REFERENCE_HW_ADDRESS	0x80000C38	none	Address of HK hardware register
OBPAR_HK_TEMP_BB3_CONV1	10019,7	Ohm	Black Body 300 temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_BB3_CONV2	100,023	Ohm	Black Body 300 temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_BB3_CONV3	0	Ohm	Black Body 300 temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_BB3_HW_ADDRESS	0x80000C28		Address of HK hardware register
OBPAR_HK_TEMP_BB3_REFERENCE_RESISTOR_VALUE	100,0013	Ohm	Expected reference resistor value
OBPAR_HK_TEMP_BB7_CONV1	0,000048726 96	°C/DN	Black Body 700 temperature conversion gain
OBPAR_HK_TEMP_BB7_CONV2	0,734	°C	Black Body 700 temperature conversion offset
OBPAR_HK_TEMP_BB7_CONV3	0		Not applicable
OBPAR_HK_TEMP_BB7_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BB7_HW_ADDRESS	0x80000C24		Address of HK hardware register
OBPAR_HK_TEMP_BOL_CHIP_CONV1	- 0,000010151 27	°C/DN	Bolometer Chip temperature conversion gain
OBPAR_HK_TEMP_BOL_CHIP_CONV2	301,6279	°C	Bolometer Chip temperature conversion offset
OBPAR_HK_TEMP_BOL_CHIP_CONV3	0		Not applicable
OBPAR_HK_TEMP_BOL_CHIP_CONVTYPE	1		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BOL_CHIP_HW_ADDRESS	0x80000C10		Address of HK hardware register
OBPAR_HK_TEMP_BOL_HOUSING_CONV1	20020	Ohm	BOL housing temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_BOL_HOUSING_CONV2	999,29	Ohm	BOL housing temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_BOL_HOUSING_CONV3	2,69	Ohm	BOL housing temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_BOL_HOUSING_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BOL_HOUSING_HW_ADDRESS	0x80000C88		Address of HK hardware register
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV1	20020	Ohm	EOP IR filter temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV2	999,48	Ohm	EOP IR filter temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV3	2,49	Ohm	EOP IR filter temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_EOP_IR_FILTER_HW_ADDRESS	0x80000C58		Address of HK hardware register
OBPAR_HK_TEMP_EOP_TMA_CONV1	20020	Ohm	EOP TMA temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_EOP_TMA_CONV2	998,54	Ohm	EOP TMA temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_EOP_TMA_CONV3	2,42	Ohm	EOP TMA temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_EOP_TMA_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_EOP_TMA_HW_ADDRESS	0x80000C60		Address of HK hardware register
OBPAR_HK_TEMP_ICU_CONV1	20020	Ohm	ICU temperature conversion 1 (R1 - series resistance)

Parameter Name	Value	Unit	Description
OBPAR_HK_TEMP_ICU_CONV2	1000	Ohm	ICU temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_ICU_CONV3	0	Ohm	ICU temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_ICU_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_ICU_HW_ADDRESS	0x80000C48		Address of HK hardware register
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV1	20020	Ohm	OST base plate temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV2	998,63	Ohm	OST base plate temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV3	2,23	Ohm	OST base plate temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_OST_BASE_PLATE_HW_ADDRESS	0x80000C78		Address of HK hardware register
OBPAR_HK_TEMP_POI_MIRROR_CONV1	20000	Ohm	Pointing Unit Mirror temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_POI_MIRROR_CONV2	1000	Ohm	Pointing Unit Mirror temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_POI_MIRROR_CONV3	-2,25	Ohm	Pointing Unit Mirror temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_POI_MIRROR_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_POI_MIRROR_HW_ADDRESS	0x80000C1C		Address of HK hardware register
OBPAR_HK_TEMP_POI_MOTOR_CONV1	20000	Ohm	Pointing Unit Motor temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_POI_MOTOR_CONV2	1000	Ohm	Pointing Unit Motor temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_POI_MOTOR_CONV3	-2,29	Ohm	Pointing Unit Motor temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_POI_MOTOR_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_POI_MOTOR_HW_ADDRESS	0x80000C20		Address of HK hardware register
OBPAR_HK_TEMP_PSU_CONV1	0,000013989 97	°C/DN	Power Supply Unit temperature conversion gain
OBPAR_HK_TEMP_PSU_CONV2	-273,2	°C	Power Supply Unit temperature conversion offset
OBPAR_HK_TEMP_PSU_CONV3	0		Not applicable
OBPAR_HK_TEMP_PSU_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_PSU_HW_ADDRESS	0x80000C18		Address of HK hardware register
OBPAR_HK_TEMP_RBA_BACK_CONV1	20000	Ohm	RBA back temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_RBA_BACK_CONV2	999,17	Ohm	RBA back temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_RBA_BACK_CONV3	-2,25	Ohm	RBA back temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_RBA_BACK_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_RBA_BACK_HW_ADDRESS	0x80000C54		Address of HK hardware register
OBPAR_HK_TEMP_RBA_FRONT_CONV1	20000	Ohm	RBA front temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_RBA_FRONT_CONV2	999,07	Ohm	RBA front temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_RBA_FRONT_CONV3	-2,18	Ohm	RBA front temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_RBA_FRONT_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_RBA_FRONT_HW_ADDRESS	0x80000C50		Address of HK hardware register

Parameter Name	Value	Unit	Description
OBPAR_HK_TEMP_REF_BB3_CONV1	10019,6	Ohm	Black Body 300 reference conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_REF_BB3_CONV2	100	Ohm	Black Body 300 reference conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_REF_BB3_CONV3	0	Ohm	Black Body 300 reference conversion 3 (Re - harness error)
OBPAR_HK_TEMP_REF_BB3_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_REF_BB3_HW_ADDRESS	0x80000C30		Address of HK hardware register
OBPAR_HK_TEMP_SOP_GRATING_CONV1	20020	Ohm	SOP Grating temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_SOP_GRATING_CONV2	999,34	Ohm	SOP Grating temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_SOP_GRATING_CONV3	2,54	Ohm	SOP Grating temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_SOP_GRATING_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_SOP_GRATING_HW_ADDRESS	0x80000C70		Address of HK hardware register
OBPAR_HK_TEMP_SOP_M1_CONV1	20020	Ohm	SOP M1 temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_SOP_M1_CONV2	999,12	Ohm	SOP M1 temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_SOP_M1_CONV3	2,48	Ohm	SOP M1 temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_SOP_M1_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_SOP_M1_HW_ADDRESS	0x80000C80		Address of HK hardware register
OBPAR_HK_TEMP_STS_CONV1	20020	Ohm	Shutter temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_STS_CONV2	999,23	Ohm	Shutter temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_STS_CONV3	2,75	Ohm	Shutter temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_STS_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_STS_HW_ADDRESS	0x80000C68		Address of HK hardware register
OBPAR_HK_VOLT_PSU_P34_CONV1	0,000000164 3822	V/DN	Power 3.4V conversion gain
OBPAR_HK_VOLT_PSU_P34_CONV2	0		Not applicable
OBPAR_HK_VOLT_PSU_P34_CONV3	0		Not applicable
OBPAR_HK_VOLT_PSU_P34_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_VOLT_PSU_P34_HW_ADDRESS	0x80000C44		Address of HK hardware register
OBPAR_HK_VOLT_PSU_P72_CONV1	0,000000364 6295	V/DN	Power 7.2V conversion gain
OBPAR_HK_VOLT_PSU_P72_CONV2	0		Not applicable
OBPAR_HK_VOLT_PSU_P72_CONV3	0		Not applicable
OBPAR_HK_VOLT_PSU_P72_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_VOLT_PSU_P72_HW_ADDRESS	0x80000C40		Address of HK hardware register
OBPAR_ICU_AUTO_REBUILD_USERDEFINED_MODE	1	none	Rebuilding in case of USER_DEFINED mode enable. 0 = off, 1 = on
OBPAR_ICU_CPUCLK	21000000	Hz	ICU core clock (Hz)
OBPAR_ICU_DELAY_RETRY_IF_TM_BUF_FULL	20	ms	Wait before retry to acquire a free TM Buffer - 0ms means no retry

Parameter Name	Value	Unit	Description
OBPAR_ICU_HK_INTERNAL_PERIOD	125	ms	Internal Period of HK aquisition task (ms)
OBPAR_ICU_HK_RESET_WITH_HK_ENABLE	1		Reset TC/TM Telemetrie counter and status in case of HK Enable 0=Off, 1=On
OBPAR_ICU_JAILBREAK_ENABLE	1	none	Can be used to disable TC Filter and allow free commanding of MERTIS. 0=off, 1=on
OBPAR_ICU_MODEBUILD_MODE	1	none	Mode of Mode Building. 0 = use physical status of unit, 1 = use logical status of units
OBPAR_ICU_OBT_REVERSEJUMP_MIN	1	s	OBT reverse jump time, which will be ignored.
OBPAR_ICU_OBT_SYNC_DELAY_MAX	950	ms	Max delay between TC Time Update and OBT time code (ms)
OBPAR_ICU_OPRATION_EXT_HK_ENABLE	1		Enable Operation Extented HK 0=off, 1=on
OBPAR_ICU_OPRATION_EXT_HK_PERIOD	20000	ms	Operation Extended HK period (ms)
OBPAR_ICU_OPRATION_HK_ENABLE	1		Enable Operation HK 0=off, 1=on
OBPAR_ICU_OPRATION_HK_PERIOD	20000	ms	Operation HK period (ms)
OBPAR_ICU_SEND_APS_CFG_WITH_DIAGNOSE_ENABLE	0	none	Send APS configuration in case of Diagnose Enable 0=Off, 1=On
OBPAR_ICU_SEND_APS_CFG_WITH_SCIENCE_ENABLE	0	none	Send APS configuration in case of Science Enable 0=Off, 1=On
OBPAR_ICU_SEND_APS_VER_WITH_SCIENCE_ENABLE	0	none	Send APS version string in case of Science Enable 0=Off, 1=On
OBPAR_ICU_START_SHELL	0	none	Start the RTEMS shell on stdio. 0=off, 1=on
OBPAR_ICU_TC_MEMORY_CHECK_BLOCK_LENGTH_MAX	1048576	Byte	Maximum block length of memory operation
OBPAR_ICU_TC_MEMORY_DUMP_BLOCK_LENGTH_MAX	1048576	Byte	Maximum block length of memory operation
OBPAR_ICU_UNSYNC_TIME_INIT	2147483648	s	Start value of unsynchronized time (s)
OBPAR_ICU_USE_BOOT_INTERFACE_TIME	0	none	Time from boot interface will be reused in the APS 0=no, 1=yes
OBPAR_ICU_USE_BOOT_INTERFACE_VALUES	1		Values from boot interface will be reused in the APS 0=no, 1=yes
OBPAR_ICU_WAIT_TIME_UPDATE_TC	5000	ms	Wait for TC_Time_Update (ms)
OBPAR_IRQMP_CFG1_INIT	0x00000168	none	MCFG1 Init value
OBPAR_IRQMP_OVERWRITE	1	none	Overwrite irq level configuration 0=off, 1=On
OBPAR_MCTRL_CFG1_INIT	0x08ABC0FF		MCFG1 Init value
OBPAR_MCTRL_CFG2_INIT	0x82C06040		MCFG2 Init value
OBPAR_MCTRL_CFG3_INIT	0x00050200		MCFG3 Init value
OBPAR_MCTRL_OVERWRITE	1		Overwrite memory configuration 0=off, 1=On
OBPAR_POI_BB_HOLD_PWM_REG_INIT	799		Init value of register (see ICD and parameter below)
OBPAR_POI_BB_HOLD_PWM_VALUE	31	none	Strength of the holding current at BB300 and BB700 position (0..31)
OBPAR_POI_BB_HOLD_TIME_REG_INIT	78750000		Init value of register: 60s. (t(s) = value * 16 /fcpu (Hz))
OBPAR_POI_CALIBRATION_CONTROL_REG_INIT	0		Init value of register - Enable Calib. Reg 0=Off, 0xA5F=On
OBPAR_POI_COIL_MODE	0		Init value of register - 0=C1+2, 1=C3+4, 2=C2+3, 3=1+4, 4..7=ALL
OBPAR_POI_DRIVER_MODE	1	none	0=open loop mode, 1=close loop mode
OBPAR_POI_HIGH_SPEED_REG_INIT	168000		Init value of register - high 8ms
OBPAR_POI_HOLD_START_REG_INIT	1261200		Init value of register (see ICD)
OBPAR_POI_HOLD_STOP_REG_INIT	4200000		Init value of register (see ICD)

Parameter Name	Value	Unit	Description
OBPAR_POI_INIT_PHASE_REG_INIT	4		Init value of register - Init phase of the POI unit, Ref: MER-SRC-SP-061, Issue 1.0, chapter 11 (FM POI User Manual
OBPAR_POI_LOW_SPEED_REG_INIT	420000		Init value of register - low 20ms
OBPAR_POI_NOMINAL_SPEED_REG_INIT	210000		Init value of register - nominal 10ms
OBPAR_POI_SENSOR_MASK_BB300	7	none	Sensor status mask in BB300 position
OBPAR_POI_SENSOR_MASK_BB700	7	none	Sensor status mask in BB700 position
OBPAR_POI_SENSOR_MASK_PLANET	7	none	Sensor status mask in planet position
OBPAR_POI_SENSOR_MASK_SPACE	7	none	Sensor status mask in space position
OBPAR_POI_SENSOR_STAT_BB300	3		Sensor status bit in BB300 position
OBPAR_POI_SENSOR_STAT_BB700	3		Sensor status bit in BB700 position
OBPAR_POI_SENSOR_STAT_PLANET	7		Sensor status bit in planet position
OBPAR_POI_SENSOR_STAT_SPACE	3		Sensor status bit in space position
OBPAR_POI_SPEED_MODE	0		Init value of register - 0=nominal, 1=low, 2=high
OBPAR_POI_START_POSITION	2		0=Planet, 1=BB7, 2=BB3, 3=SPACE
OBPAR_POI_STEP_STAT_BB300	200		Step counter in BB300 position
OBPAR_POI_STEP_STAT_BB700	100		Step counter in BB700 position
OBPAR_POI_STEP_STAT_PLANET	0		Step counter in planet position
OBPAR_POI_STEP_STAT_SPACE	300		Step counter in space position
OBPAR_POI_TRAPEZOID_REG_INIT	17476		Init value of register (see ICD)
OBPAR_POI_UNIT_MOVING_TIMEOUT	7000	ms	Absolute maxiumum time (ms) for POI operation
OBPAR_POI_USE_SAFE_POS_FROM_BOOT	1		Use safe position from boot interface 0=no, 1=yes
OBPAR_PSU_BB7_POWER	0		BB7 Power On/Off
OBPAR_PSU_EEP_POWER	0		EEPROM Power On/Off
OBPAR_PSU_EPA_ACTIVATED	0	none	EPA already activated 0=no, 1=yes
OBPAR_PSU_EPA_CONFIRM_TIMEOUT	10000	ms	EPA Confirm time out (ms)
OBPAR_PSU_EPA_ENABLE	0		Enable EPA 0=Off, 1=On
OBPAR_PSU_EPA_ON_TIME	100	ms	Maximum EPA powering time (ms)
OBPAR_PSU_HK_LATCHUP_PROTECTION	1		Enable hardware latchup protection of HK ADCs 0=disable, 1=enable
OBPAR_PSU_HK_LATCHUP_SWITCH_OFF_DELAY	2000	ms	Delay before HK Power switch on after latchup detection
OBPAR_PSU_HK_LATCHUP_SWITCH_ON_DELAY	3000	ms	Delay after HK Power switch on after latchup detection
OBPAR_PSU_HK_LATCHUP_SWITCH_ON_ENABLE	1		Automatic switch on HK power after latchup detection 0=Off, 1=On
OBPAR_PSU_HK_POWER	1		HK Power On/Off
OBPAR_PSU_POI_POWER	0		POI Power On/Off
OBPAR_PSU_PSYNC_ENABLE	0		Enable PSU sync clock generation 0=off, 1=on
OBPAR_PSU_SHH_POWER	0		SHH Power On/Off

Parameter Name	Value	Unit	Description
OBPAR_PSU_STS_POWER	0		Shutter Power Power On/Off
OBPAR_PSU_SWITCH_DELAY	250	ms	Delay after PSU switching in (ms)
OBPAR_PSU_SYNC_CLK_DIVIDER	34		PSU sync clock divider: psuclk = sysclk/(divider+1)
OBPAR_PSU_TEC_POWER	0		TEC Power On/Off
OBPAR_PSU_TIR_POWER	0		Radiometer Power On/Off
OBPAR_PSU_TIS_POWER	0		Bolometer Power On/Off
OBPAR_PSU_UNUSED_POWER	0	none	Not used Power line (QM/FM)
OBPAR_RAD_ADC_CLK_Select	1	none	Select ADC clock 0 = external (FPGA), 1 = internal (RAD)
OBPAR_RAD_CMD_OSR	2		ADC Command Operation Speed (OSR) 1..15 - see ADC Data Sheet
OBPAR_RAD_CMD_TWOX	1		ADC Command Double Conversion Speed (TWOX) 0 = standard, 1 = double speed
OBPAR_RAD_CONFIG_REG_INIT	0x00500000		Init value of register
OBPAR_RAD_CONTROL_REG_INIT	0x00000024		Init value of register
OBPAR_RAD_ENABLE_ADC_ERROR_CHECK	1	none	Enable the check of ADC EOC bits and stop the ADCs 0=Off, 1=On
OBPAR_RAD_ENABLE_SYNTHETIC_DATA	0		Enable generation of synthetic data 0=Off, 1=Pattern, Note: check of ADC bits has to be disabled!
OBPAR_RAD_LATCHUP_HANDLING_ENABLE	1		Enable handling of Radiometer Latchup 0=Off, 1=On
OBPAR_RAD_LATCHUP_IRQ_ENABLE	0	none	Enable generation of Radiometer Latchup IRQ 0=Off, 1=On
OBPAR_RAD_LATCHUP_RECOVERY_DELAY	2000	none	Switch off-on delay in case of latchup (ms)
OBPAR_RAD_OVERSAMPLING_REG_INIT	0x00000000		Init value of register
OBPAR_RAD_SLEEP_COUNT	6615	tick	Length of ADC conversion in clk cycles - Depends on TWOX and OSR!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_0	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_1	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_10	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_11	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_12	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_13	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_14	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_15	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_2	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_3	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_4	75	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_5	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_6	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_7	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_8	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_9	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_0	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_1	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_10	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_11	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_12	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_13	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_14	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_15	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_2	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_3	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_4	800	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_5	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_6	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_7	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_8	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_9	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_BB7_DISCARD_IF_TIS_OFF	1	none	Discard BB700 calibration target if TIS is switched off during science 0 = disable, 1 = enable
OBPAR_SEQ_CAL_CYCLE_DELAY	0	ms	Delay between two calibration cycle repetitions (ms).
OBPAR_SEQ_CAL_CYCLE_REPETITION_NUMBER	10	none	Calibration cycle repetitions. Note: The calibration cycle contains a several configurable steps.
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_0	5	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_1	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_2	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_3	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_0	0x00043210	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_1	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_2	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_3	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEP_NUM_0	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_1	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_2	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_3	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEPS_SETUP_0	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_1	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_2	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_3	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEP_NUM_0	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_1	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_2	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_3	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_0	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_1	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_2	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_3	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_SELECT_SETUP	0	none	Select the active calibration sequence setup 0..3
OBPAR_SEQ_CAL_START_MODE	0	none	Start Mode of calibration 0 = Wait until SH stable, 1 = Wait time
OBPAR_SEQ_CAL_START_TIMEOUT	1800000	ms	Timeout in case of start mode 'Wait until stable' or fix waiting time in ms
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_0	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_1	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_10	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_11	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_12	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_13	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_14	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_15	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_2	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_3	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_4	2200	ms	Stabilization time at the beginning of calibration step.

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_5	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_6	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_7	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_8	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_9	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STEP_0	3	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_1	4	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_10	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_11	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_12	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_13	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_14	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_15	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_2	1	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_3	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_4	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_5	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_6	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_7	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_8	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_9	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_0	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_1	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_10	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_11	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_12	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_13	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_14	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_15	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_2	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_3	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_4	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_5	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_6	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_7	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_8	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_9	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_0	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_1	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_10	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_11	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_12	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_13	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_14	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_15	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_2	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_3	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_4	1	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_5	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_6	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_7	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_8	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_9	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_0	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_1	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_10	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of

Parameter Name	Value	Unit	Description
			burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_11	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_12	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_13	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_14	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_15	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_2	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_3	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_4	32	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_5	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_6	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_7	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_8	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_9	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_0	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_1	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_10	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_11	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_12	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_13	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_14	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_15	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_2	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_3	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_4	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_5	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_6	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_7	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_8	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_9	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CALIBRATION_PERIOD	30000	ms	Science calibration Period
OBPAR_SEQ_DISCARD_AQUISITION_TEC_NOT_STABLE	1	none	Discard invalid data if TEC is unstable 0=off, 1=on
OBPAR_SEQ_INT_REPETITION_RATE	800	ms	Science internal repetition rate
OBPAR_SEQ_POI_MODE	1		Science POI operation Mode 0=off, 1=Move, 2=PlanetView, 3=BB3View, 4=BB7View, 5=SpaceView
OBPAR_SEQ_SCIENCE_DISABLE_TIME_OUT	24000	ms	Estimated time until TC science disable is executed and task 7 is suspended (ms)
OBPAR_SEQ_SCIENCE_TIR_QUICKLOOK_PERIOD	60000	ms	TIR period of science quicklook
OBPAR_SEQ_SCIENCE_TIS_QUICKLOOK_PERIOD	60000	ms	TIS period of science quicklook
OBPAR_SEQ_SWITCHOFF_TIME_ADJUST_TEMPORAL_ENABLE	1	none	In order to prevent RAD or BOL Busy situation it is possible to disable the time adjust feature during heavy configurations.
OBPAR_SEQ_TIR_REPETITION_FACTOR	1		Science internal TIR and TIS ratio
OBPAR_SEQ_TIS_BCK_DISABLE	1	none	Disable the background generation also in case of shutter is on 0=off, 1=on (default)
OBPAR_SEQ_TIS_BCK_RATE	20		Science TIS background rate
OBPAR_SHH_CONTROL_ENABLE	2		Enable the SHH controller, 0=Off, 1= Ctrl_Temperatuer, 2=Ctrl_Temperature Note: If the controller is off, the SHH power can be set manually
OBPAR_SHH_CONTROL_TEMP_REF_SENSOR	5	none	SHH controller reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4
OBPAR_SHH_CONTROL_TEMP_SETPOINT	18	°C	SHH Controller temperature set point (°C)

Parameter Name	Value	Unit	Description
OBPAR_SHH_CONTROLLER_OUTPUT_MAX	100	%	SHH controller output maximum
OBPAR_SHH_CONTROLLER_OUTPUT_MIN	0	%	SHH controller output minimum
OBPAR_SHH_INTEGRAL_GAIN_TEMPERATURE	0	none	TEC integral gain (temperature)
OBPAR_SHH_PROPORTIONAL_GAIN_TEMPERATURE	400	none	TEC proportional gain (temperature)
OBPAR_SHH_PWM_ENABLE	0	none	Enable the SHH PWM, 0=off, 1=on
OBPAR_SHH_PWM_SCALE_FACTOR	2	none	Scaling factor of the PMW Period. Should be minimum 1 (fastes)
OBPAR_SHH_STAB_INVALID_MEASUREMENT_NUM	2	none	Number of failed stable measurements, until stable flag will be invalid.
OBPAR_SHH_STAB_MEASUREMENT_ENABLE	1	none	Enable the temperature stable measurement 0=off, 1=on
OBPAR_SHH_STAB_MEASUREMENT_GRADIENT_VAL_MAX	0,002	K/s	SH temperature gradient maximum (K/s)
OBPAR_SHH_STAB_MEASUREMENT_PERIOD	10	s	Period of measurements for temperature gradient (s)
OBPAR_SHH_STAB_MEASUREMENT_REF_SENSOR	5	none	SHH stable measurement reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_E
OBPAR_SHH_STAB_MEASUREMENT_TIME_OUT	1800000	ms	SHH temperature stable time out (ms)
OBPAR_SHH_STAB_VALID_MEASUREMENT_NUM	18	none	Number of successful stable measurements, until stable flag will be valid.
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_ENABLE	1	none	Delay non large science packets. Note: They will be send out of order.
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_SIZE	512	byte	Length of a non-science packets if it will be handled as a large packet (byte).
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_TIME	125	ms	Delay between two large non-science packets (ms).
OBPAR_SPW_GRSPW_CLOCK_DIV_REG_INIT	0x00000101	none	Init value of register
OBPAR_SPW_GRSPW_CTRL_REG_INIT	0x00000B09	none	Init value of register
OBPAR_SPW_GRSPW_DMA1_CTRL_STAT_REG_INIT	0x00011010	none	Init value of register
OBPAR_SPW_GRSPW_SYSTIME_ADJUST_ENABLE	1	none	Adjust system time in case of devaition.
OBPAR_SPW_GRSPW_SYSTIME_DEVIATION_CONVERSION_FACTOR	1000	none	time deviation conversion factor used in extended HK, default 1000.
OBPAR_SPW_GRSPW_SYSTIME_DEVIATION_MAX	500	us	Absolute Maximal acceptable time deviation between time code and system time (us).
OBPAR_SPW_GRSPW1_TIMER_DISCNT_REG_INIT	0x0000F087	none	Init value of register
OBPAR_SPW_LINK_RESTART_DELAY	20	ms	Delay between stop and retsart the link (ms).
OBPAR_SPW_NODE_ADDR_TC	68	none	Spacewire Node Address RX
OBPAR_SPW_NODE_ADDR_TM_NO_SCIENCE	36	none	Spacewire Node Address TX (NonScience)
OBPAR_SPW_NODE_ADDR_TM_SCIENCE	52	none	Spacewire Node Address TX (Science)
OBPAR_SPW_PROTOCOL_ID	2	none	Spacewire protocol id
OBPAR_SPW_TX_DESCRIPTOR_FREE_RETRY	1	none	Number of retries in case of TX descriptors are blocked. The link will be stopped and started
OBPAR_SPW_TX_DESCRIPTOR_FREE_WAIT_TIME	100	ms	Maximum wait time until one descriptor is available, if all descriptors are in use (ms)
OBPAR_SPW_TX_PACKET_DELAY	1	ms	Delay between 2 TM packet transfers. Note: Should be 0ms, but can be carefully increased to slow down the TX data rate. Maximum value is 10ms
OBPAR_SPW_WAIT_BUSY	3000	ms	Wait if spw driver function is busy (ms)
OBPAR_STS_AUTO_OPEN	100	ms	STS auto open time function STS_Close_AutoOpen()used e.g. for diagnose (max. 798ms)

Parameter Name	Value	Unit	Description
OBPAR_STS_CLOSE_DELAY	7	ms	Waiting time after STS Close operation in (ms)
OBPAR_STS_CONTROL_REG_INIT	0x00000001	none	Register Init Value
OBPAR_STS_OPEN_DELAY	12	ms	Waiting time after STS Open operation in (ms)
OBPAR_STS_STATUS_CHECK_ENABLE	1		Enable STS status check, 0=off, 1=on
OBPAR_STS_TIMEOUT	700	ms	STS timeout value Note: maximum value is 798ms, see HW2SW ICD
OBPAR_STS_TIMEOUT_ENABLE	1		Enable STS time out, 0=off, 1=on
OBPAR_STS_TIMEOUT_REG_INIT	0xFFFFFFFF	none	Register Init Value
OBPAR_STS_USE_CMD_AS_STATUS	0		Use Cmd as STS status, 0=off, 1=on
OBPAR_TEC_CONTROL_PERIOD	0,2	s	TEC controller period (s)
OBPAR_TEC_CONTROLLER_OUTPUT_MAX	511		TEC controller output maximum (DN)
OBPAR_TEC_CONTROLLER_OUTPUT_MIN	-511		TEC controller output minimum (DN)
OBPAR_TEC_DERIVATE_GAIN	0	s	TEC derivate gain (s)
OBPAR_TEC_INTEGRAL_GAIN	33	1/s	TEC integral gain (1/s) - 40..2512
OBPAR_TEC_LOGGING_ENABLE	0		Enable TEC Logging, 0=off, 1=on
OBPAR_TEC_PRESCALER	2		Reload Value TEC Prescaler [f=CpuClk/256/(scaler + 1)]
OBPAR_TEC_PROCESS_OUT_OF_RANGE_ERROR_PERIOD	60000	ms	TEC process value out of range error period (ms)
OBPAR_TEC_PROCESS_VALUE_MAX	50	°C	TEC process value maximum (°C)
OBPAR_TEC_PROCESS_VALUE_MIN	-10	°C	TEC process value minimum (°C)
OBPAR_TEC_PROPORTIONAL_GAIN	250		TEC proportional gain - 190..1068
OBPAR_TEC_PWM_LIMIT_COUNT_MAX	50	none	TEC power 100% count
OBPAR_TEC_SETPOINT	25	°C	TEC Controller setpoint (°C)
OBPAR_TEC_TEMP_PEAK_ABS_ERROR_MAX	0,01	°C	TEC temperature peak max absolute error value (°C)
OBPAR_TEC_TEMP_PEAK_DISCARD_ENABLE	1	none	TEC temperature measurement peak discard 0=off, 1=on
OBPAR_TEC_TEMP_PEAK_DISCARD_NUM	1	none	TEC temperature measurement peak discard number (Note: increase dead time off controller!)
OBPAR_TEC_TEMP_STABLE_ABS_ERROR_MAX	0,05	°C	TEC temperature stable max absolute error value (°C)
OBPAR_TEC_TEMP_STABLE_FALSE_COUNT_MAX	3	none	TEC temperature stable false count
OBPAR_TEC_TEMP_STABLE_TRUE_COUNT_MAX	20	none	TEC temperature stable true count
OBPAR_TEC_TIMEOUT_ENABLE	1		Enable TEC time out of 1.5s 0=off, 1=on
OBPAR_TIR_BB3_VIEW_CALIBRATION_NUM	1	none	TIR BB3 view calibration acquisitions
OBPAR_TIR_BB3_VIEW_CALIBRATION_TIME	2200	ms	TIR BB3 view calibration time
OBPAR_TIR_BB7_VIEW_CALIBRATION_NUM	1	none	TIR BB7 view calibration acquisitions
OBPAR_TIR_BB7_VIEW_CALIBRATION_TIME	2200	ms	TIR BB7 view calibration time
OBPAR_TIR_DISCARD_SAMPLE_NUM	6		Number of samples discarded after ADC channel switching (max=50)
OBPAR_TIR_ENABLE_RAW_DATA_TRANSFER	0		Enable transfer of RAW data in a Test TM 0=Off, 1=Pattern
OBPAR_TIR_OVERSAMP_MODE	1		TIR Oversampling Mode 0=off, 1=on

Parameter Name	Value	Unit	Description
OBPAR_TIR_PROC_TIME	10	ms	TIR data processing and transfer time
OBPAR_TIR_QUICKLOOK_TARGET_BB300_ENABLE	1	none	TIR enable science quicklook target BB300TM
OBPAR_TIR_QUICKLOOK_TARGET_BB700_ENABLE	1	none	TIR enable science quicklook target BB700
OBPAR_TIR_QUICKLOOK_TARGET_PLANET_ENABLE	1	none	TIR enable science quicklook target planet
OBPAR_TIR_QUICKLOOK_TARGET_SPACE_ENABLE	1	none	TIR enable science quicklook target space
OBPAR_TIR_RAD_STABILIZATION_TIME	5	ms	RAD stabilization time after POI moving
OBPAR_TIR_SCIENCE_ENABLE	0		TIR enable science TM
OBPAR_TIR_SCIENCE_QUICKLOOK_ENABLE	0		TIR enable science quicklook TM
OBPAR_TIR_SPACE_VIEW_CALIBRATION_NUM	1	none	TIR SPACE view calibration acquisitions
OBPAR_TIR_SPACE_VIEW_CALIBRATION_TIME	2200	ms	TIR SPACE view calibration time
OBPAR_TIS_ACTIVE_WIN_CFG	3		Active Win_CFG 0=100x80, 1=66x80, 2=74x80, 3=160x120, 4=FREE
OBPAR_TIS_BB3_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS BB3 view calibration acquisitions
OBPAR_TIS_BB3_VIEW_CALIBRATION_TIME	300	ms	TIS BB3 view calibration time
OBPAR_TIS_BB7_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS BB7 view calibration acquisitions
OBPAR_TIS_BB7_VIEW_CALIBRATION_TIME	300	ms	TIS BB7 view calibration time
OBPAR_TIS_BCK_OVERSAMPLE_RATIO	50	%	TIS background oversampling ratio
OBPAR_TIS_BIN_MODE	1		Binning mode 0=1x1, 1=1x2, 2=2x2, 3=2x4
OBPAR_TIS_CALC_BCK_MACRO_PIXEL_ENABLE	1	none	TIS background macro pixel calculation enable 0 = off, 1 = on
OBPAR_TIS_CFG_REF_AREA1_POS_START_X	0	none	Left boundary window start position x
OBPAR_TIS_CFG_REF_AREA1_POS_START_Y	0	none	Left boundary window start position y
OBPAR_TIS_CFG_REF_AREA1_SIZE_X	20	pix	Left boundary window size x
OBPAR_TIS_CFG_REF_AREA1_SIZE_Y	101	pix	Left boundary window size y
OBPAR_TIS_CFG_REF_AREA2_ENABLE	1	none	Top boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA2_POS_START_X	0	none	Top boundary window start position x
OBPAR_TIS_CFG_REF_AREA2_POS_START_Y	101	none	Top boundary window start position y
OBPAR_TIS_CFG_REF_AREA2_SIZE_X	160	pix	Top boundary window size x
OBPAR_TIS_CFG_REF_AREA2_SIZE_Y	19	pix	Top boundary window size y
OBPAR_TIS_CFG_REF_AREA3_ENABLE	1	none	Right boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA3_POS_START_X	138	none	Right boundary window start position x
OBPAR_TIS_CFG_REF_AREA3_POS_START_Y	0	none	Right boundary window start position y
OBPAR_TIS_CFG_REF_AREA3_SIZE_X	22	pix	Right boundary window size x
OBPAR_TIS_CFG_REF_AREA3_SIZE_Y	101	pix	Right boundary window size y
OBPAR_TIS_CFG_REF_AREA4_ENABLE	0	none	Unused window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA4_POS_START_X	255	none	Unused window start position x
OBPAR_TIS_CFG_REF_AREA4_POS_START_Y	255	none	Unused window start position y

Parameter Name	Value	Unit	Description
OBPAR_TIS_CFG_REF_AREA4_SIZE_X	1	pix	Unused window size x
OBPAR_TIS_CFG_REF_AREA4_SIZE_Y	1	pix	Unused window size y
OBPAR_TIS_CFG0_REF_AREA1_ENABLE	1	none	Left boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG0_REF_ENABLE	1	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG0_WIN_SIZE_X	100	pix	Main window size x
OBPAR_TIS_CFG0_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG0_WIN_START_X	30	none	Main window start position x
OBPAR_TIS_CFG0_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG1_REF_ENABLE	1	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG1_WIN_SIZE_X	66	pix	Main window size x
OBPAR_TIS_CFG1_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG1_WIN_START_X	47	none	Main window start position x
OBPAR_TIS_CFG1_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG2_REF_ENABLE	1	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG2_WIN_SIZE_X	74	pix	Main window size x
OBPAR_TIS_CFG2_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG2_WIN_START_X	43	none	Main window start position x
OBPAR_TIS_CFG2_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG3_REF_ENABLE	0	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG3_WIN_SIZE_X	160	pix	Main window size x
OBPAR_TIS_CFG3_WIN_SIZE_Y	120	pix	Main window size y
OBPAR_TIS_CFG3_WIN_START_X	0	none	Main window start position x
OBPAR_TIS_CFG3_WIN_START_Y	0	none	Main window start position y
OBPAR_TIS_CFG4_REF_ENABLE	0	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG4_WIN_SIZE_X	1	pix	Main window size x
OBPAR_TIS_CFG4_WIN_SIZE_Y	1	pix	Main window size y
OBPAR_TIS_CFG4_WIN_START_X	255	none	Main window start position x
OBPAR_TIS_CFG4_WIN_START_Y	255	none	Main window start position y
OBPAR_TIS_COMP_MODE	0		Data compression mode 0=off, 1=lossless
OBPAR_TIS_DATA_PROC_MODE	0		TIS data processing mode 0/2 Planet/STS BckGrnd (depends on STS on/off), 1=No BckGrnd, 3=BB3 BckGrnd, 4=Manual setting within OBVAR_TIS_DARK_TARGET_TY
OBPAR_TIS_DECT_DEAD_PIX_NUM_0	6066	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_1	17561	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_10	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199

Parameter Name	Value	Unit	Description
			or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_11	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_12	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_13	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_14	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_15	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_2	17758	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_3	17918	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_4	19013	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_5	19064	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_6	19172	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_7	19173	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_8	19174	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_9	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_EXT_REPETITION_RATE_FOR_RES1_MODE	100	ms	TIS External repetition rate for RES1 Modes, which is default 100ms
OBPAR_TIS_OVERSAMP_AUTO_CALC_NUMBERS	0	none	TIS Oversampling calculation of maximum numbers enable 0=off, 1=on
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100000MS	128	none	TIS Oversampling number for 1000ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100000MS_DARK	128	none	TIS Oversampling number for 1000ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100MS	4	none	TIS Oversampling number for 100ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100MS_DARK	1	none	TIS Oversampling number for 100ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_2000MS	64	none	TIS Oversampling number for 2000ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_2000MS_DARK	64	none	TIS Oversampling number for 2000ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_300MS	16	none	TIS Oversampling number for 300ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_300MS_DARK	4	none	TIS Oversampling number for 300ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_800MS	32	none	TIS Oversampling number for 800ms repetition rate

Parameter Name	Value	Unit	Description
OBPAR_TIS_OVERSAMP_FIX_NUMBER_800MS_DARK	32	none	TIS Oversampling number for 800ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBERS_ENABLE	1	none	TIS Oversampling set to fix numbers enable 0=off, 1=on
OBPAR_TIS_OVERSAMP_MODE	1		TIS Oversampling mode 0=off, 1=on
OBPAR_TIS_POI_STABILIZATION_TIME	17	ms	BOL stabilization time after POI moving
OBPAR_TIS_PROC_MARGIN_TIME	1	ms	TIS data processing and transfer margin time
OBPAR_TIS_QUICKLOOK_TARGET_BACKGROUND_ENABLE	1		TIS enable science quicklook target background / shutter close
OBPAR_TIS_QUICKLOOK_TARGET_BB300_ENABLE	1	none	TIS enable science quicklook target BB300TM
OBPAR_TIS_QUICKLOOK_TARGET_BB700_ENABLE	1	none	TIS enable science quicklook target BB700
OBPAR_TIS_QUICKLOOK_TARGET_PLANET_ENABLE	1	none	TIS enable science quicklook target planet
OBPAR_TIS_QUICKLOOK_TARGET_SPACE_ENABLE	1	none	TIS enable science quicklook target space
OBPAR_TIS_REMOVE_DEAD_PIXEL_ENABLE	1	none	Enable remove off dead pixels. 0=off, 1=on
OBPAR_TIS_REMOVE_NOISE_BIT_NUM	0	none	TIS remove number of noise bits from science data by shift right operation - 0 has no effect
OBPAR_TIS_SCIENCE_ENABLE	0		TIS enable science TM
OBPAR_TIS_SCIENCE_QUICKLOOK_ENABLE	0		TIS enable science quicklook TM
OBPAR_TIS_SPACE_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS SPACE view calibration acquisitions
OBPAR_TIS_SPACE_VIEW_CALIBRATION_TIME	300	ms	TIS SPACE view calibration time
OBPAR_TIS_STS_STABILIZATION_TIME	17	ms	BOL stabilization time after STS moving
OBPAR_TIS_VALIDATE_BCK_MACRO_PIXEL_ENABLE	1	none	TIS background macro pixel validation enable 0 = off, 1 = on
OBPAR_WDG_ENABLE	1		Watchdog Enable 0=off. 1=on
OBPAR_WDG_TIMEOUT	90000	ms	Watchdog time out (ms)

Appendix 13: CONFIGURATION PARAMETER LIST - REDUNDANT

Configuration Parameter MERTIS APS v3.5.2394 02/2016 REDUNDANT	*Note: Parameters in **blue** color are different from MAIN configuration !!!*

Export Date: 09.05.2017 - 14:40:03	Source DB: MERTIS_Configuration.mdb	
Name: **SW Parameter List RED - APS V3.5.2394, 02/2016**	Source Configuration: **FM_Red_V5/09.05.2017 - MER_SW_OBPAR/V2/09.05.2017**	Number Parameter: **833**
Description: List of on-board software parameters (OBPARs) definition and setting defined for configuration FM_Red_V5 of APS V3.5.2394, 02/2016		

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SELECT_BY_OFFSET_DEAD_COUNT	0		Bias voltage and chip temperature select by macro pixel dead counter
OBPAR_BOL_BIAS_VOLT_SELECT_BY_OFFSET_ENABLE	0	none	Bias voltage and chip temperature select by macro pixel offsetr 0=off, 1=on
OBPAR_BOL_BIAS_VOLT_SELECT_BY_TEMPERATURE_ENABLE	1	none	Bias voltage and chip temperature select by temperature sensor 0=off, 1=on
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_0	5	°C	Range 0 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_1	15	°C	Range 1 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_10	35	°C	Range 10 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_2	15	°C	Range 2 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_3	25	°C	Range 3 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_4	25	°C	Range 4 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_5	25	°C	Range 5 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_6	35	°C	Range 6 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_7	35	°C	Range 7 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_8	35	°C	Range 8 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_9	35	°C	Range 9 BOL chip temperature (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_0	10116	DN	Maximum value of macro pixel for Range 0
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_1	9721	DN	Maximum value of macro pixel for Range 1
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_10	0	DN	Maximum value of macro pixel for Range 10
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_2	9490	DN	Maximum value of macro pixel for Range 2
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_3	9110	DN	Maximum value of macro pixel for Range 3
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_4	8918	DN	Maximum value of macro pixel for Range 4
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_5	8741	DN	Maximum value of macro pixel for Range 5
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_6	8365	DN	Maximum value of macro pixel for Range 6
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_7	8243	DN	Maximum value of macro pixel for Range 7
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_8	8149	DN	Maximum value of macro pixel for Range 8
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MAX_DN_9	8070	DN	Maximum value of macro pixel for Range 9

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_0	2740	DN	Minimum value of macro pixel for Range 0
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_1	3685	DN	Minimum value of macro pixel for Range 1
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_10	0	DN	Minimum value of macro pixel for Range 10
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_2	3351	DN	Minimum value of macro pixel for Range 2
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_3	3422	DN	Minimum value of macro pixel for Range 3
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_4	3405	DN	Minimum value of macro pixel for Range 4
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_5	3556	DN	Minimum value of macro pixel for Range 5
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_6	3882	DN	Minimum value of macro pixel for Range 6
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_7	4037	DN	Minimum value of macro pixel for Range 7
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_8	3884	DN	Minimum value of macro pixel for Range 8
OBPAR_BOL_BIAS_VOLT_SETTING_MACRO_MIN_DN_9	4147	DN	Minimum value of macro pixel for Range 9
OBPAR_BOL_BIAS_VOLT_SETTING_MODE	1	none	Bias voltage and chip temperature setting mode 0=manual, 1=auto
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_SENSOR	5		Reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TEMP_
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T0_MAX	8,88	°C	Maximum temperature of range 0 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T0_MIN	-50	°C	Minimum temperature of range 0 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T1_MAX	14,74	°C	Maximum temperature of range 1 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T1_MIN	9,8	°C	Minimum temperature of range 1 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T10_MAX	100	°C	Maximum temperature of range 10 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T10_MIN	100	°C	Minimum temperature of range 10 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MAX	20,54	°C	Maximum temperature of range 2 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MIN	15,92	°C	Minimum temperature of range 2 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MAX	24,8	°C	Maximum temperature of range 3 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MIN	21,4	°C	Minimum temperature of range 3 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MAX	28,41	°C	Maximum temperature of range 4 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MIN	25,67	°C	Minimum temperature of range 4 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T5_MAX	31,52	°C	Maximum temperature of range 5 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T5_MIN	29,47	°C	Minimum temperature of range 5 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T6_MAX	33,64	°C	Maximum temperature of range 6 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T6_MIN	32,62	°C	Minimum temperature of range 6 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T7_MAX	35,46	°C	Maximum temperature of range 7 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T7_MIN	34,65	°C	Minimum temperature of range 7 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T8_MAX	37,35	°C	Maximum temperature of range 8 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T8_MIN	36,5	°C	Minimum temperature of range 8 (°C)
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T9_MAX	100	°C	Maximum temperature of range 9 (°C)

Parameter Name	Value	Unit	Description
OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T9_MIN	38,29	°C	Minimum temperature of range 9 (°C)
OBPAR_BOL_CLK_PRESCALER_REG_INIT_HIGH	0x00000004		Init value of register
OBPAR_BOL_CLK_PRESCALER_REG_INIT_LOW	0x00000004		Init value of register
OBPAR_BOL_CLK_PRESCALER_REG_INIT_NOMINAL	0x00000004		Init value of register
OBPAR_BOL_CLOCK_MODE_SELECT	1		Select Clock Timing 1=Nominal (Tint=123.8us Rout=17ms), 2=Low (Tint=83.8us Rout=12ms), 3=Lowest (Tint=82.38us Rout=11ms)
OBPAR_BOL_CONTROL_REG_INIT	0x00001000		Init value of register
OBPAR_BOL_DAC_CONTINOUS_MODE	1		Bias DAC is load continuously 0=Off 1=On
OBPAR_BOL_DATA_DELAY_REG_INIT	0x00000002		Init value of register (Pixel Data Delay)
OBPAR_BOL_DECT_FIDBIAS_DAC_GAIN	0,0000709803	V/DN	DAC gain for Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_DAC_OFFSET	0	V	DAC offset for Detector FID bias voltage (V)
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE	3,971	V	Detector FID bias voltage (V)
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_0	3,971	V	Range 1 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_1	3,971	V	Range 1 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_10	3,971	V	Range 10 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_2	3,971	V	Range 2 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_3	3,971	V	Range 3 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_4	3,971	V	Range 4 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_5	3,971	V	Range 5 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_6	3,971	V	Range 6 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_7	3,971	V	Range 7 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_8	3,971	V	Range 8 Detector FID bias voltage
OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_9	3,971	V	Range 9 Detector FID bias voltage
OBPAR_BOL_DECT_SIZE_X	160	pix x	Bolometer detector size (pixel) - Max 160!
OBPAR_BOL_DECT_SIZE_Y	120	pix y	Bolometer detector size (pixel) - Max 120!
OBPAR_BOL_DECT_VSKIMBIAS_DAC_GAIN	0,0000783943	V/DN	DAC gain for Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_DAC_OFFSET	0	V	DAC offset for Detector VSKIM bias voltage (V)
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE	4,458	V	Detector VSKIM bias voltage (V)
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_0	4,397	V	Range 1 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_1	4,403	V	Range 1 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_10	4,501	V	Range 10 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_2	4,435	V	Range 2 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_3	4,435	V	Range 3 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_4	4,458	V	Range 4 Detector VSKIM bias voltage

Parameter Name	Value	Unit	Description
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_5	4,478	V	Range 5 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_6	4,469	V	Range 6 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_7	4,48	V	Range 7 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_8	4,491	V	Range 8 Detector VSKIM bias voltage
OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_9	4,501	V	Range 9 Detector VSKIM bias voltage
OBPAR_BOL_ENABLE_SYNTHETIC_DATA	0		Enable generation of synthetic data 0=Off, 1=Pattern, 2=Simu
OBPAR_BOL_LATCHUP_HANDLING_ENABLE	1		Enable handling of Bolometer Latchup 0=Off, 1=On
OBPAR_BOL_LATCHUP_IRQ_ENABLE	0	none	Enable generation of Bolometer Latchup IRQ 0=Off, 1=On
OBPAR_BOL_LATCHUP_RECOVERY_DELAY	2000	none	Switch off-on delay in case of latchup (ms)
OBPAR_BOL_LINES_PER_IMAGE_REG_INIT	0x00000077		Init value of register (number of data lines per image minus 1)
OBPAR_BOL_P165_COUNTER_REG_INIT	0x000000A4		Init value of register (length of line in pixel clocks)
OBPAR_BOL_PIXEL_PER_LINE_REG_INIT	0x0000009F		Init value of register (number of data pixel per line minus 1)
OBPAR_BOL_T1_COUNTER_REG_INIT_HIGH	0x000000B4		Init value of register
OBPAR_BOL_T1_COUNTER_REG_INIT_LOW	0x000000BA		Init value of register
OBPAR_BOL_T1_COUNTER_REG_INIT_NOMINAL	0x00000122		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_HIGH	0x00000001		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_LOW	0x00000003		Init value of register
OBPAR_BOL_T2_COUNTER_REG_INIT_NOMINAL	0x00000003		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_LOW	0x00000004		Init value of register
OBPAR_BOL_T3_COUNTER_REG_INIT_NOMINAL	0x00000004		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_LOW	0x00000005		Init value of register
OBPAR_BOL_T4_COUNTER_REG_INIT_NOMINAL	0x00000059		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_HIGH	0x00000006		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_LOW	0x00000009		Init value of register
OBPAR_BOL_T5_COUNTER_REG_INIT_NOMINAL	0x00000009		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_HIGH	0x00000003		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_LOW	0x000008C1		Init value of register
OBPAR_BOL_T6_COUNTER_REG_INIT_NOMINAL	0x0000066D		Init value of register
OBPAR_CPR_CHARACTERISTICAL_CHANNELS	1		Compression Channel Delta
OBPAR_CPR_CONTROL_REG_INIT	0x00000500		Init value of register
OBPAR_CPR_K_BIT	8		K Bit initial value
OBPAR_CPR_NSUBBANDS	5		Compression SubBands
OBPAR_CPR_TIME_OUT	10	ms	Compression time out (ms)

Parameter Name	Value	Unit	Description
OBPAR_CPR_UNSIGNED_INPUT_VALUES	0		Signed or Unsigned input values 0 = signed, 1 = unsigned
OBPAR_CPR_VERSION	1		Compression Version - select the preprocessing
OBPAR_DIAG_ANALOG_HK_ENABLE	1	none	Enable diagnose of TIR 0=off, 1=on
OBPAR_DIAG_ANALOG_HK_PAR_DIFF_TEMP_STD_MAX	0,1	K	Maximum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_DIFF_TEMP_STD_MIN	0,0001	K	Minimum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_MAX	450	V	Maximum temperature expected (°C)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_MIN	-20	°C	Minimum temperature expected (°C)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_STD_MAX	0,2	K	Maximum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_TEMP_STD_MIN	0,0001	K	Minimum standard deviation expected (K)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT_STD_MAX	0,1	V	Maximum standard deviation expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT_STD_MIN	0,000001	V	Minimum standard deviation expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT34_MAX	3,6	V	Maximum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT34_MIN	3,2	V	Minimum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT72_MAX	7,4	V	Maximum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_PAR_VOLT72_MIN	7	V	Minimum Volt expected (V)
OBPAR_DIAG_ANALOG_HK_SAMPLE_DELAY	1000	ms	Delay between two HK Samples in (ms). Note: Less than 800ms make no sense.
OBPAR_DIAG_ANALOG_HK_SAMPLE_NUM	60	none	Number of HK samples. Maximum is 1000!
OBPAR_DIAG_ANALOG_HK_TEMP_REF_SENSOR_1	5	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_ANALOG_HK_TEMP_REF_SENSOR_2	7	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_ANALOG_STAB_TIME	600000	ms	Stabilization time before start the step
OBPAR_DIAG_BOL_BEL_BOL_STAB_TIME	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_BOL_BEL_ENABLE	1	none	Enable diagnose of TIS electronic noise 0=off, 1=on
OBPAR_DIAG_BOL_BEL_OVS_NUM_1	2	none	Number of oversampling (1)
OBPAR_DIAG_BOL_BEL_OVS_NUM_2	4	none	Number of oversampling (2)
OBPAR_DIAG_BOL_BEL_OVS_NUM_3	8	none	Number of oversampling (3)
OBPAR_DIAG_BOL_BEL_OVS_NUM_4	16	none	Number of oversampling (4)
OBPAR_DIAG_BOL_BEL_SEND_IMAGE_AS_DEBUG	1	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_BOL_BEL_SH_STAB_TIMEOUT	300000	ms	Sensor head temperature staibilization time out (ms)
OBPAR_DIAG_BOL_BEL_SNR_MIN	180	none	Expected signal to noise minimum
OBPAR_DIAG_BOL_BEL_SNR_SAMPLE_NUM	40	none	Number of BB700 samples during SNR measurement. Max=40
OBPAR_DIAG_BOL_BEL_STD_DEV_MAX	20	none	Expected standard deviation maximum
OBPAR_DIAG_BOL_BEL_STD_DEV_MIN	1	none	Expected standard deviation minimum
OBPAR_DIAG_BOL_WINDOWING_ENABLE	1	none	Enable diagnose of bolometer windowing 0=off, 1=on

Parameter Name	Value	Unit	Description
OBPAR_DIAG_BOL_WINDOWING_SEND_IMAGE_AS_DEBUG	0	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_DATA_COMPRESSION_ENABLE	1	none	Enable compression of TIS diagnose data 0=off, 1=on
OBPAR_DIAG_DEBUG_LEVEL	0	none	Set the debug level of OnBoard Diagnose 0=off, 1=maximum
OBPAR_DIAG_DIAGNOSE_MODE_ENABLE	0	none	Enable the OnBoard Diagnose Mode 0=off, 1=on
OBPAR_DIAG_DISABLE_TIME_OUT	16000	ms	Estimated time until TC diag disable is executed and task 6 is suspended (ms)
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPATIAL_MAX	50,76	none	Expected barycenter spatial maximum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPATIAL_MIN	46,76	none	Expected barycenter spatial minimum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPECTRAL_MAX	54,65	none	Expected barycenter spectral maximum
OBPAR_DIAG_POI_ACCURACY_BARYCENTER_SPECTRAL_MIN	50,65	none	Expected barycenter spectral minimum
OBPAR_DIAG_POI_ACCURACY_BB7_ADD_STEPS	0	steps	Move POI a number of steps from BB700 position
OBPAR_DIAG_POI_ACCURACY_ENABLE	1	none	Enable diagnose of pointing repeatability sensors 0=off, 1=on
OBPAR_DIAG_POI_ACCURACY_OVS_NUM	64	none	Number of oversampling
OBPAR_DIAG_POI_ACCURACY_SAMPLE_NUM	20	none	Number of samples (max. 128)
OBPAR_DIAG_POI_ACCURACY_SEND_IMAGE_AS_DEBUG	1	none	Enable transfer of diagnose TIS images 0=off, 1=on
OBPAR_DIAG_POI_ACCURACY_SH_STAB_TIMEOUT	300000	ms	Sensor head temperature staibilization time out (ms)
OBPAR_DIAG_POI_ACCURACY_TEC_STAB_TIMEOUT	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_POI_SENSOR_ENABLE	1	none	Enable diagnose of pointing unit sensors 0=off, 1=on
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB3_POST	0x00003333	none	Sensor status after BB3 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB3_PRE	0x33333333	none	Sensor status before BB3 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB7_POST	0x00000333	none	Sensor status after BB7 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_BB7_PRE	0x33333300	none	Sensor status before BB7 position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_COMPARE_MODE	1	none	Sensor compare mode 0=off, 1=at_least, 2=exact
OBPAR_DIAG_POI_SINGLE_STEP_STAT_PLANET_POST	0x00007777	none	Sensor status after planet position. Each nibble is one POI step
OBPAR_DIAG_POI_SINGLE_STEP_STAT_SPACE_PRE	0x03333333	none	Sensor status before space position. Each nibble is one POI step
OBPAR_DIAG_POI_START_STEPS_NUM	10	none	Number of steps to leave the magnetic field of Planet and Space position. Should be at least 7
OBPAR_DIAG_RAD_REL_ENABLE	1	none	Enable diagnose of TIR 0=off, 1=on
OBPAR_DIAG_RAD_REL_OVS_NUM	230	none	Number of oversampling for radiometer aquisition. Should be 230
OBPAR_DIAG_RAD_REL_SAMPLE_NUM	20	none	Number of acquisitions for diagnose. Maximum is 256
OBPAR_DIAG_RAD_REL_STD_DEV_MAX	10000	none	Standard deviation maximum.
OBPAR_DIAG_RAD_REL_STD_DEV_MIN	10	none	Standard deviation minimum.
OBPAR_DIAG_RAD_REL_TARGET	3	none	Diagnose target type 0=planet, 1=space, 2=background, 3=BB7, 4=BB3
OBPAR_DIAG_SHH_CONTROL_TEMP_REF_SENSOR	5	none	SH reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=INDEX_HK_TE
OBPAR_DIAG_SHH_ENABLE	1	none	Enable diagnose of SHH 0=off, 1=on
OBPAR_DIAG_SHH_HEATING_POWER	75	%	Set SHH heating power during diagnose

Parameter Name	Value	Unit	Description
OBPAR_DIAG_SHH_HEATUP_TIME	600000	ms	Set SH heat up time. Default 10min.
OBPAR_DIAG_SHH_TEMPERATURE_MAX	40	°C	Set maximum temperature during SH diagnose.
OBPAR_DIAG_STS_ADC0_COMMAND_REG	0xA0100000	none	ADC cmd word OSR=1 (about 0.284ms conversation time)
OBPAR_DIAG_STS_ADC0_CONVTIME_REG	0x00001900	tck	21Mhz ticks conversation wait time (about 0.285ms)
OBPAR_DIAG_STS_ADC0_SEQLEN_REG	0x00000003	none	ADC channel polling sequence length (number of steps - 1)
OBPAR_DIAG_STS_ADC0_SEQUENCE0_REG	0x0000FFBB	none	STS HK polling sequence including the reference channel
OBPAR_DIAG_STS_ADC0_STABTIME_REG	0x00001900	tck	21Mhz ticks stabilization time - should be at least conversation time or 0
OBPAR_DIAG_STS_CURRENT_MEAN_MAX	0,17	A	Check Value: maximum mean current within one period
OBPAR_DIAG_STS_CURRENT_MEAN_MIN	0,12	A	Check Value: minimum mean current within one period
OBPAR_DIAG_STS_CYCLES_DELAY	1000	ms	Delay between two shutter Close/Open cycles
OBPAR_DIAG_STS_HK_ADC_RECONFIGURE_DELAY	1000	ms	Waiting time after reconfiguration of HK ADC0 (ms)
OBPAR_DIAG_STS_HK_SAMPLE_RATE	1	ms	Sample rate of shutter HK (minimum 1ms)
OBPAR_DIAG_STS_MEASUREMENT_PERIOD	112	ms	Measurement time of one shutter Close/Open cycles (ms) Plz Note: 'measurement period' divided by 'sample rate'should be equal to 112. In case of less
OBPAR_DIAG_STS_MOVE_ENABLE	1	none	Enable diagnose of shutter 0=off, 1=on
OBPAR_DIAG_STS_NUM_CYCLES	20	none	Number of shutter Close/Open cycles
OBPAR_DIAG_STS_OPEN_TRIGGERED_BY_HW	1	none	shutter open trigger: by software = 0, by hardware = 1
OBPAR_DIAG_STS_SHUTTER_CLOSE_TIME_MAX	7	ms	Check Value: Maximum time to close the shutter (ms)
OBPAR_DIAG_STS_SHUTTER_CLOSED_TIME	24	ms	Time which the shutter is commanded 'close' (ms)- max. value is 700ms!
OBPAR_DIAG_STS_SHUTTER_OPEN_TIME_MAX	12	ms	Check Value: Maximum time to open the shutter (ms)
OBPAR_DIAG_TEC_BOL_CHIP_STANDDEV_MAX	0,05	K	
OBPAR_DIAG_TEC_BOL_STAB_TIMEOUT	60000	ms	Bolometer chip temperature stabilization time out (ms).
OBPAR_DIAG_TEC_CONTROL_ENABLE	1	none	Enable diagnose of TEC 0=off, 1=on
OBPAR_DIAG_TEC_NUM_REPETITIONS	300	none	Number of Bolometer chip temperature samples
OBPAR_DIAG_TEC_REPETITION_PERIOD	400	ms	Time between Bolometer chip temperature samples. Note: Time has to be greater then HK generation time and depends on the HK ADC configuration. Some no
OBPAR_DIAG_TEC_TEMP_BOL_CHIP	30	°C	Bolometer chip temperature (°C) during diagnose
OBPAR_DIAG_TEC_USE_ACTUAL_TEMP_BOL_CHIP	1	none	Use actual bolometer chip temperature during diagnose of TEC 0=off, 1=on
OBPAR_DIAG_TEMPERATURE_DIFF_MIN	1	K	Expected minimum temperature change during diagnose
OBPAR_DIAG_TIS_COMP_ENABLE	1	none	Enable diagnose of compression unit 0=off, 1=on
OBPAR_DIAG_WAIT_BEFORE_START	10000	ms	Wait before start a step. It is a additional wait after configure the hardware (ms)
OBPAR_EEPROM_ALWAYS_ON	0		EEPROM always powered and never switched off 0=disable, 1=enable
OBPAR_EEPROM_AUTO_SWITCH_OFF_DELAY	10000	ms	Automatic switch off of eeprom power (ms)
OBPAR_EEPROM_REUSE_PBS_CACHE	1		Reuse the eeprom cache from PBS 0=off, 1=0n
OBPAR_EEPROM_SWITCH_DELAY	100	ms	Switch delay after eeprom power on/off (ms)

Parameter Name	Value	Unit	Description
OBPAR_EVT_EVENT_FILTER_ENABLE	1	none	Enable the event filter list 0=off, 1=on
OBPAR_EVT_EVENT_LIMITER_ENABLE	1	none	Enable the event limiter list 0=off, 1=on
OBPAR_EVT_FILTER_EVENT_ID_0	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_1	42226		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_10	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_11	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_12	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_13	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_14	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_15	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_16	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_17	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_18	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_19	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_2	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_3	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_4	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_5	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_6	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_7	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_8	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_FILTER_EVENT_ID_9	4294967295		Event id which shall be suppressed -1=free entry
OBPAR_EVT_TIME_LIMIT	1000	ms	Minimum time between two equal events (ms)
OBPAR_HK_ADC0_COMMAND_REG_INIT	0xA0900000		ADC0 cmd register - OSR 16384 / 13,75Hz
OBPAR_HK_ADC0_CONVTIME_REG_INIT	0x00186A00		ADC0 conversation time: 76ms
OBPAR_HK_ADC0_SEQLEN_REG_INIT	0x0000001F		ADC0 length of sequence
OBPAR_HK_ADC0_SEQUENCE0_REG_INIT	0x060D080E		ADC0 sequence 1/4
OBPAR_HK_ADC0_SEQUENCE1_REG_INIT	0x060A080C		ADC0 sequence 2/4
OBPAR_HK_ADC0_SEQUENCE2_REG_INIT	0x06040805		ADC0 sequence 3/4
OBPAR_HK_ADC0_SEQUENCE3_REG_INIT	0x06020803		ADC0 sequence 4/4
OBPAR_HK_ADC0_SGLMODE_REG_INIT	0x0000FC3C		ADC0 channel mode (single or differential)
OBPAR_HK_ADC0_STABTIME_REG_INIT	0x00019A28		ADC0 stabilization time: 5ms
OBPAR_HK_ADC1_COMMAND_REG_INIT	0xA0900000		ADC1 cmd register - OSR 16384 / 13,75Hz
OBPAR_HK_ADC1_CONVTIME_REG_INIT	0x00186A00		ADC1 conversation time: 76ms
OBPAR_HK_ADC1_SEQLEN_REG_INIT	0x00000008		ADC1 length of sequence

Parameter Name	Value	Unit	Description
OBPAR_HK_ADC1_SEQUENCE0_REG_INIT	0xCA864210		ADC1 sequence 1/4
OBPAR_HK_ADC1_SEQUENCE1_REG_INIT	0x0000000E		ADC1 sequence 2/4
OBPAR_HK_ADC1_SEQUENCE2_REG_INIT	0x00000000		ADC1 sequence 3/4
OBPAR_HK_ADC1_SEQUENCE3_REG_INIT	0x00000000		ADC1 sequence 4/4
OBPAR_HK_ADC1_SGLMODE_REG_INIT	0x00000003		ADC1 channel mode (single or differential)
OBPAR_HK_ADC1_STABTIME_REG_INIT	0x00019A28		ADC1 stabilization time: 5ms
OBPAR_HK_BB3_CORRECTION_DEBUG_ENABLE	0	none	Debugging of BB3 correction value, 0=Off 1=On
OBPAR_HK_BB3_CORRECTION_UPDATE_PERIOD	10000	ms	Measurement period of BB3 correction value. 0ms means measurement is of. Note: should be at least 18 * (ADC1 conv time + ADC1 stab time)
OBPAR_HK_BOLOMETER_OFFLINE_TEMP_SENSOR	7	none	BOL offline alternative HK temperature. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4=IND
OBPAR_HK_CONTROL_REG_INIT	0x00000404		Init value of control register
OBPAR_HK_CUR_ANA_STS_CONV1	0,00000011	A/DN	Shutter current analog conversion gain
OBPAR_HK_CUR_ANA_STS_CONV2	-0,005		Not applicable
OBPAR_HK_CUR_ANA_STS_CONV3	0		Not applicable
OBPAR_HK_CUR_ANA_STS_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_CUR_ANA_STS_HW_ADDRESS	0x80000C4C		Address of HK hardware register
OBPAR_HK_ICU_TEMP_MAX	70	°C	ICU temperature maximum (°C)
OBPAR_HK_LIMIT_CHECK_ENABLE	1	none	Enable limit check of 3.4V, 7.2V, ICU and PSU temperatures 0=off, 1=on
OBPAR_HK_POS_ANA_STS_CONV1	0,00000006	mm/DN	Shutter position analog conversion gain
OBPAR_HK_POS_ANA_STS_CONV2	-0,3		Not applicable
OBPAR_HK_POS_ANA_STS_CONV3	0		Not applicable
OBPAR_HK_POS_ANA_STS_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_POS_ANA_STS_HW_ADDRESS	0x80000C3C		Address of HK hardware register
OBPAR_HK_PSU_TEMP_MAX	80	°C	PSU temperature maximum (°C)
OBPAR_HK_PSU_VOLT_34_MAX	3,9	V	PSU 3.4 voltage maximum (V)
OBPAR_HK_PSU_VOLT_72_MAX	7,5	V	PSU 7.2 voltage maximum (V)
OBPAR_HK_PT100_LINEAR_APPROXIMATION_ALPHA	0,0038831	1/K	Alpha for linear approximation of PT100 temperature measurement (0..50°C).
OBPAR_HK_PT1000_LINEAR_APPROXIMATION_ALPHA	0,0038794	1/K	Alpha for linear approximation of PT1000 temperature measurement (0..50°C).
OBPAR_HK_SE_CORRECTION_UPDATE_ENABLE	1	none	Measurement and update of single ended correction value, 0=Off 1=On
OBPAR_HK_SE_REFERENCE_CONV1	0,000000065 73498	V/DN	Single Ended Reference conversion gain
OBPAR_HK_SE_REFERENCE_CONV2	3031871	DN	Expected Single Ended Reference DN value
OBPAR_HK_SE_REFERENCE_CONV3	0	none	Not applicable
OBPAR_HK_SE_REFERENCE_CONVTYPE	4	none	Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference

Parameter Name	Value	Unit	Description
OBPAR_HK_SE_REFERENCE_HW_ADDRESS	0x80000C38	none	Address of HK hardware register
OBPAR_HK_TEMP_BB3_CONV1	10019,6	Ohm	Black Body 300 temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_BB3_CONV2	100,059	Ohm	Black Body 300 temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_BB3_CONV3	0	Ohm	Black Body 300 temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_BB3_HW_ADDRESS	0x80000C28		Address of HK hardware register
OBPAR_HK_TEMP_BB3_REFERENCE_RESISTOR_VALUE	99,9991	Ohm	Expected reference resistor value
OBPAR_HK_TEMP_BB7_CONV1	0,00004688357	°C/DN	Black Body 700 temperature conversion gain
OBPAR_HK_TEMP_BB7_CONV2	0,489	°C	Black Body 700 temperature conversion offset
OBPAR_HK_TEMP_BB7_CONV3	0		Not applicable
OBPAR_HK_TEMP_BB7_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BB7_HW_ADDRESS	0x80000C24		Address of HK hardware register
OBPAR_HK_TEMP_BOL_CHIP_CONV1	-0,00001015127	°C/DN	Bolometer Chip temperature conversion gain
OBPAR_HK_TEMP_BOL_CHIP_CONV2	301,6279	°C	Bolometer Chip temperature conversion offset
OBPAR_HK_TEMP_BOL_CHIP_CONV3	0		Not applicable
OBPAR_HK_TEMP_BOL_CHIP_CONVTYPE	1		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BOL_CHIP_HW_ADDRESS	0x80000C10		Address of HK hardware register
OBPAR_HK_TEMP_BOL_HOUSING_CONV1	20020	Ohm	BOL housing temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_BOL_HOUSING_CONV2	998,88	Ohm	BOL housing temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_BOL_HOUSING_CONV3	2,68	Ohm	BOL housing temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_BOL_HOUSING_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_BOL_HOUSING_HW_ADDRESS	0x80000C88		Address of HK hardware register
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV1	20020	Ohm	EOP IR filter temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV2	998,9	Ohm	EOP IR filter temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONV3	2,63	Ohm	EOP IR filter temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_EOP_IR_FILTER_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_EOP_IR_FILTER_HW_ADDRESS	0x80000C58		Address of HK hardware register
OBPAR_HK_TEMP_EOP_TMA_CONV1	20020	Ohm	EOP TMA temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_EOP_TMA_CONV2	998,78	Ohm	EOP TMA temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_EOP_TMA_CONV3	2,42	Ohm	EOP TMA temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_EOP_TMA_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_EOP_TMA_HW_ADDRESS	0x80000C60		Address of HK hardware register
OBPAR_HK_TEMP_ICU_CONV1	20020	Ohm	ICU temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_ICU_CONV2	1000	Ohm	ICU temperature conversion 2 (R0 - resistance at 0°C)

Parameter Name	Value	Unit	Description
OBPAR_HK_TEMP_ICU_CONV3	0	Ohm	ICU temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_ICU_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_ICU_HW_ADDRESS	0x80000C48		Address of HK hardware register
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV1	20020	Ohm	OST base plate temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV2	998,73	Ohm	OST base plate temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONV3	2,42	Ohm	OST base plate temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_OST_BASE_PLATE_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_OST_BASE_PLATE_HW_ADDRESS	0x80000C78		Address of HK hardware register
OBPAR_HK_TEMP_POI_MIRROR_CONV1	20000	Ohm	Pointing Unit Mirror temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_POI_MIRROR_CONV2	1000	Ohm	Pointing Unit Mirror temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_POI_MIRROR_CONV3	-3,22	Ohm	Pointing Unit Mirror temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_POI_MIRROR_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_POI_MIRROR_HW_ADDRESS	0x80000C1C		Address of HK hardware register
OBPAR_HK_TEMP_POI_MOTOR_CONV1	20000	Ohm	Pointing Unit Motor temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_POI_MOTOR_CONV2	1000	Ohm	Pointing Unit Motor temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_POI_MOTOR_CONV3	-2,94	Ohm	Pointing Unit Motor temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_POI_MOTOR_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_POI_MOTOR_HW_ADDRESS	0x80000C20		Address of HK hardware register
OBPAR_HK_TEMP_PSU_CONV1	0,00001398997	°C/DN	Power Supply Unit temperature conversion gain
OBPAR_HK_TEMP_PSU_CONV2	-273,2	°C	Power Supply Unit temperature conversion offset
OBPAR_HK_TEMP_PSU_CONV3	0		Not applicable
OBPAR_HK_TEMP_PSU_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_PSU_HW_ADDRESS	0x80000C18		Address of HK hardware register
OBPAR_HK_TEMP_RBA_BACK_CONV1	20000	Ohm	RBA back temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_RBA_BACK_CONV2	998,49	Ohm	RBA back temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_RBA_BACK_CONV3	0,28	Ohm	RBA back temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_RBA_BACK_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_RBA_BACK_HW_ADDRESS	0x80000C54		Address of HK hardware register
OBPAR_HK_TEMP_RBA_FRONT_CONV1	20000	Ohm	RBA front temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_RBA_FRONT_CONV2	999,36	Ohm	RBA front temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_RBA_FRONT_CONV3	0,34	Ohm	RBA front temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_RBA_FRONT_CONVTYPE	2		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_RBA_FRONT_HW_ADDRESS	0x80000C50		Address of HK hardware register
OBPAR_HK_TEMP_REF_BB3_CONV1	10019,6	Ohm	Black Body 300 reference conversion 1 (R1 - series resistance)

Parameter Name	Value	Unit	Description
OBPAR_HK_TEMP_REF_BB3_CONV2	100	Ohm	Black Body 300 reference conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_REF_BB3_CONV3	0	Ohm	Black Body 300 reference conversion 3 (Re - harness error)
OBPAR_HK_TEMP_REF_BB3_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_REF_BB3_HW_ADDRESS	0x80000C30		Address of HK hardware register
OBPAR_HK_TEMP_SOP_GRATING_CONV1	20020	Ohm	SOP Grating temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_SOP_GRATING_CONV2	998,81	Ohm	SOP Grating temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_SOP_GRATING_CONV3	2,6	Ohm	SOP Grating temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_SOP_GRATING_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_SOP_GRATING_HW_ADDRESS	0x80000C70		Address of HK hardware register
OBPAR_HK_TEMP_SOP_M1_CONV1	20020	Ohm	SOP M1 temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_SOP_M1_CONV2	999,21	Ohm	SOP M1 temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_SOP_M1_CONV3	2,53	Ohm	SOP M1 temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_SOP_M1_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_SOP_M1_HW_ADDRESS	0x80000C80		Address of HK hardware register
OBPAR_HK_TEMP_STS_CONV1	20020	Ohm	Shutter temperature conversion 1 (R1 - series resistance)
OBPAR_HK_TEMP_STS_CONV2	998,81	Ohm	Shutter temperature conversion 2 (R0 - resistance at 0°C)
OBPAR_HK_TEMP_STS_CONV3	2,8	Ohm	Shutter temperature conversion 3 (Re - harness error)
OBPAR_HK_TEMP_STS_CONVTYPE	3		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_TEMP_STS_HW_ADDRESS	0x80000C68		Address of HK hardware register
OBPAR_HK_VOLT_PSU_P34_CONV1	0,000000164 3375	V/DN	Power 3.4V conversion gain
OBPAR_HK_VOLT_PSU_P34_CONV2	0		Not applicable
OBPAR_HK_VOLT_PSU_P34_CONV3	0		Not applicable
OBPAR_HK_VOLT_PSU_P34_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_VOLT_PSU_P34_HW_ADDRESS	0x80000C44		Address of HK hardware register
OBPAR_HK_VOLT_PSU_P72_CONV1	0,000000364 5304	V/DN	Power 7.2V conversion gain
OBPAR_HK_VOLT_PSU_P72_CONV2	0		Not applicable
OBPAR_HK_VOLT_PSU_P72_CONV3	0		Not applicable
OBPAR_HK_VOLT_PSU_P72_CONVTYPE	0		Conversion type 0 = linear SE, 1 = linear DF, 2 = PT SE, 3 = PT DF, 4 = SE Reference
OBPAR_HK_VOLT_PSU_P72_HW_ADDRESS	0x80000C40		Address of HK hardware register
OBPAR_ICU_AUTO_REBUILD_USERDEFINED_MODE	1	none	Rebuilding in case of USER_DEFINED mode enable. 0 = off, 1 = on
OBPAR_ICU_CPUCLK	21000000	Hz	ICU core clock (Hz)
OBPAR_ICU_DELAY_RETRY_IF_TM_BUF_FULL	20	ms	Wait before retry to acquire a free TM Buffer - 0ms means no retry
OBPAR_ICU_HK_INTERNAL_PERIOD	125	ms	Internal Period of HK aquisition task (ms)

Parameter Name	Value	Unit	Description
OBPAR_ICU_HK_RESET_WITH_HK_ENABLE	1		Reset TC/TM Telemetrie counter and status in case of HK Enable 0=Off, 1=On
OBPAR_ICU_JAILBREAK_ENABLE	1	none	Can be used to disable TC Filter and allow free commanding of MERTIS. 0=off, 1=on
OBPAR_ICU_MODEBUILD_MODE	1	none	Mode of Mode Building. 0 = use physical status of unit, 1 = use logical status of units
OBPAR_ICU_OBT_REVERSEJUMP_MIN	1	s	OBT reverse jump time, which will be ignored.
OBPAR_ICU_OBT_SYNC_DELAY_MAX	950	ms	Max delay between TC Time Update and OBT time code (ms)
OBPAR_ICU_OPRATION_EXT_HK_ENABLE	1		Enable Operation Extented HK 0=off, 1=on
OBPAR_ICU_OPRATION_EXT_HK_PERIOD	20000	ms	Operation Extended HK period (ms)
OBPAR_ICU_OPRATION_HK_ENABLE	1		Enable Operation HK 0=off, 1=on
OBPAR_ICU_OPRATION_HK_PERIOD	20000	ms	Operation HK period (ms)
OBPAR_ICU_SEND_APS_CFG_WITH_DIAGNOSE_ENABLE	0	none	Send APS configuration in case of Diagnose Enable 0=Off, 1=On
OBPAR_ICU_SEND_APS_CFG_WITH_SCIENCE_ENABLE	0	none	Send APS configuration in case of Science Enable 0=Off, 1=On
OBPAR_ICU_SEND_APS_VER_WITH_SCIENCE_ENABLE	0	none	Send APS version string in case of Science Enable 0=Off, 1=On
OBPAR_ICU_START_SHELL	0	none	Start the RTEMS shell on stdio. 0=off, 1=on
OBPAR_ICU_TC_MEMORY_CHECK_BLOCK_LENGTH_MAX	1048576	Byte	Maximum block length of memory operation
OBPAR_ICU_TC_MEMORY_DUMP_BLOCK_LENGTH_MAX	1048576	Byte	Maximum block length of memory operation
OBPAR_ICU_UNSYNC_TIME_INIT	2147483648	s	Start value of unsynchronized time (s)
OBPAR_ICU_USE_BOOT_INTERFACE_TIME	0	none	Time from boot interface will be reused in the APS 0=no, 1=yes
OBPAR_ICU_USE_BOOT_INTERFACE_VALUES	1		Values from boot interface will be reused in the APS 0=no, 1=yes
OBPAR_ICU_WAIT_TIME_UPDATE_TC	5000	ms	Wait for TC_Time_Update (ms)
OBPAR_IRQMP_CFG1_INIT	0x00000168	none	MCFG1 Init value
OBPAR_IRQMP_OVERWRITE	1	none	Overwrite irq level configuration 0=off, 1=On
OBPAR_MCTRL_CFG1_INIT	0x08ABC0FF		MCFG1 Init value
OBPAR_MCTRL_CFG2_INIT	0x82C06040		MCFG2 Init value
OBPAR_MCTRL_CFG3_INIT	0x00050200		MCFG3 Init value
OBPAR_MCTRL_OVERWRITE	1		Overwrite memory configuration 0=off, 1=On
OBPAR_POI_BB_HOLD_PWM_REG_INIT	799		Init value of register (see ICD and parameter below)
OBPAR_POI_BB_HOLD_PWM_VALUE	31	none	Strength of the holding current at BB300 and BB700 position (0..31)
OBPAR_POI_BB_HOLD_TIME_REG_INIT	78750000		Init value of register: 60s. (t(s) = value * 16 /fcpu (Hz))
OBPAR_POI_CALIBRATION_CONTROL_REG_INIT	0		Init value of register - Enable Calib. Reg 0=Off, 0xA5F=On
OBPAR_POI_COIL_MODE	0		Init value of register - 0=C1+2, 1=C3+4, 2=C2+3, 3=1+4, 4..7=ALL
OBPAR_POI_DRIVER_MODE	1	none	0=open loop mode, 1=close loop mode
OBPAR_POI_HIGH_SPEED_REG_INIT	168000		Init value of register - high 8ms
OBPAR_POI_HOLD_START_REG_INIT	1261200		Init value of register (see ICD)
OBPAR_POI_HOLD_STOP_REG_INIT	4200000		Init value of register (see ICD)
OBPAR_POI_INIT_PHASE_REG_INIT	4		Init value of register - Init phase of the POI unit, Ref: MER-SRC-SP-061, Issue 1.0, chapter 11 (FM POI User

Parameter Name	Value	Unit	Description
			Manual
OBPAR_POI_LOW_SPEED_REG_INIT	420000		Init value of register - low 20ms
OBPAR_POI_NOMINAL_SPEED_REG_INIT	210000		Init value of register - nominal 10ms
OBPAR_POI_SENSOR_MASK_BB300	7	none	Sensor status mask in BB300 position
OBPAR_POI_SENSOR_MASK_BB700	7	none	Sensor status mask in BB700 position
OBPAR_POI_SENSOR_MASK_PLANET	7	none	Sensor status mask in planet position
OBPAR_POI_SENSOR_MASK_SPACE	7	none	Sensor status mask in space position
OBPAR_POI_SENSOR_STAT_BB300	3		Sensor status bit in BB300 position
OBPAR_POI_SENSOR_STAT_BB700	3		Sensor status bit in BB700 position
OBPAR_POI_SENSOR_STAT_PLANET	7		Sensor status bit in planet position
OBPAR_POI_SENSOR_STAT_SPACE	3		Sensor status bit in space position
OBPAR_POI_SPEED_MODE	0		Init value of register - 0=nominal, 1=low, 2=high
OBPAR_POI_START_POSITION	2		0=Planet, 1=BB7, 2=BB3, 3=SPACE
OBPAR_POI_STEP_STAT_BB300	200		Step counter in BB300 position
OBPAR_POI_STEP_STAT_BB700	100		Step counter in BB700 position
OBPAR_POI_STEP_STAT_PLANET	0		Step counter in planet position
OBPAR_POI_STEP_STAT_SPACE	300		Step counter in space position
OBPAR_POI_TRAPEZOID_REG_INIT	17476		Init value of register (see ICD)
OBPAR_POI_UNIT_MOVING_TIMEOUT	7000	ms	Absolute maxiumum time (ms) for POI operation
OBPAR_POI_USE_SAFE_POS_FROM_BOOT	1		Use safe position from boot interface 0=no, 1=yes
OBPAR_PSU_BB7_POWER	0		BB7 Power On/Off
OBPAR_PSU_EEP_POWER	0		EEPROM Power On/Off
OBPAR_PSU_EPA_ACTIVATED	0	none	EPA already activated 0=no, 1=yes
OBPAR_PSU_EPA_CONFIRM_TIMEOUT	10000	ms	EPA Confirm time out (ms)
OBPAR_PSU_EPA_ENABLE	0		Enable EPA 0=Off, 1=On
OBPAR_PSU_EPA_ON_TIME	100	ms	Maximum EPA powering time (ms)
OBPAR_PSU_HK_LATCHUP_PROTECTION	1		Enable hardware latchup protection of HK ADCs 0=disable, 1=enable
OBPAR_PSU_HK_LATCHUP_SWITCH_OFF_DELAY	2000	ms	Delay before HK Power switch on after latchup detection
OBPAR_PSU_HK_LATCHUP_SWITCH_ON_DELAY	3000	ms	Delay after HK Power switch on after latchup detection
OBPAR_PSU_HK_LATCHUP_SWITCH_ON_ENABLE	1		Automatic switch on HK power after latchup detection 0=Off, 1=On
OBPAR_PSU_HK_POWER	1		HK Power On/Off
OBPAR_PSU_POI_POWER	0		POI Power On/Off
OBPAR_PSU_PSYNC_ENABLE	0		Enable PSU sync clock generation 0=off, 1=on
OBPAR_PSU_SHH_POWER	0		SHH Power On/Off
OBPAR_PSU_STS_POWER	0		Shutter Power Power On/Off

Parameter Name	Value	Unit	Description
OBPAR_PSU_SWITCH_DELAY	250	ms	Delay after PSU switching in (ms)
OBPAR_PSU_SYNC_CLK_DIVIDER	34		PSU sync clock divider: psuclk = sysclk/(divider+1)
OBPAR_PSU_TEC_POWER	0		TEC Power On/Off
OBPAR_PSU_TIR_POWER	0		Radiometer Power On/Off
OBPAR_PSU_TIS_POWER	0		Bolometer Power On/Off
OBPAR_PSU_UNUSED_POWER	0	none	Not used Power line (QM/FM)
OBPAR_RAD_ADC_CLK_Select	1	none	Select ADC clock 0 = external (FPGA), 1 = internal (RAD)
OBPAR_RAD_CMD_OSR	2		ADC Command Operation Speed (OSR) 1..15 - see ADC Data Sheet
OBPAR_RAD_CMD_TWOX	1		ADC Command Double Conversion Speed (TWOX) 0 = standard, 1 = double speed
OBPAR_RAD_CONFIG_REG_INIT	0x00500000		Init value of register
OBPAR_RAD_CONTROL_REG_INIT	0x00000024		Init value of register
OBPAR_RAD_ENABLE_ADC_ERROR_CHECK	1	none	Enable the check of ADC EOC bits and stop the ADCs 0=Off, 1=On
OBPAR_RAD_ENABLE_SYNTHETIC_DATA	0		Enable generation of synthetic data 0=Off, 1=Pattern, Note: check of ADC bits has to be disabled!
OBPAR_RAD_LATCHUP_HANDLING_ENABLE	1		Enable handling of Radiometer Latchup 0=Off, 1=On
OBPAR_RAD_LATCHUP_IRQ_ENABLE	0	none	Enable generation of Radiometer Latchup IRQ 0=Off, 1=On
OBPAR_RAD_LATCHUP_RECOVERY_DELAY	2000	none	Switch off-on delay in case of latchup (ms)
OBPAR_RAD_OVERSAMPLING_REG_INIT	0x00000000		Init value of register
OBPAR_RAD_SLEEP_COUNT	6615	tick	Length of ADC conversion in clk cycles - Depends on TWOX and OSR!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_0	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_1	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_10	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_11	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_12	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_13	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_14	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_15	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_2	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_3	32	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_4	75	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_5	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_6	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_7	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_8	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_NUM_STEP_9	1	none	Number of acquisitions within the calibration step. If the repetition time is <50ms this value is limited to 100!
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_0	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is

Parameter Name	Value	Unit	Description
			acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_1	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_10	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_11	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_12	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_13	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_14	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_15	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_2	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_3	49	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_4	800	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_5	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_6	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_7	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_8	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_ACQ_REP_TIME_STEP_9	100	ms	Repetition time of acquisitions within the step. Note: If the time <50ms a burst of max. 100 acquisitions is acquired and parameter oversampling is ig
OBPAR_SEQ_CAL_BB7_DISCARD_IF_TIS_OFF	1	none	Discard BB700 calibration target if TIS is switched off during science 0 = disable, 1 = enable
OBPAR_SEQ_CAL_CYCLE_DELAY	0	ms	Delay between two calibration cycle repetitions (ms).
OBPAR_SEQ_CAL_CYCLE_REPETITION_NUMBER	10	none	Calibration cycle repetitions. Note: The calibration cycle contains a several configurable steps.
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_0	5	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_1	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_2	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_CYCLIC_STEP_NUM_3	0	none	Number of steps within the Cyclic-step setup: 0 = off, 1..8

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_0	0x00043210	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_1	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_2	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_CYCLIC_STEPS_SETUP_3	0x00000000	none	Cyclic-step setup executed as configured. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEP_NUM_0	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_1	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_2	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEP_NUM_3	0	none	Number of steps within the Post-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_POST_STEPS_SETUP_0	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_1	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_2	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_POST_STEPS_SETUP_3	0x00000000	none	Post-step setup executed once at the end. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEP_NUM_0	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_1	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_2	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEP_NUM_3	0	none	Number of steps within the Pre-step setup: 0 = off, 1..8
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_0	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_1	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_2	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_PRE_STEPS_SETUP_3	0x00000000	none	Pre-step setup executed once at the beginning. Each nibble contains one step number (0..15).
OBPAR_SEQ_CAL_SELECT_SETUP	0	none	Select the active calibration sequence setup 0..3
OBPAR_SEQ_CAL_START_MODE	0	none	Start Mode of calibration 0 = Wait until SH stable, 1 = Wait time
OBPAR_SEQ_CAL_START_TIMEOUT	1800000	ms	Timeout in case of start mode 'Wait until stable' or fix waiting time in ms
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_0	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_1	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_10	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_11	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_12	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_13	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_14	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_15	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_2	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_3	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_4	2200	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_5	0	ms	Stabilization time at the beginning of calibration step.

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_6	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_7	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_8	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STAB_TIME_STEP_9	0	ms	Stabilization time at the beginning of calibration step.
OBPAR_SEQ_CAL_TARGET_STEP_0	3	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_1	4	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_10	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_11	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_12	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_13	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_14	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_15	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_2	1	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_3	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_4	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_5	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_6	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_7	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_8	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TARGET_STEP_9	0	none	Calibration Target/Referenz Target: 0/16=Planet, 1/17=Space, 2/18=Background, 3/19=BB700, 4/20=B300.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_0	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_1	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_10	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_11	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_12	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_13	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_14	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_15	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_2	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_3	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_4	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_5	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_6	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_7	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_8	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TIR_OVS_NUM_STEP_9	230	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 230=oversampling 230.
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_0	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_1	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_10	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_11	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_12	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_13	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_14	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_15	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_2	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_3	100	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_4	1	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_5	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_6	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_7	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_8	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIR_REP_FACTOR_STEP_9	8	none	Calibration internal TIR and TIS ratio within the step. Note: TIS is the master. If TIS needs more time than expected TIR will be delayed. If TIR need
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_0	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_1	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_10	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_11	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_12	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_13	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_14	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_15	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_2	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_3	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_4	32	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_5	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_6	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_7	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_8	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_OVS_NUM_STEP_9	1	none	Number of sample within the acquisition of a step. 0=off, 1=one sample, ... 4=oversampling 4. In case of burst acquisition this parameter will be igno
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_0	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_1	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_10	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_11	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_12	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_13	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_14	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_15	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_2	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_3	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_4	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_5	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused

Parameter Name	Value	Unit	Description
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_6	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_7	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_8	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CAL_TIS_WIN_SIZE_STEP_9	3	none	TIS win size within a calibration step. Default should be: 0=100x80, 1=66x80, 2=74x80, 3=120x120, 4=unused
OBPAR_SEQ_CALIBRATION_PERIOD	30000	ms	Science calibration Period
OBPAR_SEQ_DISCARD_AQUISITION_TEC_NOT_STABLE	1	none	Discard invalid data if TEC is unstable 0=off, 1=on
OBPAR_SEQ_INT_REPETITION_RATE	800	ms	Science internal repetition rate
OBPAR_SEQ_POI_MODE	1		Science POI operation Mode 0=off, 1=Move, 2=PlanetView, 3=BB3View, 4=BB7View, 5=SpaceView
OBPAR_SEQ_SCIENCE_DISABLE_TIME_OUT	24000	ms	Estimated time until TC science disable is executed and task 7 is suspended (ms)
OBPAR_SEQ_SCIENCE_TIR_QUICKLOOK_PERIOD	60000	ms	TIR period of science quicklook
OBPAR_SEQ_SCIENCE_TIS_QUICKLOOK_PERIOD	60000	ms	TIS period of science quicklook
OBPAR_SEQ_SWITCHOFF_TIME_ADJUST_TEMPORAL_ENABLE	1	none	In order to prevent RAD or BOL Busy situation it is possible to disable the time adjust feature during heavy configurations.
OBPAR_SEQ_TIR_REPETITION_FACTOR	1		Science internal TIR and TIS ratio
OBPAR_SEQ_TIS_BCK_DISABLE	1	none	Disable the background generation also in case of shutter is on 0=off, 1=on (default)
OBPAR_SEQ_TIS_BCK_RATE	20		Science TIS background rate
OBPAR_SHH_CONTROL_ENABLE	2		Enable the SHH controller, 0=Off, 1= Ctrl_Temperatuer, 2=Ctrl_Temperature Note: If the controller is off, the SHH power can be set manually
OBPAR_SHH_CONTROL_TEMP_REF_SENSOR	5	none	SHH controller reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_EOP_TMA 4
OBPAR_SHH_CONTROL_TEMP_SETPOINT	18	°C	SHH Controller temperature set point (°C)
OBPAR_SHH_CONTROLLER_OUTPUT_MAX	100	%	SHH controller output maximum
OBPAR_SHH_CONTROLLER_OUTPUT_MIN	0	%	SHH controller output minimum
OBPAR_SHH_INTEGRAL_GAIN_TEMPERATURE	0	none	TEC integral gain (temperature)
OBPAR_SHH_PROPORTIONAL_GAIN_TEMPERATURE	400	none	TEC proportional gain (temperature)
OBPAR_SHH_PWM_ENABLE	0	none	Enable the SHH PWM, 0=off, 1=on
OBPAR_SHH_PWM_SCALE_FACTOR	2	none	Scaling factor of the PMW Period. Should be minimum 1 (fastes)
OBPAR_SHH_STAB_INVALID_MEASUREMENT_NUM	2	none	Number of failed stable measurements, until stable flag will be invalid.
OBPAR_SHH_STAB_MEASUREMENT_ENABLE	1	none	Enable the temperature stable measurement 0=off, 1=on
OBPAR_SHH_STAB_MEASUREMENT_GRADIENT_VAL_MAX	0,002	K/s	SH temperature gradient maximum (K/s)
OBPAR_SHH_STAB_MEASUREMENT_PERIOD	10	s	Period of measurements for temperature gradient (s)
OBPAR_SHH_STAB_MEASUREMENT_REF_SENSOR	5	none	SHH stable measurement reference temperature index. 0=INDEX_HK_TEMP_RBA_FRONT 1=INDEX_HK_TEMP_RBA_BACK 2=INDEX_HK_TEMP_EOP_IR_FILTER 3=INDEX_HK_TEMP_E
OBPAR_SHH_STAB_MEASUREMENT_TIME_OUT	1800000	ms	SHH temperature stable time out (ms)
OBPAR_SHH_STAB_VALID_MEASUREMENT_NUM	18	none	Number of successful stable measurements, until stable flag will be valid.

Parameter Name	Value	Unit	Description
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_ENABLE	1	none	Delay non large science packets. Note: They will be send out of order.
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_SIZE	512	byte	Length of a non-science packets if it will be handled as a large packet (byte).
OBPAR_SPW_DELAY_LARGE_NONSCIENCE_TIME	125	ms	Delay between two large non-science packets (ms).
OBPAR_SPW_GRSPW_CLOCK_DIV_REG_INIT	0x00000101	none	Init value of register
OBPAR_SPW_GRSPW_CTRL_REG_INIT	0x00000B09	none	Init value of register
OBPAR_SPW_GRSPW_DMA1_CTRL_STAT_REG_INIT	0x00011010	none	Init value of register
OBPAR_SPW_GRSPW_SYSTIME_ADJUST_ENABLE	1	none	Adjust system time in case of devaition.
OBPAR_SPW_GRSPW_SYSTIME_DEVIATION_CONVERSION_FACTOR	1000	none	time deviation conversion factor used in extended HK, default 1000.
OBPAR_SPW_GRSPW_SYSTIME_DEVIATION_MAX	500	us	Absolute Maximal acceptable time deviation between time code and system time (us).
OBPAR_SPW_GRSPW1_TIMER_DISCNT_REG_INIT	0x0000F087	none	Init value of register
OBPAR_SPW_LINK_RESTART_DELAY	20	ms	Delay between stop and retsart the link (ms).
OBPAR_SPW_NODE_ADDR_TC	68	none	Spacewire Node Address RX
OBPAR_SPW_NODE_ADDR_TM_NO_SCIENCE	36	none	Spacewire Node Address TX (NonScience)
OBPAR_SPW_NODE_ADDR_TM_SCIENCE	52	none	Spacewire Node Address TX (Science)
OBPAR_SPW_PROTOCOL_ID	2	none	Spacewire protocol id
OBPAR_SPW_TX_DESCRIPTOR_FREE_RETRY	1	none	Number of retries in case of TX descriptors are blocked. The link will be stopped and started
OBPAR_SPW_TX_DESCRIPTOR_FREE_WAIT_TIME	100	ms	Maximum wait time until one descriptor is available, if all descriptors are in use (ms)
OBPAR_SPW_TX_PACKET_DELAY	1	ms	Delay between 2 TM packet transfers. Note: Should be 0ms, but can be carefully increased to slow down the TX data rate. Maximum value is 10ms
OBPAR_SPW_WAIT_BUSY	3000	ms	Wait if spw driver function is busy (ms)
OBPAR_STS_AUTO_OPEN	100	ms	STS auto open time function STS_Close_AutoOpen()used e.g. for diagnose (max. 798ms)
OBPAR_STS_CLOSE_DELAY	7	ms	Waiting time after STS Close operation in (ms)
OBPAR_STS_CONTROL_REG_INIT	0x00000001	none	Register Init Value
OBPAR_STS_OPEN_DELAY	12	ms	Waiting time after STS Open operation in (ms)
OBPAR_STS_STATUS_CHECK_ENABLE	1		Enable STS status check, 0=off, 1=on
OBPAR_STS_TIMEOUT	700	ms	STS timeout value Note: maximum value is 798ms, see HW2SW ICD
OBPAR_STS_TIMEOUT_ENABLE	1		Enable STS time out, 0=off, 1=on
OBPAR_STS_TIMEOUT_REG_INIT	0xFFFFFFFF	none	Register Init Value
OBPAR_STS_USE_CMD_AS_STATUS	0		Use Cmd as STS status, 0=off, 1=on
OBPAR_TEC_CONTROL_PERIOD	0,2	s	TEC controller period (s)
OBPAR_TEC_CONTROLLER_OUTPUT_MAX	511		TEC controller output maximum (DN)
OBPAR_TEC_CONTROLLER_OUTPUT_MIN	-511		TEC controller output minimum (DN)
OBPAR_TEC_DERIVATE_GAIN	0	s	TEC derivate gain (s)
OBPAR_TEC_INTEGRAL_GAIN	33	1/s	TEC integral gain (1/s) - 40..2512
OBPAR_TEC_LOGGING_ENABLE	0		Enable TEC Logging, 0=off, 1=on

Parameter Name	Value	Unit	Description
OBPAR_TEC_PRESCALER	2		Reload Value TEC Prescaler [f=CpuClk/256/(scaler + 1)]
OBPAR_TEC_PROCESS_OUT_OF_RANGE_ERROR_PERIOD	60000	ms	TEC process value out of range error period (ms)
OBPAR_TEC_PROCESS_VALUE_MAX	50	°C	TEC process value maximum (°C)
OBPAR_TEC_PROCESS_VALUE_MIN	-10	°C	TEC process value minimum (°C)
OBPAR_TEC_PROPORTIONAL_GAIN	250		TEC proportional gain - 190..1068
OBPAR_TEC_PWM_LIMIT_COUNT_MAX	50	none	TEC power 100% count
OBPAR_TEC_SETPOINT	25	°C	TEC Controller setpoint (°C)
OBPAR_TEC_TEMP_PEAK_ABS_ERROR_MAX	0,01	°C	TEC temperature peak max absolute error value (°C)
OBPAR_TEC_TEMP_PEAK_DISCARD_ENABLE	1	none	TEC temperature measurement peak discard 0=off, 1=on
OBPAR_TEC_TEMP_PEAK_DISCARD_NUM	1	none	TEC temperature measurement peak discard number (Note: increase dead time off controller!)
OBPAR_TEC_TEMP_STABLE_ABS_ERROR_MAX	0,05	°C	TEC temperature stable max absolute error value (°C)
OBPAR_TEC_TEMP_STABLE_FALSE_COUNT_MAX	3	none	TEC temperature stable false count
OBPAR_TEC_TEMP_STABLE_TRUE_COUNT_MAX	20	none	TEC temperature stable true count
OBPAR_TEC_TIMEOUT_ENABLE	1		Enable TEC time out of 1.5s 0=off, 1=on
OBPAR_TIR_BB3_VIEW_CALIBRATION_NUM	1	none	TIR BB3 view calibration acquisitions
OBPAR_TIR_BB3_VIEW_CALIBRATION_TIME	2200	ms	TIR BB3 view calibration time
OBPAR_TIR_BB7_VIEW_CALIBRATION_NUM	1	none	TIR BB7 view calibration acquisitions
OBPAR_TIR_BB7_VIEW_CALIBRATION_TIME	2200	ms	TIR BB7 view calibration time
OBPAR_TIR_DISCARD_SAMPLE_NUM	6		Number of samples discarded after ADC channel switching (max=50)
OBPAR_TIR_ENABLE_RAW_DATA_TRANSFER	0		Enable transfer of RAW data in a Test TM 0=Off, 1=Pattern
OBPAR_TIR_OVERSAMP_MODE	1		TIR Oversampling Mode 0=off, 1=on
OBPAR_TIR_PROC_TIME	10	ms	TIR data processing and transfer time
OBPAR_TIR_QUICKLOOK_TARGET_BB300_ENABLE	1	none	TIR enable science quicklook target BB300TM
OBPAR_TIR_QUICKLOOK_TARGET_BB700_ENABLE	1	none	TIR enable science quicklook target BB700
OBPAR_TIR_QUICKLOOK_TARGET_PLANET_ENABLE	1	none	TIR enable science quicklook target planet
OBPAR_TIR_QUICKLOOK_TARGET_SPACE_ENABLE	1	none	TIR enable science quicklook target space
OBPAR_TIR_RAD_STABILIZATION_TIME	5	ms	RAD stabilization time after POI moving
OBPAR_TIR_SCIENCE_ENABLE	0		TIR enable science TM
OBPAR_TIR_SCIENCE_QUICKLOOK_ENABLE	0		TIR enable science quicklook TM
OBPAR_TIR_SPACE_VIEW_CALIBRATION_NUM	1	none	TIR SPACE view calibration acquisitions
OBPAR_TIR_SPACE_VIEW_CALIBRATION_TIME	2200	ms	TIR SPACE view calibration time
OBPAR_TIS_ACTIVE_WIN_CFG	3		Active Win_CFG 0=100x80, 1=66x80, 2=74x80, 3=160x120, 4=FREE
OBPAR_TIS_BB3_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS BB3 view calibration acquisitions
OBPAR_TIS_BB3_VIEW_CALIBRATION_TIME	300	ms	TIS BB3 view calibration time
OBPAR_TIS_BB7_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS BB7 view calibration acquisitions

Parameter Name	Value	Unit	Description
OBPAR_TIS_BB7_VIEW_CALIBRATION_TIME	300	ms	TIS BB7 view calibration time
OBPAR_TIS_BCK_OVERSAMPLE_RATIO	50	%	TIS background oversampling ratio
OBPAR_TIS_BIN_MODE	1		Binning mode 0=1x1, 1=1x2, 2=2x2, 3=2x4
OBPAR_TIS_CALC_BCK_MACRO_PIXEL_ENABLE	1	none	TIS background macro pixel calculation enable 0 = off, 1 = on
OBPAR_TIS_CFG_REF_AREA1_POS_START_X	0	none	Left boundary window start position x
OBPAR_TIS_CFG_REF_AREA1_POS_START_Y	0	none	Left boundary window start position y
OBPAR_TIS_CFG_REF_AREA1_SIZE_X	20	pix	Left boundary window size x
OBPAR_TIS_CFG_REF_AREA1_SIZE_Y	101	pix	Left boundary window size y
OBPAR_TIS_CFG_REF_AREA2_ENABLE	1	none	Top boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA2_POS_START_X	0	none	Top boundary window start position x
OBPAR_TIS_CFG_REF_AREA2_POS_START_Y	101	none	Top boundary window start position y
OBPAR_TIS_CFG_REF_AREA2_SIZE_X	160	pix	Top boundary window size x
OBPAR_TIS_CFG_REF_AREA2_SIZE_Y	19	pix	Top boundary window size y
OBPAR_TIS_CFG_REF_AREA3_ENABLE	1	none	Right boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA3_POS_START_X	138	none	Right boundary window start position x
OBPAR_TIS_CFG_REF_AREA3_POS_START_Y	0	none	Right boundary window start position y
OBPAR_TIS_CFG_REF_AREA3_SIZE_X	22	pix	Right boundary window size x
OBPAR_TIS_CFG_REF_AREA3_SIZE_Y	101	pix	Right boundary window size y
OBPAR_TIS_CFG_REF_AREA4_ENABLE	0	none	Unused window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG_REF_AREA4_POS_START_X	255	none	Unused window start position x
OBPAR_TIS_CFG_REF_AREA4_POS_START_Y	255	none	Unused window start position y
OBPAR_TIS_CFG_REF_AREA4_SIZE_X	1	pix	Unused window size x
OBPAR_TIS_CFG_REF_AREA4_SIZE_Y	1	pix	Unused window size y
OBPAR_TIS_CFG0_REF_AREA1_ENABLE	1	none	Left boundary window configuration enabled 0=Off, 1=On
OBPAR_TIS_CFG0_REF_ENABLE	1	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG0_WIN_SIZE_X	100	pix	Main window size x
OBPAR_TIS_CFG0_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG0_WIN_START_X	30	none	Main window start position x
OBPAR_TIS_CFG0_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG1_REF_ENABLE	1	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG1_WIN_SIZE_X	66	pix	Main window size x
OBPAR_TIS_CFG1_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG1_WIN_START_X	47	none	Main window start position x
OBPAR_TIS_CFG1_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG2_REF_ENABLE	1	none	Enable reference area 0= off, 1=on

Parameter Name	Value	Unit	Description
OBPAR_TIS_CFG2_WIN_SIZE_X	74	pix	Main window size x
OBPAR_TIS_CFG2_WIN_SIZE_Y	80	pix	Main window size y
OBPAR_TIS_CFG2_WIN_START_X	43	none	Main window start position x
OBPAR_TIS_CFG2_WIN_START_Y	13	none	Main window start position y
OBPAR_TIS_CFG3_REF_ENABLE	0	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG3_WIN_SIZE_X	160	pix	Main window size x
OBPAR_TIS_CFG3_WIN_SIZE_Y	120	pix	Main window size y
OBPAR_TIS_CFG3_WIN_START_X	0	none	Main window start position x
OBPAR_TIS_CFG3_WIN_START_Y	0	none	Main window start position y
OBPAR_TIS_CFG4_REF_ENABLE	0	none	Enable reference area 0= off, 1=on
OBPAR_TIS_CFG4_WIN_SIZE_X	1	pix	Main window size x
OBPAR_TIS_CFG4_WIN_SIZE_Y	1	pix	Main window size y
OBPAR_TIS_CFG4_WIN_START_X	255	none	Main window start position x
OBPAR_TIS_CFG4_WIN_START_Y	255	none	Main window start position y
OBPAR_TIS_COMP_MODE	0		Data compression mode 0=off, 1=lossless
OBPAR_TIS_DATA_PROC_MODE	0		TIS data processing mode 0/2 Planet/STS BckGrnd (depends on STS on/off), 1=No BckGrnd, 3=BB3 BckGrnd, 4=Manual setting within OBVAR_TIS_DARK_TARGET_TY
OBPAR_TIS_DECT_DEAD_PIX_NUM_0	6066	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_1	17561	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_10	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_11	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_12	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_13	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_14	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_15	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_2	17758	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_3	17918	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused

Parameter Name	Value	Unit	Description
OBPAR_TIS_DECT_DEAD_PIX_NUM_4	19013	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_5	19064	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_6	19172	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_7	19173	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_8	19174	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_DECT_DEAD_PIX_NUM_9	-1	pix num	Bolometer dead pixel as plane number in a 1D array [pixel(x,y) --> pixel_1D_num = y * 160 + x] - 0..19199 or -1 unused
OBPAR_TIS_EXT_REPETITION_RATE_FOR_RES1_MODE	100	ms	TIS External repetition rate for RES1 Modes, which is default 100ms
OBPAR_TIS_OVERSAMP_AUTO_CALC_NUMBERS	0	none	TIS Oversampling calculation of maximum numbers enable 0=off, 1=on
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100000MS	128	none	TIS Oversampling number for 1000ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100000MS_DARK	128	none	TIS Oversampling number for 1000ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100MS	4	none	TIS Oversampling number for 100ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_100MS_DARK	1	none	TIS Oversampling number for 100ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_2000MS	64	none	TIS Oversampling number for 2000ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_2000MS_DARK	64	none	TIS Oversampling number for 2000ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_300MS	16	none	TIS Oversampling number for 300ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_300MS_DARK	4	none	TIS Oversampling number for 300ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBER_800MS	32	none	TIS Oversampling number for 800ms repetition rate
OBPAR_TIS_OVERSAMP_FIX_NUMBER_800MS_DARK	32	none	TIS Oversampling number for 800ms repetition rate and dark
OBPAR_TIS_OVERSAMP_FIX_NUMBERS_ENABLE	1	none	TIS Oversampling set to fix numbers enable 0=off, 1=on
OBPAR_TIS_OVERSAMP_MODE	1		TIS Oversampling mode 0=off, 1=on
OBPAR_TIS_POI_STABILIZATION_TIME	17	ms	BOL stabilization time after POI moving
OBPAR_TIS_PROC_MARGIN_TIME	1	ms	TIS data processing and transfer margin time
OBPAR_TIS_QUICKLOOK_TARGET_BACKGROUND_ENABLE	1		TIS enable science quicklook target background / shutter close
OBPAR_TIS_QUICKLOOK_TARGET_BB300_ENABLE	1	none	TIS enable science quicklook target BB300TM
OBPAR_TIS_QUICKLOOK_TARGET_BB700_ENABLE	1	none	TIS enable science quicklook target BB700
OBPAR_TIS_QUICKLOOK_TARGET_PLANET_ENABLE	1	none	TIS enable science quicklook target planet
OBPAR_TIS_QUICKLOOK_TARGET_SPACE_ENABLE	1	none	TIS enable science quicklook target space
OBPAR_TIS_REMOVE_DEAD_PIXEL_ENABLE	1	none	Enable remove off dead pixels. 0=off, 1=on
OBPAR_TIS_REMOVE_NOISE_BIT_NUM	0	none	TIS remove number of noise bits from science data by shift right operation - 0 has no effect
OBPAR_TIS_SCIENCE_ENABLE	0		TIS enable science TM

Parameter Name	Value	Unit	Description
OBPAR_TIS_SCIENCE_QUICKLOOK_ENABLE	0		TIS enable science quicklook TM
OBPAR_TIS_SPACE_VIEW_CALIBRATION_ACQ_NUM	1	none	TIS SPACE view calibration acquisitions
OBPAR_TIS_SPACE_VIEW_CALIBRATION_TIME	300	ms	TIS SPACE view calibration time
OBPAR_TIS_STS_STABILIZATION_TIME	17	ms	BOL stabilization time after STS moving
OBPAR_TIS_VALIDATE_BCK_MACRO_PIXEL_ENABLE	1	none	TIS background macro pixel validation enable 0 = off, 1 = on
OBPAR_WDG_ENABLE	1		Watchdog Enable 0=off. 1=on
OBPAR_WDG_TIMEOUT	90000	ms	Watchdog time out (ms)

Appendix 14: EXAMPLE MODE DESCRIPTION (Detailed) – FullWin_UnCompr (29)

Item, Step	Function, Performance	Parameters, Verification, Limitations
Generals	The mode 29 is used mainly for testing purposes where a nominal science function is needed but raw data are sent as TM. It has the following specific characteristics: - Nominal science mode function of the sub-systems - No data processing, BOL window (160x120) - Repetition rate 800msec for TIS and TIR	The repetition rate must be at least 800msec due to the high data rate of TIS full window without data compression.
Preconditions	StandBy mode Default parameter configuration	Specific parameter settings are listed in this table
Initialization by telecommanding		
Parameters	TC_Operation_Parameter	PAR_REPETITION_RATE=800msec (mode relevant) PAR_TIR_REPETITION_FACTOR=1 (mode relevant) PAR_STS_POWER=ON (mode relevant) PAR_SHH_POWER=ON (**not** mode relevant) PAR_BB7_POWER=ON (mode relevant) PAR_TIS_POWER=ON (mode relevant) PAR_TIR_POWER=ON (mode relevant) PAR_TEC_POWER=ON (mode relevant) PAR_POI_POWER=ON (mode relevant) PAR_TIS_BCK_RATE=10 (**not** mode relevant) PAR_POI_MODE=Move (mode relevant) PAR_TIS_BIN_MODE=0 (1x1) (mode relevant) PAR_TIS_WIN_SIZE=3 (120 x 160) (mode relevant) PAR_TIS_COMP_MODE=0 (no compression) (mode relevant) CALIBRATION_PERIOD=120sec (**not** mode relevant)
Parameters	TC_FuncConfig_Parameters	PAR_TIS_OVERSAMP_MODE=Yes PAR_TIR_OVERSAMP_MODE=Yes Other parameters have default settings
Powering, Intermediate mode	TC_Power_Enable	all sub-systems are initialized POI stays in the Safe position (nominally BB3 view) HK_STAT_MERTIS_MODE=3 (WarmUp)
Delay	Wait thermal stabilization time of MERTIS	For real science operation WarmUp mode has to be enabled for

Item, Step	Function, Performance	Parameters, Verification, Limitations
		minutes up to hours for thermal stabilization of MERTIS HK_STAT_SH_REF_TEMP_STABLE=1 (stable) in Operation HK
Start	TC_Science_Enable TC_Science_Enable	PID=62 (Nominal science) PID=63 (QuickLook science)
Functional procedure		
Init phase	1) Calculate and set the Mode parameter in TM 2) Dump operational parameters 3) Dump functional parameters 4) Calculate the maximum TIS and TIR oversampling parameter based on PAR_REPETITION_RATE and internal timings 5) Initialize sub-systems with specific parameter settings 6) Start data generation from BEL/BOL 7) Start data generation from REL/RAD 8) Move POI to BB3 view 9) Acquire background image from BB3 view and store it in the BB3 background image memory 10) Close STS; acquire background image and store it in the STS background image memory; open STS 10) Move POI to Planet view 12) Start periodic sequence	HK_STAT_MERTIS_MODE=29 (FullWin_UnCompr) Oversampling is the determine a arithmetic average of each pixel of calculated number of acquisitions
Periodic science sequence	1) Acquire image from TIS and TIR as well as actual time for TM time stamping of each science data set 2) Process planet view TIS and TIR data 3) Pack TIS and TIR data and send them as TM 4) Count number of TIS and TIR image acquisitions 5) After PAR_TIS_BCK_RATE number of TIS acquisitions close STS, acquire background image and store it in STS background image memory 6) After CALIBRATION_PERIOD start Calibration sequence 7) Wait for TC_Disable_Science 7a) if received stop sequence and set TM mode parameter 7b) if not received repeat from Step 1)	Power consumption (28V) = 320 … 480mA (measured EGSE with power supply) The calibration period is defined by CALIBRATION_PERIOD. The number of science acquisitions between two darks is defined by PAR_TIS_BCK_RATE.
Calibrations sequence	1) At pre-calculated number of TIS and TIR acquisitions move POI to next view; Do for BB3, BB7 and Space view 2) Move to view	POI stays on each position a certain predefined time period (holding period) before moving to the next position. This holding period is predefined due to the time needed for data acquisition and, more important, due to the thermal stabilization time constant of the

Item, Step	Function, Performance	Parameters, Verification, Limitations
	3) Wait stabilization time (detector time constant) before start image acquisition 4) Start TIS and TIR image acquisition 5) Acquire TIS and TIR data from view 6) Move to the next view 7) In case of BB3_View position store the TIS image in BB3 background memory 8) Process TIS and TIR BB3, BB7, Space View data 9) Pack TIS and TIR data and send them as TM 10) Move to Planet view	detector, especially for TIR which has a time constant of several hundred milliseconds. The holding time can be justified by setting the following On-Board parameters: OBPAR_TIS_BB3_VIEW_CALIBRATION_TIME OBPAR_TIS_BB7_VIEW_CALIBRATION_TIME OBPAR_TIS_SPACE_VIEW_CALIBRATION_TIME OBPAR_TIR_BB3_VIEW_CALIBRATION_TIME OBPAR_TIR_BB7_VIEW_CALIBRATION_TIME OBPAR_TIR_SPACE_VIEW_CALIBRATION_TIME Important is that the holding period on the SpaceView is large enough for TIR. The number of acquisitions per view can be modified by the following On-Board parameters: OBPAR_TIS_BB3_VIEW_CALIBRATION_NUM OBPAR_TIS_BB7_VIEW_CALIBRATION_NUM OBPAR_TIS_SPACE_VIEW_CALIBRATION_NUM OBPAR_TIR_BB3_VIEW_CALIBRATION_NUM OBPAR_TIR_BB7_VIEW_CALIBRATION_NUM OBPAR_TIR_SPACE_VIEW_CALIBRATION_NUM
Post sequence function	1) Move POI to Safe position 2) Set mode in TM	HK_STAT_MERTIS_MODE=3 (WarmUp)
Sub-system functions		
ICU/HK power/function	Powered-on; analog HK are acquired from the whole instrument	Default: every 20sec
BOL/BEL power/function	Powered-on; Bolometer / electronics delivers data	
TEC power/function	Powered-on; Bolometer chip temperature is stabilized	Temperature difference of BOL chip temperature and BOL chip housing cannot exceed 14K
Automatic setting of BOL/BEL working point	Enabled; separate functional description	If automatic setting of BOL/BEL working point is enabled, a temperature sensor will be used to identify the temperature range and set the corresponding BOL chip temperature, FID and VSKIM voltage. The following On-Board parameters are involved: i) OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_SENSOR OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T1_MAX;

Item, Step	Function, Performance	Parameters, Verification, Limitations
		OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MIN OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T2_MAX OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MIN OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T3_MAX OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MIN OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T4_MAX OBPAR_BOL_BIAS_VOLT_SETTING_REF_TEMP_T5_MIN These parameters select the temperature sensor and define the temperature ranges. Between two ranges has to be a small gap. This gap is needed to realize a hysteresis. The actual temperature range can be tested via the On-Board variable OBVAR_BOL_BIAS_VOLT_ACTICE_SET and HK_STAT_BOL_BIAS_VOLT_ACTIVE_PARAM_SET in operation extended HK ii) OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_1 OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_2 OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_3 OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_4 OBPAR_BOL_DECT_FIDBIAS_VOLTAGE_5 These parameters define the FID voltage for each temperature range iii) OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_1 OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_2 OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_3 OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_4 OBPAR_BOL_DECT_VSKIMBIAS_VOLTAGE_5 These parameters define the VSKIM voltage for each temperature range iv) OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_1 OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_2 OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_3

Item, Step	Function, Performance	Parameters, Verification, Limitations
		OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_4 OBPAR_BOL_BIAS_VOLT_SETTING_BOL_CHIP_TEMP_5 These parameters define the BOL chip temperature for each temperature range
STS power	Powered-on; STS closes/open the slit periodically	
STS function		
RAD/REL power/function	Powered-on; Radiometer / electronics delivers data	
POI power/function	Powered-on; POI moves periodically to all views (Planet, BB7, BB3 and Space view). When moving the POI period relates to the CALIBRATION_PERIOD.	
BB7 power/function	Powered-on; on the BB7 view position of POI, one BB7 image is sent as TM processed as science data from the Planet view	
BB3 function	Always enabled; on the BB3 view position of POI, one BB3 image is sent as TM processed as science data from the Planet view	
SHH power/function	Powered-off; sensor head temperature control is disabled	
Data processing		
TIS Oversampling	Oversampling of TIS data with the pre-calculated number of oversampling's	PAR_TIS_OVERSAMP_MODE=1 (yes)
TIS Binning	No binning	PAR_TIS_BIN_MODE=0 (1x1)
TIS background subtraction	Subtract the background data from acquired planet view data STS background stored if TIS_BACKGROUND_USAGE=STS BB3 background stored if TIS_BACKGROUND_USAGE=BB3	STS background or BB3 background subtraction is enabled
TIS compression	Compress the TIS data	PAR_TIS_COMP_MODE=0 (no compression)
TIR oversampling	Oversampling of TIR data with the pre-calculated number of oversampling's	PAR_TIR_OVERSAMP_MODE=1 (yes)
Telemetry output		
TC verification	TM_TC_Acceptance_Success TM_TC_Execution_Success	
Parameter verification	TM_Operation_Parameter TM_FunctionConfig_Parameter	
TIS science data	TM_Science_TIS_Data	Every 800msec for about 13sec 1 image, planet view (10 x TM_Science_TIS_Data) Every 20000msec with about 1-3sec delay between 1 image, BB3 view (10 x TM_Science_TIS_Data)

Item, Step	Function, Performance	Parameters, Verification, Limitations
		1 image, BB7 view (10 x TM_Science_TIS_Data) 1 image, Space view (10 x TM_Science_TIS_Data) Every 8000msec 1 image, Background (10 x TM_Science_TIS_Data) (1 image = 19200 pixel á 16bit)
	TM_Science_TIS_Data_QuickLook	Every 60sec (default) 1 image, planet, BB3, BB7 or space view (10 x TM_Science_TIS_Data_QuickLook)
TIR science data	TM_Science_TIR_Data	Every 800msec for about 13sec 1 image, planet view (1 x TM_Science_TIR_Data) Every 20000msec with about 1-3sec delay between 1 image, BB3 view (1 x TM_Science_TIR_Data) 1 image, BB7 view (1 x TM_Science_TIR_Data) 1 image, Space view (1 x TM_Science_TIR_Data) (1 image = 32 pixel á 32bit)
	TM_Science_TIR_Data_QuickLook	Every 60sec (default) 1 image, planet, BB3, BB7 or space view (1 x TM_Science_TIR_Data_QuickLook)
HK data	TM_OperationDefault_HK TM_OperationExtended_HK	1 packet every 20sec (Default) 1 packet every 20sec (Default)
Events	TM_Event_Progress (ModeTransition)	Previous mode: WarmUp Current mode: FullWin_UnCompr
	TM_Event_Progress (ModeTransition)	Previous mode: WarmUp Current mode: FullWin_UnCompr
	TM_Event_Warning TM_Event_Error TM_Event_Alarm	To be monitored if it occurs

Appendix 15: ON-BOARD SOFTWARE TRAP TABLE

Trap	TT	Pri	Description	Handler
reset	0x00	1	Power-on reset	entry point
write error	0x2B	2	write buffer error	REBOOT
instruction_access_error	0x01	3	Error during instruction fetch	REBOOT
illegal_instruction	0x02	5	UNIMP or other un-implemented instruction	REBOOT
privileged_instruction	0x03	4	Execution of privileged instruction in user mode	REBOOT
fp_disabled	0x04	6	instruction while FPU disabled	REBOOT
cp_disabled	0x24	6	instruction while Co-processor disabled	REBOOT
watchpoint_detected	0x0B	7	Hardware breakpoint match	REBOOT
window_overflow	0x05	8	SAVE into invalid window	SYSTEM
window_underflow	0x06	8	RESTORE into invalid window	SYSTEM
register_hadrware_error	0x20	9	register file EDAC error (LEON-FT only)	REBOOT
mem_address_not_aligned	0x07	10	Memory access to un-aligned address	REBOOT
fp_exception	0x08	11	FPU exception	REBOOT
cp_exception	0x28	11	Co-processor exception	REBOOT
data_access_exception	0x09	13	Access error during load or store instruction	REBOOT
tag_overflow	0x0A	14	Tagged arithmetic overflow	REBOOT
divide_exception	0x2A	15	Divide by zero	REBOOT
interrupt_level_1	0x11	31	Watchdog interrupt	ISR
interrupt_level_2	0x12	30	UART1 interrupt	ISR
interrupt_level_3	0x13	29	AHB Status interrupt	ISR
interrupt_level_4	0x14	28	Compression interrupt	ISR
interrupt_level_5	0x15	27	Radiometer interrupt	ISR
interrupt_level_6	0x16	26	Bolometer interrupt	ISR
interrupt_level_7	0x17	25	Spacewire interrupt	ISR
interrupt_level_8	0x18	24	timer0 interrupt	ISR
interrupt_level_9	0x19	23	timer1 interrupt	ISR
interrupt_level_10	0x1A	23		--
interrupt_level_11	0x1B	21		--
interrupt_level_12	0x1C	20		--
interrupt_level_13	0x1D	19		--
interrupt_level_14	0x1E	18		--
interrupt_level_15	0x1F	17		--
trap_instruction	0x80 … 0xFF	16	Software trap instruction (TA)	REBOOT except 0x83

Key:
ISR – Interrupt service Routine installed by user or RTOS
SYSTEM – trap handled by the C environment or the RTOS
REBOOT – trap handler installed by the user, which saves the context and force a reboot

Appendix 16: INSTRUMENT PICTURES (FM)

