SUBJECT: SPIRE Data ICD

PREPARED BY: K.J. King

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APPROVED BY:

Checking Engineer (IFSI) **R. Cerulli**	
OBS Engineer (IFSI) **S. Molinari**	
Project Manager (IFSI) **R. Orfei**	
Operations Scientist **S. Sidher**	
Instrument Scientist **B.M. Swinyard**	
Instrument Development Manager **E.C. Sawyer**	

Distribution

R. Orfei	IFSI
R Cerulli	IFSI
S. Molinari	IFSI
J-L Augerres	CEA, Saclay
C. Cara	CEA, Saclay
S. D. Sidher	RAL
B. M. Swinyard	RAL
K. J. King	RAL
J.A. Long	RAL

Change Record

ISSUE	DATE	
Draft 1	15th Jan 2002	Original Draft
Draft 2	15th January 2003	**Updated Draft for DPU AVM Acceptance Test** **Section 1.1**: Updated Scope description **Section 1.3.2**: Updated document references and added RD08 **Section 2.1.3:** Added note about TIME contents **Section 2.2**: Renamed APID5 **Section 2.3**: included details of which parts of the 1553 interface protocol are used **Section 3.1**: Updated Telecommand service usage **Section 3.2.3**: Defined both Housekeeping and Diagnostic reports. There are now 4 of each with 2 housekeeping and 1 diagnostic report pre-defined in the OBS **Section 3.2.3.1:** Updated definition of service (3,1) to send Table_ID as a parameter. This allows different SIDs for the same Table_ID **Section 3.2.3.2:** Service (3,2) set to Not Used **Section 3.2.3.3:** Service (3,3) now defined **Section 3.2.3.4**: Service (3,4) set to Not Used **Section 3.2.3.5**:Service (3,9) now defined **Section 3.2.3.6**: Service (3,11) set to Not Used **Section 3.2.6.1**: Memory addressing changed to use 8 bit Memory ID and 24 bit address **Section 3.2.6.2**: Memory addressing changed to use 8 bit Memory ID and 24 bit address **Section 3.2.6.3**: Memory addressing changed to use 8 bit Memory ID and 24 bit address **Section 3.2.8.1.2-4**: Deleted Cooler, SCAL and 300mk control commands – they are now implemented in software-driven VMs **Section 3.2.8.2.2-4**: Deleted Cooler, SCAL and 300mk control commands – they are now implemented in software-driven VMs **Section 3.2.8.3.1**: Changed Load_Table command to Set_Table, with consequent changes to parameters **Section 3.2.8.3.2:** Changed parameters **Section 3.2.8.3.3:** Changed parameters **Section 3.2.8.3.6**: Inserted commands to start and stop software-driven VMs **Section 3.2.8.3.20:** Deleted data packing command – data frames are packed into science packets until they are full (unless a flush command is received) **Section 3.2.9.1:** Change to packet definition to all Ack field to be changed **Section 3.2.14.1:** Service (14,1) now defined **Section 3.2.14.2:** Service (14,2) now defined **Section 3.2.14.3:** Service (14,3) now defined **Section 3.2.17.1**: Updated command description **Section 3.2.20.4:** This telecommand is no longer used – OTF and TSF provided by ground processing **Section 3.2.22:** Context Service not used **Section 4.1:** table updated to reflect changes to services **Section 4.2.1.6:** Updates Error code table **Section 4.2.3.2:** Added Critical Housekeeping Report definition **Section 4.2.3.3:** Updated Nominal Housekeeping Report definition **Section 4.2.3.4:** Added Detector Housekeeping Report definition **Section 4.2.5.1:** Removed OTF and TSF reports and added definition

		of report identified so far **Section 4.2.5.2:** Added definition of reports **Section 4.3.5.3:** Removed Error/Alarm report definition – they are not used as the ground does not remain in contact with the spacecraft **Section 4.2.6:** Defined Memory Dump reports **Section 4.2.8:** defined Function Activity Report **Section 4.2.14:** Defined Packet Generation Status Report **Section 4.2.17**: Defined Link connection Report **Section 4.2.21**: Science Data packet definition updated **Section 4.2.22**: Context Saving Service not used **Section 5.1.1**: Updated TC Parameter List **Section 5.1.3**: Updated TC Parameter Constraints Added commands to select science data Added Appendix D - description of science data processing	

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Glossary

APID	Application ID
CDMS	Command and Data Management System
DPU	Digital Processing Unit
OBS	On-Board Software
SID	Structure ID
SPIRE	Spectral and Photometric Imaging REceiver
SVM	Service Module
VM	Virtual Machine

1. INTRODUCTION

Control of the SPIRE instrument is handled by the Digital Processing Unit (DPU) part of the instrument electronics, which contains the On-Board Software (OBS). This unit is mounted on the spacecraft Service Module (SVM) and interfaces directly to the CDMS bus of the Herschel spacecraft for the purpose of transferring commands to, and collection of telemetry data from the instrument.

All data passing between the instrument and the spacecraft is transferred in the form of telemetry and telecommand packets conforming to the ESA packet standards (RD01 and RD02). The ESA Packet Utilisation Standard (RD03) defines the types of service that may be provided by units on board ESA spacecraft, but the set of supported packet types within the Herschel project is restricted. This restricted set is defined in the Herschel Packet Structure ICD (AD01) and is the minimum set necessary to meet the satellite operational requirements given in AD02.

The current issue of this document is based on Issue 0.7 of the DRCU/DPU ICD (RD06). Until that document is at Issue 1.0 the contents of this document are subject to change. Items likely to be updated in the future are marked in blue text.

1.1 Scope

This document defines the packet types and their contents that will be accepted and generated by the SPIRE instrument during all operations. These packets conform to the formats given in the Packet Structure ICD (AD01) and the Ground Segment to Instruments ICD (AD03). They also provide for the instrument functionality described in the instrument Operating Modes document (RD04) and elaborated in the instrument operating document (RD04).

The document does not describe the use of the commands (to be given in the OBS User Manual) or the way in which the commands are handled by the OBS (to be found in the OBS Architectural Design document).

1.2 Structure of the Document

Section 2 describes the packet interface between the instrument and the spacecraft. This includes the general format of the packets used by the SPIRE instrument for telecommanding and telemetry (from AD01), the allocation of Application IDs used by the instrument and the functionality of the packet transfer protocol of the instrument/spacecraft interface (from AD01, appendix 9) that is used by the instrument.

Section 3 defines the format and content of each of the telecommand packets accepted by the instrument. Section 4 defines the corresponding information for the telemetry packets generated by the instrument. A description of how these packets are handled by the instrument is given in RD05.

Section 5 defines, in detail, the parameters used in the telecommand and telemetry packets.

1.3 Documents

1.3.1 Applicable Documents

AD01 Herschel/Planck Packet Structure Interface Control Document. (SCI-PT-ICD-07527) Issue 2.0 (draft2)

AD02 Herschel/Planck Operations Interface Requirements Document (SCI-PT-RS-07360), Issue 2.0 (draft3)

AD03 Herschel Science Ground Segment to Instruments Interface Control Document (FIRST-FSC-DOC-0200), Issue 1.0

1.3.2 Reference Documents

RD01 Packet Telemetry Standard (ESA PSS-04-106), Issue 1, 1998

RD02 Packet Telecommand Standard (ESA PSS-04-107), Issue 2, 1992

RD03 Telemetry and Telecommand Packet Utilisation Standard (ECSS-E-70/41) Draft 04, April 1999

RD04 Operating Modes of the SPIRE Instrument (SPIRE-RAL-PRJ-000320), Issue 3.0, 4th January 2002

RD05 Operating the SPIRE Instrument (SPIRE-RAL-DOC-000768), Issue 0.4, 29th January 2002

RD06 DRCU/DPU Interface Control Document (SAp-SPIRE-CCa-076-02) Issue 0.7, 26th June 2002

RD07 MCU/DPU Command List Interface Control Document and User Manual (LAM/ELE/SPI/011011), Issue 2.0, 11th April 2002

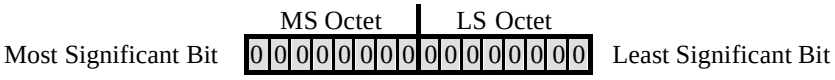
RD08 SPIRE On-Board Software User Manual (SPIRE-IFS-PRJ-001391)

RD09 Herschel SPIRE DPU Hardware User Manual (SPIRE-IFS-PRJ-001390), Issue 1, 7th October 2002

2. THE PACKET INTERFACE

2.1 Packet Structures

The following packet structures are shown as a set of 16 bit words, contained in two consecutive octets in the packet structure (all packets are composed of an even number of octets). The most significant octet of each word comes before the least significant in the packet. The least significant bit of each word is on right of each field:



2.1.1 Fields

Within a field (of any length) the most significant bit is designated bit (0), the least significant bit is bit (length-1).

2.1.2 Telecommand Packets

The following figure gives the general structure of a SPIRE TC Packet (after AD01)

Packet Header	Packet ID	0 0 0 1 1 APID
	Sequence Control	1 1 Src Count
	Length	Length
Data Field	Data Field Header	0 0 0 0 Ack 1 Type Sub-Type 0 0 0 0 0 0 0 0
	Source Data	D A T A
	Error Control	Checksum

Src,Count, Length, TIME and Checksum are defined in AD01
Ack is the most significant 3 bits of Ack as defined in AD01
Type and Sub-Type define the packet type and are also defined in AD01

2.1.3 Telemetry Packets

The following figure gives the general structure of a SPIRE TM Packet (after AD01)

Packet Header	Packet ID	0 0 0 0 1 APID
	Sequence Control	1 1 Count
	Length	Length
Data Field	Data Field Header	0 0 0 0 0 0 0 0 Type
		Sub-Type 0 0 0 0 0 0 0 0
		TIME
	Source Data	D A T A
	Error Control	Checksum

Count, Length, TIME and Checksum are defined in AD01
Type and Sub-Type define the packet type and are also defined in AD01

Note: the TIME field contains the DPU time of the construction of the packet, not the time of collection of the data.

2.2 APIDs

The Application ID is used to identify the source or destination of a telemetry packet. Herschel uses different APIDs for different types of packet (see AD1) as well as for different instruments. The APIDS to be used by SPIRE are given in the following table:

ID	Telemetry types	APID (hex)
APID1	SPIRE Telecommands, Telecommand Verification and Events	500
APID2	SPIRE Periodic Housekeeping	502
APID3	SPIRE Photometer Science Data	504
APID4	SPIRE Spectrometer Science Data	505
APID5	SPIRE Subsystem Science Data	506

2.3 Packet Transfer Protocol

At the low-level the Packet Transfer Protocol provides a series of sub-address messages to control and transfer data between subsystems. Some of these implement the packet transfer itself, others provide alternative methods of transferring data and controlling the transfer. This section identifies the sub-addresses used/accepted by the SPIRE instrument.

Description	Sub-address(es)	Comments
Mode Command	SA 0R	Used to identify the RT addressed in this subframe. The instrument responds only to its own address.
	SA 0T, 31T, 31R	Not Used
Unit Control	SA 1R	Not Used
	SA 1T	Contains Subframe counter and BIT word of 1553 i/f
Data Send	SA 2T, 3T, 4T, 7T, 9T, 29T	Not Used
Data Receive	SA 2R, 7R, 9R,	Not Used

	15R-26R, 29R	
Asynchronous Short Commands	SA 3R, 4R	Not used
Event Messages	SA 5R, 5T, 6R, 6T	Not Used
Time Messages	SA 8T	Not used
	SA 8R	Used to transfer spacecraft time from CDMU to instrument (in subframe 33) rather than use packet service (9,5)
Packet Transfer		
TM Transfer Request	SA 10T	Used by instrument to indicate to CDMU that a TM packet is ready to transfer
TM Transfer Confirmation	SA 10R	Used to implement retry at packet level
TC Transfer Confirmation	SA 27T	Instrument sends a copy of TC Transfer Descriptor to indicate reception of TC
TC Transfer Descriptor	SA 27R	Used by the instrument to prepare for TC transfer
TM Data Send	SA 11T-26T	Used to transfer TM packets from instrument to CDMU
TC Data Receive	SA 11R-14R	Used to transfer TC packets from CDMU to instrument
Low-level Commands	SA 28T, 28R	Not Used
Data Wrap	SA 30T, 30R	Not Used by instrument, but made available for future use

3. SPIRE TELECOMMAND PACKETS

This section defines all the telecommand packets accepted by the SPIRE instrument

3.1 Telecommand Packet Types

The Packet Structure ICD (AD1) defines many types of service that can be provided by an Application. The following table shows the telecommand packet types that will be accepted by the SPIRE instrument.

Description	Service Type	Service Sub-Type	Comments
Telecommand Verification Service	1		N/A
Device Command Distribution	2		Not Used
Housekeeping and Diagnostic Data Reporting			
Define New HK Parameter Report	3	1	
Define New Diagnostic Parameter Report	3	2	Not Used
Clear HK Parameter Report Definitions	3	3	
Clear Diagnostic Parameter Report Definitions	3	4	Not Used
Report HK Parameter Report Definitions	3	9	
Report Diagnostic Parameter Report Definitions	3	11	Not Used
Event Reporting	5		N/A
Memory Management			
Load Memory Using Absolute Addresses	6	2	
Dump Memory Using Absolute Addresses	6	5	
Check Memory Using Absolute Addresses	6	9	
Function Management			
Start Function	8	1	
Stop Function	8	2	
Perform Activity of Function	8	4	
Report Function Status	8	5	
Time Management			
Synchronise User	9	3	Not Used
Enable Time Synchronisation	9	4	Not Used
Time Code	9	5	Not Used
Verify User Time	9	6	Not Used
Enable Time Verification	9	7	
Synchronise Central Time Reference	9	10	Not Used
On-Board Scheduling	11		Not Used
On-Board Monitoring			
Enable Monitoring of Parameters	12	1	TBD
Disable Monitoring of Parameters	12	2	TBD
Clear Monitoring List	12	4	TBD
Modify Monitoring List	12	5	TBD
Delete Parameters from Monitoring List	12	6	TBD
Report Current Monitoring List	12	8	TBD
Packet Transmission Control			
Enable Generation of Telemetry Packets	14	1	
Disable Generation of Telemetry Packets	14	2	
Report Enabled Telemetry Packets	14	3	
On-Board Storage and Retrieval	15		Not Used
On-Board Traffic Management	16		Not Used
Test Service			
Perform Connection Test	17	1	
On-Board Control procedures	18		Not Used
Action/Event Service	19		Not Used
Information Distribution Service			

Enable Distribution of Information TC Packets	20	1	
Disable Distribution of Information TC Packets	20	2	
Report Distributed Information Packets	20	3	
Information Telecommand	20	4	
Science Data	21		N/A
Context Saving Service			TBD
Report Context	22	1 (TBC)	

3.2 Telecommand Packet Definition

3.2.1 Telecommand Verification Service

Not Applicable

3.2.2 Device Command Distribution

Not Used

3.2.3 Housekeeping and Diagnostic Data Reporting

The periodic Housekeeping and Diagnostic Data is reported, at fixed time intervals, in packets with a fixed format. A maximum of 4 different reports are available for use at the same time, each allocated a different HK_Packet_ID, in the range 0 to 3. Associated with each HK_Packet_ID is a sampling interval and an on-board table, which contains the definition of the contents of the report.

The 4 reports are defined in the following way in the OBS by default:

HK_Packet_ID	Report	Table_ID	Sampling Interval	HKS ID
0	Critical Housekeeping Report	0	2000m sec	0x0300
1	Nominal Housekeeping Report	1	1000 msec	0x0301
2	Detector Housekeeping Report	2	---- Not sampled ----	0x0302
3	--- Undefined ----	3	---- Not sampled ----	--- undefined---

The contents of each report are described in the Housekeeping Parameter Report (Services 3,25).

3.2.3.1 Define New Housekeeping Parameter Report (Service 3,1)

This command is used to define/redefine housekeeping reports

In AD01 the maximum length of a report defined in this way is restricted by the maximum length of a telecommand packet to 115 parameters and it is currently impossible to define a new HK report longer than this! Therefore a different mechanism is used in the OBS to define the reports:

- An on-board table is loaded with the definition of the report using one or more 'Load Table' commands (see section 3.2.8.3). The format of the table contents is given in RD08.
- A 'Define New Housekeeping Parameter Report' is used to associate the table containing the report definition with the HK_Packet_ID, the sampling interval and a structure ID (SID). In this case:
  - The Sampling Interval is set in msec
  - A single parameter is defined, which contains the Table_ID of the on-board table containing the report definition

0 0 0 1 1	APID1
1 1 Src	Count
Length = 15	
0 0 0 0 Ack 1 0 0 0 0 0 0 1 1	
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0	
HKPCKTID	
HKSID	
HKINTERVAL	
TABLEID	
MONITOR_TABLEID	
Checksum	

Parameters

Name	Comments
HKPCKTID	HK_Packet_ID, in range 0 - 3
HKSID	
HKINTERVAL	msec
TABLEID	Table_ID

Note: The parameter is placed in the least significant bits of the16 bit 'parameter' field and the most significant bits are padded with zeros.

Note: In order to redefine a report, the report must first be 'cleared' using service (3,3), which has the effect of stopping report generation in order that the table containing the definition of the report contents may be modified. Report generation starts with the execution of this service.

This definition assumes that only one housekeeping report (frame) will be sent in each packet. In the event that we need more than one (e.g. to increase the efficiency of reporting critical housekeeping) we will need to add a second parameter to this command to specify the number of hsk frames per packet.

An on board table will contain in TBD format the information about parameters to be monitored; since monitoring is performed on parameters sampled as part of the nominal HK packet, a monitoring table_ID must be communicated to the OBS each time the HK table ID is updated. The details are TBD.

Possible Errors

Error	TM Service	Error Code	Description
Illegal_HK_Packet_ID	(1,8)	0x0301	HK_Packet_ID Out of Range
Illegal_HK_SID	(1,8)	0x0302	HK_SID MSB not 0x03
Illegal_Table_ID	(1,8)	0x0303	TABLEID is out of rangeof possible table numbers
Illegal_HK_Sampling Interval	(1,8)	0x0304	HK_Sampling Interval is less than the absolute limit (10, TBC)
Undefined_HK_Table	(1,8)	0x0306	Table given by TABLEID or MONITOR_TABLEID is not defined
Report_in_Use	(1,8)	0x0307	An attempt is being made to modify a report without first 'clearing' it.

3.2.3.2 Define New Diagnostic Parameter Report (Service 3,2)

Not Used

3.2.3.3 Clear Housekeeping Parameter Report Definitions (Service 3,3)

This command is used to clear the definition of a housekeeping report. It is usually used prior to redefining the report with service (3,1) and has the affect of stopping report generation within the OBS.

This command should not be used for disabling reporting (use service (14,2) for this) as the definition of the report contents and sampling interval is lost.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 9															
0	0	0	0	Ack		1	0	0	0	0	0	0	1	1	
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
HKPCKTID															
Checksum															

Parameters

Name	Comments
HKPCKTID	HK_Packet_ID, in range 0 - 3

Note: The parameter is placed in the least significant bits of the16 bit 'parameter' field and the most significant bits are padded with zeros.

Possible Errors

Error	TM	Error Code	Description

	Service		
Illegal_HK_Packet_ID	(1,8)	0x0301	HK_Packet_ID Out of Range

3.2.3.4 Clear Diagnostic Parameter Report Definitions (Service 3,4)

Not Used

3.2.3.5 Report Housekeeping Parameter Report Definitions (Service 3,9)

This command is used to report the definition of a housekeeping report.

The information requested by this command is reported in TM service (3,10). This contains only the information provided in the report definition telecommand (service (3,1)). The actual definition of the report contents may be obtained by dumping the appropriate table.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 9															
0	0	0	0	Ack		1	0	0	0	0	0	0	1	1	
0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
HKPCKTID															
Checksum															

Parameters

Name	Comments
HKPCKTID	HK_Packet_ID, in range 0 - 3

Note: The parameter is placed in the least significant bits of the16 bit 'parameter' field and the most significant bits are padded with zeros.

Possible Errors

Error	TM Service	Error Code	Description
Illegal_HK_Packet_ID	(1,8)	0x0301	HK_Packet_ID Out of Range

3.2.3.6 Report Diagnostic Parameter Report Definitions (Service 3,11)

Not Used

3.2.4

Not Available

3.2.5 Event Reporting

Not Applicable

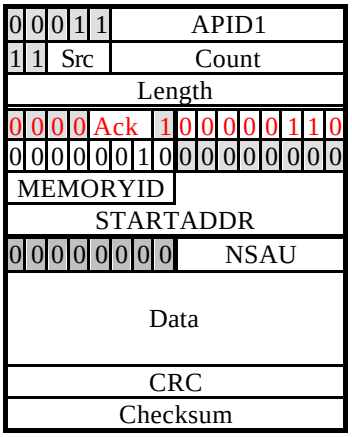
3.2.6 Memory Management

These commands allow access to the contents of memory locations. Four areas of memory have been identified, with the following MEMORYID:

0. Program Memory (RAM)
1. Data memory (RAM)
2. 1553 I/F DPRAM
3. EEPROM

When accessing memory the address is specified in terms of the number of Single Addressable Units (SAUs) from the start of the memory area. The SPIRE SAU is always 16bit words.

3.2.6.1 Load Memory Using Absolute Addresses (Service 6,2)



Parameters

Name	Comments
MEMORYID	Memory Area to be addressed
STARTADDR	Start Address in SAUs
NSAU	Number of SAUs to be loaded
DATA	Data to be loaded
CRC	CRC Checksum of data field

The DATA field will contain the words to be written into DPU memory. 48 or 32bit words will be split into 3 or 2 16bit words and written into the DATA field of the telecommand starting from the MSB.

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Memory_ID	(1,8)	0x0601	Not a valid memory ID
Illegal_Start_Address	(1,8)	0x0602	Start address outside valid range
Illegal_Nsau	(1,8)	0x0603	Length will place data outside valid address range
Bad_Nsau	(1,8)	0x0604	Length does not agree with size of data field
Bad_CRC	(1,8)	0x0605	CRC in command does not agree with calculated checksum over data in command
Bad_Load	(1,8)	0x0606	CRC in command does not agree with calculated checksum over data in memory

3.2.6.2 Dump Memory Using Absolute Addresses (Service 6,5)

0	0	0	1	1	APID1											
1	1	Src			Count											
Length = 11																
0	0	0	0	Ack		1	0	0	0	0	0	1	1	0		
0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	
MEMORYID																
STARTADDR																
NSAU																
Checksum																

Parameters

Name	Value and Comments
MEMORYID	Memory Area to be addressed
STARTADDR	Start Address in SAUs
NSAU	Number of SAUs to be dumped

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Memory_ID	(1,8)	0x0601	Not a valid memory ID
Illegal_Start_Address	(1,8)	0x0602	Start address outside valid range
Illegal_Nsau	(1,8)	0x0603	Length will read data outside valid address range

3.2.6.3 Check Memory Using Absolute Addresses (Service 6,9)

0	0	0	1	1	APID1											
1	1	Src			Count											
Length = 11																
0	0	0	0	Ack		1	0	0	0	0	0	1	1	0		
0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	
MEMORYID																
STARTADDR																
NSAU																
Checksum																

Parameters

Name	Value and Comments
MEMORYID	Memory Area to be addressed
STARTADDR	Start Address in SAUs
NSAU	Number of SAUs to be checked

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Memory_ID	(1,8)	0x0601	Not a valid memory ID
Illegal_Start_Address	(1,8)	0x0602	Start address outside valid range
Illegal_Nsau	(1,8)	0x0603	Length will read data outside valid address range

3.2.7

Not Available

3.2.8 Function Management

All command packets of this type may give rise to the following Errors:

Error	TM Service	Error Code	Description
Illegal_Function_ID	(1,2)	0x0801	Function_ID not known

3.2.8.1 Start Function (Service 8,1)

These commands allow functions that are not started automatically when the OBS runs to be started.

3.2.8.1.1 Function 0x01: Table Management

Always available - cannot be started

3.2.8.1.2 Function 0x02: Interrupt-driven VM

Always Available - cannot be started

3.2.8.1.3 Function 0x03: Software-driven VM1

Always Available - cannot be started

3.2.8.1.4 Function 0x04: Software-driven VM2

Always Available - cannot be started

3.2.8.1.5 Function 0x05: Software-driven VM3

Always Available - cannot be started

3.2.8.1.6 Function 0xC0: Operations

Always Available - cannot be started

3.2.8.1.7 Function 0xC1: Observations

Always Available - cannot be started

3.2.8.1.8 Function 0xCA: DPU

Always Available - cannot be started

3.2.8.2 Stop Function (Service 8,2)

3.2.8.2.1 Function 0x01: Table Management

Always available - cannot be stopped

3.2.8.2.2 Function 0x02: Interrupt-driven VM

Always Available - cannot be stopped

3.2.8.2.3 Function 0x03: Software-driven VM1

Always Available - cannot be stopped

3.2.8.2.4 Function 0x04: Software-driven VM2

Always Available - cannot be stopped

3.2.8.2.5 Function 0x05: Software-driven VM3

Always Available - cannot be stopped

3.2.8.2.6 Function 0xC0: Operations

Always Available - cannot be stopped

3.2.8.2.7 Function 0xC1: Observations

Always Available - cannot be stopped

3.2.8.2.8 Function 0xCA: DPU

Always Available - cannot be stopped

3.2.8.3 Perform Activity of a Function (Service 8,4)

All command packets of this type and subtype may give rise to the following Errors:

Error	TM Service	Error Code	Description
Illegal_Function_ID	(1,2)	0x0801	Function_ID not known
Illegal_Activity_ID	(1,2)	0x0802	Activity_ID not known

3.2.8.3.1 Function 0x01 Table Management, Activity 0x01: Set Table

This telecommand allocates space for a table. The previous space allocated to the table is lost.

0 0 0 1 1	APID1
1 1 Src	Count
Length =11	
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
FUNCTIONID	ACTIVITYID
TABLEID	
TABLESIZE	
Checksum	

Parameters

Name	Value and Comments
FUNCTIONID	0x01
ACTIVITYID	0x01
TABLEID	
TABLESIZE	Number of 32 bit words allocated to table

Possible Errors

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion. In the event of being unable to complete the command the following reports shall be issued:

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Table_Space_Full	(1,8)	0x0809	Not enough space available in DPU memory to create new table

Function 0x01 Table Management, Activity 0x02: Report Table

Requests telemetry packets reporting the content s of a table starting with the word at offset INDEX (32 bit words) from the start of the table and reporting COUNT words. The contents are reported in as many TM(21,4) packets as necessary to complete the request.

0 0 0 1 1	APID1
1 1 Src	Count
Length = 13	
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
FUNCTIONID	AC TIVITYID
TABLEID	
INDEX	
COUNT	
Checksum	

Parameter

Name	Value and Comments
FUNCTIONID	0x01
ACTIVITYID	0x02
TABLEID	
INDEX	Starting offset to first word to report
COUNT	Number of (32 bit) words to report

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Table_Bounds_Error	(1,8)	0x080d	Not enough data available in the table to report COUNT words
Undefined_Table_Error	(1,8)	0x0811	Table is not defined

3.2.8.3.3 Function 0x01 Table Management, Activity 0x03: Update Table

0 0 0 1 1	APID1
1 1 Src	Count
Length	
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
FUNCTIONID	ACTIVITYID
TABLEID	
INDEX	
N	
Data	
Checksum	

Parameters

Name	Value and Comments
FUNCTIONID	0x01
ACTIVITYID	0x03
TABLEID	
INDEX	Start location at which to place Data
N	Number of 32bit words to place in table
Data	N (32 bit) words to be placed in the table

Contents of the Data is dependant on the function of the table and will be specified by IFSI

Possible Errors

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion. In the event of being unable to complete the command the following reports shall be issued:

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Table_Bounds_error	(1,8)	0x080d	Not enough space available in table to write new data
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
Undefined_Table_Error	(1,8)	0x0811	Table is not defined

3.2.8.3.4 Function 0x02 Interrupt-driven VM, Activity 0x01: Execute Command List

Execute the command list held in the telecommand packet.

The Command list being executed is responsible for issuing all the necessary telecommand execution reports

0	0	0	1	1	APID1										
1	1	Src	Count												
Length															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
N															
Data															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0x02
ACTIVITYID	0x01
N	Number of 32bit words in the command List
Data	N * 32 bit data words containing the command list to execute

Possible Errors

Error	TM Service	Error Code	Description
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
VM_Active	(1,8)	0x080c	The VM is already executing a command list

3.2.8.3.5 Function 0x02 Interrupt-driven VM, Activity 0x02: Run VM

Execute a command list held in a table by the Interrupt-driven VM. If the VM is already active the telecommand is rejected with an error packet (see below).

The Command list being executed is responsible for issuing all the necessary telecommand execution reports

0	0	0	1	1	APID1										
1	1	Src	Count												
Length															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
TABLEID															
INDEX															
N															
Data															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0x02
ACTIVITYID	0x02
TABLEID	Table_ID of list to execute
INDEX	Index within Table at which to start
N	Number of data words
Data	N * 32 bit data words. These are the parameters passed to the VM in registers R(00) to R(N-1)

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
VM_Active	(1,8)	0x080c	The VM is already executing a command list
VM_Undefined_Table_Error	(1,8)	0x0810	Table is not defined

3.2.8.3.6 Function 0x02 Interrupt-driven VM, Activity 0x03: Halt VM

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0x02
ACTIVITYID	0x03

Possible Errors

Error	TM Service	Error Code	Description
VM_Inactive	(1,8)	0x080a	Command List Not Running

3.2.8.3.7 Function 0x03 Software-driven VM1 , Activity 0x02: Run VM1

Start execution of a command list held in a table by the software-driven VM1. If the VM is already active the telecommand is rejected with an error packet (see below).

The Command list being executed is responsible for issuing all the necessary telecommand execution reports

0	0	0	1	1	APID1										
1	1	Src	Count												
Length															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
TABLEID															
INDEX															
N															
Data															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0x03
ACTIVITYID	0x03
TABLEID	Table_ID of list to execute
INDEX	Index within Table at which to start
N	Number of data words
Data	N * 32 bit data words. These are the parameters passed to the VM in registers R(00) to R(N-1)

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
VM_Active	(1,8)	0x080b	The VM is already executing a command list
Undefined_Table_Error	(1,8)	0x080d	Table is not defined

3.2.8.3.8 Function 0x03 Software-driven VM1 , Activity 0x03: Halt VM1

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0x03
ACTIVITYID	0x03

Possible Errors

Error	TM Service	Error Code	Description
VM_Inactive	(1,8)	0x080a	VM Not Running

3.2.8.3.9 Function 0x04 Software-driven VM2 , Activity 0x02: Run VM2

Start execution of a command list held in a table by the software-driven VM2. If the VM is already active the telecommand is rejected with an error packet (see below).

The Command list being executed is responsible for issuing all the necessary telecommand execution reports

0	0	0	1	1	APID1										
1	1	Src	Count												
Length															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
TABLEID															
INDEX															
N															
Data															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0x04
ACTIVITYID	0x02
TABLEID	Table_ID of list to execute
INDEX	Index within Table at which to start
N	Number of data words
Data	N * 32 bit data words. These are the parameters passed to the VM in registers R(00) to R(N-1)

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
VM_Active	(1,8)	0x080b	The VM is already executing a command list
Undefined_Table_Error	(1,8)	0x080d	Table is not defined

3.2.8.3.10 Function 0x04 Software-driven VM2 , Activity 0x03: Halt VM2

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0x04
ACTIVITYID	0x03

Possible Errors

Error	TM Service	Error Code	Description
VM_Inactive	(1,8)	0x080a	VM Not Running

3.2.8.3.11 Function 0x05 Software-driven VM3 , Activity 0x02: Run VM3

Start execution of a command list held in a table by the software-driven VM 3. If the VM is already active the telecommand is rejected with an error packet (see below).

The Command list being executed is responsible for issuing all the necessary telecommand execution reports

0 0 0 1 1	APID1
1 1 Src	Count
Length	
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
FUNCTIONID	ACTIVITYID
TABLEID	
INDEX	
N	
Data	
Checksum	

Parameters

Name	Value and Comments
FUNCTIONID	0x05
ACTIVITYID	0x02
TABLEID	Table_ID of list to execute
INDEX	Index within Table at which to start
N	Number of data words
Data	N * 32 bit data words. These are the parameters passed to the VM in registers R(00) to R(N-1)

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID
Illegal_Table_Index	(1,8)	0x0806	Index outside valid range
Bad_Data	(1,8)	0x0808	N does not agree with length of data field
VM_Active	(1,8)	0x080b	The VM is already executing a command list
Undefined_Table_Error	(1,8)	0x080d	Table is not defined

3.2.8.3.12 Function 0x05 Software-driven VM3 , Activity 0x03: Halt VM3

0 0 0 1 1	APID1
1 1 Src	Count
Length = 7	
0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
FUNCTIONID	ACTIVITYID
Checksum	

Parameters

Name	Value
FUNCTIONID	0x05
ACTIVITYID	0x03

Possible Errors

Error	TM Service	Error Code	Description
VM_Inactive	(1,8)	0x080a	VM Not Running

3.2.8.3.13 Function 0xC0 Operations, Activity 0x40: Peak Up

This is a place holder for a possible command, which is still TBD

Possible parameters to this command are TBD but could include definition of the Photometer array to use to find the peak and the pixel defined to be the centre of the array.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Parameters															
Checksum															

Parameters

Name	Value
FUNCTIONID	0xC0
ACTIVITYID	0x40

Possible Errors

Error	TM Service	Error Code	Description
No_Peak	(1,8)	0x080c	Unable to find Peak

3.2.8.3.14 Function 0xC1 Observations, Activity 0x01: Set Observation ID

Set the observation ID, and set the BBID to zero. The value of these two parameters is reported in the instrument housekeeping packets and all science data packets.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 11															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
OBSID															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xC1
ACTIVITYID	0x01
OBSID	Observation ID (32 bits)

3.2.8.3.15 Function 0xC1 Observations, Activity 0x02: Set Building Block ID

Set the observation ID. This is reported in the instrument housekeeping packets and all science data packets.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 11															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
BBID															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xC1
ACTIVITYID	0x02
BBID	Building Block ID (32 bits)

3.2.8.3.16 Function 0xC1 Observations, Activity 0x03: Set Observing Mode

This value may be set by the command system in order to notify processing software of the observing mode. It is reported in the housekeeping packets

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 19															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
MODE															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xC1
ACTIVITYID	0x03
MODE	Observing Mode

3.2.8.3.17 Function 0xC1 Observations, Activity 0x04: Set Observation Step

This value may be set by the command system in order to notify processing software of the current step in the observing mode. It is reported in the housekeeping packets

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 19															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
STEP															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xC1
ACTIVITYID	0x04
STEP	Observation Step

3.2.8.3.18 Function 0xCA DPU, Activity 0x01: Synchronise DRCU Counters

This telecommand sends a broadcast command to the DRCU to reset the time counters in the DCU, SCU and MCU interfaces

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x01

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion.

3.2.8.3.19 Function 0xCA DPU, Activity 0x02: Flush

This telecommand forces the DPU to read any remaining science data from the FIFOs place them into science data packets and transmit the packets. I.e. it completely empties the DPU of science data.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 9															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
FIFOFLAGS															
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x02
FIFOFLAGS	

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion.

Possible Errors

Error	TM Service	Error Code	Description
Invalid_FIFOFLAGS	(1,8)	0x080f	Incorrect FIFOFLAGS (TBD)

3.2.8.3.20 Function 0xCA DPU, Activity 0x03: Set_TM_Nominal_Mode

This telecommand sets the telemetry interface to the CDMS to operate in Nominal Mode.

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x03

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion.

3.2.8.3.21 Function 0xCA DPU, Activity 0x04: Set_TM_Burst_Mode

This telecommand sets the telemetry interface to the CDMS to operate in Burst Mode.

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x04

This telecommand shall be expected to issue a Telecommand Execution Report - Completed, TM(1,7) on successful completion.

3.2.8.3.22 Function 0xCA DPU, Activity 0x05: Send_DRCU_Command

This telecommand allows sending a single command to the DRCU.

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 11															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
DRCU Command MSB															
DRCU Command LSB															
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x05

Possible Errors

Error	TM Service	Error Code	Description
LS_Transmit_Error	(1,8)	0x080e	Command was not correctly received by DRCU

3.2.8.3.23 Function 0xCA DPU, Activity 0x06: Reset_FIFOs

This telecommand is used to reset all FIFOs. All data currently in the FIFOs is lost.

0	0	0	1	1	APID1										
1	1	Src		Count											
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x06

3.2.8.3.24 Function 0xCA DPU, Activity 0x07: Write2EEPROM

This telecommand is used to copy PM into EEPROM

0	0	0	1	1	APID1										
1	1	Src		Count											
Length = 15															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Start_Address MSB															
Start_Address LSB															
End_Address MSB															
End_Address LSB															
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x07
Start_Address	Starting address in PM
End_Address	End address in PM

Possible Errors

Error	TM Service	Error Code	Description
EEPROM_Failed	(1,8)	0x0812	PM to EEPROM copy failed

3.2.8.3.25 Function 0xCA DPU, Activity 0x08: Force_Boot

This telecommand is used to call the DPU Boot procedure

0	0	0	1	1	APID1										
1	1	Src		Count											
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x08

3.2.8.3.26 Function 0xCA DPU, Activity 0x09: DPU_Reset

This telecommand performs a warm reset of the DPU

0	0	0	1	1	APID1										
1	1	Src		Count											
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
Checksum															

Parameters

Name	Value
FUNCTIONID	0xCA
ACTIVITYID	0x09

These telecommands are defined here as a place holder for functionality to select individual data words from science data frames in order to reduce data rate. Their format is still TBC

3.2.8.3.27 Function 0xCA DPU, Activity 0x10: Enable_Selection

Enable data selection from a science data frame. The DPU will use the contents of a table to define which words are extracted from the data frame into the telemetry packet.

It shall be possible to enable extraction from any or all science frames in order to reduce the instrument TM data rate

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 19															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
FRAMEID															
TABLEID															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xCA
ACTIVITYID	0x10
FRAMEID	Science frame to extract data from
TABLEID	Table containing the selection (0 = no selection)

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Frame_ID	(1,8)	0x0810	Not a valid frame ID
Illegal_Table_ID	(1,8)	0x0805	Not a valid table ID

3.2.8.3.28 Function 0xCA DPU, Activity 0x11: Disable_Selection

Disable selection for a science data frame. The complete data frame will now be placed into the science telemetry packets

0	0	0	1	1	APID1										
1	1	Src	Count												
Length = 19															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
FUNCTIONID								ACTIVITYID							
FRAMEID															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	0xCA
ACTIVITYID	0x10
FRAMEID	Science frame to extract data from

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Frame_ID	(1,8)	0x0810	Not a valid frame ID

3.2.8.4 Report Function Status (Service 8,5)

This telecommand requests a report on the status of a function. The instrument should respond with a TM(8,6) report.

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 7															
0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
FUNCTIONID								0	0	0	0	0	0	0	0
Checksum															

Parameter

Name	Comment
FUNCTIONID	Function to report on

3.2.9 Time Management

3.2.9.1 Enable Time Verification (Service 9,7)

On receipt of this telecommand the instrument should issue a Time Verification Report, TM(9,9).

0	0	0	1	1	APID1										
1	1	0	0	0	Count										
Length = 5															
0	0	0	0	Ack		1	0	0	0	0	1	0	0	1	
0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Checksum															

3.2.10

Not Available

3.2.11 On-Board Scheduling

Not Used

3.2.12 On-Board Monitoring

TBW

3.2.13

Not Available

3.2.14 Packet Transmission Control

3.2.14.1 Enable Generation of Telemetry Packets (Service 14,1)

This telecommand enables the transmission of instrument telemetry packets. By default all packets are enabled for transmission when the OBS starts. This telecommand is therefore only needed to restart transmission after transmission has been disabled.

0	0	0	1	1	APID1											
1	1	Src			Count											
Length																
0	0	0	0	Ack		1	0	0	0	0	1	1	1	0		
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
NPCKTS																
TYPE								SUBTYPE								
SID																
Repeat Type, Subtype and SID NPCKTS-1 times																
Checksum																

Parameters

Name	Value and Comments
NPCKTS	Number of packets to enable
TYPE	Packet Type to enable
SUBTYPE	Packet Subtype to enable
SID	Packet SID to enable

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Type	(1,8)	0x0e01	Not a valid packet type for this APID
Illegal_Subtype	(1,8)	0x0e02	Not a valid subtype for packet with type TYPE
Illegal_SID	(1,8)	0x0e03	Not at valid SID for packet with type TYPE and subtype SUBTYPE
Bad_NPCKTS	(1.8)	0x0e04	Number of packets to be enabled is not correct for telecommand length

3.2.14.2 Disable Generation of Telemetry Packets (Service 14,2)

This telecommand disables the transmission of instrument telemetry packets. By default all packets are enabled for transmission when the OBS starts.

0	0	0	1	1	APID1											
1	1	Src			Count											
Length																
0	0	0	0	Ack		1	0	0	0	0	1	1	1	0		
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
NPCKTS																
TYPE								SUBTYPE								
SID																
Repeat Type, Subtype and SID NPCKTS-1 times																
Checksum																

Parameters

Name	Value and Comments
NPCKTS	Number of packets to enable
TYPE	Packet Type to enable
SUBTYPE	Packet Subtype to enable
SID	Packet SID to enable

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Type	(1,8)	0x0E01	Not a valid packet type for this APID
Illegal_Subtype	(1,8)	0x0E02	Not a valid subtype for packet with type TYPE
Illegal_SID	(1,8)	0x0E03	Not at valid SID for packet with type TYPE and

Illegal_SID	(1,8)	0x0E03	Not at valid SID for packet with type TYPE and subtype SUBTYPE
Bad_NPCKTS	(1.8)	0x0E04	Number of packets to be enabled is not correct for telecommand length

3.2.14.3 Report Enabled Telemetry Packets (Service 14,3)

This telecommand requests a list of telemetry packet types and subtypes that are enabled for transmission
The list is reported in TM service (14,4)

0	0	0	1	1	APID1										
1	1	Src			Count										
Length = 5															
0	0	0	0	Ack		1	0	0	0	0	1	1	1	0	
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Checksum															

Parameters

Name	Value and Comments

3.2.15 On-Board Storage and Retrieval

Not Used

3.2.16 On-Board Traffic Management

Not Used

3.2.17 Test Service

3.2.17.1 Perform Connection Test (Service 17,1)

This test is used to check the End-to-End connection to the instrument. The instrument should respond with a Successful Command Acceptance Report, TM(1,1), followed by a Link Connection Report, TM(17,2).

0	0	0	1	1	APID1										
1	1	0	0	0	Count										
Length = 5															
0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Checksum															

3.2.18 On-Board Control Procedures

Not Used

3.2.19 Action/Event Service

Not Used

3.2.20 Information Distribution Service

3.2.20.1 Enable Distribution of Information TC Packets (Service 20,1)

0	0	0	1	1	APID1											
1	1	0	0	0	Count											
Length = 9																
0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
APID																
SID																
Checksum																

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Packet	(1,8)	0x1401	Not a valid packet for this APID and SID

3.2.20.2 Disable Distribution of Information TC Packets (Service 20,2)

0	0	0	1	1	APID1											
1	1	0	0	0	Count											
Length = 9																
0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
APID																
SID																
Checksum																

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Packet	(1,8)	0x1401	Not a valid packet for this APID and SID

3.2.20.3 Report Distributed Information Packets (Service 20,3)

0	0	0	1	1	APID1											
1	1	0	0	0	Count											
Length = 5																
0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
Checksum																

Possible Errors

Error	TM Service	Error Code	Description
Illegal_Packet	(1,8)	0x1401	Not a valid packet for this APID and SID

3.2.20.4 Information Telecommand (Service 20,4)

Not used

3.2.21 Science Data

Not Applicable

3.2.22 Context Saving Service

Not Used

4. SPIRE TELEMETRY PACKETS

This section defines all the TM packets that will be produced by SPIRE.

4.1 Telemetry Packet Types

The Packet Structure ICD (AD1) defines many types of service that can be provided by an Application. The following table shows the telemetry packet types that will be produced by the SPIRE.

Description	Service Type	Service Sub-Type	Comments
Telecommand Verification Service			
Telecommand Acceptance Report - Success	1	1	
Telecommand Acceptance Report - Failure	1	2	
Telecommand Execution Report - Started	1	3	
Telecommand Execution Report - Progress	1	5	
Telecommand Execution Report - Completed	1	7	
Telecommand Execution Report - Failure	1	8	
Telecommand Contents Report	1	9	Not Used
Device Command Distribution	2		N/A
Housekeeping and Diagnostic Data Reporting			
HK Parameter Report Definitions Report	3	10	
Diagnostic Parameter Definitions Report	3	12	
Housekeeping Parameter Report	3	25	
Diagnostic Parameter Report	3	26	
Event Reporting			
Event Report	5	1	
Exception Report	5	2	
Error/Alarm Report	5	4	Not Used
Memory Management			
Memory Dump, Absolute Addresses	6	6	
Memory Check Report, Absolute Addresses	6	10	
Function Management			
Function Status Report	8	6	
Time Management			
Central Time Reference	9	8	Not Used
Time Verification Report	9	9	
On-Board Scheduling	11		Not Used
On-Board Monitoring			
Current Monitoring List Report	12	9	TBD
Packet Transmission Control			
Enabled Telemetry Packets Report	14	4	
On-Board Storage and Retrieval	15		Not Used
Test Service			
Connection Test Report	17	2	
On-Board Control procedures	18		Not Used
Action/Event Service	19		Not Used
Information Distribution Service			
Distributed Information Packets Report	20	5	
Science Data			
Nominal Science Data Report	21	1	
Science Type B Data Report	21	2	
Diagnostic Science Data Report	21	3	
Auxiliary Science Data Report	21	4	
Context Saving Service	22		Not Used

4.2 Telemetry Packet definitions

4.2.1 TC Verification Service

4.2.1.1 Telecommand Acceptance Report - Success (1,1)

0	0	0	0	1	APID1										
1	1	Count													
Length = 15															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Checksum															

4.2.1.2 Telecommand Acceptance Report - Failure (1,2)

The structure of this packet depends on the type of error found.

4.2.1.2.1 Packet Control Errors

0	0	0	0	1	APID1										
1	1	Count													
Length = 19															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Failure Code															
Parameter															
Checksum															

Error	***Failure Code***	***Parameter***
Illegal APID	0	TC_Packet_APID
Incomplete Packet or invalid Length	1	TC_Packet_Length
Incorrect Checksum	2	TC_Packet_Checksum
Illegal Packet Type	3	TC_Packet_Type
Illegal Packet Sub-Type	4	TC_Packet_Sub-Type

Note: The parameter is placed in the least significant bits of the16 bit 'parameter' field and the most significant bits are padded with zeros

4.2.1.2.2 Packet Content Error

0	0	0	0	1	APID1										
1	1	Count													
Length=57															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
Packet_Sequence_Control															
Failure Code															
Parameters															
Checksum															

Error	*Failure Code*	*Parameters*
Illegal or inconsistent Application Data	5	See Note
Other TBD errors	16-255	See Note

Note: The parameters field should contain the first 20 words from the 'source data' field of the received telecommand packet, unless this field is less than 20 words in length, in which case all words from the 'source data' field will be included and padded with zeros.

4.2.1.3 *Telecommand Execution Report - Started (1,3)*

This report is generated at the start of execution of a telecommand. It is only transmitted in telemetry if the corresponding bit of the Ack field is set.

0	0	0	0	1	APID1										
1	1	Count													
Length = 15															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Checksum															

4.2.1.4 *Telecommand Execution Report - Progress (1,5)*

These reports may be generated by an executing telecommand. They are only transmitted in telemetry if the corresponding bit of the Ack filed is set.

0	0	0	0	1	APID1										
1	1	Count													
Length = 17															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Step_Number															
Checksum															

4.2.1.5 *Telecommand Execution Report - Completion (1,7)*

This report is generated at the successful completion of execution of a telecommand. It is only transmitted in telemetry if the corresponding bit of the Ack field is set.

0	0	0	0	1	APID1										
1	1	Count													
Length = 15															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Checksum															

4.2.1.6 Telecommand Execution Report - Failure (1,8)

This report is generated at the unsuccessful completion of execution of a telecommand

The structure of this packet depends on the type of error found., but follows the general form:

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
TIME															
TC_Packet_ID															
TC_Packet_Sequence_Control															
Failure Code															
Parameters															
Checksum															

The following error Failure Codes have been defined with the parameters to be provided in the TM packet:

Error	***Failure Code***	***Parameters***
Illegal_HK_Packet_ID	0x0301	HK_Packet_ID
Illegal_HK_SID	0x0302	HK_SID
Illegal_Table_ID	0x0303	HK_SID
Illegal_HK_Sampling Interval	0x0304	HK_Sampling_Interval
Bad_Ndata	0x0305	Length Ndata
Undefined_HK_Table	0x0306	HK_SID
Report_in_Use	0x0307	HK_Packet_ID
Illegal_Monitoring_TableID	0x0308	Monitoring_TableID
Undefined_Monitoring_TableID	0x0309	Monitoring_TableID
Illegal_Memory_ID	0x0601	Memory_ID
Illegal_Start_Address	0x0602	Memory_ID Start Adress
Illegal_Nsau	0x0603	Memory_ID Start_Address Nsau
Bad_Nsau	0x0604	Length Nsau
Bad_CRC	0x0605	CRC Calculated Checksum
Bad_Load	0x0606	CRC Calculated Checksum
Illegal_Function_ID	0x0801	FunctionID
Illegal_Activity_ID	0x0802	ActivityID
Illegal_Table_ID	0x0805	Table_ID
Illegal_Table_Index	0x0806	Table Index

Tabel_Bounds_Error	0x080d	TableID INDEX COUNT TABLESIZE
Bad_Data	0x0808	Length N
Table_Space_Full	0x0809	Table_ID Ndata
VM_Inactive	0x080a	-------
VM_Active	0x080c	-------
No_Peak	0x080b	TBD
Undefined_Table_ID	0x0811	Table_ID
LS_Transmission_Error	0x080e	-------
Illegal_FIFOFlags	0x080f	FIFOFLAGS
VM_Undefined_Table_ID	0x0810	Table_ID
EEPROM_Failed	0x0812	-------
Illegal_Type	0x0e01	APID Tyep Subtype SID
Illegal_Subtype	0x0e02	APID Tyep Subtype SID
Illegal_SID	0x0e03	APID Tyep Subtype SID
Bad_NPCKTS	0x0e04	Length NPCKTS
Illegal_Packet	0x1401	APID SID

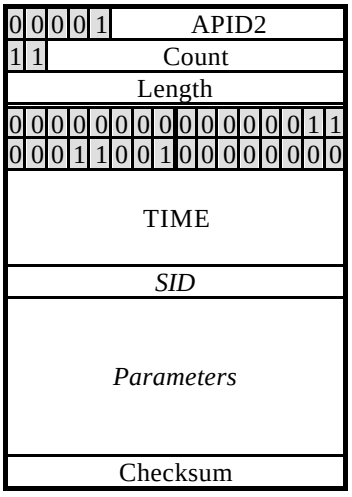
4.2.2 Device Command Distribution

Not Used

4.2.3 Housekeeping and Diagnostic Data Reporting

4.2.3.1 Housekeeping Parameter Report (Service 3,25)

The general packet structure is shown below. The Structure ID identifies the housekeeping packet type.



SID	Packet type	Default Period (msec)
0x0300	Critical Housekeeping Report	2000
0x0301	Nominal Housekeeping Report	1000
0x0302	Detector Diagnostic Report	Undefined

4.2.3.2 *Critical Housekeeping Report (SID=0x0300)*

Location (msb)		Field Length (bits)	Parameter Name	Ref.	Description
18	0	32	OBSID	AD03	Observation ID
22	0	32	BBID	AD03	Building Block ID
26	0	16	MODE		Observing Mode – set by command
28	0	16	STEP		Observation Step – set by command
30	0	16	TCRECV		Count of Telecommands Received
32	0	16	TCEXEC		Count of Telecommands Executed
34	0	48	MEMSTAT		Memory Check Flags – updated by background memory checking task
40	0	16	MONSTAT		Status of subsystems monitoring
42	0	16	EVENTSTAT		Status of events
44	0	16	DRCUIFSTAT	RD06	CmdIfStat
	0	1	IFCMDOLAPERR	RD06	Command Overlapped
	1	1	IFBCASTERR	RD06	Forbidden Broadcast
	2	1	IFREADERR	RD06	Forbidden Read
	3	1	IFTIMEOUTERR	RD06	SubSystem Timeout
	4	2	IFCMDSTAT	RD06	LastCmdStatus
46			DCUSTAT		TBC
48	0	16	PSWJFETSTAT		
	0	1	PSWJFETPWR1	RD06	P250_JFET_1
	1	1	PSWJFETPWR2	RD06	P250_JFET_2
	2	1	PSWJFETPWR3	RD06	P250_JFET_3
	3	1	PSWJFETPWR4	RD06	P250_JFET_4
	4	1	PSWJFETPWR5	RD06	P250_JFET_5
	5	1	PSWJFETPWR6	RD06	P250_JFET_6
50	0	16	PMLWJFETSTAT		
	0	1	PMWJFETPWR1	RD06	P350_JFET_1
	1	1	PMWJFETPWR2	RD06	P350_JFET_2
	2	1	PMWJFETPWR3	RD06	P350_JFET_3
	3	1	PMWJFETPWR4	RD06	P350_JFET_4
	4	1	PLWJFETPWR1	RD06	P500_JFET_1
	5	1	PLWJFETPWR2	RD06	P500_JFET_2
52	0	16	SPECJFETSTAT	RD06	
	0	1	SLWJFETPWR1		SLW_JFET1
	1	1	SSWJFETPWR1		SSW_JFET1
	2	1	SSWJFETPWR2		SSW_JFET2
54	0	16	LIASTAT	RD06	PWR_STATUS, LIA 1 to LIA 12 +5V/+9V/ -9V status
	0	1	LIA01STAT		LIA 1 +5V/+9V/-9V status
	1	1	LIA02STAT		LIA 2 +5V/+9V/-9V status
	2	1	LIA03STAT		LIA 3 +5V/+9V/-9V status
	3	1	LIA04STAT		LIA 4 +5V/+9V/-9V status
	4	1	LIA 05STAT		LIA 5 +5V/+9V/-9V status
	5	1	LIA06STAT		LIA 6 +5V/+9V/-9V status
	6	1	LIA07STAT		LIA 7 +5V/+9V/-9V status
	7	1	LIA08STAT		LIA 8 +5V/+9V/-9V status
	8	1	LIA09STAT		LIA 9 +5V/+9V/-9V status
	9	1	LIA10STAT		LIA 10 +5V/+9V/ -9V status
	10	1	LIA11STAT		LIA 11 +5V/+9V/ -9V status
	11	1	LIA12STAT		LIA 12 +5V/+9V/ -9V status
56	0	16	MCUERR	RD06	ErrorCode
58	0	16	SMECSTAT	RD06	SMECStatus

60	0	16	CHOPSTAT	RD06	ChopStatus
62	0	16	JIGGSTAT	RD06	JigStatus
64	0	16	SCUSTAT	RD06	ScuStatus
66	0	16	SUBKTEMP	RD06	SubKTempP

4.2.3.3 *Nominal Housekeeping Report (SID=0x0301)*

The following table lists the field to be found in this report

Location (msb)		Field Length (bits)	Parameter Name	Ref.	Description
octet	bit				
18	0	32	OBSID	AD03	Observation ID
22	0	32	BBID	AD03	Building Block ID
26	0	16	MODE		Observing Mode – set by command
28	0	16	STEP		Observation Step – set by command
30	0	48	THSK		Time of start of housekeeping collection
36	0	48	TSYNC		Time of last sync cmd to DRCU
42	0	16	TCRECV		Count of Telecommands Received
44	0	16	TCRECN	AD01	Packet Sequence Control, Sequence count of latest received telecommand
46	0	16	TCEXEC		Count of Telecommands Executed
48	0	16	TCEXEN	AD01	Packet Sequence Control, Sequence count of latest executed telecommand
50	0	16	TM1N	AD01	Packet Sequence Control, Sequence count of TM Packets for APID1
52	0	16	TM2N	AD01	Packet Sequence Control, Sequence count of TM Packets for APID2
54	0	16	TM3N	AD01	Packet Sequence Control, Sequence count of TM Packets for APID3
56	0	16	TM4N	AD01	Packet Sequence Control, Sequence count of TM Packets for APID4
58	0	16	TM5N	AD01	Packet Sequence Control, Sequence count of TM Packets for APID5
60	0	16			
62	0	16			
64	0	16			
66	0	16			
68	0	32	OBSLEN		Seconds since last set_OBSID command
72	0	32	RATE		Average number of bits per second in current observation
76	0	48	MEMSTAT		Memory Check Flags – updated by background memory checking task
82	0	16	MONSTAT		Status of subsystems monitoring
84	0	16	EVENTSTAT		Status of events
86	0	16			
88	0	16			
90	0	16			
92	0	16			
94	0	16		RD09	DPU Spare
96	0	16	DPU+5V	RD09	DPU monitored +5V voltage line
98	0	16	DPU+15V	RD09	DPU monitored +15V voltage line
100	0	16	DPU-15V	RD09	DPU monitored –15V voltageline
102	0	16	DPUTEMP	RD09	DPU monitored temperature
104				RD09	DPU Spare
106				RD09	DPU Spare
108	0	16	DPU+2.5V	RD09	DPU monitored +2.5V Reference voltage line
110	0	16			
112	0	16			

114	0	16	DRCUIFSTAT	RD06	CmdIfStat
	0	1	IFCMDOLAPERR	RD06	Command Overlapped
	1	1	IFBCASTERR	RD06	Forbidden Broadcast
	2	1	IFREADERR	RD06	Forbidden Read
	3	1	IFTIMEOUTERR	RD06	SubSystem Timeout
	4	2	IFCMDSTAT	RD06	LastCmdStatus
116	0	16	DRCUIFCTRL	RD06	CmdIfCtrl
	0	1	IFDATARESET	RD06	DataIfReset
	1	1	IFSSRESET	RD06	SubSystemRst
	2	1	IFSTATRESET	RD06	St RD06atusRst
118	0	16	DRCUSSDEL	RD06	SubSDelay
120	0	16			
122	0	16	DCUSTAT		TBC
124	0	16	DCUDATAMODE	RD06	DataMode
126	0	16	DCUDATAFRMS	RD06	FrameCount
128	0	16	DCUDATASTAT	RD06	StartFrame
122	0	16			
122	0	16			
124	0	16	PHOTSAMPFREQ	RD06	PhotoBiasDiv
126	0	16	PHOTBIASMODE	RD06	PhotoBiasMode
128	0	16	PHOTBIASFREQ	RD06	PhotoMClkDiv
130	0	16	PSWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 0
132	0	16	PMWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 1
134	0	16	PLWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 2
136	0	16	TCBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 3
138	0	16	PSWPHASE	RD06	PhaseShift for Photo Bias Channel 0
140	0	16	PMWPHASE	RD06	PhaseShift for Photo Bias Channel 1
142	0	16	PLWPHASE	RD06	PhaseShift for Photo Bias Channel 2
144	0	16	TCPHASE	RD06	PhaseShift for Photo Bias Channel 3
146	0	16	PSWJFETSTAT		
	0	1	PSWJFETPWR1	RD06	P250_JFET_1
	1	1	PSWJFETPWR2	RD06	P250_JFET_2
	2	1	PSWJFETPWR3	RD06	P250_JFET_3
	3	1	PSWJFETPWR4	RD06	P250_JFET_4
	4	1	PSWJFETPWR5	RD06	P250_JFET_5
	5	1	PSWJFETPWR6	RD06	P250_JFET_6
148	0	16	PMLWJFETSTAT		
	0	1	PMWJFETPWR1	RD06	P350_JFET_1
	1	1	PMWJFETPWR2	RD06	P350_JFET_2
	2	1	PMWJFETPWR3	RD06	P350_JFET_3
	3	1	PMWJFETPWR4	RD06	P350_JFET_4
	4	1	PLWJFETPWR1	RD06	P500_JFET_1
	5	1	PLWJFETPWR2	RD06	P500_JFET_2
150	0	16	PSWVSS1V	RD06	PSW_VSS for VSS Channel ID 0
152	0	16	PSWVSS2V	RD06	PSW_VSS for VSS Channel ID 1
154	0	16	PSWVSS3V	RD06	PSW_VSS for VSS Channel ID 2
156	0	16	PSWVSS4V	RD06	PSW_VSS for VSS Channel ID 3
158	0	16	PSWVSS5V	RD06	PSW_VSS for VSS Channel ID 4
160	0	16	PSWVSS6V	RD06	PSW_VSS for VSS Channel ID 5
162	0	16	PMWVSS1V	RD06	PMW_VSS for VSS Channel ID 0
164	0	16	PMWVSS2V	RD06	PMW_VSS for VSS Channel ID 1
166	0	16	PMWVSS3V	RD06	PMW_VSS for VSS Channel ID 2
168	0	16	PMWVSS4V	RD06	PMW_VSS for VSS Channel ID 3
170	0	16	PLWVSS1V	RD06	PLW_VSS for VSS Channel ID 0
172	0	16	PLWVSS2V	RD06	PLW_VSS for VSS Channel ID 1
174	0	16	PHOTHTRV	RD06	PhotoHeaterBias

176	0	16			
178	0	16			
180	0	16			
182	0	16			
184	0	16	SPECSAMPFREQ	RD06	SpectroBiasDiv
186	0	16	SPECBIASMODE	RD06	SpectroBiasMode
188	0	16	SPECBIASFREQ	RD06	SpectroMClkDiv
190	0	16	SSWBIAS	RD06	SpectroBiasAmpl for Spectro Bias Channel 0
192	0	16	SLWBIAS	RD06	SpectroBiasAmpl for Spectro Bias Channel 0
194	0	16	SSWPHASE	RD06	SpectroPhaseShift for Spectro Bias Channel 0
196	0	16	SLWPHASE	RD06	SpectroPhaseShift for Spectro Bias Channel 01
198	0	16	SPECJFETSTAT	RD06	
	0	1	SLWJFETPWR1		SLW_JFET1
	1	1	SSWJFETPWR1		SSW_JFET1
	2	1	SSWJFETPWR2		SSW_JFET2
200	0	16	SSWJFET1V	RD06	SSW_VSS for VSS Channel ID 0
202	0	16	SSWJFET2V	RD06	SSW_VSS for VSS Channel ID 1
204	0	16	SLWJFET1V	RD06	SLW_VSS for VSS Channel ID 0
206	0	16	SPECHTRV	RD06	Spectro Heater Bias
208	0	16			
210	0	16			
212	0	16	TC1TEMP	RD06	T/C 1
214	0	16	TC2TEMP	RD06	T/C 2
216	0	16	TC3TEMP	RD06	T/C 3
218	0	16	PSWBIAS-B	RD06	BIAS_BDA_1, Ph. Bolo. Bias 1 ampl. setting
220	0	16	PMWBIAS-B	RD06	BIAS_BDA_2, Ph. Bolo. Bias 2 ampl. setting
222	0	16	PLWBIAS-B	RD06	BIAS_BDA_3, Ph. Bolo. Bias 3 amplitude setting
224	0	16	SSWBIAS-B	RD06	BIAS_BDA_4, Sp. Bolo. Bias 1 amplitude setting
226	0	16	SLWBIAS-B	RD06	BIAS_BDA_5, Sp. Bolo. Bias 2 amplitude setting
228	0	16	TCBIAS-B	RD06	BIAS_TEMP_5, T/C. Bias 1 ampl. Setting
230	0	16	PHOTBIASFREQ-B	RD06	F_BIAS_PH/TC, Ph. & T/C Bias Freq div. Setting
232	0	16	SPECBIASFREQ-B	RD06	F_BIAS_SP, Sp. Bias Freq div. setting
234	0	16	PSWVSS1V-B	RD06	JFET_VSS_PSW_1, PSW_1 JFET VSS setting
236	0	16	PSWVSS2V-B	RD06	JFET_VSS_PSW_2, PSW_2 JFET VSS setting
238	0	16	PSWVSS3V-B	RD06	JFET_VSS_PSW_3, PSW_3 JFET VSS setting
240	0	16	PSWVSS4V-B	RD06	JFET_VSS_PSW_4, PSW_4 JFET VSS setting
242	0	16	PSWVSS5V-B	RD06	JFET_VSS_PSW_5, PSW_5 JFET VSS setting
244	0	16	PSWVSS6V-B	RD06	JFET_VSS_PSW_6, PSW_6 JFET VSS setting
246	0	16	PMWVSS1V-B	RD06	JFET_VSS_PMW_1, PMW_1 JFET VSS setting
248	0	16	PMWVSS2V-B	RD06	JFET_VSS_PMW_2, PMW_2 JFET VSS setting
250	0	16	PMWVSS3V-B	RD06	JFET_VSS_PMW_3, PMW_3 JFET VSS setting
252	0	16	PMWVSS4V-B	RD06	JFET_VSS_PMW_4, PMW_4 JFET VSS setting
254	0	16	PLWVSS1V-B	RD06	JFET_VSS_PLW_1, PLW_1 JFET VSS setting
256	0	16	PLWVSS2V-B	RD06	JFET_VSS_PLW_2, PLW_2 JFET VSS setting
258	0	16	LIA01TEMP	RD06	LIA_B1_TEMP, LIA board 1 temperature
260	0	16	LIA02TEMP	RD06	LIA_B2_TEMP, LIA board 2 temperature
262	0	16	LIA03TEMP	RD06	LIA_B3_TEMP, LIA board 3 temperature
264	0	16	LIA04TEMP	RD06	LIA_B4_TEMP, LIA board 4 temperature
266	0	16	LIA05TEMP	RD06	LIA_B5_TEMP, LIA board 5 temperature
268	0	16	LIA06TEMP	RD06	LIA_B6_TEMP, LIA board 6 temperature
270	0	16	LIA07TEMP	RD06	LIA_B7_TEMP, LIA board 7 temperature
272	0	16	LIA08TEMP	RD06	LIA_B8_TEMP, LIA board 8 temperature
274	0	16	LIA09TEMP	RD06	LIA_B9_TEMP, LIA board 9 temperature
276	0	16	LIA010TEMP	RD06	LIA_B10_TEMP, LIA board 01 temperature
278	0	16	LIA11TEMP	RD06	LIA_B11_TEMP, LIA board 11 temperature
280	0	16	LIA12TEMP	RD06	LIA_B12_TEMP, LIA board 21 temperature

282	0	16	BIASTEMP	RD06	BIAS_TEMP, Bias board temperature
284	0	16	DAQTEMP	RD06	DAQ_IF_TEMP, DAQ IF board temperature
286	0	16	LIASTAT	RD06	PWR_STATUS, LIA 1 to LIA 12 +5V/+9V/ -9V status
	0	1	LIA01STAT		LIA 1 +5V/+9V/-9V status
	1	1	LIA02STAT		LIA 2 +5V/+9V/-9V status
	2	1	LIA03STAT		LIA 3 +5V/+9V/-9V status
	3	1	LIA04STAT		LIA 4 +5V/+9V/-9V status
	4	1	LIA05STAT		LIA 5 +5V/+9V/-9V status
	5	1	LIA06STAT		LIA 6 +5V/+9V/-9V status
	6	1	LIA07STAT		LIA 7 +5V/+9V/-9V status
	7	1	LIA08STAT		LIA 8 +5V/+9V/-9V status
	8	1	LIA09STAT		LIA 9 +5V/+9V/-9V status
	9	1	LIA10STAT		LIA 10 +5V/+9V/ -9V status
	10	1	LIA11STAT		LIA 11 +5V/+9V/ -9V status
	11	1	LIA12STAT		LIA 12 +5V/+9V/ -9V status
288					
290					
292					
294	0	16	MCUMACTEMP	RD06	MACTemp
296	0	16	MCUSMECTEMP	RD06	SMECTemp
298	0	16	MCUBSMTEMP	RD06	BSMTemp
300	0	16	MCU+15V	RD06	P15V
302	0	16	MCU-15V	RD06	M15V
304	0	16	MCU+13V	RD06	P13V
306	0	16	MCU-13V	RD06	M13V
308	0	16	MCU+5V	RD06	P5V
310	0	16	MCUPOLLINGTIME	RD06	DPUPolling
				RD07	DPUPollingTime
312	0	16	MCUERR	RD06	ErrorCode
314					
316					
318	0	16	MCUTM10TSAMPLE	RD06	TP10SampFreq
				RD07	TelemetryPacket10Sampling
320	0	16	MCUTM11TSAMPLE	RD06	TP11SampFreq
				RD07	TelemetryPacket11Sampling
322	0	16	MCUTM12TSAMPLE	RD06	TP12SampFreq
				RD07	TelemetryPacket12Sampling
324	0	16	MCUTM13TSAMPLE	RD06	TP13SampFreq
				RD07	TelemetryPacket13Sampling
326	0	16	MCUTM14TSAMPLE	RD06	TP14SampFreq
				RD07	TelemetryPacket14Sampling
328	0	16	MCUTM15TSAMPLE	RD06	TP15SampFreq
				RD07	TelemetryPacket15Sampling
330					
332					
334		16	MCUBOOTSTAT	RD06	Boot Status Register
336		16	MCUDLOADCONF	RD06	DownloadParam
338		16	MCUDLOADWORD	RD06	DownloadWord
340		16	MCUDLOADPC	RD06	DownloadCounter
342		16	MCUULOADCONF	RD06	UploadParam
344		16	MCUULOADWORD	RD06	UploadWord
346		16	MCUULOADPC	RD06	UploadCounter
348					
350					
352	0	16	SMECENCPWR	RD06	SEncoderPwr
354	0	16	SMECLVDTPWR	RD06	SLVDTPwr

356	0	16	SMECMOTORMODE	RD06	MotorMode
358	0	16	SMECLATCHSTAT	RD06	SLaunchLatch
360	0	16	SMECLOOPMODE	RD06	SLoopMode
362					
364					
366	0	16	SCANSTART	RD06	STrajStartPos
368	0	16	SCANEND	RD06	STrajEndPos
370	0	16	SCANSPEED	RD06	SScanSpeed
372	0	16	SCANS	RD06	SscanN
				RD07	SScanNumber
374	0	16	SCANMODE	RD06	STrajMode
376					
378					
380	0	16	SMECKP	RD06	SKp
382	0	16	SMECKD	RD06	SKd
384	0	16	SMECDFILT	RD06	SderivFilt
				RD07	SDerivFilter
386	0	16	SMECKI	RD06	SKi
388	0	16	SMECINTLIMIT	RD06	SintLimit
				RD07	SIntegrationLimit
390	0	16	SMECLVDTFILTER	RD06	SLVDTFilteringFrequency
392	0	16	SMECNOTCHZERO	RD06	NotchZeroFreq
394	0	16	SMECNOTCHPOLE	RD06	NotchPoleFreq
396	0	16	SMECNOTCHZFREQ	RD06	NotchZeroFreq
398	0	16	SMECNOTCHPFREQ	RD06	NotchPoleFreq
400	0	16	SMECNOTCHZDAMP	RD06	NotchZeroDamp
402	0	16	SMECNOTCHPDAMP	RD06	NotchPoleDamp
404	0	16	SMECFEEDGAIN	RD06	SFeedFwdGain
				RD07	SFeedForwardGain
406	0	16	SMECMAXOUT	RD06	SMaxOut
				RD07	SMaxOutput
408	0	16	SMECMAXSPEED	RD06	SMaxSpeed
410	0	16	SMECMAXACCEL	RD06	SMaxAccel
				RD07	SMaxAcceleration
412	0	16	SMECMAXPOSNERR	RD06	MaxPosError
				RD07	Max tolerated position error
414	0	16	SMECMAXSPEEDERR	RD06	MaxSpeedErr
				RD07	Max tolerated speed error
416	0	16	SMECMINENCAMPL	RD06	MinEncodSAmpl
					Min Encoder signal tolerated amplitude
418	0	16	SMECMAXENCBIAS	RD06	MaxEncodSBias
					Max Encoder signal tolerated bias
420					
422					
424	0	16	SMECSTAT	RD06	SMECStatus
426	0	16	SMECENCPOSN	RD06	SEncodeIncrPos
				RD07	SEncoder IncrementPosition
428	0	16	SMECSINE000SIG	RD06	SEncodS1
				RD07	SencoderSignal1
430	0	16	SMECSINE120SIG	RD06	SEncodS2
				RD07	SencoderSignal2
432	0	16	SMECSINE240SIG	RD06	SEncodS3
				RD07	SencoderSignal3
434	0	16	SMECLVDTPOSN	RD07	SLVDT position
436	0	16	SMECLVDTACSIG	RD06	SLVDTAC
438	0	16	SMEVLVDTDCSIG	RD06	SLVDTAC

440	0	16	SMECINSTPOSNERR	RD06 RD07	MeanPosError Mean position error
442	0	16	SMECOLOOPPOSN	RD06 RD07	EstOLPos Estimated open loop position
444	0	16	SMECHOMEPOSNDIFF	RD06 RD07	PosDiff Position difference encoder/lvdt home
446	0	16	SMECENCDELTAT	RD06 RD07	EncodDT EncoderDeltaTime
448	0	16	SMECENCSHIFT	RD06 RD07	EncodShift EmcoderShift
450	0	16	SMECINSTVEL	RD06 RD07	ActualVel ActualVelocity
452	0	16	SMECMEANSPEED	RD06	MeanSpeed
454	0	16	SMECSCANPOSNERR	RD06 RD07	MeanPosError MeanPositionError
456	0	16	SMECMOTORCURR	RD06	SMotorCurrent
458	0	16	SMECMOTORBEMF	RD06	SBEMF
460					
462					
464					
466					
468	0	16	CHOPSENSPWR	RD06	CSensorPwr
470	0	16	CHOPLATCHSTAT	RD06	BSMLaunchLatch1
472	0	16	CHOPLOOPMODE	RD06	ChopLoopMode
474	0	16	CHOPPOSN0	RD06	CPosition0
476	0	16	CHOPPOSN1	RD06	CPosition1
478	0	16	CHOPPERIOD	RD06	ChopPeriod
480	0	16	CHOPMODE	RD06	ChopMode
482	0	16	CHOPS	RD06	ChopNumber
484	0	16	CHOPKP	RD06	CKp
486	0	16	CHOPKD	RD06	CKd
488	0	16	CHOPKI	RD06	CKi
490	0	16	CHOPINTTHRESH	RD06 RD07	IntegTh CIntegrationThreshold
492	0	16	CHOPPOSNERRLIMIT	RD06 RD07	CPosErrorLimit CPositionErrorLimit
494	0	16	CHOPMOTORTORQUE	RD06 RD07	CMotorTorqueC CMotorTorqueCst
496	0	16	CHOPRATELOOPSF	RD06	CRateLoopsf
498	0	16	CHOPACCELLOOPSF	RD06	CAccelLoopsf
500	0	16	CHOPRATELIMIT	RD06	CRateLimit
502	0	16	CHOPACCELLIMIT	RD06	CAccelLimi
504	0	16	CHOPSTATECOEFF1	RD06 RD07	CStateCoeffn CStateCoeff1
506	0	16	CHOPSTATECOEFF2	RD06 RD07	CstateCoeffn CStateCoeff2
508	0	16	CHOPSTATECOEFF3	RD06 RD07	CstateCoeffn CStateCoeff3
510	0	16	CHOPSTATECOEFF4	RD06 RD07	CstateCoeffn CStateCoeff4
512	0	16	CHOPICNCOEFF1	RD06 RD07	ICnCoeffn ICnCoeff1
514	0	16	CHOPICNCOEFF2	RD06 RD07	ICnCoeffn ICnCoeff2
516	0	16	CHOPICNCOEFF3	RD06 RD07	ICnCoeffn ICnCoeff3

518	0	16	CHOPICNCOEFF4	RD06 RD07	ICnCoeffn ICnCoeff4
520	0	16	CHOPOUTCOEFF1	RD06 RD07	COutCoeffn COutCoeff1
522	0	16	CHOPOUTCOEFF2	RD06 RD07	COutCoeffn CoutCoeff2
524	0	16	CHOPOUTCOEFF3	RD06 RD07	COutCoeffn CoutCoeff3
526	0	16	CHOPOUTCOEFF4	RD06 RD07	COutCoeffn CoutCoeff4
528					Reserved
530					Reserved
532					Reserved
534					Reserved
536					Reserved
538					Reserved
540					Reserved
542					Reserved
544					Reserved
546					Reserved
548					Reserved
550					Reserved
552					Reserved
554					Reserved
556					Reserved
558					Reserved
560					Reserved
562					Reserved
564	0	16	CHOPPROFILEVAL01	RD06 RD07	CprofileValuen CprofileValue1
566	0	16	CHOPPROFILEVAL02	RD06 RD07	CprofileValuen CprofileValue2
568	0	16	CHOPPROFILEVAL03	RD06 RD07	CprofileValuen CprofileValue3
570	0	16	CHOPPROFILEVAL04	RD06 RD07	CprofileValuen CprofileValue4
572	0	16	CHOPPROFILEVAL05	RD06 RD07	CprofileValuen CprofileValue5
574	0	16	CHOPPROFILEVAL06	RD06 RD07	CprofileValuen CprofileValue6
576	0	16	CHOPPROFILEVAL07	RD06 RD07	CprofileValuen CprofileValue7
578	0	16	CHOPPROFILEVAL08	RD06 RD07	CprofileValuen CprofileValue8
580	0	16	CHOPPROFILEVAL09	RD06 RD07	CprofileValuen CprofileValue9
582	0	16	CHOPPROFILEVAL10	RD06 RD07	CprofileValuen CprofileValue10
584	0	16	CHOPPROFILEVAL11	RD06 RD07	CprofileValuen CprofileValue11
586	0	16	CHOPPROFILEVAL12	RD06 RD07	CprofileValuen CprofileValue12
588	0	16	CHOPPROFILEVAL13	RD06 RD07	CprofileValuen CprofileValue13
590	0	16	CHOPPROFILEVAL14	RD06 RD07	CprofileValuen CprofileValue14

592	0	16	CHOPPROFILEVAL15	RD06 RD07	CprofileValuen CprofileValue15
594					Reserved
596	0	16	CHOPSTAT	RD06	ChopStatus
598	0	16	CHOPPOSN	RD06	CPosition
600	0	16	CHOPPOSNERR	RD06 RD07	CMeanPosError CMeanPositionError
602	0	16	CHOPSENSPOSN1	RD06 RD07	CMagnetoResPos1 CMagnetoresistive pos #1
604	0	16	CHOPSENSPOSN2	RD06 RD07	CMagnetoResPos2 CMagnetoresistive pos #2
606	0	16	CHOPMOTORCURR	RD06	CMotorCurrent
608	0	16	CHOPBEMF	RD06	CBEMF
610					
612					
614					
616					
618	0	16	JIGGSENSPWR	RD06	JSensorPwr
620	0	16	JIGGLATCHSTAT	RD06	BSMLaunchLatch2
622	0	16	JIGGLOOPMODE	RD06	Jig LoopMode
624	0	16	JIGGPOSN0	RD06	JPosition0
626	0	16	JIGGPOSN1	RD06	JPosition1
628	0	16	JIGGPERIOD	RD06	JigPeriod
630	0	16	JIGGMODE	RD06	JigMode
632	0	16	JIGGLES	RD06	JigNumber
634	0	16	JIGGKP	RD06	JKp
636	0	16	JIGGKD	RD06	JKd
638	0	16	JIGGKI	RD06	JKi
640	0	16	JIGGINTTHRESH	RD06	JIntegTh
642	0	16	JIGGPOSNERRLIMIT	RD06	JPosErrorLimit
644	0	16	JIGGMOTORTORQUE	RD06	JMotorTorqueC
646	0	16	JIGGRATELOOPSF	RD06	JRateLoopsf
648	0	16	JIGGACCELLOOPSF	RD06	JAccelLoopsf
650	0	16	JIGGRATELIMIT	RD06	JRateLimit
652	0	16	JIGGACCELLIMIT	RD06	JAccelLimi
654	0	16	JIGGSTATECOEFF1	RD06	JStateCoeffn
656	0	16	JIGGSTATECOEFF2	RD06	JStateCoeffn
658	0	16	JIGGSTATECOEFF3	RD06	JStateCoeffn
660	0	16	JIGGSTATECOEFF4	RD06	JStateCoeffn
662	0	16	JIGGICNCOEFF1	RD06	ICnCoeffn
664	0	16	JIGGICNCOEFF2	RD06	ICnCoeffn
666	0	16	JIGGICNCOEFF3	RD06	ICnCoeffn
668	0	16	JIGGICNCOEFF4	RD06	ICnCoeffn
670	0	16	JIGGOUTCOEFF1	RD06	COutCoeffn
672	0	16	JIGGOUTCOEFF2	RD06	COutCoeffn
674	0	16	JIGGOUTCOEFF3	RD06	COutCoeffn
676	0	16	JIGGOUTCOEFF4	RD06	COutCoeffn
678					Reserved
680					Reserved
682					Reserved
684					Reserved
686					Reserved
688					Reserved
690					Reserved
692					Reserved
694					Reserved

696					Reserved
698					Reserved
700					Reserved
702					Reserved
704					Reserved
706					Reserved
708					Reserved
710					Reserved
712					Reserved
714	0	16	JIGGPROFILEVAL01	RD06	CprofileValuen
716	0	16	JIGGPROFILEVAL02	RD06	CprofileValuen
718	0	16	JIGGPROFILEVAL03	RD06	CprofileValuen
720	0	16	JIGGPROFILEVAL04	RD06	CprofileValuen
722	0	16	JIGGPROFILEVAL05	RD06	CprofileValuen
724	0	16	JIGGPROFILEVAL06	RD06	CprofileValuen
726	0	16	JIGGPROFILEVAL07	RD06	CprofileValuen
728	0	16	JIGGPROFILEVAL08	RD06	CprofileValuen
730	0	16	JIGGPROFILEVAL09	RD06	CprofileValuen
732	0	16	JIGGPROFILEVAL10	RD06	CprofileValuen
734	0	16	JIGGPROFILEVAL11	RD06	CprofileValuen
736	0	16	JIGGPROFILEVAL12	RD06	CprofileValuen
738	0	16	JIGGPROFILEVAL13	RD06	CprofileValuen
740	0	16	JIGGPROFILEVAL14	RD06	CprofileValuen
742	0	16	JIGGPROFILEVAL15	RD06	CprofileValuen
744					Reserved
746	0	16	JIGGSTAT	RD06	JigStatus
748	0	16	JIGGPOSN	RD06	JPosition
750	0	16	JIGGPOSNERR	RD06	JMeanPosError
752	0	16	JIGGSENSPOSN1	RD06	JMagnetoResPos1
754	0	16	JIGGSENSPOSN2	RD06	JMagnetoResPos2
756	0	16	JIGGMOTORCURR	RD06	JMotorCurrent
758	0	16	JIGGBEMF	RD06	JBEMF
760					
762					
764					
766					
768	0	16	MCUTRACETSAMPLE	RD06 RD07	TraceSampFreq TraceeSampling
770	0	16	MCUTRACEBUFLEN	RD06 RD07	TraceBufLength TraceBuffer
772	0	16	MCUTRACEPARM01	RD06 RD07	Trace Param 1 TraceParam#1
774	0	16	MCUTRACEPARM02	RD06 RD07	Trace Param 2 TraceParam#2
776	0	16	MCUTRACEPARM03	RD06 RD07	Trace Param 3 TraceParam#3
778	0	16	MCUTRACEPARM04	RD06 RD07	Trace Param 4 TraceParam#4
780	0	16	MCUTRACEPARM05	RD06 RD07	Trace Param 5 TraceParam#5
782	0	16	MCUTRACEPARM06	RD06 RD07	Trace Param 6 TraceParam#6
784	0	16	MCUTRACEPARM07	RD10	TraceParam#7
786	0	16	MCUTRACEPARM08	RD10	TraceParam#8
788	0	16	MCUTRACEPARM09	RD10	TraceParam#9
790	0	16	MCUTRACEPARM10	RD10	TraceParam#10

792	0	16	MCUTRACEPARM11	RD10	TraceParam#11
794	0	16	MCUTRACEPARM12	RD10	TraceParam#12
796	0	16	MCUTRACEPARM13	RD10	TraceParam#13
798	0	16	MCUTRACEPARM14	RD10	TraceParam#14
800	0	16	MCUTRACEPARM15	RD10	TraceParam#15
802	0	16	MCUTRACEPARM16	RD10	TraceParam#16
804	0	16	MCUTRACEPARM17	RD10	TraceParam#17
806	0	16	MCUTRACEPARM18	RD10	TraceParam#18
808	0	16	MCUTRACEPARM19	RD10	TraceParam#19
810					
812					
814					
816					
818	0	16	SCUSTAT	RD06	ScuStatus
820	0	16	SCUTEMPSTAT	RD06	TempOnOff
822	0	16	SCUDCDCSTAT	RD06	DRelOnOff
824	0	16	SCU+5V	RD06	ScuCHTp05
826	0	16	SCU+9V	RD06	ScuCHTp09
828	0	16	SCU-9V	RD06	ScuCHTn09
830	0	16	SPHSCURR	RD06	SPHSHeatB
832	0	16	EVHSCURR	RD06	EVHSHeatB
834	0	16	TCHTRCURR	RD06	TCHeaterB
836	0	16	SPHTRCURR	RD06	SPHeater
838	0	16	CCUTEMP	RD06	CcuTempRd
840	0	16	TCUTEMP	RD06	TcuTempRd
842	0	16	PSUTEMP	RD06	PsuTempRd
844	0 0 15	16 8 1	SCUFRAMECONF SCUFRAMERATE SCUFRAMETYPE	RD06 RD06	FrameConf FrameRAte
846	0	16	SCUFRAMES	RD06	SeqLength
848					
850					
852	0	16	PCALV	RD06	PhCalVolt
854	0	16	SCAL2V	RD06	SCal2Volt
856	0	16	SCAL4V	RD06	SCal4Volt
858	0	16	PCALCURR	RD06	PhCalBias
860	0	16	SCAL2CURR	RD06	SCal2Bias
862	0	16	SCAL4CURR	RD06	SCal4Bias
864					
866	0	16	SUBKSTAT	RD06	SubKpOnOff
868	0	16	SUBKTEMP	RD06	SubKTempP
870					
872	0	16	FPUTEMP01	RD06	FpuTemp01
874	0	16	FPUTEMP02	RD06	FpuTemp02
876	0	16	FPUTEMP03	RD06	FpuTemp03
878	0	16	FPUTEMP04	RD06	FpuTemp04
880	0	16	FPUTEMP05	RD06	FpuTemp05
882	0	16	FPUTEMP06	RD06	FpuTemp06
884	0	16	FPUTEMP07	RD06	FpuTemp07
886	0	16	FPUTEMP08	RD06	FpuTemp08
888	0	16	FPUTEMP09	RD06	FpuTemp09
890	0	16	FPUTEMP10	RD06	FpuTemp10
892	0	16	FPUTEMP11	RD06	FpuTemp11
894	0	16	FPUTEMP12	RD06	FpuTemp12
896	0	16	FPUTEMP13	RD06	FpuTemp13

898	0	16	FPUTEMP14	RD06	FpuTemp14
900	0	16	FPUTEMP15	RD06	FpuTemp15
902	0	16	FPUTEMP16	RD06	FpuTemp16

4.2.3.4 Detector Housekeeping Report (SID=0x0302)

The following table lists the field to be found in this report

Location (msb) octet	bit	Field Length (bits)	Parameter Name	Reference	Description
18	0	32	OBSID	AD03	Observation ID
22	0	32	BBID	AD03	Building Block ID
26	0	16	PSWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 0
28	0	16	PMWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 1
30	0	16	PLWBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 2
32	0	16	TCBIAS	RD06	PhotoBiasAmpl for Photo Bias Channel 3
34	0	16	PSWPHASE	RD06	PhaseShift for Photo Bias Channel 0
36	0	16	PMWPHASE	RD06	PhaseShift for Photo Bias Channel 1
38	0	16	PLWPHASE	RD06	PhaseShift for Photo Bias Channel 2
40	0	16	TCPHASE	RD06	PhaseShift for Photo Bias Channel 3
42	0	16	PSWJFETSTAT		
	0	1	PSWJFETPWR1	RD06	P250_JFET_1
	1	1	PSWJFETPWR2	RD06	P250_JFET_2
	2	1	PSWJFETPWR3	RD06	P250_JFET_3
	3	1	PSWJFETPWR4	RD06	P250_JFET_4
	4	1	PSWJFETPWR5	RD06	P250_JFET_5
	5	1	PSWJFETPWR6	RD06	P250_JFET_6
44	0	16	PMLWJFETSTAT		
	0	1	PMWJFETPWR1	RD06	P350_JFET_1
	1	1	PMWJFETPWR2	RD06	P350_JFET_2
	2	1	PMWJFETPWR3	RD06	P350_JFET_3
	3	1	PMWJFETPWR4	RD06	P350_JFET_4
	4	1	PLWJFETPWR1	RD06	P500_JFET_1
	5	1	PLWJFETPWR2	RD06	P500_JFET_2
46	0	16	PSWVSS1V	RD06	PSW_VSS for VSS Channel ID 0
48	0	16	PSWVSS2V	RD06	PSW_VSS for VSS Channel ID 1
50	0	16	PSWVSS3V	RD06	PSW_VSS for VSS Channel ID 2
52	0	16	PSWVSS4V	RD06	PSW_VSS for VSS Channel ID 3
54	0	16	PSWVSS5V	RD06	PSW_VSS for VSS Channel ID 4
56	0	16	PSWVSS6V	RD06	PSW_VSS for VSS Channel ID 5
58	0	16	PMWVSS1V	RD06	PMW_VSS for VSS Channel ID 0
60	0	16	PMWVSS2V	RD06	PMW_VSS for VSS Channel ID 1
62	0	16	PMWVSS3V	RD06	PMW_VSS for VSS Channel ID 2
64	0	16	PMWVSS4V	RD06	PMW_VSS for VSS Channel ID 3
66	0	16	PLWVSS1V	RD06	PLW_VSS for VSS Channel ID 0
68	0	16	PLWVSS2V	RD06	PLW_VSS for VSS Channel ID 1
70	0	16	PHOTHTRV	RD06	PhotoHeaterBias
72	0	16	LIA1OFFSET1	RD06	Offset_P1 for Channel_P1 0
74	0	16	LIA1OFFSET2	RD06	Offset_P1 for Channel_P1 1
76	0	16	LIA1OFFSET3	RD06	Offset_P1 for Channel_P1 2
78	0	16	LIA1OFFSET4	RD06	Offset_P1 for Channel_P1 3
80	0	16	LIA1OFFSET5	RD06	Offset_P1 for Channel_P1 4
82	0	16	LIA1OFFSET6	RD06	Offset_P1 for Channel_P1 5
84	0	16	LIA1OFFSET7	RD06	Offset_P1 for Channel_P1 6
86	0	16	LIA1OFFSET8	RD06	Offset_P1 for Channel_P1 7
88	0	16	LIA1OFFSET9	RD06	Offset_P1 for Channel_P1 8
90	0	16	LIA1OFFSET10	RD06	Offset_P1 for Channel_P1 9
92	0	16	LIA1OFFSET11	RD06	Offset_P1 for Channel_P1 10

94	0	16	LIA1OFFSET12	RD06	Offset_P1 for Channel_P1 11
96	0	16	LIA1OFFSET13	RD06	Offset_P1 for Channel_P1 12
98	0	16	LIA1OFFSET14	RD06	Offset_P1 for Channel_P1 13
100	0	16	LIA1OFFSET15	RD06	Offset_P1 for Channel_P1 14
102	0	16	LIA1OFFSET16	RD06	Offset_P1 for Channel_P1 15
104	0	16	LIA1OFFSET17	RD06	Offset_P1 for Channel_P1 16
106	0	16	LIA1OFFSET18	RD06	Offset_P1 for Channel_P1 17
108	0	16	LIA1OFFSET19	RD06	Offset_P1 for Channel_P1 18
110	0	16	LIA1OFFSET20	RD06	Offset_P1 for Channel_P1 19
112	0	16	LIA1OFFSET21	RD06	Offset_P1 for Channel_P1 20
114	0	16	LIA1OFFSET22	RD06	Offset_P1 for Channel_P1 21
116	0	16	LIA1OFFSET23	RD06	Offset_P1 for Channel_P1 22
118	0	16	LIA1OFFSET24	RD06	Offset_P1 for Channel_P1 23
120	0	16	LIA1OFFSET25	RD06	Offset_P1 for Channel_P1 24
122	0	16	LIA1OFFSET26	RD06	Offset_P1 for Channel_P1 25
124	0	16	LIA1OFFSET27	RD06	Offset_P1 for Channel_P1 26
126	0	16	LIA1OFFSET28	RD06	Offset_P1 for Channel_P1 27
128	0	16	LIA1OFFSET29	RD06	Offset_P1 for Channel_P1 28
130	0	16	LIA1OFFSET30	RD06	Offset_P1 for Channel_P1 29
132	0	16	LIA1OFFSET31	RD06	Offset_P1 for Channel_P1 30
134	0	16	LIA1OFFSET32	RD06	Offset_P1 for Channel_P1 31
136	0	16	LIA2OFFSET1	RD06	Offset_P2 for Channel_P2 0
138	0	16	LIA2OFFSET2	RD06	Offset_P2 for Channel_P2 1
140	0	16	LIA2OFFSET3	RD06	Offset_P2 for Channel_P2 2
142	0	16	LIA2OFFSET4	RD06	Offset_P2 for Channel_P2 3
144	0	16	LIA2OFFSET5	RD06	Offset_P2 for Channel_P2 4
146	0	16	LIA2OFFSET6	RD06	Offset_P2 for Channel_P2 5
148	0	16	LIA2OFFSET7	RD06	Offset_P2 for Channel_P2 6
150	0	16	LIA2OFFSET8	RD06	Offset_P2 for Channel_P2 7
152	0	16	LIA2OFFSET9	RD06	Offset_P2 for Channel_P2 8
154	0	16	LIA2OFFSET10	RD06	Offset_P2 for Channel_P2 9
156	0	16	LIA2OFFSET11	RD06	Offset_P2 for Channel_P2 10
158	0	16	LIA2OFFSET12	RD06	Offset_P2 for Channel_P2 11
160	0	16	LIA2OFFSET13	RD06	Offset_P2 for Channel_P2 12
162	0	16	LIA2OFFSET14	RD06	Offset_P2 for Channel_P2 13
164	0	16	LIA2OFFSET15	RD06	Offset_P2 for Channel_P2 14
166	0	16	LIA2OFFSET16	RD06	Offset_P2 for Channel_P2 15
168	0	16	LIA2OFFSET17	RD06	Offset_P2 for Channel_P2 16
170	0	16	LIA2OFFSET18	RD06	Offset_P2 for Channel_P2 17
172	0	16	LIA2OFFSET19	RD06	Offset_P2 for Channel_P2 18
174	0	16	LIA2OFFSET20	RD06	Offset_P2 for Channel_P2 19
176	0	16	LIA2OFFSET21	RD06	Offset_P2 for Channel_P2 20
178	0	16	LIA2OFFSET22	RD06	Offset_P2 for Channel_P2 21
180	0	16	LIA2OFFSET23	RD06	Offset_P2 for Channel_P2 22
182	0	16	LIA2OFFSET24	RD06	Offset_P2 for Channel_P2 23
184	0	16	LIA2OFFSET25	RD06	Offset_P2 for Channel_P2 24
186	0	16	LIA2OFFSET26	RD06	Offset_P2 for Channel_P2 25
188	0	16	LIA2OFFSET27	RD06	Offset_P2 for Channel_P2 26
190	0	16	LIA2OFFSET28	RD06	Offset_P2 for Channel_P2 27
192	0	16	LIA2OFFSET29	RD06	Offset_P2 for Channel_P2 28
194	0	16	LIA2OFFSET30	RD06	Offset_P2 for Channel_P2 29
196	0	16	LIA2OFFSET31	RD06	Offset_P2 for Channel_P2 30
198	0	16	LIA2OFFSET32	RD06	Offset_P2 for Channel_P2 31
200	0	16	LIA3OFFSET1	RD06	Offset_P3 for Channel_P3 0
202	0	16	LIA3OFFSET2	RD06	Offset_P3 for Channel_P3 1

204	0	16	LIA3OFFSET3	RD06	Offset_P3 for Channel_P3 2
206	0	16	LIA3OFFSET4	RD06	Offset_P3 for Channel_P3 3
208	0	16	LIA3OFFSET5	RD06	Offset_P3 for Channel_P3 4
210	0	16	LIA3OFFSET6	RD06	Offset_P3 for Channel_P3 5
212	0	16	LIA3OFFSET7	RD06	Offset_P3 for Channel_P3 6
214	0	16	LIA3OFFSET8	RD06	Offset_P3 for Channel_P3 7
216	0	16	LIA3OFFSET9	RD06	Offset_P3 for Channel_P3 8
218	0	16	LIA3OFFSET10	RD06	Offset_P3 for Channel_P3 9
220	0	16	LIA3OFFSET11	RD06	Offset_P3 for Channel_P3 10
222	0	16	LIA3OFFSET12	RD06	Offset_P3 for Channel_P3 11
224	0	16	LIA3OFFSET13	RD06	Offset_P3 for Channel_P3 12
226	0	16	LIA3OFFSET14	RD06	Offset_P3 for Channel_P3 13
228	0	16	LIA3OFFSET15	RD06	Offset_P3 for Channel_P3 14
230	0	16	LIA3OFFSET16	RD06	Offset_P3 for Channel_P3 15
232	0	16	LIA3OFFSET17	RD06	Offset_P3 for Channel_P3 16
234	0	16	LIA3OFFSET18	RD06	Offset_P3 for Channel_P3 17
236	0	16	LIA3OFFSET19	RD06	Offset_P3 for Channel_P3 18
238	0	16	LIA3OFFSET20	RD06	Offset_P3 for Channel_P3 19
240	0	16	LIA3OFFSET21	RD06	Offset_P3 for Channel_P3 20
242	0	16	LIA3OFFSET22	RD06	Offset_P3 for Channel_P3 21
244	0	16	LIA3OFFSET23	RD06	Offset_P3 for Channel_P3 22
246	0	16	LIA3OFFSET24	RD06	Offset_P3 for Channel_P3 23
248	0	16	LIA3OFFSET25	RD06	Offset_P3 for Channel_P3 24
250	0	16	LIA3OFFSET26	RD06	Offset_P3 for Channel_P3 25
252	0	16	LIA3OFFSET27	RD06	Offset_P3 for Channel_P3 26
254	0	16	LIA3OFFSET28	RD06	Offset_P3 for Channel_P3 27
256	0	16	LIA3OFFSET29	RD06	Offset_P3 for Channel_P3 28
258	0	16	LIA3OFFSET30	RD06	Offset_P3 for Channel_P3 29
260	0	16	LIA3OFFSET31	RD06	Offset_P3 for Channel_P3 30
262	0	16	LIA3OFFSET32	RD06	Offset_P3 for Channel_P3 31
264	0	16	LIA4OFFSET1	RD06	Offset_P4 for Channel_P4 0
266	0	16	LIA4OFFSET2	RD06	Offset_P4 for Channel_P4 1
268	0	16	LIA4OFFSET3	RD06	Offset_P4 for Channel_P4 2
270	0	16	LIA4OFFSET4	RD06	Offset_P4 for Channel_P4 3
272	0	16	LIA4OFFSET5	RD06	Offset_P4 for Channel_P4 4
274	0	16	LIA4OFFSET6	RD06	Offset_P4 for Channel_P4 5
276	0	16	LIA4OFFSET7	RD06	Offset_P4 for Channel_P4 6
278	0	16	LIA4OFFSET8	RD06	Offset_P4 for Channel_P4 7
280	0	16	LIA4OFFSET9	RD06	Offset_P4 for Channel_P4 8
282	0	16	LIA4OFFSET10	RD06	Offset_P4 for Channel_P4 9
284	0	16	LIA4OFFSET11	RD06	Offset_P4 for Channel_P4 10
286	0	16	LIA4OFFSET12	RD06	Offset_P4 for Channel_P4 11
288	0	16	LIA4OFFSET13	RD06	Offset_P4 for Channel_P4 12
290	0	16	LIA4OFFSET14	RD06	Offset_P4 for Channel_P4 13
292	0	16	LIA4OFFSET15	RD06	Offset_P4 for Channel_P4 14
294	0	16	LIA4OFFSET16	RD06	Offset_P4 for Channel_P4 15
296	0	16	LIA4OFFSET17	RD06	Offset_P4 for Channel_P4 16
298	0	16	LIA4OFFSET18	RD06	Offset_P4 for Channel_P4 17
300	0	16	LIA4OFFSET19	RD06	Offset_P4 for Channel_P4 18
302	0	16	LIA4OFFSET20	RD06	Offset_P4 for Channel_P4 19
304	0	16	LIA4OFFSET21	RD06	Offset_P4 for Channel_P4 20
306	0	16	LIA4OFFSET22	RD06	Offset_P4 for Channel_P4 21
308	0	16	LIA4OFFSET23	RD06	Offset_P4 for Channel_P4 22
310	0	16	LIA4OFFSET24	RD06	Offset_P4 for Channel_P4 23
312	0	16	LIA4OFFSET25	RD06	Offset_P4 for Channel_P4 24

314	0	16	LIA4OFFSET26	RD06	Offset_P4 for Channel_P4 25
316	0	16	LIA4OFFSET27	RD06	Offset_P4 for Channel_P4 26
318	0	16	LIA4OFFSET28	RD06	Offset_P4 for Channel_P4 27
320	0	16	LIA4OFFSET29	RD06	Offset_P4 for Channel_P4 28
322	0	16	LIA4OFFSET30	RD06	Offset_P4 for Channel_P4 29
324	0	16	LIA4OFFSET31	RD06	Offset_P4 for Channel_P4 30
326	0	16	LIA4OFFSET32	RD06	Offset_P1 for Channel_P4 31
328	0	16	LIA5OFFSET1	RD06	Offset_P5 for Channel_P5 0
330	0	16	LIA5OFFSET2	RD06	Offset_P5 for Channel_P5 1
332	0	16	LIA5OFFSET3	RD06	Offset_P5 for Channel_P5 2
334	0	16	LIA5OFFSET4	RD06	Offset_P5 for Channel_P5 3
336	0	16	LIA5OFFSET5	RD06	Offset_P5 for Channel_P5 4
338	0	16	LIA5OFFSET6	RD06	Offset_P5 for Channel_P5 5
340	0	16	LIA5OFFSET7	RD06	Offset_P5 for Channel_P5 6
342	0	16	LIA5OFFSET8	RD06	Offset_P5 for Channel_P5 7
344	0	16	LIA5OFFSET9	RD06	Offset_P5 for Channel_P5 8
346	0	16	LIA5OFFSET10	RD06	Offset_P5 for Channel_P5 9
348	0	16	LIA5OFFSET11	RD06	Offset_P5 for Channel_P5 10
350	0	16	LIA5OFFSET12	RD06	Offset_P5 for Channel_P5 11
352	0	16	LIA5OFFSET13	RD06	Offset_P5 for Channel_P5 12
354	0	16	LIA5OFFSET14	RD06	Offset_P5 for Channel_P5 13
356	0	16	LIA5OFFSET15	RD06	Offset_P5 for Channel_P5 14
358	0	16	LIA5OFFSET16	RD06	Offset_P5 for Channel_P5 15
360	0	16	LIA5OFFSET17	RD06	Offset_P5 for Channel_P5 16
362	0	16	LIA5OFFSET18	RD06	Offset_P5 for Channel_P5 17
364	0	16	LIA5OFFSET19	RD06	Offset_P5 for Channel_P5 18
366	0	16	LIA5OFFSET20	RD06	Offset_P5 for Channel_P5 19
368	0	16	LIA5OFFSET21	RD06	Offset_P5 for Channel_P5 20
370	0	16	LIA5OFFSET22	RD06	Offset_P5 for Channel_P5 21
372	0	16	LIA5OFFSET 23	RD06	Offset_P5 for Channel_P5 22
374	0	16	LIA5OFFSET24	RD06	Offset_P5 for Channel_P5 23
376	0	16	LIA5OFFSET25	RD06	Offset_P5 for Channel_P5 24
378	0	16	LIA5OFFSET26	RD06	Offset_P5 for Channel_P5 25
380	0	16	LIA5OFFSET27	RD06	Offset_P5 for Channel_P5 26
382	0	16	LIA5OFFSET28	RD06	Offset_P5 for Channel_P5 27
384	0	16	LIA5OFFSET29	RD06	Offset_P5 for Channel_P5 28
386	0	16	LIA5OFFSET30	RD06	Offset_P5 for Channel_P5 29
388	0	16	LIA5OFFSET31	RD06	Offset_P5 for Channel_P5 30
390	0	16	LIA5OFFSET32	RD06	Offset_P5 for Channel_P5 31
392	0	16	LIA6OFFSET1	RD06	Offset_P6 for Channel_P6 0
394	0	16	LIA6OFFSET2	RD06	Offset_P6 for Channel_P6 1
396	0	16	LIA6OFFSET3	RD06	Offset_P6 for Channel_P6 2
398	0	16	LIA6OFFSET4	RD06	Offset_P6 for Channel_P6 3
400	0	16	LIA6OFFSET5	RD06	Offset_P6 for Channel_P6 4
402	0	16	LIA6OFFSET6	RD06	Offset_P6 for Channel_P6 5
404	0	16	LIA6OFFSET7	RD06	Offset_P6 for Channel_P6 6
406	0	16	LIA6OFFSET8	RD06	Offset_P6 for Channel_P6 7
408	0	16	LIA6OFFSET9	RD06	Offset_P6 for Channel_P6 8
410	0	16	LIA6OFFSET10	RD06	Offset_P6 for Channel_P6 9
412	0	16	LIA6OFFSET11	RD06	Offset_P6 for Channel_P6 10
414	0	16	LIA6OFFSET12	RD06	Offset_P6 for Channel_P6 11
416	0	16	LIA6OFFSET13	RD06	Offset_P6 for Channel_P6 12
418	0	16	LIA6OFFSET14	RD06	Offset_P6 for Channel_P6 13
420	0	16	LIA6OFFSET15	RD06	Offset_P6 for Channel_P6 14
422	0	16	LIA6OFFSET16	RD06	Offset_P6 for Channel_P6 15

424	0	16	LIA6OFFSET17	RD06	Offset_P6 for Channel_P6 16
426	0	16	LIA6OFFSET18	RD06	Offset_P6 for Channel_P6 17
428	0	16	LIA6OFFSET19	RD06	Offset_P6 for Channel_P6 18
430	0	16	LIA6OFFSET20	RD06	Offset_P6 for Channel_P6 19
432	0	16	LIA6OFFSET21	RD06	Offset_P6 for Channel_P6 20
434	0	16	LIA6OFFSET22	RD06	Offset_P6 for Channel_P6 21
436	0	16	LIA6OFFSET23	RD06	Offset_P6 for Channel_P6 22
438	0	16	LIA6OFFSET24	RD06	Offset_P6 for Channel_P6 23
440	0	16	LIA6OFFSET25	RD06	Offset_P6 for Channel_P6 24
442	0	16	LIA6OFFSET26	RD06	Offset_P6 for Channel_P6 25
444	0	16	LIA6OFFSET27	RD06	Offset_P6 for Channel_P6 26
446	0	16	LIA6OFFSET28	RD06	Offset_P6 for Channel_P6 27
448	0	16	LIA6OFFSET29	RD06	Offset_P6 for Channel_P6 28
450	0	16	LIA6OFFSET30	RD06	Offset_P6 for Channel_P6 29
452	0	16	LIA6OFFSET31	RD06	Offset_P6 for Channel_P6 30
454	0	16	LIA6OFFSET32	RD06	Offset_P6 for Channel_P6 31
456	0	16	LIA7OFFSET1	RD06	Offset_P7 for Channel_P7 0
458	0	16	LIA7OFFSET2	RD06	Offset_P7 for Channel_P7 1
460	0	16	LIA7OFFSET3	RD06	Offset_P7 for Channel_P7 2
462	0	16	LIA7OFFSET4	RD06	Offset_P7 for Channel_P7 3
464	0	16	LIA7OFFSET5	RD06	Offset_P7 for Channel_P7 4
466	0	16	LIA7OFFSET6	RD06	Offset_P7 for Channel_P7 5
468	0	16	LIA7OFFSET7	RD06	Offset_P7 for Channel_P7 6
470	0	16	LIA7OFFSET8	RD06	Offset_P7 for Channel_P7 7
472	0	16	LIA7OFFSET9	RD06	Offset_P7 for Channel_P7 8
474	0	16	LIA7OFFSET10	RD06	Offset_P7 for Channel_P7 9
476	0	16	LIA7OFFSET11	RD06	Offset_P7 for Channel_P7 10
478	0	16	LIA7OFFSET12	RD06	Offset_P7 for Channel_P7 11
480	0	16	LIA7OFFSET13	RD06	Offset_P7 for Channel_P7 12
482	0	16	LIA7OFFSET14	RD06	Offset_P7 for Channel_P7 13
484	0	16	LIA7OFFSET15	RD06	Offset_P7 for Channel_P7 14
486	0	16	LIA7OFFSET16	RD06	Offset_P7 for Channel_P7 15
488	0	16	LIA7OFFSET17	RD06	Offset_P7 for Channel_P7 16
490	0	16	LIA7OFFSET18	RD06	Offset_P7 for Channel_P7 17
492	0	16	LIA7OFFSET19	RD06	Offset_P7 for Channel_P7 18
494	0	16	LIA7OFFSET20	RD06	Offset_P7 for Channel_P7 19
496	0	16	LIA7OFFSET21	RD06	Offset_P7 for Channel_P7 20
498	0	16	LIA7OFFSET22	RD06	Offset_P7 for Channel_P7 21
500	0	16	LIA7OFFSET23	RD06	Offset_P7 for Channel_P722
502	0	16	LIA7OFFSET24	RD06	Offset_P7 for Channel_P7 23
504	0	16	LIA7OFFSET25	RD06	Offset_P7 for Channel_P7 24
506	0	16	LIA7OFFSET26	RD06	Offset_P7 for Channel_P7 25
508	0	16	LIA7OFFSET27	RD06	Offset_P7 for Channel_P7 26
510	0	16	LIA7OFFSET28	RD06	Offset_P7 for Channel_P7 27
512	0	16	LIA7OFFSET29	RD06	Offset_P7 for Channel_P7 28
514	0	16	LIA7OFFSET30	RD06	Offset_P7 for Channel_P7 29
516	0	16	LIA7OFFSET31	RD06	Offset_P7 for Channel_P7 30
518	0	16	LIA7OFFSET32	RD06	Offset_P7 for Channel_P7 31
520	0	16	LIA8OFFSET1	RD06	Offset_P8 for Channel_P8 0
522	0	16	LIA8OFFSET2	RD06	Offset_P8 for Channel_P8 1
524	0	16	LIA8OFFSET3	RD06	Offset_P8 for Channel_P8 2
526	0	16	LIA8OFFSET4	RD06	Offset_P8 for Channel_P8 3
528	0	16	LIA8OFFSET5	RD06	Offset_P8 for Channel_P8 4
530	0	16	LIA8OFFSET6	RD06	Offset_P8 for Channel_P8 5
532	0	16	LIA8OFFSET7	RD06	Offset_P8 for Channel_P8 6

534	0	16	LIA8OFFSET8	RD06	Offset_P8 for Channel_P8 7
536	0	16	LIA8OFFSET9	RD06	Offset_P8 for Channel_P8 8
538	0	16	LIA8OFFSET10	RD06	Offset_P8 for Channel_P8 9
540	0	16	LIA8OFFSET11	RD06	Offset_P8 for Channel_P8 10
542	0	16	LIA8OFFSET12	RD06	Offset_P8 for Channel_P8 11
544	0	16	LIA8OFFSET13	RD06	Offset_P8 for Channel_P8 12
546	0	16	LIA8OFFSET14	RD06	Offset_P8 for Channel_P8 13
548	0	16	LIA8OFFSET15	RD06	Offset_P8 for Channel_P8 14
550	0	16	LIA8OFFSET16	RD06	Offset_P8 for Channel_P8 15
552	0	16	LIA8OFFSET17	RD06	Offset_P8 for Channel_P8 16
554	0	16	LIA8OFFSET18	RD06	Offset_P8 for Channel_P8 17
556	0	16	LIA8OFFSET19	RD06	Offset_P8 for Channel_P8 18
558	0	16	LIA8OFFSET20	RD06	Offset_P8 for Channel_P8 19
560	0	16	LIA8OFFSET21	RD06	Offset_P8 for Channel_P8 20
562	0	16	LIA8OFFSET22	RD06	Offset_P8 for Channel_P8 21
564	0	16	LIA8OFFSET23	RD06	Offset_P8 for Channel_P8 22
566	0	16	LIA8OFFSET24	RD06	Offset_P8 for Channel_P8 23
568	0	16	LIA8OFFSET25	RD06	Offset_P8 for Channel_P8 24
570	0	16	LIA8OFFSET26	RD06	Offset_P8 for Channel_P8 25
572	0	16	LIA8OFFSET27	RD06	Offset_P8 for Channel_P8 26
574	0	16	LIA8OFFSET28	RD06	Offset_P8 for Channel_P8 27
576	0	16	LIA8OFFSET29	RD06	Offset_P8 for Channel_P8 28
578	0	16	LIA8OFFSET30	RD06	Offset_P8 for Channel_P8 29
580	0	16	LIA8OFFSET31	RD06	Offset_P8 for Channel_P8 30
582	0	16	LIA8OFFSET32	RD06	Offset_P8 for Channel_P8 31
584	0	16	LIA9OFFSET1	RD06	Offset_P9 for Channel_P9 0
586	0	16	LIA9OFFSET2	RD06	Offset_P9 for Channel_P9 1
588	0	16	LIA9OFFSET3	RD06	Offset_P9 for Channel_P9 2
590	0	16	LIA9OFFSET4	RD06	Offset_P9 for Channel_P9 3
592	0	16	LIA9OFFSET5	RD06	Offset_P9 for Channel_P9 4
594	0	16	LIA9OFFSET6	RD06	Offset_P9 for Channel_P9 5
596	0	16	LIA9OFFSET7	RD06	Offset_P9 for Channel_P9 6
598	0	16	LIA9OFFSET8	RD06	Offset_P9 for Channel_P9 7
600	0	16	LIA9OFFSET9	RD06	Offset_P9 for Channel_P9 8
602	0	16	LIA9OFFSET10	RD06	Offset_P9 for Channel_P9 9
604	0	16	LIA9OFFSET11	RD06	Offset_P9 for Channel_P9 10
606	0	16	LIA9OFFSET12	RD06	Offset_P9 for Channel_P9 11
608	0	16	LIA9OFFSET13	RD06	Offset_P9 for Channel_P9 12
610	0	16	LIA9OFFSET14	RD06	Offset_P9 for Channel_P9 13
612	0	16	LIA9OFFSET15	RD06	Offset_P9 for Channel_P9 14
614	0	16	LIA9OFFSET16	RD06	Offset_P9 for Channel_P9 15
616	0	16	LIA9OFFSET17	RD06	Offset_P9 for Channel_P9 16
618	0	16	LIA9OFFSET18	RD06	Offset_P9 for Channel_P9 17
620	0	16	LIA9OFFSET19	RD06	Offset_P9 for Channel_P9 18
622	0	16	LIA9OFFSET20	RD06	Offset_P9 for Channel_P9 19
624	0	16	LIA9OFFSET21	RD06	Offset_P9 for Channel_P9 20
626	0	16	LIA9OFFSET22	RD06	Offset_P9 for Channel_P9 21
628	0	16	LIA9OFFSET23	RD06	Offset_P9 for Channel_P9 22
630	0	16	LIA9OFFSET24	RD06	Offset_P9 for Channel_P9 23
632	0	16	LIA9OFFSET25	RD06	Offset_P9 for Channel_P9 24
634	0	16	LIA9OFFSET26	RD06	Offset_P9 for Channel_P9 25
636	0	16	LIA9OFFSET27	RD06	Offset_P9 for Channel_P9 26
638	0	16	LIA9OFFSET28	RD06	Offset_P9 for Channel_P9 27
640	0	16	LIA9OFFSET29	RD06	Offset_P9 for Channel_P9 28
642	0	16	LIA9OFFSET30	RD06	Offset_P9 for Channel_P9 29

644	0	16	LIA9OFFSET31	RD06	Offset_P9 for Channel_P9 30
646	0	16	LIA9OFFSET32	RD06	Offset_P9 for Channel_P9 31
648	0	16	SSWBIAS	RD06	SpectroBiasAmpl for Spectro Bias Channel 0
650	0	16	SLWBIAS	RD06	SpectroBiasAmpl for Spectro Bias Channel 0
652	0	16	SSWPHASE	RD06	SpectroPhaseShift for Spectro Bias Channel 0
654	0	16	SLWPHASE	RD06	SpectroPhaseShift for Spectro Bias Channel 01
656	0	16	SPECJFETSTAT	RD06	
	0	1	SLWJFETPWR1		SLW_JFET1
	1	1	SSWJFETPWR1		SSW_JFET1
	2	1	SSWJFETPWR2		SSW_JFET2
658	0	16	SSWJFET1V	RD06	SSW_VSS for VSS Channel ID 0
660	0	16	SSWJFET2V	RD06	SSW_VSS for VSS Channel ID 1
662	0	16	SLWJFET1V	RD06	SLW_VSS for VSS Channel ID 0
664	0	16	SPECHTRV	RD06	Spectro Heater Bias
666	0	16	SLIA1OFFSET1	RD06	Offset_S1 for Channel_S1 0
668	0	16	SLIA1OFFSET2	RD06	Offset_S1 for Channel_S1 1
670	0	16	SLIA1OFFSET3	RD06	Offset_S1 for Channel_S1 2
672	0	16	SLIA1OFFSET4	RD06	Offset_S1 for Channel_S1 3
674	0	16	SLIA1OFFSET5	RD06	Offset_S1 for Channel_S1 4
676	0	16	SLIA1OFFSET6	RD06	Offset_S1 for Channel_S1 5
678	0	16	SLIA1OFFSET7	RD06	Offset_S1 for Channel_S1 6
680	0	16	SLIA1OFFSET8	RD06	Offset_S1 for Channel_S1 7
682	0	16	SLIA1OFFSET9	RD06	Offset_S1 for Channel_S1 8
684	0	16	SLIA1OFFSET10	RD06	Offset_S1 for Channel_S1 9
686	0	16	SLIA1OFFSET11	RD06	Offset_S1 for Channel_S1 10
688	0	16	SLIA1OFFSET12	RD06	Offset_S1 for Channel_S1 11
690	0	16	SLIA1OFFSET13	RD06	Offset_S1 for Channel_S1 12
692	0	16	SLIA1OFFSET14	RD06	Offset_S1 for Channel_S1 13
694	0	16	SLIA1OFFSET15	RD06	Offset_S1 for Channel_S1 14
696	0	16	SLIA1OFFSET16	RD06	Offset_S1 for Channel_S1 15
698	0	16	SLIA1OFFSET17	RD06	Offset_S1 for Channel_S1 16
700	0	16	SLIA1OFFSET18	RD06	Offset_S1 for Channel_S1 17
702	0	16	SLIA1OFFSET19	RD06	Offset_S1 for Channel_S1 18
704	0	16	SLIA1OFFSET20	RD06	Offset_S1 for Channel_S1 19
706	0	16	SLIA1OFFSET21	RD06	Offset_S1 for Channel_S1 20
708	0	16	SLIA1OFFSET22	RD06	Offset_S1 for Channel_S1 21
710	0	16	SLIA1OFFSET23	RD06	Offset_S1 for Channel_S1 22
712	0	16	SLIA1OFFSET24	RD06	Offset_S1 for Channel_S1 23
714	0	16	SLIA2OFFSET1	RD06	Offset_S2 for Channel_S2 0
716	0	16	SLIA2OFFSET2	RD06	Offset_S2 for Channel_S2 1
718	0	16	SLIA2OFFSET3	RD06	Offset_S2 for Channel_S2 2
720	0	16	SLIA2OFFSET4	RD06	Offset_S2 for Channel_S2 3
722	0	16	SLIA2OFFSET5	RD06	Offset_S2 for Channel_S2 4
724	0	16	SLIA2OFFSET6	RD06	Offset_S2 for Channel_S2 5
726	0	16	SLIA2OFFSET7	RD06	Offset_S2 for Channel_S2 6
728	0	16	SLIA2OFFSET8	RD06	Offset_S2 for Channel_S2 7
730	0	16	SLIA2OFFSET9	RD06	Offset_S2 for Channel_S2 8
732	0	16	SLIA2OFFSET10	RD06	Offset_S2 for Channel_S2 9
734	0	16	SLIA2OFFSET11	RD06	Offset_S2 for Channel_S2 10
736	0	16	SLIA2OFFSET12	RD06	Offset_S2 for Channel_S2 11
738	0	16	SLIA2OFFSET13	RD06	Offset_S2 for Channel_S2 12
740	0	16	SLIA2OFFSET14	RD06	Offset_S2 for Channel_S2 13
742	0	16	SLIA2OFFSET15	RD06	Offset_S2 for Channel_S2 14
744	0	16	SLIA2OFFSET16	RD06	Offset_S2 for Channel_S2 15
746	0	16	SLIA2OFFSET17	RD06	Offset_S2 for Channel_S2 16

748	0	16	SLIA2OFFSET18	RD06	Offset_S2 for Channel_S2 17
750	0	16	SLIA2OFFSET19	RD06	Offset_S2 for Channel_S2 18
752	0	16	SLIA2OFFSET20	RD06	Offset_S2 for Channel_S2 19
754	0	16	SLIA2OFFSET21	RD06	Offset_S2 for Channel_S2 20
756	0	16	SLIA2OFFSET22	RD06	Offset_S2 for Channel_S2 21
758	0	16	SLIA2OFFSET23	RD06	Offset_S2 for Channel_S2 22
760	0	16	SLIA2OFFSET24	RD06	Offset_S2 for Channel_S2 23
762	0	16	SLIA3OFFSET1	RD06	Offset_S3 for Channel_S3 0
764	0	16	SLIA3OFFSET2	RD06	Offset_S3 for Channel_S3 1
766	0	16	SLIA3OFFSET3	RD06	Offset_S3 for Channel_S3 2
768	0	16	SLIA3OFFSET4	RD06	Offset_S3 for Channel_S3 3
770	0	16	SLIA3OFFSET5	RD06	Offset_S3 for Channel_S3 4
772	0	16	SLIA3OFFSET6	RD06	Offset_S3 for Channel_S3 5
774	0	16	SLIA3OFFSET7	RD06	Offset_S3 for Channel_S3 6
776	0	16	SLIA3OFFSET8	RD06	Offset_S3 for Channel_S3 7
778	0	16	SLIA3OFFSET9	RD06	Offset_S3 for Channel_S3 8
780	0	16	SLIA3OFFSET10	RD06	Offset_S3 for Channel_S3 9
782	0	16	SLIA3OFFSET11	RD06	Offset_S3 for Channel_S3 10
784	0	16	SLIA3OFFSET12	RD06	Offset_S3 for Channel_S3 11
786	0	16	SLIA3OFFSET13	RD06	Offset_S3 for Channel_S3 12
788	0	16	SLIA3OFFSET14	RD06	Offset_S3 for Channel_S3 13
790	0	16	SLIA3OFFSET15	RD06	Offset_S3 for Channel_S3 14
792	0	16	SLIA3OFFSET16	RD06	Offset_S3 for Channel_S3 15
794	0	16	SLIA3OFFSET17	RD06	Offset_S3 for Channel_S3 16
796	0	16	SLIA3OFFSET18	RD06	Offset_S3 for Channel_S3 17
798	0	16	SLIA3OFFSET19	RD06	Offset_S3 for Channel_S3 18
800	0	16	SLIA3OFFSET20	RD06	Offset_S3 for Channel_S3 19
802	0	16	SLIA3OFFSET21	RD06	Offset_S3 for Channel_S3 20
804	0	16	SLIA3OFFSET22	RD06	Offset_S3 for Channel_S3 21
806	0	16	SLIA3OFFSET23	RD06	Offset_S3 for Channel_S3 22
808	0	16	SLIA3OFFSET24	RD06	Offset_S3 for Channel_S3 23

4.2.4

Not Available

4.2.5 Event Reporting

4.2.5.1 Event Report (5,1)

These reports provide information on events in the instrument which may impact on the scientific results, but which should have no impact on the health and safety of the instrument. These will include the reporting of anomalies which have been dealt with by the DPU

4.2.5.1.1 New Step Report

Indicates a new step in the current operation Mode

0 0 0 0 1	APID1
1 1	Count
Length = 25	
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1	
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0	
TIME	
SID = 0x0501	
OBSID	
BBID	
MODE	
STEP	
Checksum	

Parameter	Comment
SID	0x0501
OBSID	Observation ID
BBID	Building Block ID
MODE	Current Mode
STEP	Step Number

4.2.5.1.2 Peak Up Report

0 0 0 0 1	APID1
1 1	Count
Length	
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1	
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0	
TIME	
SID = 0x0504	
OBSID	
BBID	
Parameters	
Checksum	

Parameter	Comment
SID	0x0504
OBSID	Observation ID
BBID	Building Block ID
Parameters	TBD, but will contain information for the AOCS to offset to bring the peak on to the required pixel

4.2.5.1.3 Block Not Allocated

The OBS failed to allocate a memory block from the VIRTUOSO Memory Pools

0	0	0	0	1	APID1										
1	1	Count													
Length = 29															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
TIME															
SID = 0x0505															
OBSID															
BBID															
POOLID															
SIZE															
ALLOC_RESULT															
TASKID															
Checksum															

Parameter	Comment
SID	0x0505
OBSID	Observation ID
BBID	Building Block ID
POOLID	1. ID of the VIRTUOSO Pool which failed to allocate block. IDs are defined in RD08
SIZE	Size in Bytes of the requested memory block
ALLOC_RESULT	Allocation Result: 1. Allocation Failed 2. Allocation Timed out
TASKID	ID of the OBS task where failure occurred. IDs are defined in RD08

4.2.5.1.4 Unknown DRCU Command

The command sent to the DRCU is unknown

0	0	0	0	1	APID1										
1	1	Count													
Length = 27															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
SID = 0x0509															
OBSID															
BBID															
COMMAND															
ACK															
Checksum															

Parameter	Comment
SID	0x0509
OBSID	Observation ID
BBID	Building Block ID
COMMAND	copy of command sent to DRCU (32 bits)
ACK	Echo of command word received by the DPU

4.2.5.1.5 Forbidden DRCU Command

The command sent to the DRCU is forbidden

0	0	0	0	1	APID1										
1	1	Count													
Length = 27															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
SID = 0x050A															
OBSID															
BBID															
COMMAND															
ACK															
Checksum															

Parameter	Comment
SID	0x050A
OBSID	Observation ID
BBID	Building Block ID
COMMAND	copy of command sent to DRCU (32 bits)
ACK	Echo of command word received by the DPU

4.2.5.1.6 Frame ID Error

When copying data frames from the FIFO to the internal science data buffer, the frame ID is not correct. (The DPU should also execute a procedure to resynchronise with the science data in the FIFO).

0	0	0	0	1	APID1										
1	1	Count													
Length = 25															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
TIME															
SID = 0x0511															
OBSID															
BBID															
FRAMEID															
FIFOID															
Checksum															

Parameter	Comment
SID	0x0511
OBSID	Observation ID
BBID	Building Block ID
FRAMEID	The Frame ID received from the DRCU
FIFOID	The ID of the FIFO where the frame has been received

4.2.5.1.7 Frame Length Error

When copying data frames from the FIFO to the internal science data buffer, the frame length is not correct (RD06).

0	0	0	0	1	APID1										
1	1	Count													
Length = 27															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
TIME															
SID = 0x0507															
OBSID															
BBID															
FRAMEID															
LENGTHRD															
LENGTHEX															
Checksum															

Parameter	Comment
SID	0x0507
OBSID	Observation ID
BBID	Building Block ID
FRAMEID	The Frame ID received form the DRCU
LENGTHRD	Frame length as read from the DRCU frame
LENGTHEX	Expected frame length for that frame ID

4.2.5.1.8 Frame Checksum Error

When copying data frames from the FIFO to the internal science data buffer, the Checksum word at the end of the frame is not correct.

0	0	0	0	1	APID1										
1	1	Count													
Length = 27															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
SID = 0x0508															
OBSID															
BBID															
FRAMEID															
CHKWORDEX															
CHKWORDRD															
Checksum															

Parameter	Comment
SID	0x0508
OBSID	Observation ID
BBID	Building Block ID
FRAMEID	The Frame ID received form the DRCU
CHKWORDEX	XOR checksum computed on the read frame
CHKWORDRD	Checksum word read at the end of teh received frame

4.2.5.1.9 Subsystem Timeout Error

This is issued when the DRCU responds with a timeout to a sent command.

0	0	0	0	1	APID1										
1	1	Count													
Length = 25															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
TIME															
SID = 0x050B															
OBSID															
BBID															
CID															
ACK															
Checksum															

Parameter	Comment
SID	0x050B
OBSID	Observation ID
BBID	Building Block ID
CID	16 MSb of the command sent to the DRCU
ACK	MS 16 bits of response from DRCU containing the Ack bits received from the DRCU

4.2.5.1.10 Subsystem Response Error

This is issued when there is an error in the transmission of a GET command to the DRCU, i.e. when the CID returned by the DRCU is not identical to the CID sent.

0	0	0	0	1	APID1										
1	1	Count													
Length = 25															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
TIME															
SID = 0x050C															
OBSID															
BBID															
CID															
RESPONSE															
Checksum															

Parameter	Comment
SID	0x050C
OBSID	Observation ID
BBID	Building Block ID
CID	16 MSb of the command sent to the DRCU
RESPONSE	The CID returned by the DRCU

4.2.5.1.11 DPU Pool Full Error

This (a warning more than an error) is issued when the DPU internal memory pools (where the TM packets are stored before being sent to the 1553 I/F, it will be detailed in the ADD some time) reach a 80% occupation.

0	0	0	0	1	APID1										
1	1	Count													
Length = 21															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
SID = 0x050D															
OBSID															
BBID															
Checksum															

Parameter	Comment
SID	0x050D
OBSID	Observation ID
BBID	Building Block ID

4.2.5.1.12 DPU FIFO Full Error

This (a warning more than an error) is issued when the DPU internal VIRTUOSO FIFOs (used to exchange messages between OBS tasks, it will be detailed in the ADD some time) reach a 80% occupation.

0	0	0	0	1	APID1										
1	1	Count													
Length = 21															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
TIME															
SID = 0x050E															
OBSID															
BBID															
Checksum															

Parameter	Comment
SID	0x050E
OBSID	Observation ID
BBID	Building Block ID

Exception Report (5,2)

These reports indicate an anomaly with the instrument that cannot be dealt with by the DPU and that action should be taken by the spacecraft.

4.2.5.2.1 DRCU Anomaly

OBS has detected an unrecoverable anomaly in the DRCU - expected action is for the CDMS to switch off the DRCU

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
TIME															
SID = 0x0520															
OBSID															
BBID															
ANOMALYID															
Checksum															

Parameter	Comment
SID	0x0520
OBSID	Observation ID
BBID	Building Block ID
ANOMALYID	Anomaly ID

4.2.5.2.2 DPU Anomaly

OBS has detected an unrecoverable anomaly in the DPU - expected action is for the CDMS to switch off the DPU

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
TIME															
SID = 0x0521															
OBSID															
BBID															
ANOMALYID															
Checksum															

Parameter	Comment
SID	0x0521
OBSID	Observation ID
BBID	Building Block ID
ANOMALYID	Anomaly ID

4.2.5.2.3 Operations Anomaly

OBS has detected a problem during an observation - expected action is for the CDMS to suspend SPIRE commanding until the instrument is ready to resume.

0	0	0	0	1	APID1											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
TIME																
SID = 0x0530																
OBSID																
BBID																
ANOMALYID																
Checksum																

Parameter	Comment
SID	0x0530
OBSID	Observation ID
BBID	Building Block ID
ANOMALYID	Anomaly ID

4.2.5.2.4 Resume

Resume SPIRE Commanding - with next subschedule

0	0	0	0	1	APID1											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
TIME																
SID = 0x0531																
OBSID																
BBID																
Checksum																

Parameter	Comment
SID	0x0531
OBSID	Observation ID
BBID	Building Block ID

4.2.5.3 Error/Alarm Report (5,4)

4.2.5.3.1 Memory Check Error

Generated when the Boot Software memory check fails

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
TIME															
EVENTID															
SID = 0x0540															
MEMID								NPAGES							
Page IDs															
Checksum															

Parameter	Comment
EVENTID	TBD
SID	0x0540
MEMID	Memory ID
NPAGES	Number of failed memory pages
Page IDs	ID of each failed page (8 bits) Up to 40 pages may be reported in one event packet

4.2.6 Memory Management

4.2.6.1 Memory Dump, Absolute Addresses

This report is issued in response to TC (6,5). Multiple packets may be generated in order to dump the requested address range.

0 0 0 0 1	APID1
1 1	Count
Length	
0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0	
0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0	
TIME	
MEMORYID	
STARTADDR	
NSAU	
Data	
CHK	
Checksum	

Parameters

Name	Value and Comments
MEMORYID	Memory Area to be addressed
STARTADDR	Start Address in SAUs
NSAU	Number of SAUs to be dumped
Data	Contents of memory in increasing address
CHK	Checksum over the data included in this packet

4.2.6.2 Memory Check Report, Absolute Addresses

This report is issued in response to TC (6,9). Multiple packets may be generated in order to dump the requested address range.

0 0 0 0 1	APID1
1 1	Count
Length =17	
0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0	
0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0	
TIME	
MEMORYID	
STARTADDR	
NSAU	
CHK	
Checksum	

Parameters

Name	Value and Comments
MEMORYID	Memory Area to be addressed
STARTADDR	Start Address in SAUs
NSAU	Number of SAUs to be checked
CHK	Checksum over the data included in the address range (STARTADDR to STARTADDR+NSAU)

4.2.7

Not Available

4.2.8 Function Management

This report is issued in response to TC (8,5).

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
TIME															
FUNCTIONID								ACTIVITYID							
SID															
Parameters															
Checksum															

Parameters

Name	Value and Comments
FUNCTIONID	ID of function to be reported
ACTIVITYID	Current Activity
SID	0x0806
Parameters	Parameters send in corresponding TC packet starting the activity

4.2.9 Time Management

4.2.9.1 Time Verification Report

This report is generated in response to TC(9,7)

0	0	0	0	1	APID1										
1	1	Count													
Length = 17															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
TIME															
TDPU															
Checksum															

4.2.10

Not Available

4.2.11 On Board Scheduling

Not Used

4.2.12 On Board Monitoring

TBW

4.2.13

Not Available

4.2.14 Packet Transmission Control

This report is issued in response to TC (14,3).

0	0	0	0	1	APID1											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
TIME																
NDEF																
Type Subtype SID																
Type Subtype SID																
Checksum																

Parameters

Name	Value and Comments
NDEF	Number of sets of (Type, Subtype, SID) to follow
Type	Packet Type
Subtype	Packet Subtype
SID	Parameters send in corresponding TC packet starting the activity

4.2.15 On Board Storage and Retrieval

Not Used

4.2.16 On Board Traffic Management

Not Used

4.2.17 Test Service

This report is generated in response to TC (17,1)

0	0	0	0	1	APID1											
1	1	Count														
Length = 17																
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
Checksum																

4.2.18 On Board Control Procedures

Not Used

4.2.19 Action/Event Service

Not Used

4.2.20 Information Distribution Service

4.2.20.1 Distributed Information Packets Report (Service 20,5)

0	0	0	0	1	APID1										
1	1	Count													
Length															
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
NPKT															
$APID_1$															
SID_1															
:															
:															
:															
$APID_{NPKT}$															
SID_{NPKT}															
Checksum															

4.2.21 Science Data

4.2.21.1 Nominal Science Data Report (21,1)

0	0	0	0	1	APID											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
TIME																
SID																
OBSID																
BBID																
Parameters																
Checksum																

The reports available are identified by the APID (APID3 = Photometer, APID4 = Spectrometer) and the SID (composed of the Frame Structure (MSByte) and FrameID (LSByte)):

APID	SID	Report
APID3	0x0200	Photometer Full Array
APID4	0x0201	Spectrometer Full Array
APID5	0x0511	SMEC
APID5	0x0612	BSM
APID5	0x1020	SCU
APID5	0x8080	DPU

The *parameters* field contains one or more blocks of science data all of the same type. These blocks are the same as the science data frames issued by the DRCU, with the possibility of the frame header and trailer having been removed.

Normally the DPU fills the TM packet with the maximum number of blocks before the packet is made available for transmission. In the event of a **flush** telecommand the packet is transmitted immediately and will not be filled. The **length** field, with the APID and SID, allows the number of blocks in the packet to be calculated.

The possible block types are as follows:

4.2.21.1.1 Photometer Full Array Block

This block of data is inserted in the *Parameter* field once.

Block Length=294
FrameID=00
288 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.1.2 Spectrometer Full Array Block

Block Length=78
FrameID=01
72 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.1.3 SMEC Block

In order to meet the telemetry bit rate requirements, this block of data is derived from the science data frame (FrameID=11) received from the MCU by stripping it of its header and trailer.

Acquisition Time MSW
Acquisition Time LSW
Optical encoder Coarse Posn
Optical encoder Fine Posn
LVDT Fine Position
Commanded Current
Actuator Back EMF

This structure is TBC

4.2.21.1.4 BSM Block

Block Length=13
FrameID=12
Acquisition Time MSW
Acquisition Time LSW
Chop Position
Chop Commanded Current
Chop Back EMF
Jiggle Position
Jiggle Commanded Current
Jiggle Back EMF
Frame_Time MSW
Frame_Time LSW
Checkword

This structure is TBC

4.2.21.1.5 SCU Block

Block Length=30
FrameID=20
HSK Data
ADC _Flags
Frame_Time MSW
Frame_Time LSW
Checkword

This structure is TBC
The content of the HSK Data is TBD

4.2.21.1.6 DPU Structure

This block of data is dependant on the observational mode executing.

This structure is TBC

4.2.21.2 Science Type B Data Report (21,2)

0	0	0	0	1	APID											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
TIME																
SID																
OBSID																
BBID																
Parameters																
Checksum																

The reports available are identified by the APID (APID3 = Photometer, APID4 = Spectrometer) and the SID (composed of the Frame Structure (MSByte) and FrameID (LSByte)):

APID	SID	Report
APID3	0x0102	PSW Array
APID3	0x0103	PMW Array
APID3	0x0104	PLW Array
APID4	0x0105	SSW Array
APID4	0x0106	SLW Array
APID5	0x0510	SMEC Step (TBC)

The *parameters* field contains one or more blocks of science data all of the same type. These blocks are the same as the science data frames issued by the DRCU, with the possibility of the frame header and trailer having been removed.

Normally the DPU fills the TM packet with the maximumnumber of blocks before the packet is made available for transmission. In the event of a **flush** telecommand the packet is transmitted immediately and will not be filled. The **length** field, with the APID and SID, allows the number of blocks in the packet to be calculated.

The possible block types are as follows:

4.2.21.2.1 PSW Array Block

Block Length=150
FrameID=02
144 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.2.2 PMW Array Block

Block Length=102
FrameID=03
96 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.2.3 PLW Array Block

Block Length=54
FrameID=04
48 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.2.4 SSW Array Block

Block Length=54
FrameID=05
48 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.2.5 SLW Array Block

Block Length=30
FrameID=06
24 Detector Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detectors in the block is TBD

4.2.21.2.6 SMEC Step Block

It is TBD whether a separate block type is needed for this mode

4.2.21.3 Diagnostic Science Report (21,3)

0	0	0	0	1	APID											
1	1	Count														
Length																
0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
TIME																
SID																
OBSID																
BBID																
Parameters																
Checksum																

The reports available are identified by the APID (APID3 = Photometer, APID4 = Spectrometer) and the SID (composed of the Frame Structure (MSByte) and FrameID (LSByte)):

APID	SID	Report
APID3	0x0307	Photometer Test Pattern
APID3	0x020A	Spectrometer Test Pattern
APID5	0x0814	MCU Trace
APID5	0x0915	MCU Test Pattern
APID5	0x1121	SCU Test Pattern

The *parameters* field contains one or more blocks of science data all of the same type. These blocks are the same as the science data frames issued by the DRCU, with the possibility of the frame header and trailer having been removed.

Normally the DPU fills the TM packet with the maximum number of blocks before the packet is made available for transmission. In the event of a **flush** telecommand the packet is transmitted immediately and will not be filled. The **length** field, with the APID and SID, allows the number of blocks in the packet to be calculated.

The possible block types are as follows:

4.2.21.3.1 Photometer Test Pattern Block

This block of data is inserted in the *Parameter* field once.

Block Length=294
FrameID=07
288 Test Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The content of the Test Values is TBD

4.2.21.3.2 Spectrometer Test Pattern Block

Block Length=78
FrameID=0A
72 Test Values
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The content of the Test Values is TBD

4.2.21.3.3 MCU Trace Block

Block Length=24
FrameID=14
19 Trace Values
Frame_Time MSW
Frame_Time LSW
Checkword

The content of the Trace values is set by command

It is TBD if other trace block structures are possible

4.2.21.3.4 MCU Test Pattern Block

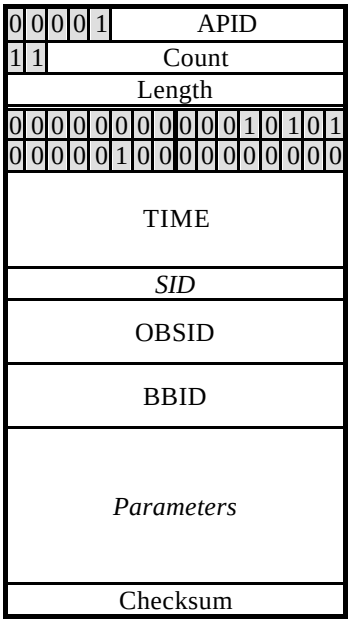
TBD

4.2.21.3.5 SCU Test Pattern Block

Block Length=30
FrameID=21
Test Data
Frame_Time MSW
Frame_Time LSW
Checkword

This structure is TBC
The content of the Test Data is TBD

4.2.21.4 Auxiliary Science Data Report (21,4)



The reports available are identified by the APID (APID3 = Photometer, APID4 = Spectrometer) and the SID (composed of the Frame Structure (MSByte) and FrameID (LSByte)):

APID	SID	Report
APID3	0x0208	Photometer Offsets
APID4	0x0209	Spectrometer Offsets

The *parameters* field contains one or more blocks of science data all of the same type. These blocks are the same as the science data frames issued by the DRCU, with the possibility of the frame header and trailer having been removed.

Normally the DPU fills the TM packet with the maximum number of blocks before the packet is made available for transmission. In the event of a **flush** telecommand the packet is transmitted immediately and will not be filled. The **length** field, with the APID and SID, allows the number of blocks in the packet to be calculated.

The possible block types are as follows:

4.2.21.4.1 Photometer Offsets Block

This block of data is inserted in the *Parameter* field once.

Block Length=294
FrameID=08
288 Offsets
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detector offsets in the block is TBD

4.2.21.4.2 Spectrometer Offsets Block

Block Length=78
FrameID=09
72 Offsets
ADC_Flags
Frame_Time MSW
Frame_Time LSW
Checkword

The order of the detector offsets in the block is TBD

4.2.22 Context Saving Service

Not Used

5. PARAMETERS

5.1 TC Parameters

5.1.1 Parameter Definition

Parameter Name	Service Reference	Type	Size (bits)	Conversion Curve	Constraint Table	Comments
Activity_ID	(8,4)	Integer	8	None	None	
APID	(20,1) (20,2)	Integer	11	None	None	Application ID
BBID	(8,4)		32			Field is split into 3 parts:
BBINTR		Constant	2	None	None	Location: Bits 0-1 Value: 2
BBTYPE		Integer	14	None	None	Location: Bits 2-15
BBCOUNT		Integer	16	None	None	Location: Bits 16-31
COUNT	(8,4)	Integer	16	None	None	Number of words to be reported
CRC	(6,2)	Unsigned Integer	16	None	None	Cyclic Redundancy Check - algorithm TBD
Data	(6,2) (8,4)					Variable length field of any data type. Must be an integer number of 16 bits in length
FIFOFLAGS	(8,4)		16			Flags indicating the FIFO(s) to flush
FIFODPU		Integer	1	Flush	None	Location: bit 15: DPU science buffer
FIFODCU		Integer	1	Flush	None	Location: bit 14: DCU FIFO
FIFOSCU		Integer	1	Flush	None	Location: bit 13: SCU FIFO
FIFOMCU		Integer	1	Flush	None	Location: bit 12: MCU FIFO
FRAMEID	(8,4)	Integer	16	None	Frame	
FUNCTIONID	(8,1) (8,2) (8,4) (8,5)	Integer	8	Func_ID	None	
HKPCKTID	(3,1) (3,3) (3,9)	Integer	16	None	Hsk_ID	Identifies housekeeping packet definitions
HKSID	(3,1)	Unsigned	16	None	None	Unique identifier for housekeeping parameter list

		Integer				Value = 0x03nn where nn = a unique number (starting from 0) defining the report structure
HKINTERVAL	(3,1)	Unsigned Integer	16	None	Period	Time between each packet generated, in milliseconds
INDEX	(8,4)	Unsigned Integer	16	None	None	Offset into a table(in octets)
Length	(6,2) (6,5) (6,9)	Unsigned Integer	16	None	None	
MEMORYID	(6,2) (6,5) (6,9)	Integer	16	Mem_ID	None	ID of Memory Area to be addressed
MODE	(8,4)	Unsigned Integer	16	None	None	Observing Mode
N	(8,4)	Unsigned Integer	16	None	N32	
NCHOP	(8,4)	Integer	16	None	TBD	Number of Chop science data frames to combine into one Chop Science TM Packet
NDATA	(8,4)	Unsigned Integer	16	None	N32	
NDCU	(8,4)	Integer	16	None	TBD	Number of DCU science data frames to combine into one Chop Science TM Packet
NDPU	(8,4)	Integer	16	None	TBD	Number of DPU science data frames to combine into one Chop Science TM Packet
NJIGGLE	(8,4)	Integer	16	None	TBD	Number of Jiggle science data fra mes to combine into one Chop Science TM Packet
NPCKTS	(14,1) (14,2)	Integer	16	None	None	Number of packet types to follow
NSAU	(6,2) (6,5) (6,9)	Integer	16	None	None	Number of SAUs to transfer
NSCU	(8,4)	Integer	16	None	TBD	Number of SCU science data frames to combine into one Chop Science TM Packet
NSMEC	(8,4)	Integer	16	None	TBD	Number of SMEC science data frames to combine into one Chop Science TM Packet
OBSID	(8,4)	Unsigned	32	None	None	Observation ID

		Integer				
Parameters	(8,4)					Variable length field of 32 data words.
SID	(8,1) (8,4) (14,1) (14,2) (20,1) (20,2)	Unsigned Integer	16	None	None	Unique identifier for parameter list
STARTADDR	(6,2) (6,5) (6,9)	Unsigned Integer	16	None	None	Start address of memory area to be addressed
STEP	(8,4)	Unsigned Integer	16	None	None	Observation Step
SUBTYPE	(14,1) (14,2)	Integer	8	None	None	Packet Subtype
TABLEID	(8,4)	Integer	16	None	Tab_ID	Number of an OBS table
TABLESIZE	(8,4)	Integer	16	None	TBD	Table size in 32 bit words
TYPE	(14,1) (14,2)	Integer	8	None	None	Packet Type

5.1.2 Conversion Curves

Name	Type	Raw Value	Converted Value	Comments
Data_Type	Enumerated	0 1 2 3	8Bits 16Bits 24Bits 32Bits	
Func_ID	Enumerated	0x01 0x02 0x03 0x04 0xC0 0xC1 0xCA	Table Cooler SCAL 300mK Ops Obs DPU	TableManagement CoolerControl SCALControl 300mKControl Operations Observations DPU
Info_Type	Enumerated	0 1 2 3	Off Target On Target Start Scan End Scan	
Mem_ID	Enumerated	TBD TBD TBD	PROG DATA EEPROM	
Flush	Enumerated	0 1	Do not flush FIFO Flush FIFO	

5.1.3 Constraints

Name	Type	Minimum Value	Maximum Value	Comments
Bit2	Range	0	3	Value held in lowest 2 bits of field
Frame	Set			Set of possible frame IDs, TBD
Hsk_ID	Range	0	3	Allows up to 4 housekeeping packets to be defined

Hsk_Value	Range	0x00000000	0x000FFFFF	The value is held in lowest 20 bits of the field
N16	Range	1	112	Number of 16 bit data words held in a command
N32	Range	1	56	Number of 32 bit data words held in a command
Nsamples	Range	1	32	
Period	Range	10	60000	Time period expressed as milliseconds - range is 0.01 to 60 seconds
Tab_ID	Range	0	127	

5.2 TM Parameters

5.2.1 Parameter Definition

Name	DRCU Name	Length (bits)	Conversion	Limits	Description
BBID BBINSTR BBTYPE BBCNT		**32** 2 14 16			**Building Block ID** Instrument (Bits 0,1) BB type (Bits 2-15) BB sequence count (Bits 16-31)
BIASTEMP	BIAS_TEMP	8	TBD		BIAS Board Temperature
CCUTEMP	CcuTempRd	TBD	TBD	TBD	Temperature from sensor on CCHK Board
CHOPACCELLIMIT	CAccelLimi	16, TBC			
CHOPACCELLOOPSF	CAccelLoopsf	16, TBC			
CHOPBEMF	CBEMF	16, TBC	TBD		
CHOPINTTHRESH	IntegTh	16			Integration threshold for the Chop PID Controller
CHOPKD	CKd	16			Derivative Gain of Chop Axis PID Controller
CHOPKI	CKi	16			Integral Gain of Chop Axis PID Controller
CHOPKP	CKp	16			Proportional Gain of Chop Axis PID Controller
CHOPLATCHSTAT	BSMLaunchLatch1	1	LATCH		Chopper Axis Launch Latch Status
CHOPLOOPMODE	ChopLoopMode	2	CLOOPMODE		Chopper Axis Loop Mode
CHOPMODE	ChopMode	2	CHOPMODE		Chopping Mode

CHOPMOTORCURR	CMotorCurrent	16, TBC	TBD		
CHOPMOTORTORQUE	CMotorTorqueC	16, TBC	TBD		
CHOPPERIOD	ChopPeriod	16	PERIOD		Chop Cycle Period
CHOPICNCOEFF1	ICnCoeff1	16, TBC	TBD		
CHOPICNCOEFF2	ICnCoeff2	16, TBC	TBD		
CHOPICNCOEFF3	ICnCoeff3	16, TBC	TBD		
CHOPICNCOEFF4	ICnCoeff4	16, TBC	TBD		
CHOPOUTCOEFF1	CoutCoeff1	16, TBC	TBD		
CHOPOUTCOEFF2	CoutCoeff2	16, TBC	TBD		
CHOPOUTCOEFF3	CoutCoeff3	16, TBC	TBD		
CHOPOUTCOEFF4	CoutCoeff4	16, TBC	TBD		
CHOPPOSN	ActualPosition	16			Last Absolute position of the Chopper
CHOPPOSNERR	CMeanPositionError	16			Mean Position Error over a Chopper movement
CHOPPOSNERRLIMIT	CPositionErrorLimit	16			Minimum Value of Chop Position Error that causes a PID error to be reported
CHOPPOSN0	Position0	16			Chopper Axis Position 0
CHOPPOSN1	Position1	16			Chopper Axis Position 1
CHOPRATELIMIT	CRateLimit	16, TBC			
CHOPRATELOOPSF	CRateLoopsf	16, TBC			
CHOPPROFILEVAL01	CprofileValue1	16, TBC	TBD		
CHOPPROFILEVAL02	CprofileValue2	16, TBC	TBD		
CHOPPROFILEVAL03	CprofileValue3	16, TBC	TBD		
CHOPPROFILEVAL04	CprofileValue4	16, TBC	TBD		
CHOPPROFILEVAL05	CprofileValue5	16, TBC	TBD		
CHOPPROFILEVAL06	CprofileValue6	16, TBC	TBD		
CHOPPROFILEVAL07	CprofileValue7	16, TBC	TBD		
CHOPPROFILEVAL08	CprofileValue8	16, TBC	TBD		
CHOPPROFILEVAL09	CprofileValue9	16, TBC	TBD		
CHOPPROFILEVAL10	CprofileValue10	16, TBC	TBD		
CHOPPROFILEVAL11	CprofileValue11	16, TBC	TBD		
CHOPPROFILEVAL12	CprofileValue12	16, TBC	TBD		
CHOPPROFILEVAL13	CprofileValue13	16, TBC	TBD		
CHOPPROFILEVAL14	CprofileValue14	16, TBC	TBD		

CHOPPROFILEVAL15	CprofileValue15	16, TBC	TBD		
CHOPS	ChopNumber	16			Number of Chop Cycles to perform
CHOPSENSPOSN1	CMagnetoResPos1	16, TBC	TBD		
CHOPSENSPOSN2	CMagnetoResPos2	16, TBC	TBD		
CHOPSENSPWR	SensorPwr	1	CHOPSENS		Chopper axis sensor power status
CHOPSTAT	ChopStatus	16, TBC	TBD		Contents of Chop Axis Activity Status Register
CHOPSTATECOEFF1	CStateCoeff1	16, TBC	TBD		
CHOPSTATECOEFF2	CStateCoeff2	16, TBC	TBD		
CHOPSTATECOEFF3	CStateCoeff3	16, TBC	TBD		
CHOPSTATECOEFF4	CStateCoeff4	16, TBC	TBD		
DAQBIAS5V	DcuDAQp05	TBD	TBD	TBD	Voltage to DAQ Board on +5V line
DAQ9V	DcuDAQp09	TBD	TBD	TBD	Voltage to DAQ Board on +9V line
DAQ9VN	DcuDAQn09	TBD	TBD	TBD	Voltage to DAQ Board on -9V line
DAQTEMP	DAQ_I/F_TEMP	8	TBD		DAQ I/F Board Temperature
DCUDATAFRMS	frame	8	DCUFRMS		Number of DCU data frames to generate
DCUDATAMODE	mode	5	DCUMODE		DCU data collection mode
DCUDATASTAT	start	1	DCUSTAT		Status of DCU data frame generation
DCUFLAGS		16			DCU Status -TBC
DCUTEMP	DcuTempRd	TBD	TBD	TBD	Temperature from sensor on Distribution Board
DPU5V		12	TBD		DPU +5V line voltage
DPU15V		12	TBD		DPU +15V line voltage
DPU15VN		12	TBD		DPU -15V line voltage
DPUI		12	TBD		DPU measured input current
DPU_Spare1		12	TBD		
DPU_Spare2		12	TBD		
DPU_Spare3		12	TBD		
DPUTEMP		12	TBD		DPU DC-DC Converter Temperature
JIGGKDHIGH	KdHigh	16, TBC			Maximum Derivative Gain of Chop Axis PID Controller?
JIGGKDLOW	KdLow	16, TBC			Minimum Derivative Gain of Chop Axis PID Controller?
JIGGFILTHIGH	DerivFilterHigh	16, TBC			Filtering Time Constant to calculate the derivative term of the Chop PID Controller
JIGGFILTLOW	DerivFilterLow	16, TBC			Filtering Time Constant to calculate the derivative term of the Chop PID Controller

JIGGKIHIGH	KiHigh	16, TBC			Maximum Integral Gain of Chop Axis PID Controller?
JIGGKILOW	KiLow	16, TBC			Minimum Integral Gain of Chop Axis PID Controller?
JIGGKPHIGH	KpHigh	16, TBC			Maximum Proportional Gain of Chop Axis PID Controller?
JIGGKPLOW	KpLow	16, TBC			Minimum Proportional Gain of Chop Axis PID Controller?
JIGGLATSTAT	JiggleLaunchLatch	1	LATCH		Jiggle Axis Launch Latch Status
JIGGLOOPMODE	JiggleLoopMode	2	JLOOPMODE		Jiggle Axis Loop Mode
JIGGMEANPERR	MeanPositionError	16, TBC			Mean Position Error over a Jiggle movement?
JIGGMODE	JiggleMode	2	JIGGMODE		Jiggling Mode
JIGGPERIOD	JigglePeriod	16, TBC	PERIOD		Jiggle Cycle Period – TBD if applicable
JIGGPERRLIM	PositionErrorLimit	16, TBC			Minimum Value of Chop Position Error that causes a PID error to be reported?
JIGGPOSN	ActualPosition	16, TBC			Last Absolute position of the Jiggle Axis
JIGGPOSN0	Position0	16, TBC			Jiggle Axis Position 0
JIGGPOSN1	Position1	16, TBC			Jiggle Axis Position 1 – TBD if applicable
JIGGLES	JiggleNumber	16, TBC			Number of Jiggle Cycles to perform – TBD if applicable
JIGGSATNLIM	IntegrationLimit	16, TBC			Integration Saturation Limit for the Chop PID Controller?
JIGGSENSPWR	SensorPwr	1	JIGGSENS		Jiggle Axis sensor power status
JIGGSTAT	JiggleStatus	16, TBC	TBD		Contents of Jiggle Axis Activity Status Register
LIA01TEMP	LIA_B1TEMP	8	TBD		LIA Board 1 Temperature
LIA02TEMP	LIA_B2_TEMP	8	TBD		LIA Board 2 Temperature
LIA03TEMP	LIA_B3_TEMP	8	TBD		LIA Board 3 Temperature
LIA04TEMP	LIA_B4_TEMP	8	TBD		LIA Board 4 Temperature
LIA05TEMP	LIA_B5_TEMP	8	TBD		LIA Board 5 Temperature
LIA06TEMP	LIA_B6_TEMP	8	TBD		LIA Board 6 Temperature
LIA07TEMP	LIA_B7_TEMP	8	TBD		LIA Board 7 Temperature
LIA08TEMP	LIA_B8_TEMP	8	TBD		LIA Board 8 Temperature
LIA09TEMP	LIA_B9_TEMP	8	TBD		LIA Board 9 Temperature
LIA10TEMP	LIA_B10_TEMP	8	TBD		LIA Board 10 Temperature
LIA11TEMP	LIA_B11_TEMP	8	TBD		LIA Board 11Temperature
LIA12TEMP	LIA_B12_TEMP	8	TBD		LIA Board 12 Temperature
MCUFLAGS		16			MCU Status -TBC
MCUTIMEOUT	DPU_PollingTime				Maximum Time between commands before an IO error is reported

MCUTELSTAT	Telemetry	TBD	TBD		Define TM packets to be sent
MCUTELSAMP	TelemetrySampling	TBD	TBD		Sampling Rate of Telemetry Packets
MEMCHK		48	TBD		Memory Check Flags
MODE		16	TBD		Instrument Operating Mode
MONFLAGS		16			Subsystem Monitoring Status -TBC
OBSID		32			Observation ID
OBSLEN		32			Time since start of Observation (secs)
OTFERROR		16, TBC	TBD		On Target Flag Error
OTFTIME		48			On Target Flag Time
OTF		1	OTF		On Target Flag
PHOTBIAS9V	DcuBPHp09	TBD	TBD	TBD	Voltage to Photometer Bias Board on +9V line
PHOTBIAS9VN	DcuBPHn09	TBD	TBD	TBD	Voltage to Photometer Bias Board on -9V line
PHOTBIASFREQ	Div_photo_bias	9	BIASFREQ		Photometry Bias frequency
PHOTBIASMODE	Mode_photo_bias	8	BIASMODE		Photometry bias generator mode
PHOTLIA5V	Dc uLPHp05	TBD	TBD	TBD	Voltage to Photometer LIA Board on +5V line
PHOTLIA9V	Dc uLPHp09	TBD	TBD	TBD	Voltage to Photometer LIA Board on +9V line
PHOTLIA9VN	Dc uLPHn09	TBD	TBD	TBD	Voltage to Photometer LIA Board on -9V line
PHOTSAMPFREQ	Div_photo_sampl	8	PSAMPFREQ		Photometry sampling frequency
PHTRV	Ampl_photo_heater	8	HTR		Voltage applied to photometer heaters
PLWBIAS	Ampl_P500	8	BIAS		Amplitude of bias for photometry long wave channels
PLWJFET1V	Ampl_P500_VSS1	8	JFETV		Voltage applied to JFET for photometry long wave channels (group1)
PLWJFET2V	Ampl_P500_VSS2	8	JFETV		Voltage applied to JFET for photometry long wave channels (group2)
PLWPHSE	Phase_shift_P500	8	PHASE		Phase shift for long wave photometry channels demodulation
PMLWJFETSTAT		**6**			
PMWJFET1STAT	P350_JFET_1	1	JFETSTAT		Status of JFET power for photometry medium wave channels (group1) (Bit 7)
PMWJFET2STAT	P350_JFET_2	1	JFETSTAT		Status of JFET power for photometry medium wave channels (group2) (Bit 6)
PMWJFET3STAT	P350_JFET_3	1	JFETSTAT		Status of JFET power for photometry medium wave channels (group3) (Bit 5)
PMWJFET4STAT	P350_JFET_4	1	JFETSTAT		Status of JFET power for photometry medium wave channels (group4) (Bit 4)
PLWJFET1STAT	P500_JFET_1	1	JFETSTAT		Status of JFET power for photometry long wave channels (group1) (Bit 3)
PLWJFET2STAT	P500_JFET_2	1	JFETSTAT		Status of JFET power for photometry long wave channels (group2) (Bit 2)
PMWBIAS	Ampl_P350	8	BIAS		Amplitude of bias for photometry medium wave channels
PMWJFET1V	Ampl_P350_VSS1	8	JFETV		Voltage applied to JFET for photometry medium wave channels (group1)
PMWJFET2V	Ampl_P350_VSS2	8	JFETV		Voltage applied to JFET for photometry medium wave channels (group2)

PMWJFET3V	Ampl_P350_VSS3	8	JFETV		Voltage applied to JFET for photometry medium wave channels (group3)
PMWJFET4V	Ampl_P350_VSS4	8	JFETV		Voltage applied to JFET for photometry medium wave channels (group4)
PMWPHSE	Phase_shift_P350	8	PHASE		Phase shift for medium wave photometry channels demodulation
PSUTEMP	PsuTempRd	TBD	TBD	TBD	PSU Temperature Sensor reading
PSWBIAS	Ampl_P250	8	BIAS		Amplitude of bias for photometry short wave channels
PSWJFET1V	Ampl_P250_VSS1	8	JFETV		Voltage applied to JFET for photometry short wave channels (group1)
PSWJFET2V	Ampl_P250_VSS2	8	JFETV		Voltage applied to JFET for photometry short wave channels (group2)
PSWJFET3V	Ampl_P250_VSS3	8	JFETV		Voltage applied to JFET for photometry short wave channels (group3)
PSWJFET4V	Ampl_P250_VSS4	8	JFETV		Voltage applied to JFET for photometry short wave channels (group4)
PSWJFET5V	Ampl_P250_VSS5	8	JFETV		Voltage applied to JFET for photometry short wave channels (group5)
PSWJFET6V	Ampl_P250_VSS6	8	JFETV		Voltage applied to JFET for photometry short wave channels (group6)
PSWJFETSTAT		**6**			
PSWJFET1STAT	P250_JFET_1	1	JFETSTAT		Status of JFET power for photometry short wave channels (group1) (Bit 7)
PSWJFET2STAT	P250_JFET_2	1	JFETSTAT		Status of JFET power for photometry short wave channels (group2) (Bit 6)
PSWJFET3STAT	P250_JFET_3	1	JFETSTAT		Status of JFET power for photometry short wave channels (group3) (Bit 5)
PSWJFET4STAT	P250_JFET_4	1	JFETSTAT		Status of JFET power for photometry short wave channels (group4) (Bit 4)
PSWJFET5STAT	P250_JFET_5	1	JFETSTAT		Status of JFET power for photometry short wave channels (group5) (Bit 3)
PSWJFET6STAT	P250_JFET_6	1	JFETSTAT		Status of JFET power for photometry short wave channels (group6) (Bit 2)
PSWPHSE	Phase_shift_P250	8	PHASE		Phase shift for short wave photometry channels demodulation
RATE		32			Data Rate (average bits/sec over observation)
SCANMODE	ScanMode	2	SCANMODE		SMEC Scan Mode
SCANS	ScanNumber	16			Number of SMEC Scans to perform TBC
SCANSPEED	ScanSpeed	16			SMEC Scan Speed
SCANSTART	ScanStart	16			SMEC Scan Start Position
SCANSTAT	StartScan	1	SCANSTAT		SMEC Scan Status
SCU5V	ScuCHTp05	12, TBC	TBD		Voltage on SCU 5Vline
SCU9V	ScuCHTp09	12, TBC	TBD		Voltage on SCU+9Vline
SCU9VN	ScuCHTn09	12, TBC	TBD		Voltage on SCU -9Vline
SCUCAL1I	CalibraI1	12, TBC	TBD		Current in Calibrator 1
SCUCAL1V	CalibraV1	12, TBC	TBD		Voltage Applied to Calibrator 1
SCUCAL2I	CalibraI2	12, TBC	TBD		Current in Calibrator 2
SCUCAL2V	CalibraV2	12, TBC	TBD		Voltage Applied to Calibrator 2
SCUCAL3I	CalibraI3	12, TBC	TBD		Current in Calibrator 3

SCUCAL3V	CalibraV3	12, TBC	TBD		Voltage Applied to Calibrator 3
SCUCMDSTAT		TBD	TBD		Command Interface Control Status Word - TBD
SCUDATAFREQ	FrameRate	16,TBC	TBD		Frame Rate
SCUDELAY	SubsDelay	16,TBC	TBD		Subsystem Response Time
SCUFLAGS		16			SCU Status -TBC
SCUFRAMES	SeqLength	16,TBC			Number of frames
SCUHHTRV	HheaterV1	12, TBC	TBD		Voltage Applied to High Power Heater
SCULHTR1V	LHeaterV1	12, TBC	TBD		Voltage Applied to Low Power Heater1
SCULHTR2V	LheaterV2	12, TBC	TBD		Voltage Applied to Low Power Heater2
SCULHTR3V	LheaterV3	12, TBC	TBD		Voltage Applied to Low Power Heater3
SCUSTAT	DRelOnOff	8	TBD		Status of Distribution Board relays
SCUSUBKFREQ	SubKpRate	16,TBC	TBD		Sampling Rate of SubK temperatures
SCUSUBSSTAT	SubStatus	TBD	TBD		Subsystem Status
SCUTEMPSTAT Allocation of bits TBD	TempOnOff	12	TBD		Power on status of temperature probes
SHTRV	Ampl_spectro_heater	8	HTR		Voltage applied to spectrometer heaters
SJFETSTAT		**6**			
SLWJFET1STAT	S-LW_JFET_1	1	JFETSTAT		Status of JFET power for spectrometry long wave channels (Bit 7)
SSWJFET1STAT	S-SW_JFET_1	1	JFETSTAT		Status of JFET power for spectrometry short wave channels (group1) (Bit 6)
SSWJFET2STAT	S-SW_JFET_2	1	JFETSTAT		Status of JFET power for spectrometry short wave channels (group2) (Bit 5)
SLWBIAS	Ampl_S-LW	8	BIAS		Amplitude of bias for spectrometry long wave channels
SLWJFET1V	Ampl_S-LW_VSS1	8	JFETV		Voltage applied to JFET for spectrometry long wave channels
SLWPHSE	Phase_shift_S-LW	8	PHASE		Phase shift for long wave spectrometry channels demodulation
SMECOENCPWR	EncoderPwr	3	TBD		SMEC Optical Encoder LED power
SMECFILTHIGH	DerivFilterHigh	16,TBC			Filtering Time Constant to calculate the derivative term of the SMEC PID Controller
SMECFILTLOW	DerivFilterLow	16,TBC			Filtering Time Constant to calculate the derivative term of the SMEC PID Controller
SMECSATNLIM	IntegrationLimit	16,TBC			Integration Saturation Limit for the SMEC PID Controller?
SMECINITSTAT		TBD			Initialisation Status of SMEC
SMECKDHIGH	KdHigh	16,TBC			Maximum Derivative Gain of SMEC PID Controller?
SMECKDLOW	KdLow	16,TBC			Minimum Derivative Gain of SMEC PID Controller?
SMECKIHIGH	KiHigh	16,TBC			Maximum Integral Gain of SMEC PID Controller?

SMECKILOW	KiLow	16,TBC			Minimum Integral Gain of SMEC PID Controller?
SMECKPHIGH	KpHigh	16,TBC			Maximum Proportional Gain of SMEC PID Controller?
SMECKPLOW	KpLow	16,TBC			Maximum Proportional Gain of SMEC PID Controller?
SMECLAT1STAT	LaunchLatch1	1	LATCH		SMEC Launch Latch1 Status
SMECLAT2STAT	LaunchLatch2	1	LATCH		SMEC Launch Latch2 Status
SMECLOOPMODE	LoopMode	2	LOOPMODE		SMEC Control Loop Mode
SMECLVDTPWR	LVDTPwr	1	TBD		SMEC LVDT Oscillator On/Off
SMECMEANPERR	MeanPositionError	16,TBC	TBD		Mean SMEC Position Error over scan
SMECMEANVEL	MeanSpeed	16,TBC	TBD		Mean SMEC Speed over scan
SMECNOTCHIGH	NotchParamHigh	16,TBC			TBW
SMECNOTCHLOW	NotchParamLow	16,TBC			TBW
SMECPOSN	ActualPosition	16,TBC			Last Absolute position of the SMEC
SMECPERRLIM	PositionErrorLimit	16,TBC			Minimum Value of SMEC Position Error that causes a PID error to be reported?
SMECSTAT	SmecStatus	16,TBC	TBD		Contents of SMEC Activity Status Register
SMECVEL	ActualVelocity	16,TBC			Instantaneous Velocity (20Hz filtered) of the SMEC
SPECBIAS9V	DcuBSPp09	TBD	TBD	TBD	Voltage to Spectrometer Bias Board on +9V line
SPECBIAS9VN	DcuBSPn09	TBD	TBD	TBD	Voltage to Spectrometer Bias Board on -9V line
SPECBIASFREQ	Div_spectro_bias	9	BIASFREQ		Spectrometry Bias frequency
SPECBIASMODE	Mode_spectro_bias	8	BIASMODE		Spectrometry bias generator mode
SPECLIA5V	DcuLSPp05	TBD	TBD	TBD	Voltage to Spectrometer LIA Board on +5V line
SPECLIA9V	DcuLSPp09	TBD	TBD	TBD	Voltage to Spectrometer LIA Board on +9V line
SPECLIA9VN	DcuLSPn09	TBD	TBD	TBD	Voltage to Spectrometer LIA Board on -9V line
SPECSAMPFREQ	Div_spectro_sampl	8	SSAMPFREQ		Spectrometry sampling frequency
SSWBIAS	Ampl_S-SW	8	BIAS		Amplitude of bias for spectrometry short wave channels
SSWJFET1V	Ampl_S-SW_VSS1	8	JFETV		Voltage applied to JFET for spectrometry short wave channels (group1)
SSWJFET2V	Ampl_S-SW_VSS2	8	JFETV		Voltage applied to JFET for spectrometry short wave channels (group2)
SSWPHSE	Phase_shift_S-SW	8	PHASE		Phase shift for short wave spectrometry channels demodulation
STEP		16			Number of current step in an observation
SUBKTEMP	SubKTempP	TBD	TBD	TBD	Temperature from SubK temperature probe
TRACEPERIOD	TraceSampling		PERIOD		Time period between successive Trace Values
TRACESIZE	TraceBuffer	16, TBC			Trace Buffer Size

TRACEPARM1	TraceParam#1	TBD			Trace Parameter 1
TRACEPARM2	TraceParam#2	TBD			Trace Parameter 2
TRACEPARM3	TraceParam#3	TBD			Trace Parameter 3
TRACEPARM4	TraceParam#4	TBD			Trace Parameter 4
TRACEPARM5	TraceParam#5	TBD			Trace Parameter 5
TRACEPARM6	TraceParam#6	TBD			Trace Parameter 6
TC1TEMP	T/C1	20	TBD		Thermal Control Thermistor #1 value
TC2TEMP	T/C2	20	TBD		Thermal Control Thermistor #2 value
TC3TEMP	T/C3	20	TBD		Thermal Control Thermistor #3 value
TCBIAS	Ampl_T/C	8	BIAS		Amplitude of bias for thermal control channels
TCEXEC		16			Number of telecommand packets executed since switch on
TCEXEN		16			Sequence Control word of last executeded telecommand packet
TCPHSE	Phase_shift_T/C	8	PHASE		Phase shift for thermal control channels demodulation
TCRECN		16			Sequence Control word of last received telecommand packet
TCRECV		16			Number of telecommand packets received since switch on
TCUTEMP	TcuTempRd	TBD	TBD	TBD	Temperature from sensor on Temp Board
TDPU		48			Local DPU On Board Time
TEMP01	FpuTemp01	TBD	TBD	TBD	To be replaced by correct name
TEMP02	FpuTemp02	TBD	TBD	TBD	To be replaced by correct name
TEMP03	FpuTemp03	TBD	TBD	TBD	To be replaced by correct name
TEMP04	FpuTemp04	TBD	TBD	TBD	To be replaced by correct name
TEMP05	FpuTemp05	TBD	TBD	TBD	To be replaced by correct name
TEMP06	FpuTemp06	TBD	TBD	TBD	To be replaced by correct name
TEMP07	FpuTemp07	TBD	TBD	TBD	To be replaced by correct name
TEMP08	FpuTemp08	TBD	TBD	TBD	To be replaced by correct name
TEMP09	FpuTemp09	TBD	TBD	TBD	To be replaced by correct name
TEMP10	FpuTemp10	TBD	TBD	TBD	To be replaced by correct name
TEMP11	FpuTemp11	TBD	TBD	TBD	To be replaced by correct name
TEMP12	FpuTemp12	TBD	TBD	TBD	To be replaced by correct name
TEMP13	FpuTemp13	TBD	TBD	TBD	To be replaced by correct name
TEMP14	FpuTemp14	TBD	TBD	TBD	To be replaced by correct name
TEMP15	FpuTemp15	TBD	TBD	TBD	To be replaced by correct name

TEMP16	FpuTemp16	TBD	TBD	TBD	To be replaced by correct name
THSK		48			DPU Time of start of last housekeeping data collection period
TSFTIME		48			Telescope Scan Time
TSF		1	TSF		Telscope Scan Flag
TSYNC		48			DPU Time of last DRCU Synchronisation
SCUSPARE	Reserved	TBD			

5.2.2 Conversion Curves

Name	Type	Raw Value	Converted Value	Units	Comments
BIAS	Analogue	0 255	0.0 Vbmax	Volts	$Eng = \frac{Vb\max * Raw}{255}$
BIASFREQ	Derived Calculated	*Raw*	*Eng*	Hz	$Eng = \frac{TBD\ MHz}{2 * Raw}$
BIASMODE	Enumerated	0c00 0x01 0x02 …… …… 0xFD 0xFE 0xFF	OFF DC001 DC002 …….. …….. DC253 DC252 SINE		Values 0x01 to 0xFE are test levels
CHOPMODE	Enumerated	0 1 2	STOP STEP TOGGLE		Chopping Stopped Chopping in step mode Chopping in toggle mode
CHOPSENS	Enumerated	0 1	ON OFF		Values TBC
CLOOPMODE	Enumerated	0 1 2	OPEN BEMF SENS		Loop Open Loop closed using Back EMF Loop Closed using Magnetoresistive Sensor
DCUFRMS	Enumerated	0 1 2 ….. ….. 254 255	CONT. 1 2 ….. ….. 254 255		

DCUMODE	Enumerated	0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x08 0x0C 0x10 0x14 0x18 0x1C	PHOT PSW PMW PLW SPEC SSW SLW PTEST STEST POFFSET SOFFSET POFFGET SOFFGET		
DCUSTAT	Enumerated	0 1	OFF RUN		
HTR	Analogue	0 255	0.0 Vhmax	Volts	$Eng = \frac{Vh\,\max * \ Raw}{255}$
JFETSTAT	Enumerated	0 1	OFF ON		
JFETV	Analogue	0 255	0.0 VSSmax	Volts	$Eng = \frac{VSS\,\max * \ Raw}{255}$
JIGGLEMODE	Enumerated	0 1 2	STOP STEP TOGGLE		Jiggling Stopped Jiggling in step mode Jiggling in toggle mode - TBD if applicable
JIGGLESENS	Enumerated	0 1	ON OFF		Values TBC
JLOOPMODE	Enumerated	0 1 2	OPEN BEMF SENS		Loop Open Loop closed using Back EMF Loop Closed using Magnetoresistive Sensor
LATCH	Enumerated	0 1	Engaged Disengaged		Values TBC
LOOPMODE	Enumerated	0	OPEN		Loop Open

		1 2 3	BEMF LVDT OENC		Loop closed using Back EMF Loop Closed using LVDT Loop Closed using Optical Encoder
OTF	Enumerated	0 1	Off Target On Target		
PERIOD				mS	
PHASE	Analogue	0 255	0 360	Degrees	$Eng = \frac{360 * Raw}{255}$
PSAMPFREQ	Derived Calculated	*Raw*	*Eng*	Hz	$Eng = \frac{PHOTBIASFREQ_{Eng}}{2 * Raw}$
SCANMODE	Enumerated	0 1 2 3	STOP STEP SAWTOOTH TRIANGLE		
SCANSTAT	Enumerated	0 1	STOP RUN		
SSAMPFREQ TSF	Derived Calculated Enumerated	*Raw* 2 3	*Eng* Scanning Pointing	Hz	$Eng = \frac{SPECBIASFREQ_{Eng}}{2 * Raw}$

5.2.3 Constraints

Appendix A

This section describes the use of the On Board Software (OBS) commands and telemetry in sufficient detail that the interface can be understood.

6. TABLES

Much of the data used by the OBS for operations will be held in tables. These will be used to hold, for example:

- Housekeeping packet parameter lists
- Jiggle position tables
- Command Lists

The OBS will provide for the definition of up to 128 tables, within a fixed-size memory area and will automatically move data within this memory area in order to allow update of tables, including a change in size.

By default the following table numbers are assigned and populated in the OBS, though they may be changed by command:

Table ID	Description
00	Critical Housekeeping Report Definition
01	Nominal Housekeeping Report Definition
02	Detector Housekeeping Report Definition
03	undefined
21	Cooler Recycle
22	Cooler Temperature Control
23	300mK Temperature Control
24	SCAL Temperature Control
31	CHOP
32	SCAN
100	Functions

All tables are accessed using a Table_ID and individual locations in the table are accessed by an index, specified as a number of words, offset from the beginning of the table. The word size is 32bits.

Appendix B

7. CONTROL LOOPS

Several control loops are executed by the On-board Software. These are all implemented as PID (Proportional, Integral, Differential) control algorithms, where the control variable (C) is adjusted to maintain the measurement variable (M) at the set point (S). The equation giving this relationship is

$$C_N = C_{N-1} + K_P * (S - M_N) + K_I * \left(S - \frac{\sum_{i=N-n}^{i=N} M_i}{n+1} \right) + K_D * (M_N - M_{N-1})$$

Where:

C_N = Control variable value for sample period N
M_N = Measurement Variable value at sample N
S = Required Set Point of the measurement variable
K_P = Proportional Gain
K_I = Integral Ga in
K_D = Differential Gain
n = number of samples in the integral

7.1 Control Loop Parameters

When starting the control loop the following parameters have to be provided

- S = Required Set Point of the measurement variable
- K_P = Proportional Gain
- K_I = Integral Gain
- K_D = Differential Gain
- n = number of samples in the integral (max 32, TBC)
- dt = the time interval between samples
- P_M = The housekeeping parameter to use as the measurement variable
- P_C =The housekeeping parameter to use as the control variable

It is expected that the software shall maintain a buffer containing the last n samples in order to calculate the integral term for each sample period.

If the accuracy of the measurement sampling interval cannot be guaranteed, the software will also need to maintain a buffer containing the time of each of the n samples in order to make a more accurate estimate of the integral and differential terms (the equation above assumes a fixed sampling period).

The software must ensure that the accuracy of the calculation is adequate (e.g. by use of floating point, or fixed point, math functions)

Appendix C

8. COMMAND LIST

This section (TBW) defines the command list entries that are available.

Appendix D

9. SCIENCE DATA

Science data is extracted in the form of science frames from the three FIFOs filled via the high speed telemetry interface. This appendix indicates how the OBS will handle this data.

9.1 Assumptions

The OBS provides 3 buffers (one per FIFO) to hold the telemetry packet as it is accumulated

9.2 Science Processing

This section describes the processing for the DCU telemetry (the other science telemetry will work in exactly the same way)

Assume that the FIFO is empty (following a Flush_FIFOs command)

When science data is generated by the DCU it is inserted into the FIFO. When the FIFO is half full an interrupt is passed to the OBS and it executes the following steps:

1. Check that a complete frame is available (each frame starts with a word indicating the length of the frame). If not, wait for more data
2. Check the content of the frame is correct using the checkword in the frame
3. Check the Frame ID is valid - if not, issue an event packet (Bad_Science_Data) containing the frame and flush the FIFO
4. If the telemetry buffer is empty -
   - Create a SID for the telemetry packet from the FRAMEID and put it in the telemetry buffer
   - Add the current OBSID and BBID to the telemetry buffer
5. Check the FRAMEID is the same as the FRAMEID in the SID of the telemetry buffer. If not, issue an event packet (Bad_Frame_ID) containing the frame
6. Move the frame to the telemetry buffer, removing the LENGTH and FRAMEID words and selecting only those words defined in the selection table associated with this FRAMEID. (If no selection table is associated with FRAMEID, then all data is selected)
7. If NDCU frames are now in the telemetry buffer, add the appropriate packet header (depends on FRAMEID) and send it to the instrument output telemetry stream
8. Clear the telemetry buffer
9. Repeat from Step 1