EarthCARE MSI ICU OBSW

Application Software Interface Control Document

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DOCUMENT SIGNATURE TABLE

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DOCUMENT CHANGE RECORD

Issue / Revision	Date	Section / Page	Description
1.0	03/12/2010	all	First Issue for SW-PDR data package
1.1	09/12/2010	s1.3.1, s2.5, s5, s6	Updated due to the up-issue of the SRB to 1.3 and the HW/SW ICD to 1.21.
1.2	23/06/2011		Updated following SW-PDR:
		§17	RID 029
		§1.3.1	RID 031
		§2.1	RID 032
		§2.1	RID 033
		§2.2	RID 034
		§2.5.8	RID 035
		§2.5.9	RID 036
		§2.5.12	RID 037
		§2.5.17, 2.5.18, 2.5.19	RID 038
		§2.5.28	RID 039
		§3.1	RID 040
		§4	RID 042
		§4.4	RID 043
		§4	RID 044
		§4	RID 045
		§4	RID 046
		§5.6, 6.7	RID 047
		§7.5	RID 049
		§7.6	RID 050
		§13.6	RID 053
		§8.2	FEE Register Response Service Type corrected
		§15	Removed digital checks from monitoring IDs table
2.0	22/09/2011		Issued for SW-DDR data package
		§2, 3	TM and TC packets fully described

Issue / Revision	Date	Section / Page	Description
		§1.3.1	Updated to PUS issue 5
		§2.2, 2.7, 3.5.1, 4, 5, 8	Updated to PUS Services Definition issue 4
		§3.5..3.8	Updated in line with ASW detailed design
			Updated for EC-CN-SSL-MSI-004 and EC-CN-MSI-SSL-005:
		§1.3.1, 2.2, 2.7, 3.5, 5, 6.12, 7.4, 8.11, 8.13, 8.15, 8.16, 9, 17	Updated to SRB issue 3
		§1.3.1	Updated to HW SW ICD issue 3
		§5.8, 6.9	Defined VNSOU/TIROU Mechanism Position Report TM Packet formats
		§5.13..5.16, 6.14..6.15, 8.16, 17	Added TCs required for Mode Transition and Calibration procedures
		§2.7, 7.3	Updated to SRB issue 3
		§3.4.3	Updated to TM/TC ICD issue 3
		§1.3.1, 13.1, 13.4, 15, 16	Updated to FDIR Monitoring & Limits issue 3
		§3.2.3	Fault ID TM definitions added
		§4.8, 4.10, 17	Deleted Thermal Control TCs in line with resolution of Queries 869 and 870
		§15	Updated modes in which monitoring tables place as resolution of Query 643

Issue / Revision	Date	Section / Page	Description
			Resolution of outstanding SW-PDR RIDs:
		§3.4.3.2	RID 041
		§7.4	RID 048
		§10	RID 051
		§13.3	RID 052
		No update	RID 054
		§3.4.3.1	RID 215
		§1.3.1	RID 216
		§3.4.3.2	RID 217
		§3.5.1	RID 219
		§15	RID 220
		§3.6.1, 3.7.5, 3.8.1	RID 253
		§3.4.3.2	RID 254
		§5, 6, 7, 8, 9	RID 256
		§13.1	RID 258
2.1	11/11/2011		SW-DWT RIDs addressed:
		§3.5.2, 3.7.10	MSI_SOFTWARE-1
		§3.1.1	MSI_SOFTWARE-2
		§3.6.15	MSI_SOFTWARE-3 (explanation added)
		§3.7.10 (old)	MSI_SOFTWARE-4
		§3.7.13	MSI_SOFTWARE-5
		§2.7.1.26	MSI_SOFTWARE-78
		§12.1.21	MSI_SOFTWARE-79
		§3.4.3.2, 12.1.28	MSI_SOFTWARE-80
		§3.4.3.2	MSI_SOFTWARE-81
		§3.6.6	MSI_SOFTWARE-82
		§10	MSI_SOFTWARE-87
		§3.1.17	MSI_SOFTWARE-88
		§12.1.22	MSI_SOFTWARE-89
		§12.2	MSI_SOFTWARE-90

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		§3.6, 12.4, 14, 15	MSI_SOFTWARE-93
		§15	MSI_SOFTWARE-97
		§12.4	MSI_SOFTWARE-95
		§14	MSI_SOFTWARE-96
		§11, 12 (old)	MSI_SOFTWARE-99
		§2.4.11	MSI_SOFTWARE-100
		§2.5.3	MSI_SOFTWARE-101
		§12.1.22	MSI_SOFTWARE-104
		§15	MSI_SOFTWARE-110
		§8.11	MSI_SOFTWARE-125
			SW-PDR RIDs addressed:
		§12.1.23, 14	SW-PDR RID 086
		§12.4.2	SW-PDR RID 242
			Addressed in previous issues but not recorded:
		§2.7.1.30	SW-PDR RID 075
		§5.13, 6.14	SW-PDR RID 078
		§3.4.3	SW-PDR RID 116
			Incorporating changes arising from SRB issue 5 (EC-CN-SSL-MSI-006):
		§5.9	Parameter added to Set TIROU Mechanism Final Deceleration Phase TC for MSISW-1944
		§6.10	Parameter added to Set VNSOU Mechanism Final Deceleration Phase TC for MSISW-1946
			NB: Start FEE Memory Test TC parameters already in line with changes to MSISW-1882
		§1.4.2	Rationalised acronyms list with [RD6]
3	27/01/2012		Issue for SW-0 data package
			Updated following issue of BSW/Framework SW-CDR data pack:
		§16	MSIASW-319 traced to Default Event Actions
		§14	MSIASW-321 traced to Default Monitoring
		§4	MSISW-1650 traced to Thermal Control

Issue / Revision	Date	Section / Page	Description
			Updated during development:
		§1.5	SW-DDR RID 98: Packet format diagram conventions described
		§15, 16	MSIASW-198 and MSIASW-199 traced to monitoring of TIR Peltier hot side, and Event/Action to switch off TIR Peltier supply when hot side threshold exceeded
		§5.8, 6.9, 7.6, 8.6	PCAT defined for various MSI-specific TM packets as resolution of Query 1140
		§10	Secondary Voltage Fail data clarified as resolution of Query 1046
		§12.1, 12.1.12, 12.1.18, 12.1.19	Clarified that boolean data pool parameters are implemented using an enumeration Ada data type.
		§12.1.1	Baseline_Value data pool parameter corrected to unsigned 24-bit integer value
		§12.1.2	Calibration State data pool parameter enumerated values corrected so as align with ASW SDD and enumeration names truncated to 14 character maximum required by XCoG.
		§12.1.6, 12.1.9, 12.1.14, 12.1.20	Clarified that data pool parameters for registers are implemented using unsigned integers rather than structures or enumerations.
		§12.1.14	Enumerated values defined for TIR/VBS slew state and pointing direction data pool parameters
		§12.1.7	FEE State data pool parameter clarified as unsigned 8-bit integer value
		§12.1.15, 12.1.29	Background Task group of data pool parameters merged into Memory Scrubbing group. Scrubbing region and scrubbing rate data pool parameters corrected to unsigned 32-bit and unsigned 16-bit values respectively.
		§12.1.30	WatchdogStatus data pool parameter clarified as a boolean.
		§6.15	VNS_NotInit (signalling HW initilisation value) added

Issue / Revision	Date	Section / Page	Description
4	20/08/12		Issue for SW-CDR data package
			SW-DWT RIDs addressed:
		§3.4.3, 12.3	MSI_SOFTWARE-8 MSI TM and ANC TM Packet definitions added
			Updates to reflect changes identified in the implementation phase:
		§12.1.17	Specified details of ENUMs to be used
		§12.1.5	Add table entry 'CRC_Error_Count'
		§12.1.21	Delete table entry 'CRC_Error_Count', delete table entry 'TC_ErrCount'
		§10	Power Control Register in RT Configuration Monitoring Data corrected to bits 0-7 (from 0-8)
		§3.5.10	TIR_Position_Monitor event report size changed
		3.2.3.39. 3.7.16	TC ack and event to handle the FEE Command Queue full event.
		§3.2.4	Paragraph added
		§3.11.1	Typo: Service Sub-Type Id = 144 to read Service Sub-Type Id = 145
		§3.15.1	Typo: Service Sub-Type Id = 2 to read Service Sub-Type Id = 3
		§12.1.14	Attribute of TIR_Pointing_Direction_typ - TIR_INVALID(0) added.
			Attribute of VNS_Pointing_Direction_typ – VNS_INVALID(0) added.
		§3.7.17	Paragraph added
		§3.7.1	EID_OVERFLOW_TC_Q replaced with EID_ OVERFLOW_ INTERNAL_TC_Q
		§12.4.1	EID_MEMORY_DUMP_IN_PROGRESS removed – not required as dump updates provided every second
		§2.7.1.12	In the TC Source Packet Data Field: parameter 'EEPROM Bank Id' and associated details deleted from TC(8,1) EEPROM Write Protection Lock command
		§3.6.38	EID_HTR_PRIM_SENSOR_FAIL replaced by EID_INVALID_PRIMARY_TEMPERATURE with new structure

Issue / Revision	Date	Section / Page	Description
		§3.6.39	EID_HTR_SEC_SENSOR_FAIL replaced by EID_INVALID_SECONDARY_TEMPERATURE with new structure
		§3.8.3 §15	EID_HTR_MAIN_SECONDARY_THERM_FAILED replaced by EID_NO_VALID_TEMPERATURE with new structure. Note deleted: 'This Event appears to duplicate the "Thermal Control Loop Secondary Sensor Failure" Event. Corresponding entry in Event Action table modfied
		§12.4.2	EID_TCL_PRIM_SENSOR_FAIL replaced by EID_INVALID_PRIMARY_TEMPERATURE EID_TCL_SEC_SENSOR_FAIL replaced by EID_INVALID_SECONDARY_TEMPERATURE
		§12.4.4	EID_HTR_MAIN_SECONDARY_THERM_FAILED replaced by EID_NO_VALID_TEMPERATURE
		§7.1, §2.7.1.6, §2.7.1.17, §2.7.1.18, §2.7.1.19	'TIR/VNS Flat Field Reference Set ID' parameters set to 8 Bits length.
		§12.1.3	Bug 1499: CPU load monitoring extension added
		§4.8	Changed format of set Peltier Cooler Constant Current
		§7.7 & §7.8	Add Load TIR, VNS TCs as agreed in MSI e-mail 25/04/2012
		§2.7.1.9	Extend description
		§3.6.40	Add DPRAM_DOUBLE_BIT_ERROR event – FW bug 1763

Issue / Revision	Date	Section / Page	Description
		§14	Delete the following monitors as the ASW raises the events: EID_EEPROM_PROTECTED_WRITE EID_UNEXPECTED_LOPT_AT_PSS_100US EID_UNEXPECTED_LOPT_AT_PSS_4MS EID_EDAC_ERROR_ASW EID_FEE_STATUS_ERROR EID_FEE_USL_ERROR
	30-Jul-12	§5.4.5.7	Bug 1911 (Failed_Mem_Access enumeration requires additional failure item)
		§12.1.30	Add PM Services Group
		§3.6.3 §14	Remove PPS Selection Validity Flag Event. The time manager checks the PPS status register and generates an appropriate event if a fault (spurious or missing PPS) is reported for the selected PPS. This is framework functionality.
		§3.5.4	Updated Perform_Self_Test report
		§12.2.1	Remove the following: FID_VNS_SLEW_RETRY_UNSUCCESSFUL FID_VNS_SLEW_CORRECTION_UNSUCCESSFUL
	10/08/2012	§12.2.26	Timing control registers aligned with autocode and BBR definition.
	14/08/2012	§9.8	Bug 1796 (Clarify History Area)
	16/08/2012	§§12.1.28, 12.1.29	Changes to History Area Usage parameter
	19/08/2012	§3.5.11	Added additional TM (5,1)
	19/08/2012	§3.7	Additional events and move events from 3.6
4.1	22/08/12		Draft created for next release
	23/08/12	§3.6.31 §3.6.32 §12.4.2	Added TIR/VNS Reference Set Not Loaded. To implement solution agrred with SEA in e-mail 09/08/12 (MSI ICU SW FID 10005 Invalid Flat Field and missing SID)
		§14	Monitors EID_VMON_ICU_P_3_3_WIDE and EID_VMON_ICU_P_5_WIDE updated inline with Query 1856

Issue / Revision	Date	Section / Page	Description
	29/08/12	§12.1.26	PPS acceptance/synchronisation limit reported in DP.
		§3.6.33 §3.6.34	Added EID_TIR_NULL_SLEW_REQUESTED, EID_VNS_NULL_SLEW_REQUESTED
		§12.1.27	Added Milbus_DMA_Budy, FEE_Status_Validity, FEE_State_Validity to HK_Monitoring_Validity group
		§12.2	FID_WR_FEE_INV_STATE and FID_RD_FEE_IN_STATE removed
		§3.7.16	Milbus RX TC Read Fail Event description corrected.
		§3.7.10 §3.7.11	Default Event Action Initialistion failure and Default Monitor Initialisation failure event updated.
		§12.1.15	Update Memory Scrubbing Software Group CR 52
		§12.1.5 §3.4.3.1	TECHNICAL_PAN-2 & TECHNICAL_PAN-3 Event Manager Software Group add TC_Failure_and_Event_Count and Last_Event_Error_ID
		§2.7.1.23	TECHNICAL_PAN-14: INS mode applicable to Self Test corrected
		§§2, 3	TECHNICAL_PAN-17: packet descriptions corrected to highlight difference between unused and present bits
		§12.4.4	High Severity Event List
		§14, 15	Service 12 Default Monitoring List Service 19 Default EA List
		§2.7.1	Added following TCs: ○ Reset ICU MilBus Inactivity ○ Set PPS Acceptance Limit ○ Set PPS Sync Limit
		§2.7.1	TECHNICAL_PAN-11 Added following TCs: ○ Enable MilBus Inactivity Reset ○ Disable MilBus Inactivity Reset

Issue / Revision	Date	Section / Page	Description
		§8.1.10	TECHNICAL_PAN-10: Set minimum value to 16
		§3.4.3	Update to default packet definitions.
		§12.1.12	Updated ICU register support datapool group definition.
		§12.2	TECHNICAL_PAN-4
		§12.4 §14	Columns for FID & EID removed. Monitoring ID added
		§3.6.30	TECHNICAL_PAN-5 DPRAM Error Status memory buffer specification updated for MSI.
		§3.7.26	TECHNICAL_PAN-6 LUT Checksum Error Event removed
		§14	Monitoring Event List updated to latest FDIR input (EC-IC-SEA-MSI-004 Issue 5.0).
		§12.2, §3.2.3	FID_CALIB_TC_TIMEOUT, FID_THERMAL_PARAMETER added.
		§16	Reimport data from DOORs
4.2	06/03/2013	§2.7.1.41, §2.7.1.42.	Bug 2286.
		§3.7.17	Bug 2277.
		§14	Rid HK-01, monitoring limit update MID 108
		§3.7.21	Rid HK-32, event queue occupancy.
		§12.1.5	RID HK-30 (AI#23) EC-NCR-SEA-MSI-0009, order of engineering group (HK buffer datapool representation).
		§3.2.3.58	Add description for FID_TIR_CURR_POS_INVALID
		§12	HK-36 – Corrections for mechsnism control DP group (General alignment of DP groups with database).
		§12.4.1	RID-MPC-002; History Loading Area Event ID.
		§14	RID-MPC-003; TBD Science Packet Sequence Counter MID TBD.
		§15	RID HK-18: MAJOR_MODE-TRANSITION_FAIL added

Issue / Revision	Date	Section / Page	Description
		DCR	RID - MPC-004
			CN number provided in Change Log for 2.1
		§3.7.23 §3.8.2	EC-NCR-SEA-MSI-0023 – provide additional failure information for mode transition failure.
		§12.4.3 §14 §15	Revised monitoring and event action table in line with EC-I-SEA-MSI-0004 Issue 6.0 (FDIR)
		§2.7	RID HK-02: Update FIDs
5.0	07/06/13	§12.1.4	Bug 2432 / EC-NCR-SEA-MSI-0011
		§3.4.3	Bug 2193 – define intial enabled state of SIDs
		Table 11	Bug 2444 – Modify memory partition addressed.
		§12.4.2	BBR ASW CRD RID SY-73
		§15	Bug -2523 Remove (SEA E-Mail 23rd May) EID_FEE_DETECTOR_LATCHUP & EID_FEE_EDAC_DOUBLE_ERROR
		§14, §15	Bug 2473 EC-I-SEA-MSI-0004 Issue 6.1 (FDIR)
		§5.13, §5.14,	SEA Issue TRAC#38 (Bug 2453)
		§5.15, §5.16,	Include all TCs in database
		§6.14,§6.15, §8.15, §8.16,	
		§2.7.1.38,	
		§2.7.1.39,	
		§7.7, §7.8	
5.1	19/11/2014	§2.7.1.20	Bug 2551 (Set ATC Wait Timeout)
		§4.4	NCR-0016 – document range for PID values
		§3.6.5, §12.4.2	Bug 2478
		§12.5	EC.NCR.ASD.SY-0730 – remove DPRAM entry – ASW does not scrub DPRAM

Issue / Revision	Date	Section / Page	Description
		§2.7.1.39, §2.7.1.40, §5.13, §5.14, §5.15, §5.16, §6.14, §6.15, §7.7,§7.8, §8.15, §8.16	TRB action SSTL-4 – remove only from statement referencing OBCP interpreter
		§3.7.35 §12.1.10	TRB action SSTL-5/AI-4- remove 'right justified)
		§4.4 §4.6	TRB action SSTL-6/AI-5- correct 'Maximum Power for Limitation of Calculated Power' in figure.
		§8.3, §8.11	TRB action SSTL-9/AI-9- correct text & figure
		§14	TRB action SSTL-11 – extend description for EID_CPU_CYCLE
		§12.1.18	TRB action SSTL-12/AI-12 – add reference
		§10	Bug 2642 (Summit register 9 bits)
		§2.7.1.27 §2.7.1.28	SEA E-Mail query 05/03/14 – add explanation for TCs Enable/Disable Milbus Inactivity reset
		§3.5.16 §3.7.37	EC.NCR.ASD.SY-0825 – add events
		§12.5	EC.NCR.ASD.SY-0973
		§ 2.7.1.20, §2.7.1.42, §2.7.1.43	OBS 2638
		§12.1.6	OBS 2736
		§10	OBS 2740
		§12.2	OBS 2634
		§12, §14, §15	OBS 2773 CCN-14
		§2.6.3	Add format for Service 6 Check TC and remove check length restriction.
		§2.7.1.10	BWL Parameter Setting max range corrected.
		§3.6.2	Scrub counter descriptions expanded
		§10	RT Health descriptions expanded
5.2	27/02/2015	§2.3	QR RID ADS-10

Issue / Revision	Date	Section / Page	Description
		§2.4	QR RID ADS-10
		§2.5	QR RID ADS-10
		§2.6	QR RID ADS-10, ADS-19
		§2.7.1	QR RID ADS-10
		§2.8.1	QR RID ADS-10
		§2.9	QR RID ADS-10
		§2.11	QR RID ADS-10
		§2.12	QR RID ADS-10
		§2.13.1	QR RID ADS-10
		§2.9	QR RID ADS-10
		§3.3.1	OBS 2804
		§3.4.3.4	QR RID SSTL-1
		§4.3	QR RID ADS-10
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		§4.9	QR RID ADS-10
		§5	QR RID ADS-10
		§6	QR RID ADS-10
		§7	QR RID ADS-10
		§8	QR RID ADS-10
		§9	QR RID ADS-10
		§10	OBS 2718
		§12.5	QR RID ADS-19
		§12.7	QR RID ADS-20
		§14	QR RID HK-08, HK-09, HK-10
5.3	05/03/2015	§3.4.3.4	SW-QR RID SSTL-1 AI#14

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1. INTRODUCTION

1.1 Purpose and Scope

This document is the Interface Control Document (ICD) for the EarthCARE MSI ICU OBSW's Application Software (ASW).

The EarthCARE MSI ICU is mounted within the ICU enclosure on the EarthCARE spacecraft. It is based on a LEON2 microprocessor running at 33MHz and supported by PROM and EDAC-controlled EEPROM and RAM memories.

The ASW is run following the successful completion of a "GOTO STANDBY" command executed by the Boot Software (BSW). The ASW contains the main operating modes of the MSI instrument.

The purpose of the ICD is to detail the software interfaces that are specific to the ASW. The ASW is written in accordance with ECSS Space Engineering Software Standard [AD1]. Inline tracing to the Software Requirements Baseline (SRB) [AD4] is also provided.

1.2 Overview of the Document

Chapter 2 describes the list of supported TC Source Packets, and details any deviations from the standard message formats detailed in EarthCARE PUS [AD6]. This includes the message layout for all Service 8 functions.

Chapter 3 describes the list of supported TM Source Packets, and details any deviations from the standard message formats detailed in EarthCARE PUS [AD6]. This includes the formats for all events currently identified as being generated by the ASW.

Chapters 4, 5, 6, 7, 8 and 9 identify the TC and TM Source Packets associated with the MSI Private Services which are applicable to the ASW.

Chapter 10 describes the health message transmitted on the MIL-STD-1553B bus by the ASW.

Chapter 12 details enumerated lists of Identifiers (IDs) currently defined for the ASW.

Chapter 13 defines the memory usage to be employed in the RAM region of memory.

Chapter 14 lists the Default Monitoring IDs supported on the ASW.

Chapter 15 lists the Default Event Actions supported on the ASW.

Chapter 16 lists the DOORS Identifiers allocated to each TC for requirements tracing purposes.

1.3 Applicable and Reference Documents

For the documents listed below, the version listed in the SCIDL, EC-LI-SSL-MSI-0008 Issue 4.4, is deemed to apply. When an issue is quoted, that issue and no other must be used.

1.3.1 Applicable Documents

[AD1] ECSS Space Engineering Standard ECSS-E-40. (28 Nov 2003)

[AD2] MSI ICU Hardware/Software ICD, EC-IC-SEA-MSI-0002

[AD3] EarthCARE MSI TM/TC ICD, EC-IC-SEA-MSI-0003

[AD4] MSI ICU Software Requirements Baseline, EC-RS-SEA-MSI-0001

[AD5] FEE Register List, EC.LI.SSTL.MSI.00038

[AD6] EarthCARE Packet Utilisation Standard, EC.STD.ASD.SY.00001

[AD7] EarthCARE BBR ICU OBSW Boot Software ICD, EC-IC-SSL-SY-0008

1.3.2 Reference Documents

[RD1] FDIR Monitoring and Limits, EC-IC-SEA-MSI-0004

[RD2] EarthCARE MSI ICU OBSW ASW Software Design Document, EC-DD-SSL-MSI-0001

[RD3] MSI Technical Description, EC.RP.SSTL.MSI.00005, Issue 7

[RD4] Atmel SPARC V8 Processor AT697E, doc7703b_at697f.pdf

[RD5] MILBUS Protocol Specification, EC.RS.ASD.SY.00011

[RD6] Dictionary of Acronyms and Abbreviations, EC-LI-SEA-MSI-0001 Issue 1.0

[RD7] EarthCARE MSI ICU OBSW API Software ICD, EC-IC-SSL-MSI-0002

[RD8] EarthCARE MSI ICU OBSW ASW Software User Manual, EC-UM-SSL-MSI-0001

[RD9] Earthcare MSI Tracability Matrices, EC-TN-SSL-MSI-0005

1.4 Definitions, Acronyms, and Abbreviations

1.4.1 Definitions

1.4.1.1 Bit Numbering and Ordering

The Bit Numbering and Ordering convention illustrated in Figure 1 has been adopted for the EarthCARE mission and shall be adhered to for all EarthCARE ICU software and products.

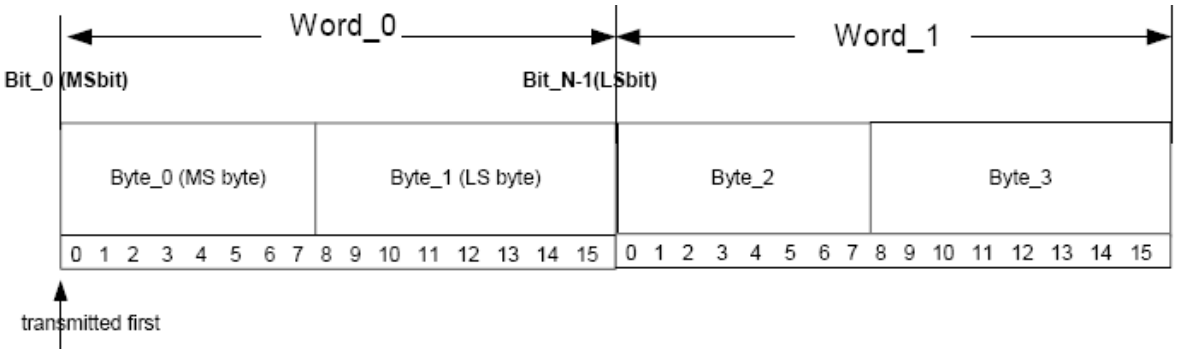

Figure 1: Definition of Data Words and their Byte Allocation

The convention used throughout this document to illustrate telecommand and telemetry packet structures uses a single table row to indicate 16 bit word unless otherwise stated. Hatched out cells indicate bytes not used. Data Types

The data sizes defined in Table 1 have been adopted in the ASW.

Table 1: Data Types

Data Type	Number of Bytes
Unsigned_8	1
Unsigned_16	2
Unsigned_32	4
Boolean	1
Enumerated	n

1.4.2 Acronyms and Abbreviations

The general list of acronyms and abbreviations for the EarthCARE MSI ICU project can be found in [RD6]. The following list is supplementary to this.

ATC	Acquisition Transfer Confirmation
ATR	Acquisition Transfer Request
BWL	Bandwidth Limit
DTC	Distribution Transfer Confirmation
DTD	Distribution Transfer Descriptor
EGSE	Electrical Ground Support Equipment
ESTEC	European Space Research and Technology Evaluation Centre
HKTM	Housekeeping Telemetry
ID	Identifier
LOBT	Local Onboard Time
LS	Least Significant
MS	Most Significant
MTU	Maximum Transmission Unit
OBSW	On-board Software
RAM	Random Access Memory
SEU	Single Event Upset
SID	Structural Identifier
SIF	Serial Interface
SIS	SPARC Instruction Set
SSL	SciSys UK Ltd.
STF	Software Test Facility
TC(x,y)	Telecommand(service type x, service sub-type y)
TM(x,y)	Telemetry(service type x, service sub-type y)

1.5 Packet Format Diagram Conventions

Throughout this document, packet formats are described using diagrams and associated text. Each diagram is organised as:

- a table
- each row representing 16-bits or 2 octets of packet data
    - the first row being the first octets of data
    - the last row being the last octets of data (unless otherwise stated)

- with the left-most bit of a row being the first bit and the right-most bit of a row being the last bit of the 2 octets of packet data
- each field having a title and number of bits specified OR hashed out to represent an unused field.

1.6 Approval and Distribution

The SciSys MSI Project Manager shall authorise all issues of the ICD.

Following approval the ICD will be released both internally and to the customer.

Following formal review and the completion of any associated review actions, the customer shall approve the ICD, as recorded in the Minutes at the SW-DDR Closeout.

2. TC SOURCE PACKETS

2.1 General

TC Source Packets are received by the ASW from the MIL-STD-1553B Interface. The ASW supports the following list of standard Services and Sub-Types as detailed in the EarthCARE PUS standard [AD6]:

- Service 2:
  - Sub-type 132: Direct I/O
- Service 3:
  - Sub-type 1: Define new HK Parameter Report
  - Sub-type 2: Define new Diagnostic Parameter Report
  - Sub-type 3: Clear HK Parameter Report Definitions
  - Sub-type 4: Clear Diagnostic Parameter Report Definitions
  - Sub-type 5: Enable HK Parameter Report Generation
  - Sub-type 6: Disable HK Parameter Report Generation
  - Sub-type 7: Enable Diagnostic Parameter Report Generation
  - Sub-type 8: Disable Diagnostic Parameter Report Generation
  - Sub-type 9: Report HK Parameter Report Definitions
  - Sub-type 11: Report Diagnostic Parameter Report Definitions
  - Sub-type 128: Request HK/Diagnostic Parameter Report Summary
  - Sub-type 130: Define HK Parameter Report Collection Interval
  - Sub-type 131: Define Diagnostic Parameter Report Collection Interval
  - Sub-type 136: Request HK Parameter Report
  - Sub-type 138: Add HK Parameters to existing HK Parameter Report
  - Sub-type 139: Report Snapshot HK Parameter Anomaly Report
- Service 5:
  - Sub-type 5: Enable Event Packet Generation
  - Sub-type 6: Disable Event Packet Generation
  - Sub-type 133: Report Disabled EIDs
- Service 6:
  - Sub-type 2: Load Memory Using Absolute Address
  - Sub-type 5: Dump Memory Using Absolute Address
  - Sub-type 9: Check Memory Using Absolute Address
- Service 8:
  - Sub-type 1: Perform Function

  - Sub-type 140: Enable Function Execution
  - Sub-type 141: Disable Function Execution
  - Sub-type 142: Enable Autoreset of Execution Enable Flag
  - Sub-type 143: Disable Autoreset of Execution Enable Flag
  - Sub-type 144: Report Function Status
- Service 9:
  - Sub-type 135: Trigger Time Synchronisation Verification
  - Sub-type 136: Select Time Synchronisation Reference
- Service 12:
  - Sub-type 1: Enable monitoring of Parameters
  - Sub-type 2: Disable Monitoring of Parameters
  - Sub-type 4: Clear Monitoring List
  - Sub-type 5: Add Parameters to Monitoring List
  - Sub-type 6: Delete Parameters from Monitoring List
  - Sub-type 8: Report Current Monitoring List
- Service 17:
  - Sub-type 1: Perform Connection Test
- Service 19:
  - Sub-type 1: Add Events to Detection List
  - Sub-type 2: Delete Events from Detection List
  - Sub-type 3: Clear Event Detection List
  - Sub-type 4: Enable Actions
  - Sub-type 5: Disable Actions
  - Sub-type 6: Report Event Detection List
  - Sub-type 130: Report Single Event Detection Entry
- Service 140:
  - Sub-type 1: Set N Parameters
  - Sub-type 2: Get N Parameters
  - Sub-type 4: Define Onboard Parameter
- Service 145:
  - Sub-type 128: Update Spacecraft State Vector

The TC Source packet formats are defined in EarthCARE PUS standard [AD6]. Where the definition is insufficient, or missing, then the packet format will be defined below.

2.2 Long Duration Commands

A long duration command is considered to be a command that takes greater than 10s to execute.

The ASW software considers the following TC commands to be long duration commands [MSISW-407]:

- TC(6,5) 'Dump Memory Using Absolute Address'
- TC(8,1) Mode Transition Functions
    - Function 2 Transition to INS-SBY (INS-IDL)
    - Function 4 Transition to INS-IDL (when current mode is INS-SBY or INS-NOM)
    - Function 6 Transition to INS-NOM (when current mode is INS-IDL)
- TC(239,5/6/7/10) TIROU Mechanism Service: Set to Cold Space View, Set to Black Body View, Set to Nadir View, Command TIROU Mechanism
- TC(236,5/6/7/8/10) VNSOU Mechanism Service: Set to Solar Diffuser View 1, Solar Diffuser View 1, Set to Dark View, Set to Nadir View, Command VNSOU Mechanism
- TC(238,11) Start FEE Memory Test

The ASW will support the ability to abort long duration commands using the following procedures.

The ASW will abort a TC(6,5) 'Dump Memory Using Absolute Address' command upon receipt of a second TC(6,5) command. In this case, the existing memory dump operation will be halted, with a TM(1,8) message Execution Failure Acknowledgement Report will be generated with a FailureID (FID_REPORT_ABORTED), and the new memory dump operation initiated.

The ASW will abort an ongoing transition to INS-NOM, upon receipt of a TC(8,1) Function 5 "Transition to INS-IDR" command. In this case the original Mode Transition will be halted, a TM(1,8) message Execution Failure Acknowledgement Report will be generated with a FailureID (FID_MODE_TRANSITION_FAILURE), and the Mode Transition procedure to INS-IDR started.

The ASW will abort an ongoing transition to INS-IDL upon receipt of a TC(8,1) Function 3 "Transition to SBR" command. In this case the original Mode Transition will be halted, a TM(1,8) message Execution Failure Acknowledgement Report will be generated with a FailureID (FID_MODE_TRANSITION_FAILURE), and the Mode Transition procedure to INS-SBR started.

TIROU and VNSOU Mechanism Movement will be aborted on reception of a dedicated "Abort TIR Mechanism Operation" or "Abort VNS Mechanism Operation" TC.

Start FEE Memory Test will be aborted on reception of a dedicated "Abort FEE Memory Check" TC.

2.3 Service 2 – Device Command Distribution Service

2.3.1 Direct I/O

MSISW-838, MSISW-1940

Service Type Id = 2.
Service Sub-Type Id = 132.

The ASW provides limited support for directly accessing Hardware IO registers. The Device IO Command allows for a Hardware Register to be directly populated with a supplied value or for the register value to be read, bypassing the API layer interface [RD7]. The format for the Direct I/O TC is shown below in Figure 2.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 2
Service Sub Type = 132						Source ID
Device						Channel
Command						Mode
Ipar[0] MSWord						
Ipar[0] LSWord						
Ipar[1] MSWord						
Ipar[1] LSWord						
Ipar[2] MSWord						
Ipar[2] LSWord						
Dsize MSWord						
Dsize LSWord						
Packet Error Control.						

Figure 2: Direct I/O TC Format

Where:

- Device is 1 – MSI_IO_DEVICE
- Channel is 1 – MSI_IO_CHANNEL
- Command is 1 – MSI_IO_WRITE_COMMAND, 2 – MSI_IO_READ_COMMAND
- Mode is 1 – Not Used.
- Ipar[0] is Memory Mapped Register address. Refer to [AD2] for valid register addresses.
- Ipar[1] is 32 bit Data value. Refer to [AD2] for valid data values applicable for register address. The field is not used for a MSI_IO_READ_COMMAND command.
- Ipar[2] is 0 – Not used.
- DSize is 0

2.4 Service 3 – Housekeeping and Diagnostic Data Reporting Service

2.4.1 Define New HK Parameter Report

Service Type Id = 3
Service Sub-Type Id = 1

Upon reception of TC(3,1) a new HK Report Definition is created in the onboard system. A corresponding "Report Generation Flag" is created and set to "disabled". TM(3,25) for this new defined HK Parameter Report has to be enabled with TC(3,5). The format for the Define New HK Parameter Report TC is shown below in Figure 3.

SID	
Collection Interval	
NPAR	
Parameter ID MS word (repeat NPAR times)	
Parameter ID LS word (repeat NPAR times)	

Figure 3: Define New HK Parameter Report TC Format

Where:

- SID: Structure ID (1…127)
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (1….65535)
- NPAR: number of cumulated parameters in the definition (1…52)
- Parameter ID Number uniquely identifying a parameter out of a list

2.4.2 Define New Diagnostic Parameter Report

Service Type Id = 3
Service Sub-Type Id = 2

Upon reception of TC(3,2) a new Diagnostic Report Definition is created in the onboard system. A corresponding "Report Generation Flag" is created and set to "disabled". TM(3,26) for this new defined Diagnostic Parameter Report has to be enabled with TC(3,7). The format for the Define New Diagnostic Parameter Report TC is shown below in Figure 4.

SID	
Collection Interval	
NPAR1	
Parameter ID MS word	
Parameter ID LS word	
NFA	NREP
NPAR2	
Parameter ID MS word	
Parameter ID LS word	

Figure 4: Define New Diagnostic Parameter Report TC Format

Where:

- SID: Structure ID (128…255)
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (1…65535)
- NPAR1: The number of parameters in the definition that are sampled once per collection interval (0…47)
- Parameter ID: Number uniquely identifying a parameter out of a list
- NFA: The number of fixed-length arrays (0…1)

- NREP: The number of values to be sampled for each parameter within this fixed length array (1…255)
- NPAR2: The number of different parameters within this fixed-length array, each of which shall be sampled "NREP" times per collection interval (0…46)
- Parameter ID: Number uniquely identifying a parameter out of a list

2.4.3 Clear HK Parameter Report Definitions

Service Type Id = 3
Service Sub-Type Id = 3

Upon reception of TC(3,3) the HK Report Definition specified by the SID number is removed from the onboard system. All related flags (Report Generation Flag) shall be cleared. This TC can be sent only if the associated report generation of this *SID* has been disabled first. The format of the Clear HK Parameter Report Definitions TC is shown below in Figure 5.

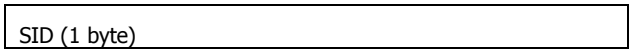

Figure 5: Clear HK Parameter Report Definitions TC Format

Where:

- SID: Structure ID of HK Report Definition to be cleared

2.4.4 Clear Diagnostic Parameter Report Definitions

Service Type Id = 3
Service Sub-Type Id = 4

Upon reception of TC(3,4) the Diagnostic Report Definition specified by the SID number is removed from the onboard system. All related flags (Report Generation Flag) shall be cleared. This TC can be sent only if the associated report generation for this *SID* has been stopped first. The format for the Clear Diagnostic Parameter Report Definitions TC is shown below in Figure 6.

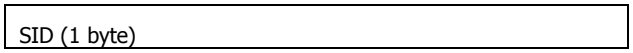

Figure 6: Clear Diagnostic Parameter Report Definitions TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition to be cleared

2.4.5 Enable HK Parameter Report Generation

Service Type Id = 3
Service Sub-Type Id = 5

Upon reception of TC(3,5) the HK Report Definition specified by the SID number is enabled. The format for the Enable HK Parameter Report Generation TC is shown below in Figure 7.

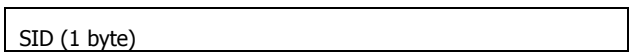

Figure 7: Enable HK Parameter Report Generation TC Format

Where:

- SID: Structure ID of HK Report Definition

2.4.6 Disable HK Parameter Report Generation

Service Type Id = 3
Service Sub-Type Id = 6

Upon reception of TC(3,6) the HK Report Definition specified by the SID number is disabled. The format for the Disable HK Parameter Report Generation TC is shown below in Figure 8.

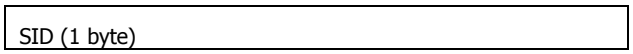

Figure 8: Disable HK Parameter Report Generation TC Format

Where:

- SID: Structure ID of HK Report Definition

2.4.7 Enable Diagnostic Parameter Report Generation

Service Type Id = 3
Service Sub-Type Id = 7

Upon reception of TC(3,7) the Diagnostics report Definition specified by the SID number is enabled. The format for the Enable Diagnostic Parameter Generation TC is shown below in Figure 9.

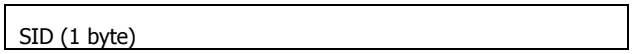

Figure 9: Enable Diagnostic Parameter Report Generation TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition

2.4.8 Disable Diagnostic Parameter Report Generation

Service Type Id = 3
Service Sub-Type Id = 8

Upon reception of TC(3,8) the Diagnostics report Definition specified by the SID number is disabled.

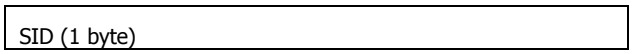

Figure 10: Disable Diagnostic Parameter Report Generation TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition

2.4.9 Report HK Parameter Report Definition

Service Type Id = 3
Service Sub-Type Id = 9

Upon reception of TC(3,9) the HK Parameter Report Definition Report TM(3,10) specified by the SID number shall be generated.

SID (1 byte)

Figure 11: Report HK Parameter Report Definition TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition

2.4.10 Report Diagnostic Parameter Report Definitions

Service Type Id = 3
Service Sub-Type Id = 11

Upon reception of TC(3,11) the Diagnostic Parameter Report Definition Report specified by the SID number shall be generated.

SID (1 byte)

Figure 12: Report Diagnostic Parameter Report Definitions TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition

2.4.11 Report HK/Diag Parameter Report Definitions in Summary Form

Service Type Id = 3
Service Sub-Type Id = 128

Upon reception of TC(3,128) the HK/Diagnostic Parameter Report Definition Report TM(3,129) shall be generated.

2.4.12 Define HK Parameter Report Collection Interval

Service Type Id = 3
Service Sub-Type Id = 130

Upon reception of TC(3,130), the collection interval for the specified HK Parameter Report shall be changed. The HK Parameter Report Generation for the specified SID must be disabled in order to fulfil the request.

SID	
Collection Interval	

Figure 13: Define HK Parameter Report Collection Interval TC Format

Where:

- SID: Structure ID
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (1…65535)

2.4.13 Define Diagnostic Parameter Report Collection Interval

Service Type Id = 3
Service Sub-Type Id = 131

Upon reception of TC(3,131), the collection interval for the specified Diagnostic Parameter Report shall be changed. The Diagnostic Parameter Report Generation for the specified SID must be disabled in order to fulfil the request.

SID	
Collection Interval	

Figure 14: Diagnostic HK Parameter Report Collection Interval TC Format

Where:

- SID: Structure ID
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (1…65535)

2.4.14 Request HK Parameter Report

Service Type Id = 3
Service Sub-Type Id = 136

Upon reception of TC(3,136) the HK Parameter Report specified by the SID number is generated only once.

SID (1 byte)

Figure 15: Request HK Parameter Report TC Format

Where:

- SID: Structure ID of Diagnostic Report Definition

2.4.15 Add HK Parameters to Existing HK Parameter Report

Service Type Id = 3
Service Sub-Type Id = 138

TC(3,138) is used to add additional HK parameters to an already defined HK Report TM(3,25).

SID	NPAR
Parameter ID MS word	
Parameter ID LS word	

Figure 16: Add HK Parameters to Existing HK Parameter Report TC Format

Where:

- SID: Structure ID
- NPAR: number of appended parameters in the definition (1…48)
- Parameter ID: Number uniquely identifying a parameter out of a list

2.4.16 Request Snapshot HK Parameter Anomaly Report

Service Type Id = 3
Service Sub-Type Id = 139

Upon reception of TC(3,139), one TM(5,x) Event Report shall be generated with a severity corresponding to the given EID and with the SID and all parameters of the HK or Diagnostic SID definition in the parameter field of the Event Report.

EID	
SID	

Figure 17: Request Snapshot HK Parameter Anomaly Report TC Format

Where:

- EID: Event Identifier
- SID: Structure ID

2.5 Service 5 – Event Reporting Service

2.5.1 Enable Event Packet Generation

Service Type Id = 5
Service Sub-Type Id = 5

Upon reception of TC(5,5) the Event Report generation specified by the *EID* number is enabled.

NEID	
EID	

Figure 18: Enable Event Packet Generation TC Format

Where:

- NEID: Number of EID's (1…97)
- EID: Event Packet Structure Identifier

2.5.2 Disable Event Packet Generation

Service Type Id = 5
Service Sub-Type Id = 6

Upon reception of TC(5,6) the Event Report generation specified by the *EID* number is disabled.

NEID	
EID	

Figure 19: Disable Event Packet Generation TC Format

Where:

- NEID: Number of EID's (1…97)
- EID: Event Packet Structure Identifier

2.5.3 Report Disabled EID's

Service Type Id = 5
Service Sub-Type Id = 133

Upon reception of TC(5,133) the Disabled EID's Report TM(5,134) shall be generated.

2.6 Service 6 – Memory Management Service

2.6.1 Load Memory using Absolute Addresses

Service Type Id = 6
Service Sub-Type Id = 2

TC(6,2) shall load any data or code to the memory on-board identified by the relevant parameters of the TC. No scattered Memory Load is foreseen.

Memory ID
Start Address MS word
Start Address LS word
Length MS word
Length LS word
Data (variable)

Figure 20: Load Memory using Absolute Addresses

Where:

- Memory: Identification Number of the on board memory block. Refer to Table 10.
- Start Address: Start Address (in Smallest Addressable Units, with count starting from zero) within the memory block for loading the data
    - SAU is 8 bits
- Length: Length of data block (in Smallest Addressable Units, with count starting from 1) (1….MAXSAU)
    - MAXSAU is determined by the end of the memory area being loaded or by the maximum size of a TC packet
- Data: The data to be loaded

2.6.2 Dump Memory using Absolute Addresses

Service Type Id = 6
Service Sub-Type Id = 5

TC(6,5) requests a dump of any data or code from the memory onboard identified by the relevant parameters of the TC. No scattered Memory Dump is foreseen.

Memory ID
Start Address MS word
Start Address LS word
Length MS word
Length LS word

Figure 21: Dump Memory using Absolute Addresses

Where:

- Memory: Identification Number of the on board memory block. Refer to Table 10.

- Start Address: Start Address (in Smallest Addressable Units, with count starting from zero) within the memory block for loading the data
    - SAU is 8 bits
- Length: Number of SAU's to be dumped (1…..MAXSAU)
    - MAXSAU is determined by the end of the memory area being dumped

2.6.3 Memory Check Report

Service Type Id = 6.
Service Sub-Type Id = 9.

TC(6,9) requests a check of any data or code in the memory onboard identified by the relevant parameters of the TC. No scattered Memory Check is foreseen.

Memory ID
Start Address MS word
Start Address LS word
Length MS word
Length LS word

Figure 22: Check Memory using Absolute Addresses

Where:

- Memory: Identification Number of the on board memory block. Refer to Table 10.
- Start Address: Start Address (in Smallest Addressable Units, with count starting from zero) within the memory block for loading the data
    - SAU is 8 bits
- Length: Number of SAU's to be dumped (1…..MAXSAU)
    - MAXSAU is determined by the end of the memory area being checked

2.7 Service 8 – Function Management Service

2.7.1 Perform Function

Service Type Id = 8.
Service Sub-Type Id = 1.

TC(8,1) performs the function with the specified Function ID, if its execution is allowed. i.e. the current status is "enabled".

Function ID	
Parameters (0…..m byte)	

Figure 23: Perform Function

Where:

- Function ID: Identification of the function to be activated (0…255)
- Parameter: Parameter relating to the function to be performed

The following sub-sections define the functions implemented by the EarthCARE MSI ICU ASW.

In all figures representing the TC Message layout:

- Source Id field is as defined in the EarthCARE PUS [AD6] Section B.2.4
- Packet Error Control is populated by the Algorithm defined in the EarthCARE PUS [AD6] Section B.4.4.

2.7.1.1 Reset Commanding

Function Id = 1.

MSISW-981

The TC Source Packet Data Field for the 'Reset Commanding' function is shown below in Figure 24.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 1						
Packet Error Control.						

Figure 24: Reset Commanding TC Format

2.7.1.2 Initiate Transition to INS-SBY

Function Id = 2.

MSISW-984

The TC Source Packet Data Field for the 'Initiate Transition to INS-SBY' function is shown below in Figure 25.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 2						
Packet Error Control.						

Figure 25: Initiate Transition to INS-SBY TC Format

2.7.1.3 Initiate Transition to INS-SBR

Function Id = 3.

MSISW-987

The TC Source Packet Data Field for the 'Initiate Transition to INS-SBR' function is shown below in Figure 26.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 3						
Packet Error Control.						

Figure 26: Initiate Transition to INS-SBR TC Format

2.7.1.4 Initiate Transition to INS-IDL

Function Id = 4.

MSISW-990

The TC Source Packet Data Field for the 'Initiate Transition to INS-IDL' function is shown below in Figure 27.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 4						
Packet Error Control.						

Figure 27: Initiate Transition to INS-IDL TC Format

2.7.1.5 Initiate Transition to INS-IDR

Function Id = 5.

MSISW-993

The TC Source Packet Data Field for the 'Initiate Transition to INS-IDR' function is shown below in Figure 28.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 5						
Packet Error Control.						

Figure 28: Initiate Transition to INS-IDR TC Format

2.7.1.6 Initiate Transition to INS-NOM

Function Id = 6.

MSISW-996

The TC Source Packet Data Field for the 'Initiate Transition to INS-NOM' function is shown below in Figure 29.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 6						
TIR Flat Field Reference Set ID						VNS Flat Field Reference Set ID
Packet Error Control.						

Figure 29: Initiate Transition to INS-NOM TC Format

Where:

- TIR Flat Field Reference Set ID is 0 – 31 (8 bits)
- VNS Flat Field Reference Set ID is 0 – 31 (8 bits)

2.7.1.7 Initiate Transition to INS-DEC

Function Id = 7.

MSISW-999

The TC Source Packet Data Field for the 'Initiate Transition to INS-DEC' function is shown below in Figure 30.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 7						
Packet Error Control.						

Figure 30: Initiate Transition to INS-DEC TC Format

2.7.1.8 Reset ICU

Function Id = 30.

MSISW-933

The TC Source Packet Data Field for the 'Reset ICU' function is shown below in Figure 31.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 30						
Packet Error Control.						

Figure 31 : Reset ICU TC Format

2.7.1.9 Scrubbing Configuration

Function Id = 31.

MSISW-1841

The TC Source Packet Data Field for the 'Scrubbing Configuration' function is shown below in Figure 32.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 31						
Scrubbing Rate						
Number of Regions						
Memory Id [0]						
Region [0] start address (MS Word)						
Region [0] start Address (LS Word)						
Region [0] Length (MS Word)						
Region [0] Length (LS Word)						
…						
Memory Id [n]						
Region [n] start address (MS Word)						
Region [n] start Address (LS Word)						
Region [n] Length (MS Word)						
Region [n] Length (LS Word)						
Packet Error Control.						

Figure 32: Scrubbing Configuration TC Format

Where:

- Number of Regions is 0 – 4. A number of regions of 0 is equivalent to disabling scrubbing, no further checks are done in this case. A number of regions greater than 0 defined for any region enables scrubbing automatically.
- Scrubbing Rate is in Bytes/second. Allowable range of 612 – 3060 provides a complete RAM scrub time of 50 minutes down to 10 minutes. Rates that are not word compatible are rejected. The scrubbing rate is applied to all defined scrubbing regions in 1 second.
- Memory Id[n] is the Memory Id of the device to be scrubbed. Refer to Table 11.
- Start Address[n] is the absolute byte address to start scrubbing from. Must be valid address within specified Memory Id.
- Length[n] is the length in bytes to scrub within the memory. Start Address + Length must not exceed the end of the address range for specified Memory Id. Lengths that are not word compatible are rejected.

2.7.1.10 BWL Parameter Setting

Function Id = 32.

MSISW-1035

The TC Source Packet Data Field for the 'BWL Parameter Setting' function is shown below in Figure 33.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 32						
BWL MTU Size						
Packet Error Control.						

Figure 33: BWL Parameter Setting TC Format

Where:

- BWL MTU Size is maximum size (MTU) of Source Data Field within a TM Packet in bytes. Range 1 – 2034.

2.7.1.11 EEPROM Write Protection Unlock

Function Id = 34.

MSISW-948

The TC Source Packet Data Field for the 'EEPROM Write Protection Unlock' function is shown below in Figure 34.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8	
Service Sub Type = 1						Source ID	
Function ID = 34						Filler (7 bits)	EEPROM Bank Id (1 bit)
EEPROM Write Address 1 MS Word (16 bits)							
EEPROM Write Address 1 LS Word (16 bits)							
EEPROM Unlock Key 1 MS Word (16 bits)							
EEPROM Unlock Key 1 LS Word (16 bits)							
EEPROM Write Address 2 MS Word (16 bits)							
EEPROM Write Address 2 LS Word (16 bits)							
EEPROM Unlock Key 2 MS Word (16 bits)							
EEPROM Unlock Key 2 LS Word (16 bits)							
EEPROM Write Address 3 MS Word (16 bits)							
EEPROM Write Address 3 LS Word (16 bits)							
EEPROM Unlock Key 3 MS Word (16 bits)							
EEPROM Unlock Key 3 LS Word (16 bits)							
Packet Error Control.							

Figure 34: EEPROM Write Protection Unlock TC Format

Where:

- EEPROM Bank Id is 0 – EEPROM Bank 0, 1 – EEPROM Bank 1
- EEPROM Write Address[n] is absolute byte address at which to write the unlock key [n].
- EEPROM Unlock Key[n] is 32 bit data value to write to Address[n] to unlock EEPROM write protection (see [AD2]).

2.7.1.12 EEPROM Write Protection Lock

Function Id = 35.

MSISW-950

The TC Source Packet Data Field for the 'EEPROM Write Protection Lock' function is shown below in Figure 35.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 35						
Packet Error Control.						

Figure 35: EEPROM Write Protection Lock TC Format

2.7.1.13 Power EEPROM On

Function Id = 36.

MSISW-1520

The TC Source Packet Data Field for the 'Power EEPROM On' function is shown below in Figure 36.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 36						
Packet Error Control.						

Figure 36: Power EEPROM On TC Format

2.7.1.14 Power EEPROM Off

Function Id = 37.

MSISW-1521

The TC Source Packet Data Field for the 'Power EEPROM Off' function is shown below in Figure 37.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 37						
Packet Error Control.						

Figure 37: Power EEPROM Off TC Format

2.7.1.15 Transition to OBS Submode

Function Id = 8.

MSISW-1017

The TC Source Packet Data Field for the 'Transition to OBS Submode' function is shown below in Figure 38.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 8						
Packet Error Control.						

Figure 38: Transition to OBS Submode TC Format

2.7.1.16 Transition to RAW Submode

Function Id = 9.

MSISW-1020

The TC Source Packet Data Field for the 'Transition to RAW Submode' function is shown below in Figure 39.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 9						
Packet Error Control.						

Figure 39: Transition to RAW Submode TC Format

2.7.1.17 Start TIR Calibration

Function Id = 10.

MSISW-1711

The TC Source Packet Data Field for the 'Start TIR Calibration' function is shown below in Figure 40.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 10						TIR Flat Field Reference Set ID
Packet Error Control.						

Figure 40: Start TIR Calibration TC Format

Where:

- TIR Flat Field Reference Set ID is 0 – 31 (8 bits)

2.7.1.18 Start VNS Calibration 1

Function Id = 11.

MSISW-1712

The TC Source Packet Data Field for the 'Start VNS Calibration 1' function is shown below in Figure 41.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 11						VNS Flat Field Reference Set ID
Packet Error Control.						

Figure 41: Start VNS Calibration 1 TC Format

Where:

- VNS Flat Field Reference Set ID is 0 – 31 (8 bits)

2.7.1.19 Start VNS Calibration 2

Function Id = 12.

MSISW-1713

The TC Source Packet Data Field for the 'Start VNS Calibration 2' function is shown below in Figure 42.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 12						VNS Flat Field Reference Set ID
Packet Error Control.						

Figure 42: Start VNS Calibration 2 TC Format

Where:

- VNS Flat Field Reference Set ID is 0 – 31 (8 bits)

2.7.1.20 Set ATC Wait Timeout

Function Id = 49.

The TC Source Packet Data Field for the 'Set ATC Wait Timeout' function is shown below in Figure 43.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 49						Number of minor frames
Packet Error Control.						

Figure 43: Set ATC Wait Timeout

Where:

Minor frames are 50 msec in duration. To specify the correct full number of minor frames for a required wait, set it to (ms wait required/50ms) + 1.
The default wait is 600 ms, i.e. 13 minor frames.

2.7.1.21 Enable Science Data Processing

Function Id = 50.

MSISW-1929

The TC Source Packet Data Field for the 'Enable Science Data Processing' function is shown below in Figure 44.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 50						
Packet Error Control.						

Figure 44: Enable Science Data Processing TC Format

2.7.1.22 Disable Science Data Processing

Function Id = 51.

MSISW-1930

The TC Source Packet Data Field for the 'Disable Science Data Processing' function is shown below in Figure 45.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 51						
Packet Error Control.						

Figure 45: Disable Science Data Processing TC Format

2.7.1.23 Band Mapping

Function Id = 55.

MSISW-1936

The TC Source Packet Data Field for the 'Band Mapping' function is shown below in Figure 46.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 55						
Band ID 1 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B1 (VNS)						Band ID 2 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B2 (VNS)
Band ID 3 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B3 (VNS)						Band ID 4 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B4 (VNS)
Band ID 7 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B7 (TIR)						Band ID 8 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B8 (TIR)

Band ID 9 to Flat Field Mapping: i.e. the Flat Field ID associated with Band B9 (TIR)	Band ID RB to Flat Field Mapping: i.e. the Flat Field ID associated with Band RB (TIR)
Packet Error Control.	

Figure 46: Band Mapping TC Format

Where:

- Band ID1 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID2 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID3 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID4 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID5 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID6 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID7 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used
- Band ID8 for Flat Field Mapping is 8 bits, 0 – 7 (NO_OF_BUFFERS-1), 8-255 not used

2.7.1.24 Perform Self Test

Function Id = 33.

MSISW-1755

The TC Source Packet Data Field for the 'Perform Self Test' function is shown below in Figure 47. This will only be executed when in INS-SBY mode (ECASW-766).

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 233						
Packet Error Control.						

Figure 47: Perform Self Test TC Format

2.7.1.25 Watchdog Enable

Function Id = 38.

MSISW-1757

The TC Source Packet Data Field for the 'Watchdog Enable' function is shown below in Figure 48.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 38						
Packet Error Control.						

Figure 48: Watchdog Enable TC Format

2.7.1.26 Watchdog Inhibit

Function Id = 39.

MSISW-1758

The TC Source Packet Data Field for the 'Watchdog Inhibit' function is shown below in Figure 49.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 39						
Packet Error Control.						

Figure 49: Watchdog Inhibit TC Format

2.7.1.27 Enable MilBus Inactivity Reset

Function Id = 44.

The TC Source Packet Data Field for the 'Enable MilBus Inactivity Reset' function is shown below. The autonomous reset in response to MilBus inactivity is implemented using an Event Action with Event EID_MIL_INACTIVE, therefore this TC enables the EID_MIL_INACTIVE event.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 44						
Packet Error Control.						

Figure 50: Enable MilBus Inactivity Reset

2.7.1.28 Disable MilBus Inactivity Reset

Function Id = 45.

The TC Source Packet Data Field for the 'Disable MilBus Inactivity Reset' function is shown below. The autonomous reset in response to MilBus inactivity is implemented using an Event Action with Event EID_MIL_INACTIVE, therefore this TC disables the EID_MIL_INACTIVE event.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 45						
Packet Error Control.						

Figure 51: Disable MilBus Inactivity Reset

2.7.1.29 Set TIR TDI Calibration Delay

Function Id = 56.

MSISW-1765

The TC Source Packet Data Field for the 'Set TIR TDI Calibration Delay' function is shown below in Figure 52.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 56						
TDI Delay (16 bits)						
Packet Error Control.						

Figure 52: Set TIR TDI Calibration Delay TC Format

Where:

- TDI Delay is 16 bits, number of Ground Lines to delay before performing TIR calibration – range 0 to 65535

2.7.1.30 Set FEE LBR VNS Day

Function Id = 150.

MSISW-1801

The TC Source Packet Data Field for the 'Set FEE LBR VNS Day' function is shown below in Figure 53.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 150						
Packet Error Control.						

Figure 53: Set FEE LBR VNS Day TC Format

2.7.1.31 Set FEE LBR VNS Night

Function Id = 151.

MSISW-1807

The TC Source Packet Data Field for the 'Set FEE LBR VNS Night' function is shown below in Figure 54.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 151						
Packet Error Control.						

Figure 54: Set FEE LBR VNS Night TC Format

2.7.1.32 SID ID for Science Ancillary Packets

Function Id = 54.

MSISW-1063

The TC Source Packet Data Field for the 'SID ID for Science Ancillary Packets' function is shown below in Figure 55.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 54						SID ID
Packet Error Control.						

Figure 55: SID ID for Science Ancillary Packets TC Format

Where:

- SID ID is 8 bits
  - 0, no HK Report is acquired as Ancillary data
  - 1 – 127, Structure Identifier for HK Report to be acquired as Ancillary data
  - 128-255, not used

2.7.1.33 Load Waveform Control Table

Function Id = 57.

MSISW-1830

The TC Source Packet Data Field for the 'Load Waveform Control Table' function is shown below in Figure 56.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 57						
Packet Error Control.						

Figure 56: Load Waveform Control Table TC Format

2.7.1.34 Set WCT Scaling Factor

Function Id = 58.

MSISW-1831

The TC Source Packet Data Field for the 'Set WCT Scaling Factor' function is shown below in Figure 57.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8	
Service Sub Type = 1						Source ID	
Function ID = 58						Filler (1 bit)	Wave Control Table Scaling Factor (7 bits)

Packet Error Control.

Figure 57: Set WCT Scaling Factor TC Format

Where:

- Wave Control Table Scaling Factor is a 7 bit value that the hardware multiplies the 7 bit PWM value by to give a 14 bit result. The hardware then takes the top 7 bits of the results as an input to the PWM generator (see [AD2])

2.7.1.35 FEE Command Resend

Function Id = 59.

MSISW-1913

The TC Source Packet Data Field for the 'Command Resend' function is shown below in Figure 58.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 59						Number of Resends
Packet Error Control.						

Figure 58: Command Resend TC Format

Where:

- Number of Resends is the number of retries for FEE commands, 8 bits
  - 0-3, number of re-sends
  - 4-255, not used

2.7.1.36 Mechanism Power Supply On

Function Id = 152

MSISW-1957

The TC Source Packet Data Field for the 'Mechanism Power Supply On' function is shown below in Figure 59.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 152						
Packet Error Control.						

Figure 59: Mechanism Power Supply On TC Format

2.7.1.37 Mechanism Power Supply Off

Function Id = 153.

MSISW-1958

The TC Source Packet Data Field for the 'Mechanism Power Supply Off' function is shown below in Figure 60.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 153						
Packet Error Control.						

Figure 60: Mechanism Power Supply Off TC Format

2.7.1.38 Set Truncation Factor

Function Id = 60.

MSISW-1998

The TC Source Packet Data Field for the 'Set Truncation Factor' function is shown below in Figure 61.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8	
Service Sub Type = 1						Source ID	
Function ID = 60						Flat Field ID (4 bits)	Truncation Factor (4 bits)
Packet Error Control.							

Figure 61: Set Truncation Factor TC Format

Where:

- Flat Field ID is 4 bits
  - 0-7, Flat Field ID
  - 8-15, not used
- Truncation Factor is 4 bits
  - 0-7, Truncation Factor
  - 8-15, not used

2.7.1.39 Switch On Decontamination Heater

Function Id = 161.

MSISW-1994

The TC Source Packet Data Field for the 'Switch On Decontamination Heater' function is shown below in Figure 62.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 161						
Packet Error Control.						

Figure 62: Switch On Decontamination Heater

Note that it is expected that this TC will be invoked from the OBCP interpreter.

2.7.1.40 Switch Off Decontamination Heater

Function Id = 162.

MSISW-1994

The TC Source Packet Data Field for the 'Switch Off Decontamination Heater' function is shown below in Figure 63.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 162						
Packet Error Control.						

Figure 63: Switch Off Decontamination Heater

Note that it is expected that this TC will be invoked from the OBCP interpreter.

.

2.7.1.41 Reset ICU MIL Bus Inactivity

Function Id = 48.

The TC Source Packet Data Field for the 'Reset ICU Mil Bus Inactivity' function is shown below The TC is triggered internally by the SW in case MIL-Bus inactivity results in an ICU reset.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 48						
Packet Error Control.						

Figure 64 Reset ICU Mil Bus Inactivity

2.7.1.42 Set PPS Acceptance Limit

Function Id = 46.

At software start-up the default PPS Acceptance Limit is 4 milliseconds.

The TC Source Packet Data Field for the 'Set PPS Acceptance Limit' function is shown below.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 46						
Limit MS Word (16bits)						
Limit LS Word (16bits)						
Packet Error Control.						

Figure 65: Set PPS Acceptance Limit

Where:

Limit is the upper limit for an acceptable time difference between a Time Message from the OBC and the PPS reception time. The Limit is specified in microseconds.

2.7.1.43 Set PPS Sync Limit

Function Id = 47.

At software start-up the default PPS Sync Limit is 100 microseconds.

The TC Source Packet Data Field for the 'Set PPS Sync Limit' function is shown below.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 8
Service Sub Type = 1						Source ID
Function ID = 47						
Limit MS Word (16bits)						
Limit LS Word (16bits)						
Packet Error Control.						

Figure 66: Set PPS Sync Limit

Where:

Limit is the upper limit for a time difference between a Time Message from the OBC and the PPS reception time for which the LOBT is considered to be synchronised. The Limit is specified in microseconds. The 'PPS Sync Limit' should always be less than the 'PPS Acceptance Limit'.

2.7.2 Enable Function Execution

Service Type Id = 8.
Service Sub-Type Id = 140

TC(8,140) sets the execution status of the function identified by Function ID to "Enabled".

N	Function ID (repeat N times)

Figure 67: Enable Function Execution TC Format

Where:

- Number of function status values to be set (0….213)
  - N = 0 means all function status values to be set
- Function ID: Identification number of the Function

2.7.3 Disable Function Execution

Service Type Id = 8.
Service Sub-Type Id = 141

TC(8,141) sets the execution status of the function identified by Function ID to "Disabled".

N	Function ID (repeat N times)

Figure 68: Disable Function Execution TC Format

Where:

- Number of function status values to be set (0….213)
  - N = 0 means all function status values to be set
- Function ID: Identification number of the Function

2.7.4 Enable Autoreset of Execution Enable Flag

Service Type Id = 8.
Service Sub-Type Id = 142

TC(8,142) sets the *autoreset status* of the function identified by *Function ID* to "Autoreset Enabled" and the *execution status* to "Disabled". This means the function must be explicitly enabled before it can be executed only once. After execution the function status is set back to "Disabled" automatically.

N	Function ID (repeat N times)

Figure 69: Enable Autoreset of Execution Enable Flag TC Format

Where:

- Number of function status values to be set (0….213)
  - N = 0 means all function status values to be set
- Function ID: Identification number of the Function

2.7.5 Disable Autoreset of Execution Enable Flag

Service Type Id = 8.
Service Sub-Type Id = 143

TC(8,143) sets the *autoreset status* of the function identified by *Function ID* to "Auroreset disabled". The *execution status* is unaffected. With "Autoreset disabled" the *execution status* remains statically at the value set by TC(8,140) and TC(8,141), regardless whether the function has been executed or not.

N	Function ID (repeat N times)

Figure 70: Disable Autoreset of Execution Enable Flag TC Format

Where:

- Number of function status values to be set (0….213)
  - N = 0 means all function status values to be set
- Function ID: Identification number of the Function

2.7.6 Report Function Status

Service Type Id = 8.
Service Sub-Type Id = 144

TC(8,144) request the Function Status Report TM(8,145).

N	Function ID (repeat N times)

Figure 71: Report Function Status TC Format

Where:

- Number of function status values to be reported (0….213)
  - N = 0 means all function status values to be reported
- Function ID: Identification number of the Function

2.8 Service 9 – Time Management Service

2.8.1 Trigger Time Synchronization Verification

Service Type Id = 9
Service Sub-Type Id = 135

Upon reception of TC(9,135) the receiving application shall generate at reception of the next synchronisation reference and distribute in case of successful synchronisation an Event Report packet TM(5,1,32) 'EID_Time_Sync_OK' containing

- Info 1 parameter: LOBT at reception of this TC
- Info 2 parameter: received OBT for next synchronization reference
- Info 3 parameter: new LOBT at synchronization reference
- Info 4 parameter: original LOBT at synchronisation reference

Note:

The difference (Info 3 parameter – Info 4 parameter) yields the drift of the LOBT in between 2 synchronisation references. In case of unsuccessful synchronisation an Event Report packet TM(5,3,32800) 'EID_Time_Synch_Fail' containing

- Info 1 parameter: LOBT at reception of this TC
- Info 2 parameter: received OBT for next synchronization reference
- Info 3 parameter: new LOBT at synchronization reference
- Info 4 parameter: original LOBT at synchronisation reference

2.8.2 Select Time Synchronization Reference

Service Type Id = 9
Service Sub-Type Id = 136

TC(9,136) is used to select the synchronization reference for external datation users. This can be either PPS main, PPS red or none.

Filler (6 bits)	SynchRef (2 bit)

Figure 72: Select Time Synchronization Reference TC Format

Where:

- SynchRef: Identifies the current synchronization reference (0…none / 1…PPS main / 2…PPS red)

2.9 Service 12 – On Board Parameter Monitoring

2.9.1 Enable Monitoring of Parameters

Service Type Id = 12
Service Sub-Type Id = 1

Upon reception of TC(12,1) the monitoring of the specified parameters shall be enabled.

N	Monitoring ID

Figure 73: Enable Monitoring of Parameters TC Format

Where:

- N: Number of parameter ID's following (0….193):
  - 0: enable Monitoring Service, leaving each individual entry in its current state
  - 1…193: each parameter in request set to enabled
- Monitoring lD: Identification of a monitoring control table entry (1…255)

2.9.2 Disable Monitoring of Parameters

Service Type Id = 12
Service Sub-Type Id = 2

Upon reception of TC(12,2) the monitoring of the specified parameters shall be disabled.

N	Monitoring ID

Figure 74: Disable Monitoring of Parameters TC Format

Where:

- N: Number of parameter ID's following (0….193) :
  - 0: enable Monitoring service, leaving each individual entry in its current state
- 1…193: each parameter in request set to enabled
- Monitoring lD: Identification of a monitoring control table entry (1…255)

2.9.3 Change Maximum Reporting Delay

Service Type Id = 12
Service Sub-Type Id = 4

Upon reception of TC(12,4) the service provider shall act as follows:

- clear all entries of the monitoring list
- clear all entries of the transition reporting list

The TC will be rejected if the monitoring service has not been globally disabled before.

2.9.4 Add/Modify Parameters to/in Monitoring List

Service Type Id = 12
Service Sub-Type Id = 5

Upon reception of TC(12,5) the specified record shall be added to/modified in the monitoring list. If the Monitoring ID already exists the new record shall replace the old one.

N	Monitoring ID
Parameter ID MS word	
Parameter ID LS word	
&Validity Parameter MS word	
&Validity Parameter LS word	
Parameter Monitoring Interval	
Rep	Monitoring Status
NOL	
Limit Monitoring	Low Limit[0] MS word
Limit Monitoring	Low Limit[0] LS word
Limit Monitoring	Low Limit[1] MS word
Limit Monitoring	Low Limit[1] LS word
Limit Monitoring	EID
Limit Monitoring	High Limit[0] MS word
Limit Monitoring	High Limit[0] LS word
Limit Monitoring	High Limit[1] MS word
Limit Monitoring	High Limit[1] LS word
Limit Monitoring	EID

NOE	
Expected Value	Mask MS word
Expected Value	Mask LS word
Expected Value	Expected Value MS word
Expected Value	Expected Value LS word
Expected Value	EID

Figure 75: Add/Modify Parameters to/in Monitoring List TC Format

Where:

- N: Repetition count for the following fields (1…5)
- Monitoring ID: ID of Monitoring Control Table Entry (1…255)
- Parameter ID: Unique identification of the parameter to monitor
- &Validity Parameter: A Boolean parameter whose value determines whether a parameter is valid or not
- Parameter Monitoring interval: Defines the number of cycles in between two subsequent monitorings (1…65636)
- Rep: Repetition Interval (1…255)
- Monitoring Status: The Boolean parameter whose value determines whether monitoring of this entry is applied (0 disabled/ 1 enabled)
- NOL: Presence of limit check definition
- Low Limit: Low limit
- EID: Event ID associated with the low limit of the monitoring description
- High Limit: high limit
- EID: Event ID associated with the high limit of the monitoring description
- NOE: Presence of expected value check definition
- Mask: Bit mask used to monitor only selected bits from a composite parameter
- Expected Value: Expected value
- EID: Event ID associated with the monitoring description

2.9.5 Delete Parameters from Monitoring List

Service Type Id = 12
Service Sub-Type Id = 6

Upon reception of TC(12,6) the specified parameter shall be deleted from the monitoring list, provided the parameters monitoring is not "ENABLED".

N	Monitoring ID

Figure 76: Delete Parameters from Monitoring List TC Format

Where:

- N: Number of Parameters follow (1…193)

- Monitoring ID: ID of Monitoring Control Table Entry (1…255)

2.9.6 Report Current Monitoring List

Service Type Id = 12
Service Sub-Type Id = 8

Upon reception of TC(12,8) the report TM(12,9) shall be generated.

2.10 Service 17 – Test Services

2.10.1 Perform Connection Test

Service Type Id = 17
Service Sub-Type Id = 1

TC(17,1) is used to test the end-to-end connection between ground and the onboard application process. The addressed onboard application responds with TM(17,2).

2.11 Service 19 – Event/Action Service

2.11.1 Add Events to the Detection List

Service Type Id = 19
Service Sub-Type Id = 1

Upon reception of TC(19,1) the specified event shall be added. If the PRID/EID combination is already in the detection list the entry shall be updated. The event action status shall be set to "disabled".

Filler (1 bit)	PRID (7 bits)	
EID		
TC		

Figure 77: Add Events to the Detection List TC Format

Where:

- PRID: Process ID
- EID: Event Identifier
- TC: Complete TC packet

2.11.2 Delete Events from the Detection List

Service Type Id = 19
Service Sub-Type Id = 2

Upon reception of TC(19,2) the specified event shall be deleted.

Filler (1 bit)	PRID (7 bits)	
EID		

Figure 78: Delete Events from the Detection List TC Format

Where:

- PRID: Process ID
- EID: Event Identifier

2.11.3 Clear Events from the Detection List

Service Type Id = 19
Service Sub-Type Id = 3

Upon reception of TC(19,3) the all entries in the event detection list shall be deleted.

2.11.4 Enable Actions

Service Type Id = 19
Service Sub-Type Id = 4

Upon receipt of TC(19.4) the action associated to the specified event shall be enabled.

N	Filler (1 bit)	PRID
EID		

Figure 79 : Enable Actions TC Format

Where:

- N: Number of parameter sets to follow
  - 0, enable the Event Action Service, leaving each individual entry in its current state
  - 1-71, number of parameter sets to follow
  - 72-255, not used
- PRID: Process ID
- EID: Event identifier

2.11.5 Disable Actions

Service Type Id = 19
Service Sub-Type Id = 5

Upon reception of TC(19,5) the specified event shall be disabled.

N	Filler (1 bit)	PRID
EID		

Figure 80 : Disable Actions TC Format

Where:

- N: Number of parameter sets to follow
  - 0, enable the Event Action Service, leaving each individual entry in its current state
  - 1-71, number of parameter sets to follow
  - 72-255, not used

- PRID: Process ID
- EID: Event identifier

2.11.6 Report the Event Detection List

Service Type Id = 19
Service Sub-Type Id = 6

Upon reception of TC(19,6) the report TM(19,7) shall be generated.

2.11.7 Report Single Event Detection Entry

Service Type Id = 19
Service Sub-Type Id = 130

Upon reception of TC(19,130) the report TM(19,131) shall be generated.

Filler (1 bit)	PRID (7 bits)	
EID		

Figure 81: Report Single Event Detection Entry TC Format

Where:

- PRID: Process ID
- EID: Event Identifier

2.12 Service 140 – Parameter Management Service

2.12.1 Set N Parameters

Service Type Id = 140
Service Sub-Type Id = 1

Upon receipt of TC(140,1) the values of the N predefined parameters shall be set to a given value.

NPAR	
Parameter ID MS word (repeat NPAR times)	
Parameter ID LS word (repeat NPAR times)	
Parameter Value (deduced) (repeat NPAR times)	

Figure 82: Set N Parameters TC Format

Where:

- NPAR: Amount of parameters to be set (1…38)
- Parameter ID: Number uniquely identifying a parameter out of a list
- Parameter Value: new parameter value

2.12.2 Get N Parameters

Service Type Id = 140
Service Sub-Type Id = 2

Upon receipt of TC(140,2) the value of N predefined parameters shall be reported by TM(140.3).

NPAR	
Parameter ID MS word	(repeat NPAR times)
Parameter ID LS word	(repeat NPAR times)

Figure 83: Get N Parameters TC Format

Where:

- Amount of parameters to be reported (1….48)
- Parameter ID: Number uniquely identifying a parameter of a list

2.12.3 Define Onboard Parameter

Service Type Id = 140
Service Sub-Type Id = 4

TC(140,4) defines a new onboard Parameter, or replaces an existing one. The definition consists in associating a predefined "auxiliary=spare" logical identifier (unique "Parameter ID") to a physical RAM memory location which corresponds to a data of the ASW. Thus, once the definition has been performed, the onboard Parameter can be used through its logical "Parameter ID" in the frame of other services (Housekeeping, Monitoring, TM Extraction …).

NPAR
Parameter ID MS word
Parameter ID LS word
RAM Address MS word
RAM Address LS word
Param Length
Param Type MS word
Param Type LS word

Figure 84: Define Onboard Parameter TC Format

Where:

- NPAR: number of cumulated parameters in the definition (1…..14)
- Parameter ID: number uniquely identifying a parameter out of a list of generic parameters
- RAM Address: Memory address building the pointer to the data value to be assigned to the HK
- Param Length: Length of memory in smallest addressable units (SAU) are to be assigned to Parameter ID (0…255)
- Param Type: Type of associated data

2.13 Service 145 – Spacecraft State Vector (SSV) Management

2.13.1 Update Spacecraft State Vector (SSV)

Service Type Id = 145
Service Sub-Type Id = 128

The service sub-type TC(145,128) is to be provided by each application having the need to get information about the current spacecraft state like orbit position, quality of the supporting services, and other mission specific realtime information. The service sub-type is generated on-board and sent to other on-board applications for example in instruments and/or equipments to distribute the Spacecraft State Vector as needed.

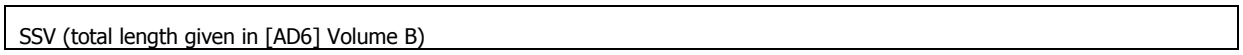

Figure 85: Update Spacecraft State Vector (SSV) TC Format

Where:

- SSV: Spacecraft State Vector

3. TM SOURCE PACKETS

3.1 General

TM Source Packets are sent by the ASW over the MIL-STD-1553B Interface. The ASW supports the following list of Services and Sub-Types defined in [AD1]:

- Service 1:
  - Sub-type 1: Telecommand Acceptance Report – success
  - Sub-type 2: Telecommand Acceptance Report – failure
  - Sub-type 7: Telecommand Execution Completion Report – success
  - Sub-type 8: Telecommand Execution Completion Report – failure
- Service 2:
  - Sub-type 133: Direct I/O Response
- Service 3:
  - Sub-type 10: HK Parameter Report Definitions Report
  - Sub-type 12: Diagnostic Parameter Report Definitions Report
  - Sub-type 25: Housekeeping Parameter Report
  - Sub-type 26: Diagnostic Parameter Report
  - Sub-type 129: HK/Diag Parameter Report Definitions Report Summary
- Service 5:
  - Sub-type 1: Normal Progress Report
  - Sub-type 2: Error/Anomaly Report – low severity
  - Sub-type 3: Error/Anomaly Report – medium severity
  - Sub-type 4: Error/Anomaly Report – high severity
  - Sub-type 134: Disabled EID Report
- Service 6:
  - Sub-type 6: Memory Dump Response
  - Sub-type 10: Memory Check Report
- Service 8:
  - Sub-type 145: Function Status Report
- Service 12:
  - Sub-type 9: Current Monitoring List Report
- Service 17:
  - Sub-type 2: Link Connection Report
- Service 19:

- Sub-type 7: Event Detection List Report
- Sub-type 131: Single Event Detection Entry Report

- Service 140:
  - Sub-type 3: Parameter Report

The TM Source Packet formats are defined in EarthCARE PUS [AD6]. Where the definition is insufficient, or missing, then the packet format will be defined below.

3.1.1 TM Packet Data Field Header

The TM Packet Data Field Header will be populated as detailed in Figure 86. This will be at the start of but not reproduced for each TM packet detailed in the remainder of this section.

Spare = 0	Pus version = 001	Spare = 0	Service Type (8 bits)
Service Sub-Type (8 bits)			Destination ID (8 bits)
Coarse Time Field MS word (16 bits)			
Coarse Time Field LS word (16 bits)			
Fine Time Field MS Byte (8 bits)			Fine Time Field (8 bits)
Fine Time Field LS Byte (8 bits)			Synch/Time Quality (8 bits)

Figure 86: TM Packet Data Field Header Format

Where:

- Service Type – Source packet specific
- Service Sub-Type – Source Packet specific
- Destination ID – Fixed at 0x00 = Ground
- Coarse Time – 32 bit copy of LOBT Coarse Time register from the PS_FPGA
- Fine Time – 24 bit copy of LOBT Fine Time register from the PS_FPGA
- Synch/Time Quality – Format defined in EarthCARE PUS [AD6] section 4.8.1

3.2 Service 1 – Telecommand Verification Service

3.2.1 Telecommand Acceptance Report – Success

Service Type Id = 1
Service Sub-Type Id = 1

This report is generated if the corresponding ACK flag was set in the TC. The report informs the TC source about the successful reception of the TC by the receiving onboard application (PRID).

ID = ID_Telecommand_Acceptance_Report_Success
TC Packet Sequence Control (16 bits)

Figure 87: Telecommand Acceptance Report – Succss TM Packet Format

Where:

- TC Packet Sequence Control – copy of the 16 bits of the TC Packet Sequence Control contained in the TC Packet Header

3.2.2 Telecommand Acceptance Report – Failure

Service Type Id = 1
Service Sub-Type Id = 2

This report is generated if the acceptance check of a TC failed. Each application process shall provide TC acceptance failure report independent from the ACK flag settings. The actual failure cause can be determined *by the FID* and the attached parameters. Dedicated details are given in the unit specific volumes in [AD6].

ID = Telecommand Acceptance Report – Failure
TC Packet Sequence Control (16 bits)
Fault ID (FID) (16 bits)
Parameters (data types and size variable) (16 bits)

Figure 88: Telecommand Acceptance Report – Failure TM Packet Format

Where:

- TC Packet Sequence Control – copy of the 16 bits of the TC Packet Sequence Control contained in the TC Packet Header
- Fault ID (FID) – Fault Identification Code, as defined in [AD6]
- Parameters (data types and size variable) – Complimentary information, as defined in [AD6]

3.2.3 Telecommand Execution Completion Report – Failure

Service Type Id = 1
Service Sub-Type Id = 8

Each application process shall provide TC execution failure report independent from the ACK flag settings.

3.2.3.1 FID_INVALID_MODE_TRANSIT

Mode transition failed due to invalid requested transition.

FID (16 bits) = FID_INVALID_MODE_TRANSIT
Current_Mode (MS word)
Current_Mode (LS word)
Target_Mode (MS word)
Target_Mode (LS word)

Figure 89: FID_INVALID_MODE_TRANSIT Fault Report TM Packet Format

3.2.3.2 WR_FEE_INV_REG_ID

Write_FEE_Register failed due to invalid Register_ID

FID (16 bits) = FID_WR_FEE_INV_REG_ID	
	Register_ID (8 bits)

Figure 90: WR_FEE_INV_REG_ID Fault Report TM Packet Format

3.2.3.3 WR_FEE_NOT_POWERED

Write_FEE_Register failed due to FEE power state being OFF

FID (16 bits) = FID_WR_FEE_NOT_POWERED

Figure 91: WR_FEE_NOT_POWERED Fault Report TM Packet Format

3.2.3.4 RD_FEE_INV_REG_ID

Read_FEE_Register failed due to invalid Register_ID

FID (16 bits) = FID_RD_FEE_INV_REG_ID	
	Register_ID (8 bits)

Figure 92: RD_FEE_INV_REG_ID Fault Report TM Packet Format

3.2.3.5 RD_FEE_NOT_POWERED

Read_FEE_Register failed due to FEE power state being OFF

FID (16 bits) = FID_RD_FEE_NOT_POWERED

Figure 93: RD_FEE_NOT_POWERED Fault Report TM Packet Format

3.2.3.6 TEST_FEE_REG_ERRORS

The Test FEE Registers procedure failed. The parameters indicate the success or failure state for each of the potential 128 registers; 0 = OK; 1 = NOK. Note that not all register IDs have defined uses and not all are testable. Where not defined or not testable the failure state will be reported as OK.

FID (16 bits) = FID_TEST_FEE_REG_ERRORS
Test status for Register IDs 0..15 (16 bits)
Test status for Register IDs 16..31 (16 bits)
Test status for Register IDs 32..47 (16 bits)
Test status for Register IDs 48..63 (16 bits)
Test status for Register IDs 64..79 (16 bits)
Test status for Register IDs 80..95 (16 bits)
Test status for Register IDs 96..111 (16 bits)
Test status for Register IDs 112..127 (16 bits)

Figure 94: TEST_FEE_REG_ERRORS Fault Report TM Packet Format

3.2.3.7 CHECK_FEE_REG_ERRORS

The Check FEE Registers procedure failed. The parameters indicate the success or failure state for each of the potential 128 registers; 0 = OK; 1 = NOK. Note that not all register IDs have defined uses and not all are checked. Where not defined or not checked the failure state will be reported as OK.

FID (16 bits) = FID_CHECK_FEE_REG_ERRORS
Check status for Register IDs 0..15 (16 bits)
Check status for Register IDs 16..31 (16 bits)
Check status for Register IDs 32..47 (16 bits)
Check status for Register IDs 48..63 (16 bits)
Check status for Register IDs 64..79 (16 bits)
Check status for Register IDs 80..95 (16 bits)
Check status for Register IDs 96..111 (16 bits)
Check status for Register IDs 112..127 (16 bits)

Figure 95: CHECK_FEE_REG_ERRORS Fault Report TM Packet Format

3.2.3.8 FEE_CMD_FAILED

An FEE command was unsuccessful after retries.

FID (16 bits) = FID_FEE_CMD_FAILED

Figure 96: FEE_CMD_FAILED Fault Report TM Packet Format

3.2.3.9 FEE_TEST_CMD_FAILED

An FEE command during the Register Test sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_TEST_CMD_FAILED

Figure 97: FEE_TEST_CMD_FAILED Fault Report TM Packet Format

3.2.3.10 FEE_LOAD_CMD_FAILED

An FEE command during the Register Load sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_LOAD_CMD_FAILED

Figure 98: FEE_LOAD_CMD_FAILED Fault Report TM Packet Format

3.2.3.11 FEE_CHECK_CMD_FAILED

An FEE command during the Register Check sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_CHECK_CMD_FAILED

Figure 99: FEE_CHECK_CMD_FAILED Fault Report TM Packet Format

3.2.3.12 FEE_EXT_MEM_CMD_FAILED

An FEE command during the ASW-controlled FEE external memory test sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_EXT_MEM_CMD_FAILED

Figure 100: FEE_EXT_MEM_CMD_FAILED Fault Report TM Packet Format

3.2.3.13 FEE_INT_MEM_CMD_FAILED

An FEE command during the ASW-controlled FEE internal memory test sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_INT_MEM_CMD_FAILED

Figure 101: FEE_INT_MEM_CMD_FAILED Fault Report TM Packet Format

3.2.3.14 FEE_FEE_MEM_CMD_FAILED

An FEE command during the FEE-controlled FEE memory test sequence was unsuccessful after retries; sequence was aborted.

FID (16 bits) = FID_FEE_FEE_MEM_CMD_FAILED

Figure 102: FEE_FEE_MEM_CMD_FAILED Fault Report TM Packet Format

3.2.3.15 FEE_MEM_TEST_NOT ENABLED

The ASW-controlled FEE Memory Test TC did not start because the procedure has not been enabled.

FID (16 bits) = FID_FEE_MEM_TEST_NOT_ENABLED

Figure 103: FEE_MEM_TEST_NOT_ENABLED Fault Report TM Packet Format

3.2.3.16 FEE_MEM_TEST_ABORTED

The ASW-controlled FEE Memory Test TC failed because the procedure was aborted by command.

FID (16 bits) = FID_FEE_MEM_TEST_ABORTED

Figure 104: FEE_MEM_TEST_ABORTED Fault Report TM Packet Format

3.2.3.17 TIR_SLEW_IN_PROGRESS

A requested TIR or VNS slew is not permitted because a TIR slew is already in progress.

FID (16 bits) = FID_TIR_SLEW_IN_PROGRESS

Figure 105: TIR_SLEW_IN_PROGRESS Fault Report TM Packet Format

3.2.3.18 VNS_SLEW_IN_PROGRESS

A requested TIR or VNS slew is not permitted because a VNS slew is already in progress.

FID (16 bits) = FID_VNS_SLEW_IN_PROGRESS

Figure 106: VNS_SLEW_IN_PROGRESS Fault Report TM Packet Format

3.2.3.19 MECHANISM_POWER_IS_OFF

A requested TIR or VNS slew is not permitted because the mechanism power is off.

FID (16 bits) = FID_MECHANISM_PWR_IS_OFF

Figure 107: MECHANISM_PWR_IS_OFF Fault Report TM Packet Format

3.2.3.20 ENCODER_POWER_IS_OFF

A requested TIR or VNS slew is not permitted because the LED encoder power is off.

FID (16 bits) = FID_ENCODER_PWR_IS_OFF

Figure 108: ENCODER_PWR_IS_OFF Fault Report TM Packet Format

3.2.3.21 TIR_STEP_COUNT_OUT_OF_RANGE

The requested step number is not within the defined range.

FID (16 bits) = FID_TIR_STEP_COUNT_OUT_OF_RANGE

Figure 109: TIR_STEP_COUNT_OUT_OF_RANGE Fault Report TM Packet Format

3.2.3.22 TIR_SLEW_PROHIBITED_INVALID_SCT

A requested TIR slew is not possible because a valid SCT could not be constructed.

FID (16 bits) = FID_TIR_SLEW_PROHIBITED_INVALID_SCT

Figure 110: TIR_SLEW_PROHIBITED_INVALID_SCT Fault Report TM Packet Format

3.2.3.23 TIR_SEEK_FAILED_POSITION_INVALID

A requested TIR slew was unsuccessful because the position was not indicated as valid following an attempted 'seek' operation (i.e. Cold Space Datum not indicated as 'encountered' in the TIR Position Monitor Register).

FID (16 bits) = FID_TIR_SEEK_FAILED_POSITION_INVALID

Figure 111: TIR_SEEK_FAILED_POSITION_INVALID Fault Report TM Packet Format

3.2.3.24 TIR_SEEK_FAILED_UNEXPECTED_ENCODER_VALUE

A requested TIR slew was unsuccessful because the encoder value (as reported in the TIR Position Monitor Register) did not match the expected value after a seek operation, i.e. either :

a) For a starting sector of '10' or '11', the encoder value was not '00' after a 1000-step CW slew;

b) For a starting sector of '10' or '11', the encoder value was not '10' after the third CCW slew;

c) For a starting sector of '00' or '01', the encoder value was not '10' after the third CCW slew;

FID (16 bits) = FID_TIR_SEEK_FAILED_UNEXPECTED_ENCODER_VALUE

Figure 112: TIR_SEEK_FAILED_UNEXPECTED_ENCODER_VALUE Fault Report TM Packet Format

3.2.3.25 TIR_MECHANISM_TIMEOUT

A time-out occurred during a requested TIR slew.

FID (16 bits) = FID_TIR_MECHANISM_TIMEOUT

Figure 113: TIR_MECHANISM_TIMEOUT Fault Report TM Packet Format

3.2.3.26 VNS_STEP_COUNT_OUT_OF_RANGE

The requested step number is not within the defined range.

FID (16 bits) = FID_VNS_STEP_COUNT_OUT_OF_RANGE

Figure 114: VNS_STEP_COUNT_OUT_OF_RANGE Fault Report TM Packet Format

3.2.3.27 VNS_SLEW_PROHIBITED_INVALID_SCT

A requested VNS slew was unsuccessful because a valid SCT could not be constructed.

FID (16 bits) = FID_VNS_SLEW_PROHIBITED_INVALID_SCT

Figure 115: VNS_SLEW_PROHIBITED_INVALID_SCT Fault Report TM Packet Format

3.2.3.28 VNS_SEEK_FAILED_POSITION_INVALID

A requested VNS slew was unsuccessful because the position was not indicated as valid following an attempted 'seek' operation (i.e. none of positions A..D were indicated as 'encountered' in the VNS Position Monitor Register).

FID (16 bits) = FID_VNS_SEEK_FAILED_POSITION_INVALID

Figure 116: VNS_SEEK_FAILED_POSITION_INVALID Fault Report TM Packet Format

3.2.3.29 VNS_MECHANISM_TIMEOUT

A time-out occurred during a requested VNS slew.

FID (16 bits) = FID_VNS_MECHANISM_TIMEOUT

Figure 117: VNS_MECHANISM_TIMEOUT Fault Report TM Packet Format

3.2.3.30 MECHANISM_ABORT_IN_PROGRESS

A requested mechanism operation abort was rejected because an abort process was already in progress.

FID (16 bits) = FID_MECHANISM_ABORT_IN_PROGRESS

Figure 118: MECHANISM_ABORT_IN_PROGRESS Fault Report TM Packet Format

3.2.3.31 MECHANISM_SLEW_ABORTED

A requested mechanism operation was aborted either following an Abort TC or because an abort case was detected.

FID (16 bits) = FID_MECHANISM_SLEW_ABORTED

Figure 119: Mechanism_Slew_Aborted Fault Report TM Packet Format

3.2.3.32 PARK_POSITION_NOT_REACHED

A requested mechanism operation abort was not successful because the parked position was not reached successfully.

FID (16 bits) = FID_PARK_POSITION_NOT_REACHED

Figure 120: Park_Position_Not_Reached Fault Report TM Packet Format

3.2.3.33 INVALID_MODE_FOR_TC

Mechanism is in invalid mode to handle the requested telecommand.

FID (16 bits) = FID_INVALID_MODE_FOR_TC	
Current Mode (8 bits)	Current Submode (8 bits)

Figure 121: FID_INVALID_MODE_FOR_TC Fault Report TM Packet Format

3.2.3.34 TC_IN_THE_Q

Telecommand cannot be executed because execution of another telecommand is pending.

FID (16 bits) = FID_TC_IN_THE_Q

Figure 122: FID_INVALID_MODE_FOR_TC Fault Report TM Packet Format

3.2.3.35 INVALID_TIR_POINTING_DIRECTION_FOR_TC

Telecommand cannot be executed because it is invalid for the current TIR pointing direction.

FID (16 bits) = ID_INVALID_TIR_POINTING_DIRECTION_FOR_TC	
TIR pointing direction (8 bits)	

Figure 123: FID_INVALID_TIR_POINTING_DIRECTION_FOR_TC Fault Report TM Packet Format

3.2.3.36 INVALID_REFERENCE_SET_ID

Provided Reference Set ID is invalid.

FID (16 bits) = FID_INVALID_REFERENCE_SET_ID

Figure 124: FID_INVALID_REFERENCE_SET_ID Fault Report TM Packet Format

3.2.3.37 INVALID_VNS_POINTING_DIRECTION_FOR_TC

Telecommand cannot be executed because it is invalid for the current VNS pointing direction.

FID (16 bits) = ID_INVALID_VNS_POINTING_DIRECTION_FOR_TC	
VNS pointing direction (8 bits)	

Figure 125: FID_INVALID_VNS_POINTING_DIRECTION_FOR_TC Fault Report TM Packet Format

3.2.3.38 FLAT_FIELD_REFERENCE_SET_INVALID

Reference Set is invalid.

FID (16 bits) = FID_FLAT_FIELD_REFERENCE_SET_INVALID

Figure 126: FID_FLAT_FIELD_REFERENCE_SET_INVALID Fault Report TM Packet Format

3.2.3.39 INVALID_BAND_ID

Requested Band ID is invalid.

FID (16 bits) = FID_INVALID_BAND_ID

Figure 127: FID_INVALID_BAND_ID Fault Report TM Packet Format

3.2.3.40 FID_INVALID_FF_AVERAGE_NUMBER

Provided Flat Field Average number is invalid.

FID (16 bits) = FID_INVALID_FF_AVERAGE_NUMBER

Figure 128 FID_INVALID_FF_AVERAGE_NUMBER Fault Report TM Packet Format

3.2.3.41 FID_INVALID_FLAT_FIELD_ID

Provided Flat Field ID is invalid.

FID (16 bits) = FID_INVALID_FLAT_FIELD_ID

Figure 129 FID_INVALID_FLAT_FIELD_ID Fault Report TM Packet Format

3.2.3.42 FID_INVALID_TRUNCATION_FACTOR

Provided Truncation Factor is invalid.

FID (16 bits) = FID_INVALID_TRUNCATION_FACTOR

Figure 130 FID_INVALID_TRUNCATION_FACTOR Fault Report TM Packet Format

3.2.3.43 FID_INVALID_CALIBRATION_STATE

Telecommand is invalid for the current calibration state.

FID (16 bits) = FID_INVALID_CALIBRATION_STATE	
Calibration State (8 bits)	

Figure 131 FID_INVALID_CALIBRATION_STATE Fault Report TM Packet Format

3.2.3.44 FID_INVALID_TIR_POINTING_DIRECTION

Provided TIR pointing direction is invalid.

FID (16 bits) = FID_INVALID_TIR_POINTING_DIRECTION

Figure 132 FID_INVALID_TIR_POINTING_DIRECTION Fault Report TM Packet Format

3.2.3.45 FID_INVALID_VNS_POINTING_DIRECTION

Provided VNS pointing direction is invalid.

FID (16 bits) = FID_INVALID_VNS_POINTING_DIRECTION

Figure 133 FID_INVALID_VNS_POINTING_DIRECTION Fault Report TM Packet Format

3.2.3.46 FID_INVALID_NUM_OF_FINAL_STEPS

Requested Final Number of Steps is invalid

FID (16 bits) = FID_INVALID_NUM_OF_FINAL_STEPS

Figure 134 FID_INVALID_NUM_OF_FINAL_STEPS Fault Report TM Packet Format

3.2.3.47 FID_TIR_SLEW_FAILED

Requested TIR slew failed

FID (16 bits) = FID_TIR_SLEW_FAILED

Figure 135 FID_TIR_SLEW_FAILED Fault Report TM Packet Format

3.2.3.48 FID_VNS_SLEW_FAILED

Requested VNS slew failed

FID (16 bits) = FID_VNS_SLEW_FAILED

Figure 136 FID_VNS_SLEW_FAILED Fault Report TM Packet Format

3.2.3.49 FID_FEE_COMMAND_QUEUE_FULL

A requested FEE read or write register command was not successful because the queue for it to be written to is full

FID (16 bits) = FID_FEE_COMMAND_QUEUE_FULL

Figure 137: FID_FEE_COMMAND_QUEUE_FULL Fault Report TM Packet Format

3.2.3.50 FID_FEE_OPERATION_IN_PROGRESS

A requested FEE Operation of the same type as the one requested is already in progress.

FID (16 bits) = FID_FEE_OPERATION_IN_PROGRESS

Figure 138: FID_FEE_OPERATION_IN_PROGRESS Fault Report TM Packet Format

3.2.3.51 FID_FEE_REGISTER_ACQUIS_RATE_INVALID

A requested to change the acquisition rate of a FEE register has fail because the supplied value is out of range.

FID (16 bits) = FID_FEE_REGISTER_ACQUIS_RATE_INVALID

Figure 139: FID_FEE_REGISTER_ACQUIS_RATE_INVALID Fault Report TM Packet Format

3.2.3.52 FID_FEE_RESEND_ATTEMPTS_INVALID

A requested to change the number of resend attempts the FEE will make has fail because the supplied value is out of range.

FID (16 bits) = **FID_FEE_RESEND_ATTEMPTS_INVALID**

Figure 140: FID_FEE_RESEND_ATTEMPTS_INVALID Fault Report TM Packet Format

3.2.3.53 FID_FEE_INVALID_TIMING_PULSE

A requested time pulse is outside of valid range.

FID (16 bits) = FID_FEE_INVALID_TIMING_PULSE

Figure 141: FID_FEE_INVALID_TIMING_PULSE Fault Report TM Packet Format

3.2.3.54 FID_CALIB_TC_TIMEOUT

The calibration TC has been executing for longer than the timeout period (23 seconds).

FID (16 bits) = FID_CALIB_TC_TIMEOUT

Figure 142: FID_CALIB_TC_TIMEOUT Fault Report TM Packet Format

The actions invoked by the following TCs rely on a specific number of ground line packets being accumulated.

- TC(239,21) Generate TIR Reference Set
- TC(239,22) Dwell At TIR Cold Space View
- TC(239,23) Dwell At TIR Black Body View
- TC(236,21) Generate VNS Reference Set

If indications that the required number of packets have been accumulated, are not received within the timeout period (23 seconds) this FID is raised and the action is aborted.

3.2.3.55 FID_THERMAL_PARAM

The thermal parameter is out of range.

FID (16 bits) = FID_THERMAL_PARAMETER	
Thermal Parameter Number (8 bits)	

Figure 143: FID_THERMAL_PARAM Fault Report TM Packet Format

The actions invoked by the following TCs require a set number of ground line science packets to be received:

3.2.3.56 FID_TIR_CURR_POS_INV

At the start of the slew the value returned for step count (i.e. between mechanical end stops) is illegal, therefore required slew profile can not be calculated.

FID (16 bits) = FID_TIR_CURR_POS_INV

Figure 144: FID_TIR_CURR_POS_INV Fault Report TM Packet Format

3.2.4 Telecommand Execution Completion – Success

Service Type Id = 1
Service Sub-Type Id = 7

This report is generated if the corresponding ACK flag was set in the TC. The report informs the TC source about the successful completion of the execution of the TC by the receiving onboard application (PRID).

ID = ID_Telecommand_Completion_Report_Success
TC Packet Sequence Control (16 bits)

Figure 145: Telecommand Execution Completion Report – Success TM Packet Format

Where:

TC Packet Sequence Control – copy of the 16 bits of the TC Packet Sequence Control contained in the TC Packet Header

3.3 Service 2 – Device Command Distribution Service

3.3.1 Direct I/O Response

Service Type Id = 2.
Service Sub-Type Id = 133.

The ASW provides limited support for directly accessing Hardware IO registers. The Direct IO Response is generated in response to TC(2,132) Direct IO Commanding and supplies the contents of the accessed register. The format for Direct IO Response is shown below in Figure 146.

IOTDef MSWord
IOTDef LS Word
Request Id MS Word
Request Id LS Word
Status MS Word
Status LS Word
IO_Stat MS Word
IO_Stat LS Word
Opar[0] MSWord
Opar[0] LSWord
Opar[1] MSWord
Opar[1] LSWord
Opar[2] MSWord
Opar[2] LSWord
Dsize MSWord
Dsize LSWord

Figure 146: Direct IO Response TM Packet Format

Where:

- IOTDef is 1 – MSI_IO_TRANSACTION
- Request Id is Id of the IO Transaction Id
- Status is 0 – IO_SUCCESSFUL
- IO_Stat is 0 – Not used
- Opar[0] is Memory Mapped Register address. Refer to [AD2] for valid register addresses
- Opar[1] is 32 bit data value. Refer to [AD2] for data value formats applicable for the register address
- Opar[2] is 0 – Not used
- Dsize is 0.

3.4 Service 3 – Housekeeping Report

3.4.1 HK Parameter Report Definitions Report

Service Type Id = 3
Service Sub-Type Id = 10

TM(3,10) is the response to TC(3,9).

SID	
Collection Interval	
NPAR	
Parameter ID MS word (repeat NPAR times)	
Parameter ID LS word (repeat NPAR times)	

Figure 147: HK Parameter Report Definitions Report TM Packet Format

Where:

- SID: Structure ID of the HK Report Definition to be reported
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (value 1…65535)
- NPAR: number of cumulated parameters in the definition (value 0…N_MAX)
- Parameter ID: Number uniquely identifying a parameter out of a list

3.4.2 Diagnostic Parameter Report Definitions Report

Service Type Id = 3
Service Sub-Type Id = 12

TM(3,12) is the response to TC(3,11).

SID			
Collection Interval			
NPAR1			
Parameter ID MS word (repeat NPAR1 times)			
Parameter ID LS word (repeat NPAR1 times)			
NFA		NREP (repeat NFA times)	
NPAR2 (repeat NFA times)			
Parameter ID MS word (repeat NPAR1 times)	(repeat NPAR2 times)	(repeat NFA times)	
Parameter ID LS word (repeat NPAR1 times)	(repeat NPAR2 times)	(repeat NFA times)	

Figure 148: Diagnostic Parameter Report Definitions Report TM Packet Format

Where:

- SID: Structure ID of the HK report
- Collection Interval: generation period for this HK TM packet expressed in number of cycles (value 1…65535)
- NPAR1: The number of parameters in the definition that are sampled once per collection interval (value 0…NPAR1_MAX)
- Parameter ID: Number uniquely identifying a parameter out of a list
- NFA: The number of fixed-length arrays (0 or 1)
- NREP: The number of values to be sampled for each parameter within this fixed-length array (1…NREP_MAX)

- NPAR2: The number of different parameters within this fixed-length array, each of which shall be sampled "NREP" times per collection interval (1…NPAR2_MAX)
- Parameter ID: Number uniquely identifying a parameter out of a list

3.4.3 Housekeeping Parameter Report

Service Type Id = 3
Service Sub-Type Id = 25

MSIASW-192, MSISW-799, MSISW-1426

The ASW supports the following fixed definitions of Housekeeping reports.

3.4.3.1 SID 1 – Default Short Housekeeping Report

The structure of the TM Source Packet data field for default Short Housekeeping Report is shown in Figure 149, as defined in [AD3]. The default Short Housekeeping Report will be enabled as default and have a defined collection interval of 1Hz.

MSIASW-237

SID = 1	HW Validity ASW Primary Monitor (8 bits)
TC Count (8 bits)	Last Accepted TC Service Type ID (8 bits)
Last Accepted TC Service Sub-Type ID (8 bits)	Last Accepted TC(8,1) Function ID (8 bits)
Instrument Mode (8 bits)	Instrument Sub Mode (8 bits)
Mode Transition Status (8 bits)	Error Count (8 bits)
EEPROM Bank Health (16 bits)	
Last Error ID (16 bits)	
PPS Source (8 bits)	PPS Status (8 bits)
Power Control Status Word LS (16 bits)	
Overcurrent Status Word LS (16 bits)	
Busiest Scheduler Period (8 bits)	Busiest Scheduler Software Loading (%) (8 bits)
	FEE Status Register MS (8 bits)
FEE Status Register LS (16 bits)	
TEC PWM (16 btis)	
TIR Temp 1 (Detector hot side temperature sensor) (16 bits)	
Motor Control (16 bits)	
Motor PWM Scaling Factor (16 bits)	
Motor PWM drive level and polarity signal (16 bits)	
TIR Virtual Step Count (16 bits)	
TIR Physical Position (16 bits)	
VNS Virtual Step Count (16 bits)	
VNS Physical Position (16 bits)	

TIR Pointing Direction (8 bits)	VNS Pointing Direction (8 bits)

Figure 149: Default Short Housekeeping Report TM Packet Format

Where:

- HW Validity ASW Primary Monitor is Data Pool parameter Valid_1, defined in section 12.1.30 as follows:
  - Bits 0 – 2. Not used. Read as zero.
  - Bit 3. ICU redundancy selection. 1 – Redundant, 0 – Nominal
  - Bit 4. Reset Register contents valid. 1 – Valid, 0 – invalid.
  - Bit 5. MSI Instrument Config valid. 1 – valid, 0 – invalid.
  - Bit 6. PPS Source valid. 1 – valid, 0 – invalid.
  - Bit 7. PPS Status valid. 1 – valid, 0 – invalid.

  Bits 5 and 6 shall be set to invalid following an unsuccessful call to the Timing Control Interface API. Otherwise they are set to valid.
- TC Count is Data Pool parameter MCMD_Count, defined in section 12.1.23 as count of accepted TC commands. Counter wraps at 255.
- Last Accepted TC Service Type ID is Data Pool parameter LastAccServiceId, defined in section 12.1.23 as PUS Service Type of last TC that passed command acceptance checks.
- Last Accepted TC Service Sub-Type ID is Data Pool parameter LastAccSubServId, defined in section 12.1.23 as PUS Service Sub-Type of last TC that passed command acceptance checks.
- Last Received TC(8,1) Function ID is Data Pool parameter LastAcc_Funct_Id, defined in section 12.1.23 as the Function ID of the last TC(8,1) Function that passed command acceptance checks.
- Instrument Mode is Data Pool parameter Current_Mode, defined in section 12.1 as detailed in Table 12.
- Instrument Sub-Mode is Data Pool parameter Current_Sub-Mode, defined in section 12.1 as detailed in Table 13.
- Mode Transition Status is Data Pool parameter Transition_Status, defined in section 12.1 as the status of the current mode transition.
- Error Count is Data Pool parameter `TC_Failure_and_Event_Count`, defined in section 12.1.6 as count of all TM(1,2) (1,8) plus low, medium and high severity events. Counter wraps at 255 to 0..
- EEPROM Bank Health is Data Pool parameter EEPROM_Status, defined in section 12.1.13 as follows:
  - Bits 0 – 12. Counter of number of EEPROM page writes.
  - Bit 13. EEPROM bank selected.
  - Bit 14. EEPROM Power State. 1 – EEPROM Power on, 0 – EEPROM Power off

  - Bit 15. EEPROM Write State. 1 – EEPROM Write enabled, 0 – EEPROM Write disabled.

- Last Error ID is Data Pool parameter `Last_event_Error_ID`, defined in section 12.1.6 as Last failing event ID (5,2 5,3 or 5,4).
- PPS Source is Data Pool parameter PPS_Control, defined in section 12.1.29 as follows:
  - Bit 0 – 5. Not used. Read as zero.
  - Bit 6. PPS disabled. 1 – PPS Disabled, 0 – PPS enabled.
  - Bit 7. PPS Selected. 1 – PPS2 selected, 0 – PPS1 selected.
- PPS Status is Data Pool parameter PPS_Status, defined in section 12.1.29 as follows:
  - Bit 0 – 1. Not used. Read as zero.
  - Bit 2. Missing Valid PPS2, 1 – missing PPS2, 0 – other.
  - Bit 3. Missing Valid PPS1, 1 – missing PPS1, 0 – other.
  - Bit 4. Spurious PPS2, 1 – spurious PPS2, 0 – other.
  - Bit 5. Spurious PPS1, 1 – spurious PPS1, 0 – other.
  - Bit 6. Valid PPS2 detected. 1 – valid PPS2, 0 – invalid.
  - Bit 7. Valid PPS1 detected. 1 – valid PPS1, 0 – invalid.
- Power Control Status Word LS is Data Pool parameter PowerControl_Reg, defined in section 12.1.13 as the least significant 16 bits of the Power Control Register [AD2].
- Overcurrent Status Word LS is Data Pool parameter OverCurrent_Sts, defined in section 12.1.13 as the least significant 16 bits of the Over Current Status Register [AD2].
- Busiest Scheduler Period is Data Pool parameter Busiest_Period, defined in section 12.1 as Schedule period of longest duration during previous cycle. (1-10)
- Busiest Scheduler Software Loading is Data Pool parameter Busiest_Period_Processor_Usage, defined in section 12.1 as the processor loading during busiest schedule period (%).
- FEE Status Register is Data Pool parameter FEE_Status_Reg, defined in section 12.1.10 as the contents of the FEE Status Register [AD5].
- TEC PWM is Data Pool parameter TEC_PWM_Control, defined in section 12.1.27 as the contents of the TEC PWM Control Register [AD2]
- TIROU Temp 1 (Detector hot side temperature sensor) is Data Pool parameter THERM_FEE_TIR_BASE, defined in section 13.1 as the FEE TIR Base Thermistor value [AD2].
- Motor Control is Data Pool parameter Mtr_Ctrl_Setting, defined in section 12.1.15 as the contents of the Motor Control Register [AD2]
- Motor PWM Scaling Factor is Data Pool parameter Mtr_PWM_ScalFact, defined in section 12.1.15 as the Motor PWM Scale Factor field in the Motor PWM Scaling Control Register [AD2]
- Motor PWM drive level and polarity signal is Data Pool parameter Mtr_PWM_Ctrl_Reg, defined in section 12.1.15 as the contents of the Motor PWM Control Register [AD2]

- TIR Virtual Step Count is Data Pool parameter TIR_Virt_Enc_Sts, defined in section 12.1.15 as the contents of the TIR Virtual Encoder Status Register [AD2]
- TIR Physical Position is Data Pool parameter TIR_Position_Mon, defined in section 12.1.15 as the contents of the TIR Position Monitor Register [AD2]
- VNS Virtual Step Count is Data Pool parameter VNS_Virt_Enc_Sts, defined in section 12.1.15 as the contents of the VNS Virtual Encoder Status Register [AD2]
- VNS Physical Position is Data Pool parameter VNS_Position_Mon, defined in section 12.1.15 as the contents of the VNS Position Monitor Register [AD2]
- TIR Pointing Direction is Data Pool parameter TIR_Pointing_Dir, defined in section 12.1.15 as the TIR Pointing Direction field in the Instrument Configuration Register [AD2]
- VNS Pointing Direction is Data Pool parameter VNS_Pointing_Dir, defined in section 12.1.15 as the VNS Pointing Direction field in the Instrument Configuration Register [AD2]

3.4.3.2 SID 2 – Default ICU Housekeeping Report

The structure of the TM Source Packet data field for default ICU Housekeeping Report is shown in Figure 150, as defined in [AD3]. The default ICU Housekeeping Report will be enabled as default and have a defined collection interval of 0.05 Hz.

SID = 2	Onboard Time Correction; fine time at PPS (LSBytes) (MS) (8 bits)
Onboard Time Correction; fine time at PPS (LSBytes) (LS) (16 bits)	
SW Version (MS) (16 bits)	
SW Version (LS) (16 bits)	
History Area Percentage (8 bits)	
HW Validity ASW Primary Monit (8 bits)	HW Validity Thermistors (8 bits)
AAM Thermistor (16 bits)	
ICP Thermistor (16 bits)	
Chassis Thermistor (16 bits)	
PDM Thermistor 1 (16 bits)	
PDM Thermistor 2 (16 bits)	
PDM Thermistor 3 (16 bits)	
Spare Temp 1 (16 bits)	
Spare Temp 3 (16 bits)	
Optical Bench Heater (16 bits)	
TIROU Heater 1 (Rear Plate) (16 bits)	
TIROU Heater 2 (Rear Optics) (16 bits)	
VNSOU Heater 1 (SWIR2 Cold Finger) (16 bits)	
VNSOU Heater 2 (SWIR2 Barrel) (16 bits)	

VNSOU Heater 3 (Optical Unit) (16 bits)	
VNSOU Heater 4 (Calibration Unit) (16 bits)	
VNS Decontamination Heater (8 bits) bits)	Thermal Control Status (8 bits)
TEC Status (8 bits)	TEC Mode (8 bits)
TEC Constant Power (16 bits)	
OB Heater Status (8 bits)	OB Heater Mode (8 bits)
OB Heater Constant Power (16 bits)	
TIROU Heater 1 Status (8 bits)	TIROU Heater 1 Mode (8 bits)
TIROU Heater 1 Constant Power (16 bits)	
TIROU Heater 2 Status (8 bits)	TIROU Heater 2 Mode (8 bits)
TIROU Heater 2 Constant Power (16 bits)	
VNSOU Heater 1 Status (8 bits)	VNSOU Heater 1 Mode (8 bits)
VNSOU Heater 1 Constant Power (16 bits)	
VNSOU Heater 2 Status (8 bits)	VNSOU Heater 2 Mode (8 bits)
VNSOU Heater 2 Constant Power (16 bits)	
VNSOU Heater 3 Status (8 bits)	VNSOU Heater 3 Mode (8 bits)
VNSOU Heater 3 Constant Power (16 bits)	
VNSOU Heater 4 Status (8 bits)	VNSOU Heater 4 Mode (8 bits)
VNSOU Heater 4 Constant Power (16 bits)	
Science Processing Status (8 bits)	FEE Packet Hander Status (8 bits)
Science Data Processing Monitor (8 bits)	Interrupt Mask (8 bits)
Microstep Period Repeat Factor (8 bits)	ADC Latch Up and Buffer Double Bit Errors (8 bits)
Total SEU Count (32 bits)	
Address of Last SEU (MS) (16 bits)	
Address of Last SEU (LS) (16 bits)	
Bandwidth Limit Size (16 bits)	
Scrubbing Rate (16 bits)	
Scrubbing Memory Region 1 (8 bits)	
Scrubbing Memory Region 2 (8 bits)	
Scrubbing Memory Region 3 (8 bits)	
Scrubbing Memory Region 4 (8 Bits)	
Watchdog Status (8 bits)	Spare (8 bits)
ICU Secondary Supply 1 (+5V) Digital (16 bits)	
ICU Secondary Supply 2 (+12V) Analogue (16 bit)	
ICU Secondary Supply 3 (-12V) Analogue (16 bit)	

ICU Secondary Supply 4 (+3V3) Motor & Heater (16 bit)
ADC16 2V5 Reference (16 bits)
ADC16 5V Reference (ADC12) (16 bits)
ADC12 5V Reference (16 bits)
ADC16 5V Reference (ADC16) (16 bits)
HTR_I_Mon (16 bits)
ICU +24V Motor Monitor (16 bits)
ICU +20V Motor Monitor (16 bits)
Primary Bus Input Voltage Monitor (16 bits)
Primary Bus Input Current Monitor (16 bits)
Mtr_Htr_Bus_I_Mon (16 bits)
Mtr_Htr_Bus_V_Mon (16 bits)
ICU_Bus_I_Mon (16 bits)
FEE Bus I Monitor (16 bits)
FEE Bus V Monitor (16 bits)
TIR Encoder Monitor (16 bits)
VNS Encoder Monitor (16 bits)
FEE_7V_Detector Monitor (16 bits)
FEE_4V_Electronics Monitor (16 bits)
Spare (16 bits)
Spare (16 bits)
Spare (16 bits)
Spare (16 bits)

Figure 150: Default ICU Housekeeping Report TM Packet Format

Where:

- Onboard Time Correction is Data Pool parameter LOBT_PPSArr_Fine, defined in section 12.1.29 as the Fine LOBT Register value at time of PSS.
- SW Version is Data Pool parameter is Data Pool parameter Software_Version, defined in section 12.1.12 as the software version.
- History Area Used Bytes is Data Pool parameter History_UsedSize, define in section 12.1.32as the number of bytes used in the History Area.
- HW Validity ASW Primary Monitor is Data Pool parameter Valid_1, defined in section 12.1.30 as follows:
    - Bits 0 – 2. Not used. Read as zero.
    - Bit 3. ICU redundancy selection. 1 – Redundant, 0 – Nominal
    - Bit 4. Reset Register contents valid. 1 – Valid, 0 – invalid.

  - Bit 5. MSI Instrument Config valid. 1 – valid, 0 – invalid.
  - Bit 6. PPS Source valid. 1 – valid, 0 – invalid.
  - Bit 7. PPS Status valid. 1 – valid, 0 – invalid.

  Bits 5 and 6 shall be set to invalid following an unsuccessful call to the Timing Control Interface API. Otherwise they are set to valid.

- HW Validity Thermistors is Data Pool parameter Valid_3, defined in section 12.1.30 as follows:
  - Bits 0 – 2. Not used. Read as zero.
  - Bit 3. ICU redundancy selection
  - Bit 4. Reset Register contents valid. 1 – Valid, 0 – invalid.
  - Bit 5. MSI Instrument Config valid. 1 – valid, 0 – invalid.
  - Bit 6. PPS Source valid. 1 – valid, 0 – invalid.
  - Bit 7. PPS Status valid. 1 – valid, 0 – invalid.
- AAM Thermistor is Data Pool parameter THERM_ICU_AAM, defined in section 13.1 as the AAM Thermistor value [AD2].
- ICP Thermistor is Data Pool parameter THERM_ICU_ICP, defined in section 13.1 as the ICP Thermistor value [AD2].
- Chassis Thermistor is Data Pool parameter THERM_ICU_CHASSIS, defined in section 13.1 as the Chassis Thermistor value [AD2].
- PDM Thermistor 1 is Data Pool parameter THERM_ICU_PDM_1, defined in section 13.1 as the PDM Thermistor 1 value [AD2].
- PDM Thermistor 2 is Data Pool parameter THERM_ICU_PDM_2, defined in section 13.1 as the PDM Thermistor 2 value [AD2].
- PDM Thermistor 3 is Data Pool parameter THERM_ICU_PDM_3, defined in section 13.1 as the PDM Thermistor 3 value [AD2].
- Spare Temp 1 is unused, 16 bits
- Spare Temp 3 is unused, 16 bits
- Optical Bench Heater is Data Pool parameter Htr1_PWM_Control, defined in section 12.1.27 as the contents of the Heater 1 PWM Control Register [AD2].
- TIROU Heater 1 (Rear Plate) is Data Pool parameter Htr2_PWM_Control, defined in section 12.1.27 as the contents of the Heater 2 PWM Control Register [AD2].
- TIROU Heater 2 (Rear Optics) is Data Pool parameter Htr3_PWM_Control, defined in section 12.1.27 as the contents of the Heater 3 PWM Control Register [AD2].
- VNSOU Heater 1 (SWIR2 Cold Finger) is Data Pool parameter Htr4_PWM_Control, defined in section 12.1.27 as the contents of the Heater 4 PWM Control Register [AD2].
- VNSOU Heater 2 (SWIR2 Barrel) is Data Pool parameter Htr5_PWM_Control, defined in section 12.1.27 as the contents of the Heater 5 PWM Control Register [AD2].

- VNSOU Heater 3 (Optical Unit) is Data Pool parameter Htr6_PWM_Control, defined in section 12.1.27 as the contents of the Heater 6 PWM Control Register [AD2].
- VNSOU Heater 4 (Calibration Unit) is Data Pool parameter Htr7_PWM_Control, defined in section 12.1.27 as the contents of the Heater 7 PWM Control Register [AD2].
- VNSOU Decontamination Heater is Data Pool parameter DeconHtr_Control, defined in section 12.1.27 as the contents of the Decontamination Heater Control Register [AD2].
- Thermal Control Status is Data Pool parameter ThControl_Status, defined in section 12.1.25 as the activation status of Thermal Control.
- TEC Status is Data Pool parameter TEC_Status, defined in section 12.1.25 as the activation status of the TEC Thermal Control loop.
- TEC Mode is Data Pool parameter TEC_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the TEC Thermal Control loop.
- TEC Constant Power is Data Pool parameter TEC_Const_Power, defined in section 12.1.25 as the configured constant power to be applied to the TEC heater when in constant power mode.
- OB Heater Status is Data Pool parameter OB_Htr_Status, defined in section 12.1.25 as the activation status of the OB Thermal Control loop.
- OB Heater Mode is Data Pool parameter OB_Heater_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the OB Thermal Control loop.
- OB Heater Constant Power is Data Pool parameter OB_HtrConstPower, defined in section 12.1.25 as the configured constant power to be applied to the OB heater when in constant power mode.
- TIROU Heater 1 Status is Data Pool parameter TIR_H1_Status, defined in section 12.1.25 as the activation status of the TIROU Heater 1 Thermal Control loop.
- TIROU Heater 1 Mode is Data Pool parameter TIROU_Htr_1_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the TIROU Heater 1 Thermal Control loop.
- TIROU Heater 1 Constant Power is Data Pool parameter TIR_H1ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the TIROU Heater 1 heater when in constant power mode.
- TIROU Heater 2 Status is Data Pool parameter TIR_H2_Status, defined in section 12.1.25 as the activation status of the TIROU Heater 2 Thermal Control loop.
- TIROU Heater 2 Mode is Data Pool parameter TIROU_Htr_2_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the TIROU Heater 2 Thermal Control loop.
- TIROU Heater 2 Constant Power is Data Pool parameter TIR_H2ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the TIROU Heater 2 heater when in constant power mode.
- VNSOU Heater 1 Status is Data Pool parameter VNS_H1_Status, defined in section 12.1.25 as the activation status of the VNSOU Heater 1 Thermal Control loop.

- VNSOU Heater 1 Mode is Data Pool parameter VNSOU_Htr_1_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the VNSOU Heater 1 Thermal Control loop.
- VNSOU Heater 1 Constant Power is Data Pool parameter VNS_H1ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the VNSOU Heater 1 heater when in constant power mode.
- VNSOU Heater 2 Status is Data Pool parameter VNS_H2_Status, defined in section 12.1.25 as the activation status of the VNSOU Heater 2 Thermal Control loop.
- VNSOU Heater 2 Mode is Data Pool parameter VNSOU_Htr_2_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the VNSOU Heater 2 Thermal Control loop.
- VNSOU Heater 2 Constant Power is Data Pool parameter VNS_H2ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the VNSOU Heater 2 heater when in constant power mode.
- VNSOU Heater 3 Status is Data Pool parameter VNS_H3_Status, defined in section 12.1.25 as the activation status of the VNSOU Heater 3 Thermal Control loop.
- VNSOU Heater 3 Mode is Data Pool parameter VNSOU_Htr_3_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the VNSOU Heater 3 Thermal Control loop.
- VNSOU Heater 3 Constant Power is Data Pool parameter VNS_H3ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the VNSOU Heater 3 heater when in constant power mode.
- VNSOU Heater 4 Status is Data Pool parameter VNS_H4_Status, defined in section 12.1.25 as the activation status of the VNSOU Heater 4 Thermal Control loop.
- VNSOU Heater 4 Mode is Data Pool parameter VNSOU_Htr_4_Mode, defined in section 12.1.26 as the mode (PID Loop or Constant Power) of the VNSOU Heater 4 Thermal Control loop.
- VNSOU Heater 4 Constant Power is Data Pool parameter VNS_H4ConstPower, defined in section 12.1.25 as the configured constant power to be applied to the VNSOU Heater 4 heater when in constant power mode.
- Science Processing Status is Data Pool parameter SciDataModeCtrol, defined in section 12.1.22 as the Generate science and LBR Anc HK Packets field of the Science Data Mode Control Register [AD2].
- FEE Packet Handler Status is Data Pool parameter Science_ErrorSts, defined in section 12.1.22 as bits 7-0 of the Science Error Status Register [AD2].
- Science Data Processing Monitor is Data Pool parameter Science_Proc_Mon, defined in section 12.1.22 as the bits 7-0 of the Science Processing Monitor Register [AD2].
- Interrupt Mask is Data Pool parameter FPGA_Intr_Mask, defined in section 12.1.13 as the contents of the Interrupt Mask Register [AD2].
- Microstep Period Repeat Factor is Data Pool parameter Mstep_PerRpt_Reg, defined in section 12.1.15 as the bits 7-0 of the Microstep Repeat Factor Register [AD2].

- ADC Latch Up and Buffer Double Bit Errors is Data Pool parameter SEE_Error_Status, defined in section 12.1.13 as the bits 7-0 of the SEE Error Status Register [AD2].
- Total SEU Count is Data Pool parameter SEU_CountLastScr, defined in section 12.1.17 as the total SEU count. This is the count of SEUs detected since the last software restart.
- Address of Last SEU is Data Pool parameter is Data Pool parameter Last_SEU_Address, defined in section 12.1.17 as the address of the last SEU.
- Bandwidth Limit Size is Data Pool parameter MTU_Size, defined in section 12.1.13 as the Maximum Transmission Size (MTU).
- Scrubbing Rate is Data Pool parameter ScrubRate, defined in section 12.1.17 as the current memory scrubbing rate.
- Scrubbing Memory Regions (1-4) are the memory ID's of the selected devices to be scrubbed, defined in section 12.1.17.
- Watchdog Status is Data Pool parameter WatchdogStatus, defined in section 12.1.31 as the current watchdog status.
- Spare is unused, 8 bits
- ICU Secondary Supply 1 (+5V) Digital is Data Pool parameter VMON_ICU_P_5, defined in section 13.1 as the +5V Monitor value [AD2]
- ICU Secondary Supply 2 (+12V) Analogue is Data Pool parameter VMON_ICU_P_12, defined in section 13.1 as the +12V Monitor value [AD2]
- ICU Secondary Supply 3 (-12V) Analogue is Data Pool parameter VMON_ICU_N_12, defined in section 13.1 as the -12V Monitor value [AD2]
- ICU Secondary Supply 4 (+3V3) Motor & Heater is Data Pool parameter VMON_ICU_P_3V3, defined in section 13.1 as the +3V3 Monitor value [AD2]
- ADC16 2V5 Reference is Data Pool parameter VMON_ICU_ADC16_P_2V5, defined in section 13.1 as the ADC16 2V5 Reference value [AD2]
- ADC16 5V Reference (ADC12) is Data Pool parameter VMON_ICU_ADC16_P_5, defined in section 13.1 as the ADC12 5V Reference value [AD2]
- ADC12 5V Reference is Data Pool parameter VMON_ICU_ADC12_P_5V, defined in section 13.1 as the ADC12 5V Reference value [AD2]
- ADC16 5V Reference (ADC16) is Data Pool parameter VMON_ICU_ADC16_REF, defined in section 13.1 as the ADC12 5V Reference value [AD2]
- HTR_I_Mon is Data Pool parameter IMON_HTR, defined in section 13.1 as the Htr_I_Mon value [AD2]
- ICU +24V Motor Monitor is Data Pool parameter VMON_ICU_P_24, defined in section 13.1 as the +24V Monitor value [AD2]
- ICU +20V Motor Monitor is Data Pool parameter VMON_ICU_P_20, defined in section 13.1 as the +20V Monitor value [AD2]
- Primary Bus Input Voltage Monitor is Data Pool parameter IMON_BUS_PRIMARY, defined in section 13.1 as the Bus_I_Monitor value [AD2]

- Mtr_Htr_Bus_I_Mon is Data Pool parameter IMON_BUS_MTR_HTR, defined in section 13.1 as the Mtr_Htr_Bus_I_Mon value [AD2]
- Mtr_Htr_Bus_V_Mon is Data Pool parameter VMON_BUS_MTR_HTR, defined in section 13.1 as the Mtr_Htr_Bus_V_Mon value [AD2]
- ICU_BUS_I_Mon is Data Pool parameter IMON_BUS_ICU, defined in section 13.1 as the ICU_Bus_I_Mon value [AD2]
- FEE_Bus I Monitor is Data Pool parameter IMON_BUS_FEE, defined in section 13.1 as the FEE_Bus_I_Mon value [AD2]
- FEE_Bus V Monitor is Data Pool parameter VMON_BUS_FEE, defined in section 13.1 as the FEE_Bus_V_Mon value [AD2]
- TIR Encoder Monitor is Data Pool parameter VMON_TIR_ENC, defined in section 13.1 as the TIR_Enc_Monitor value [AD2]
- VNS Encoder Monitor is Data Pool parameter VMON_VNS_ENC, defined in section 13.1 as the VNS_Enc_Monitor value [AD2]
- FEE_7V_Dector Monitor is Data Pool parameter VMON_FEE_P_7, defined in section 13.1 as the +7V_FEE_Secondary value [AD2]
- FEE_4V_Dector Monitor is Data Pool parameter VMON_FEE_P_4, defined in section 13.1 as the +4V_FEE_Secondary value [AD2]
- Spare is unused, 64 bits

3.4.3.3 SID 10 – Default HKTM Packet

The structure of the TM Source Packet data field for default Housekeeping Report is shown below, as defined in [AD3]. The default Housekeeping Report will be enabled as default and have a defined collection interval of 0.05 Hz.

SID = 10	HW Validity ASW Primary Monitor (8 bits)
VNSOU Temp 1 (SWIR 2 barrel 1) (16 bits)	
VNSOU Temp 2 (SWIR 2 barrel 2) (16 bits)	
VNSOU Temp 3 (Optical Unit 1) (16 bits)	
VNSOU Temp 4 (Optical Unit 2) (16 bits)	
VNS Cal Thermistor 1 (16 bits)	
VNS Cal Thermistor 2 (16 bits)	
TIROU Temp 2 (TIR Bench 1) (16 bits)	
TIROU Temp 3 (TIR Bench 2) (16 bits)	
TIROU Temp 4 (Rear Optics 1) (16 bits)	
TIROU Temp 5 (Rear Optics 2) (16 bits)	
TIROU Temp 6 (Filter Mask Top) (16 bits)	
TIROU Temp 7 (Filter Mask Bottom) (16 bits)	
TIROU Temp 8 (Ge Lens 2) (16 bits)	

TIROU Temp 9 (Internal Reference BB) (16 bits)	
OB Temp 1 (16 bits)	
OB Temp 2 (16 bits)	
FEE Temp 1 (16 bits)	
VNSOU Temp 5 (SWIR 2 cold finger) (16 bits)	
VNSOU Temp 6 (SWIR 2 radiator) (16 bits)	
VNS Radiator Temperature 1 (16 bits)	
TIROU CBB Temp 1 (Calibration BB 1) (16 bits)	
TIROU CBB Temp 2 (Calibration BB 2) (16 bits)	
Spare Temp 1 (16 bits)	
Spare Temp 2 (16 bits)	
TIR Slow Speed Coasting Phase (16 bits)	
TIR Deceleration Phase (16 bits)	
VNS Slow Speed Coasting Phase (16 bits)	
VNS Deceleration Phase (16 bits)	
TIR Flat Field Offset ID (8 bits)	VNS Flat Field Offset ID (8 bits)
TIR TDI Delay (in Ground Lines) (16 bits)	
Averaging Number (8 bits)	B1 Truncation Factor (8 bits)
B2 Truncation Factor (8 bits)	B3 Truncation Factor (8 bits)
B4 Truncation Factor (8 bits)	B7 Truncation Factor (8 bits)
B8 Truncation Factor (8 bits)	B9 Truncation Factor (8 bits)
Ref Band Truncation Factor (8 bits)	Band ID 1 Flat Field Mapping (8 bits)
Band ID 2 Flat Field Mapping (8 bits)	Band ID 3 Flat Field Mapping (8 bits)
Band ID 4 Flat Field Mapping (8 bits)	Band ID 5 Flat Field Mapping (8 bits)
Band ID 6 Flat Field Mapping (8 bits)	Band ID 7 Flat Field Mapping (8 bits)
Band ID 8 Flat Field Mapping (8 bits)	FEE Validity (8 bits)
Vis VDDA (16 bits)	
Vis VDET (16 bits)	
Vis Vvideo (16 bits)	
FILTER_7V_P (16 bits)	
NIR VDDA (16 bits)	
NIR VDET (16 bits)	
NIR Vvideo (16 bits)	
ADC 08 Ref (16 bits)	
SWIR1 VDDA (16 bits)	

SWIR1 VDET (16 bits)	
SWIR1 Vvideo (16 bits)	
SWIR2 VDDA (16 bits)	
SWIR2 VDET (16 bits)	
SWIR2 Vvideo (16 bits)	
ADC 16 Ref (16 bits)	
TIR VDDA (16 bits)	
TIR VDDL (16 bits)	
TIR VBUS (16 bits)	
TIR VFID (16 bits)	
TIR VSKIMMING (16 bits)	
TIR VEB (16 bits)	
TIR Vvideo (16 bits)	
TIR ADC P (16 bits)	
ADC 24 Ref (16 bits)	
VNS VIS Detector Temperature (16 bits)	
VNS NIR Detector Temperature (16 bits)	
VNS SWIR1 Detector Temperature (16 bits)	
VNS SWIR2 Detector Temperature (16 bits)	
TIR Detector Temperature (16 bits)	
Timing Pulse (Ground Line) (24 bits)	
FEE Number of Resends (8 bits)	FEE State Register Request Status (8 bits)
FEE State Register Request Rate (8 bits)	FEE ADC Registers Request Status (8 bits)
FEE ADC Registers Request Rate (8 bits)	FEE USL Monitor (8 bits)
FEE Command (32 bits)	
FEE Monitor (32 bits)	
Spare (32 bits)	

Figure 151: Default Housekeeping Report TM Packet Format

Where:

- HW Validity ASW Primary Monitor is Data Pool parameter Valid_1, defined in section 12.1.30 as follows:
  - Bits 0 – 2. Not used. Read as zero.
  - Bit 3. ICU redundancy selection. 1 – Redundant, 0 – Nominal
  - Bit 4. Reset Register contents valid. 1 – Valid, 0 – invalid.
  - Bit 5. MSI Instrument Config valid. 1 – valid, 0 – invalid.

- Bit 6. PPS Source valid. 1 – valid, 0 – invalid.
- Bit 7. PPS Status valid. 1 – valid, 0 – invalid.

Bits 5 and 6 shall be set to invalid following an unsuccessful call to the Timing Control Interface API. Otherwise they are set to valid.

- VNSOU Temp 1 (SWIR 2 barrel 1) is Data Pool parameter TH_VNS_SW2_BRL_1, defined in section 12.1.5 as the VNS SW2 Barrel Thermistor 1 value [AD2].
- VNSOU Temp 2 (SWIR 2 barrel 2) is Data Pool parameter TH_VNS_SW2_BRL_2, defined in section 12.1.5 as the VNS SW2 Barrel Thermistor 1 value [AD2].
- VNSOU Temp 3 (Optical Unit 1) is Data Pool parameter THERM_VNS_OU_1, defined in section 12.1.5 as the VNS OU Thermistor 1 value [AD2].
- VNSOU Temp 4 (Optical Unit 2) is Data Pool parameter THERM_VNS_OU_2, defined in section 12.1.5 as the VNS OU Thermistor 2 value [AD2].
- VNS Cal Thermistor 1 is Data Pool parameter THERM_VNS_CAL_1, defined in section 12.1.5 as the VNS Calibration Thermistor 1 value [AD2].
- VNS Cal Thermistor 2 is Data Pool parameter THERM_VNS_CAL_2, defined in section 12.1.5 as the VNS Calibration Thermistor 2 value [AD2].
- TIROU Temp 2 (TIR Bench 1) is Data Pool parameter TH_TIR_BENCH_1, defined in section 12.1.5 as the TIR Bench Thermistor 1 value [AD2].
- TIROU Temp 3 (TIR Bench 2) is Data Pool parameter TH_TIR_BENCH_2, defined in section 12.1.5 as the TIR Bench Thermistor 2 value [AD2].
- TIROU Temp 4 (Rear Optics 1) is Data Pool parameter TH_TIR_LENS8_1, defined in section 12.1.5 as the TIR Lens8 Thermistor 1 value [AD2].
- TIROU Temp 5 (Rear Optics 2) is Data Pool parameter TH_TIR_LENS8_2, defined in section 12.1.5 as the TIR Lens8 Thermistor 2 value [AD2].
- TIROU Temp 6 (Filter Mask Top) is Data Pool parameter TH_TIR_MASK_TOP, defined in section 12.1.5 as the TIR Masp Top Thermistor value [AD2].
- TIROU Temp 7 (Filter Mask Bottom) is Data Pool parameter TH_TIR_MASK_BOTTOM, defined in section 12.1.5 as the TIR Masp Bottom Thermistor value [AD2].
- TIROU Temp 8 (Ge Lens 2) is Data Pool parameter THERM_TIR_LENS2, defined in section 12.1.5 as the TIR Lens2 Thermistor value [AD2].
- TIROU Temp 9 (Internal Reference BB) is Data Pool parameter THERM_TIR_RBB, defined in section 12.1.5 as the TIR RBB Thermistor value [AD2].
- OB Temp 1 is Data Pool parameter THERM_OB_1, defined in section 12.1.5 as the OB Thermistor 1 value [AD2].
- OB Temp 2 is Data Pool parameter THERM_OB_2, defined in section 12.1.5 as the OB Thermistor 2 value [AD2].
- FEE Temp 1 is Data Pool parameter THERM_FEE, defined in section 12.1.5 as the FEE Thermistor value [AD2].
- VNSOU Temp 5 (SWIR 2 cold finger) is Data Pool parameter PRT_VNS_SW2_1, defined in section 12.1.5 as the VNS SW2 Cold PT1000 1 value [AD2].

- VNSOU Temp 6 (SWIR 2 radiator) is Data Pool parameter PRT_VNS_SW2_2, defined in section 12.1.5 as the VNS SW2 Cold PT1000 2 value [AD2].
- VNS Radiator Temperature 1 is Data Pool parameter PRT_VNS_RAD, defined in section 12.1.5 as the VNS Rad PT1000 value [AD2].
- TIROU CBB Temp 1 (Calibration BB 1) is Data Pool parameter PRT_CBB_PT_1, defined in section 12.1.5 as the TIR CBB PT 1 value [AD2].
- TIROU CBB Temp 2 (Calibration BB 2) is Data Pool parameter PRT_CBB_PT_2, defined in section 12.1.5 as the TIR CBB PT 2 value [AD2].
- Spare Temp 1 is unused, 16 bits
- Spare Temp 2 is unused, 16 bits
- TIR Slow Speed Coasting Phase is Data Pool parameter TIR_S_CoastSteps, defined in section 12.1.14 as the TIR Low Speed Casting Base value [AD2].
- TIR Deceleration Phase is Data Pool parameter TIR_T_FinalSteps, defined in section 12.1.14 as the 'Remaining deceleration steps after low speed cost for TIR' value [AD2].
- VNS Slow Speed Coasting Phase is Data Pool parameter VNS_S_CoastSteps, defined in section 12.1.14 as the VNS Low Speed Casting Base value [AD2].
- VNS Deceleration Phase is Data Pool parameter VNS_T_FinalSteps, defined in section 12.1.14 as the 'Remaining deceleration steps after low speed cost for VNS' value [AD2].
- TIR Flat Field Offset ID is Data Pool parameter TIRreferencSetID, defined in section 12.1.1 as the TIR Reference Set ID value [AD2].
- VNS Flat Field Offset ID is Data Pool parameter VNSreferencSetID, defined in section 12.1.1 as the VNS Reference Set ID value [AD2].
- TIR TDI Delay (in Ground Lines) is Data Pool parameter TIRTDICalibSDelay, defined in section 12.1.1 as the TIR TDI Calibration Delay value [AD2].
- Averaging Number is Data Pool parameter Average_Number, defined in section 12.1.1 as the Average Number value [AD2].
- B1 Truncation Factor is Data Pool parameter B1TruncatnFactor, defined in section 12.1.1 as the B1 Truncation Factor value [AD2].
- B2 Truncation Factor is Data Pool parameter B2TruncatnFactor, defined in section 12.1.1 as the B2 Truncation Factor value [AD2].
- B3 Truncation Factor is Data Pool parameter B3TruncatnFactor, defined in section 12.1.1 as the B3 Truncation Factor value [AD2].
- B4 Truncation Factor is Data Pool parameter B4TruncatnFactor, defined in section 12.1.1 as the B4 Truncation Factor value [AD2].
- B7 Truncation Factor is Data Pool parameter B7TruncatnFactor, defined in section 12.1.1 as the B7 Truncation Factor value [AD2].
- B8 Truncation Factor is Data Pool parameter B8TruncatnFactor, defined in section 12.1.1 as the B8 Truncation Factor value [AD2].
- B9 Truncation Factor is Data Pool parameter B9TruncatnFactor, defined in section 12.1.1 as the B9 Truncation Factor value [AD2].

- Ref Band Truncation Factor is Data Pool parameter RefBandTruncFact, defined in section 12.1.1 as the Reference Band Truncation Factor value [AD2].
- Band ID 1 Flat Field Mapping is Data Pool parameter BandID1FFMapping, defined in section 12.1.1 as the Band ID 1 Flat Field Mapping value [AD2].
- Band ID 2 Flat Field Mapping is Data Pool parameter BandID2FFMapping, defined in section 12.1.1 as the Band ID 2 Flat Field Mapping value [AD2].
- Band ID 3 Flat Field Mapping is Data Pool parameter BandID3FFMapping, defined in section 12.1.1 as the Band ID 3 Flat Field Mapping value [AD2].
- Band ID 4 Flat Field Mapping is Data Pool parameter BandID4FFMapping, defined in section 12.1.1 as the Band ID 4 Flat Field Mapping value [AD2].
- Band ID 5 Flat Field Mapping is Data Pool parameter BandID5FFMapping, defined in section 12.1.1 as the Band ID 5 Flat Field Mapping value [AD2].
- Band ID 6 Flat Field Mapping is Data Pool parameter BandID6FFMapping, defined in section 12.1.1 as the Band ID 6 Flat Field Mapping value [AD2].
- Band ID 7 Flat Field Mapping is Data Pool parameter BandID7FFMapping, defined in section 12.1.1 as the Band ID 7 Flat Field Mapping value [AD2].
- Band ID 8 Flat Field Mapping is Data Pool parameter BandID8FFMapping, defined in section 12.1.1 as the Band ID 8 Flat Field Mapping value [AD2].
- FEE Validity is Data Pool parameter Valid_2, defined in section 12.1.30 as the FEE Power Status (HK Validity) value [AD2].
- Vis VDDA is Data Pool parameter Vis_VDDA, defined in section 12.1.11 as the Vis VDDA value [AD2].
- Vis VDET is Data Pool parameter Vis_VDET, defined in section 12.1.11 as the Vis VDET value [AD2].
- Vis Vvideo is Data Pool parameter Vis_Vvideo, defined in section 12.1.11 as the Vis Vvideo value [AD2].
- Filter_7V_P is Data Pool parameter Filter_7V_P, defined in section 12.1.11 as the 7V_Filter_P value [AD2].
- NIR VDDA is Data Pool parameter NIR_VDDA, defined in section 12.1.11 as the NIR DDA value [AD2].
- NIR VDET is Data Pool parameter NIR_VDET, defined in section 12.1.11 as the NIR VDET value [AD2].
- NIR Vvideo is Data Pool parameter NIR_Vvideo, defined in section 12.1.11 as the NIR Vvideo value [AD2].
- ADC 08 Ref is Data Pool parameter ADC_08_Ref, defined in section 12.1.11 as the FEE ADC 08 Ref value [AD2].
- SWIR1 VDDA is Data Pool parameter SWIR1_VDDA, defined in section 12.1.11 as the SWIR1 VDDA value [AD2].
- SWIR1 VDET is Data Pool parameter SWIR1_VDET, defined in section 12.1.11 as the SWIR1 VDET value [AD2].

- SWIR1 Vvideo is Data Pool parameter SWIR1_Vvideo, defined in section 12.1.11 as the SWIR1 Vvideo value [AD2].
- SWIR2 VDDA is Data Pool parameter SWIR2_VDDA, defined in section 12.1.11 as the SWIR2 VDDA value [AD2].
- SWIR2 VDET is Data Pool parameter SWIR2_VDET, defined in section 12.1.11 as the SWIR2 VDET value [AD2].
- SWIR2 Vvideo is Data Pool parameter SWIR2_Vvideo, defined in section 12.1.11 as the SWIR2 Vvideo value [AD2].
- SWIR2 ADC Ref is Data Pool parameter SWIR2_ADC_Ref, defined in section 12.1.11 as the SWIR2 ADC Ref value [AD2].
- TIR VDDA is Data Pool parameter TIR_VDDA, defined in section 12.1.11 as the TIR VDDA value [AD2].
- TIR VDDL is Data Pool parameter TIR_VDDL, defined in section 12.1.11 as the TIR VDDL value [AD2].
- TIR VBUS is Data Pool parameter TIR_VBUS, defined in section 12.1.11 as the TIR VBUS value [AD2].
- TIR VFID is Data Pool parameter TIR_VFID, defined in section 12.1.11 as the TIR VFID value [AD2].
- TIR VSKIMMING is Data Pool parameter TIR_VSKIMMING, defined in section 12.1.11 as the TIR VSKIMMING value [AD2].
- TIR VEB is Data Pool parameter TIR_VEB, defined in section 12.1.11 as the TIR VEB value [AD2].
- TIR Vvideo is Data Pool parameter TIR_Vvideo, defined in section 12.1.11 as the TIR Vvideo value [AD2].
- TIR ADC P is Data Pool parameter TIR_ADC_P, defined in section 12.1.11 as the TIR ADC P value [AD2].
- ADC 24 Ref is Data Pool parameter ADC_24_Ref, defined in section 12.1.11 as the ADC 24 Ref value [AD2].

- VNS VIS Detector Temperature is Data Pool parameter VTEMP_FEE_VIS, defined in section 12.1.5 as the FEE_VIS_VTEMP value [AD2].
- VNS NIR Detector Temperature is Data Pool parameter VTEMP_FEE_NIR, defined in section 12.1.5 as the FEE_NIR_VTEMP value [AD2].
- VNS SWIR1 Detector Temperature is Data Pool parameter VTEMP_FEE_SW1, defined in section 12.1.5 as the FEE_SW1_VTEMP value [AD2].
- VNS SWIR2 Detector Temperature is Data Pool parameter VTEMP_FEE_SW2, defined in section 12.1.5 as the FEE_SW2_VTEMP value [AD2].
- TIR Detector Temperature is Data Pool parameter VTEMP_FEE_TIR, defined in section 12.1.5 as the FEE_TIR_VTEMP value [AD2].

- Timing Pulse (Ground Line) is Data Pool parameter GL_Sync_Period, defined in section 12.1.22 as the Ground Line Sync Period value [AD2].
- FEE Number of Resends is Data Pool parameter FEENumberResends, defined in section 12.1.9 as the FEE number of command resends value [AD2].
- FEE State Register Request Status is Data Pool parameter FEEStsReqEnState, defined in section 12.1.9 as the FEE Status Register Request Enabled state value [AD2].
- FEE State Register Request Rate is Data Pool parameter FEEStsRegReqRate, defined in section 12.1.9 as the FEE Status Register Request Rate value [AD2].
- FEE ADC Registers Request Status is Data Pool parameter FEEADCReqEnState, defined in section 12.1.9 as the FEE ADC Register Request Enabled State value [AD2].
- FEE ADC Registers Request Rate is Data Pool parameter FEEADCRegReqRate, defined in section 12.1.9 as the FEE ADC Register Request Rate value [AD2].
- FEE USL Monitor is Data Pool parameter FEEUSLMonitorReg, defined in section 12.1.7 as the FEE USL Monitor Register (8 LS bits) value [AD2].
- FEE Command is Data Pool parameter FEE_Command_Reg, defined in section 12.1.7 as the FEE Command Register value [AD2].
- FEE Monitor is Data Pool parameter FEEMonitoringReg, defined in section 12.1.7 as the FEE Monitoring Register value [AD2].
- Spare is unused, 32 bits.

3.4.3.4 SID 61 – Default ANC Packet

The structure of the TM Source Packet Source Data field for the default Ancillary Packet is shown in the table below, as defined in [AD3]. The default Ancillary Packet HK Report will have a defined collection interval of 1Hz but by default will NOT be enabled.

Note that, in the Instrument Science X-band data stream, this Source Data field is included in the Private Science Data Header which follows the Packet Header and Data Field Header appropriate for the Instrument Science TM structure (see [AD6] Volume B).

SID = 61	Coarse Time (MSB) (8 bits)
Coarse Time (cont.) (16 bits)	
Coarse Time (LSB) (8 bits)	Fine Time (MSB) (8 bits)
Fine Time (LSBs) (16 bits)	
LOBT fine time at PPS arrival MS 16 bits	
LOBT fine time at PPS arrival (cont) 8 bits	HW Validity ASW Primary Monitor (8 bits)
VNSOU Temp 1 (SWIR 2 barrel 1) (16 bits)	
VNSOU Temp 2 (SWIR 2 barrel 2) (16 bits)	
VNSOU Temp 3 (Optical Unit 1) (16 bits)	
VNSOU Temp 4 (Optical Unit 2) (16 bits)	
VNS Cal Thermistor 1 (16 bits)	
VNS Cal Thermistor 2 (16 bits)	

TIROU Temp 1 (TIR Detector Hot Side Temperature) (16 bits)
TIROU Temp 2 (TIR Bench 1) (16 bits)
TIROU Temp 3 (TIR Bench 2) (16 bits)
TIROU Temp 4 (Rear Optics 1) (16 bits)
TIROU Temp 5 (Rear Optics 2) (16 bits)
TIROU Temp 6 (Filter Mask Top) (16 bits)
TIROU Temp 7 (Filter Mask Bottom) (16 bits)
TIROU Temp 8 (Ge Lens 2) (16 bits)
TIROU Temp 9 (Internal Reference BB) (16 bits)
VNSOU Temp 5 (SWIR 2 cold finger) (16 bits)
VNSOU Temp 6 (SWIR 2 radiator) (16 bits)
VNS Radiator Temperature 1 (16 bits)
TIROU CBB Temp 1 (Calibration BB 1) (16 bits)
TIROU CBB Temp 2 (Calibration BB 2) (16 bits)
Spare Temp 1 (16 bits)
Spare Temp 2 (16 bits)
Vis VDDA (16 bits)
Vis VDET (16 bits)
Vis Vvideo (16 bits)
FILTER_7V_P (16 bits)
NIR VDDA (16 bits)
NIR VDET (16 bits)
NIR Vvideo (16 bits)
ADC 08 Ref (16 bits)
SWIR1 VDDA (16 bits)
SWIR1 VDET (16 bits)
SWIR1 Vvideo (16 bits)
SWIR2 VDDA (16 bits)
SWIR2 VDET (16 bits)
SWIR2 Vvideo (16 bits)
ADC 16 Ref (16 bits)
TIR VDDA (16 bits)
TIR VDDL (16 bits)
TIR VBUS (16 bits)
TIR VFID (16 bits)

TIR VSKIMMING (16 bits)
TIR VEB (16 bits)
TIR Vvideo (16 bits)
TIR ADC P (16 bits)
ADC 24 Ref (16 bits)
VNS VIS Detector Temperature (16 bits)
VNS NIR Detector Temperature (16 bits)
VNS SWIR1 Detector Temperature (16 bits)
VNS SWIR2 Detector Temperature (16 bits)
TIR Detector Temperature (16 bits)
Spare (112 bits)

Figure 152: Default ANC TM Packet Format

Where:

- Coarse Time and Fine Time are fields of the current OBT Timestamp.
- HW Validity ASW Primary Monitor is the data pool value Valid_1, defined in section 12.1.5 as Valid_1 [AD2].
- VNSOU Temp 1 (SWIR 2 barrel 1) is Data Pool parameter TH_VNS_SW2_BRL_1, defined in section 12.1.5 as the VNS SW2 Barrel Thermistor 1 value [AD2].
- VNSOU Temp 2 (SWIR 2 barrel 2) is Data Pool parameter TH_VNS_SW2_BRL_2, defined in section 12.1.5 as the VNS SW2 Barrel Thermistor 1 value [AD2].
- VNSOU Temp 3 (Optical Unit 1) is Data Pool parameter THERM_VNS_OU_1, defined in section 12.1.5 as the VNS OU Thermistor 1 value [AD2].
- VNSOU Temp 4 (Optical Unit 2) is Data Pool parameter THERM_VNS_OU_2, defined in section 12.1.5 as the VNS OU Thermistor 2 value [AD2].
- VNS Cal Thermistor 1 is Data Pool parameter THERM_VNS_CAL_1, defined in section 12.1.5 as the VNS Calibration Thermistor 1 value [AD2].
- VNS Cal Thermistor 2 is Data Pool parameter THERM_VNS_CAL_2, defined in section 12.1.5 as the VNS Calibration Thermistor 2 value [AD2].
- TIROU Temp 1 (Detector hot side temperature sensor) is Data Pool parameter THERM_FEE_TIR_BASE, defined in section 13.1 as the FEE TIR Base Thermistor value [AD2].
- TIROU Temp 2 (TIR Bench 1) is Data Pool parameter TH_TIR_BENCH_1, defined in section 12.1.5 as the TIR Bench Thermistor 1 value [AD2].
- TIROU Temp 3 (TIR Bench 2) is Data Pool parameter TH_TIR_BENCH_2, defined in section 12.1.5 as the TIR Bench Thermistor 2 value [AD2].
- TIROU Temp 4 (Rear Optics 1) is Data Pool parameter TH_TIR_LENS8_1, defined in section 12.1.5 as the TIR Lens8 Thermistor 1 value [AD2].

- TIROU Temp 5 (Rear Optics 2) is Data Pool parameter TH_TIR_LENS8_2, defined in section 12.1.5 as the TIR Lens8 Thermistor 2 value [AD2].
- TIROU Temp 6 (Filter Mask Top) is Data Pool parameter TH_TIR_MASK_TOP, defined in section 12.1.5 as the TIR Masp Top Thermistor value [AD2].
- TIROU Temp 7 (Filter Mask Bottom) is Data Pool parameter TH_TIR_MASK_BOTTOM, defined in section 12.1.5 as the TIR Masp Bottom Thermistor value [AD2].
- TIROU Temp 8 (Ge Lens 2) is Data Pool parameter THERM_TIR_LENS2, defined in section 12.1.5 as the TIR Lens2 Thermistor value [AD2].
- TIROU Temp 9 (Internal Reference BB) is Data Pool parameter THERM_TIR_RBB, defined in section 12.1.5 as the TIR RBB Thermistor value [AD2].
- VNSOU Temp 5 (SWIR 2 cold finger) is Data Pool parameter PRT_VNS_SW2_1, defined in section 12.1.5 as the VNS SW2 Cold PT1000 1 value [AD2].
- VNSOU Temp 6 (SWIR 2 radiator) is Data Pool parameter PRT_VNS_SW2_2, defined in section 12.1.5 as the VNS SW2 Cold PT1000 2 value [AD2].
- VNS Radiator Temperature 1 is Data Pool parameter PRT_VNS_RAD, defined in section 12.1.5 as the VNS Rad PT1000 value [AD2].
- TIROU CBB Temp 1 (Calibration BB 1) is Data Pool parameter PRT_CBB_PT_1, defined in section 12.1.5 as the TIR CBB PT 1 value [AD2].
- TIROU CBB Temp 2 (Calibration BB 2) is Data Pool parameter PRT_CBB_PT_2, defined in section 12.1.5 as the TIR CBB PT 2 value [AD2].
- Spare Temp 1 is unused, 16 bits
- Spare Temp 2 is unused, 16 bits
- Vis VDDA is Data Pool parameter Vis_VDDA, defined in section 12.1.11 as the Vis VDDA value [AD2].
- Vis VDET is Data Pool parameter Vis_VDET, defined in section 12.1.11 as the Vis VDET value [AD2].
- Vis Vvideo is Data Pool parameter Vis_Vvideo, defined in section 12.1.11 as the Vis Vvideo value [AD2].
- FILTER 7V P is Data Pool parameter Filter_7V_P, defined in section 12.1.11 as the 7V Filter P value [AD2].
- NIR DDA is Data Pool parameter NIR_DDA, defined in section 12.1.11 as the NIR DDA value [AD2].
- NIR VDET is Data Pool parameter NIR_VDET, defined in section 12.1.11 as the NIR VDET value [AD2].
- NIR Vvideo is Data Pool parameter NIR_Vvideo, defined in section 12.1.11 as the NIR Vvideo value [AD2].
- ADC 08 Ref is Data Pool parameter ADC_08_Ref, defined in section 12.1.11 as the ADC 08 Ref value [AD2].
- SWIR1 VDDA is Data Pool parameter SWIR1_VDDA, defined in section 12.1.11 as the SWIR1 VDDA value [AD2].

- SWIR1 VDET is Data Pool parameter SWIR1_VDET, defined in section 12.1.11 as the SWIR1 VDET value [AD2].
- SWIR1 Vvideo is Data Pool parameter SWIR1_Vvideo, defined in section 12.1.11 as the SWIR1 Vvideo value [AD2].
- SWIR2 VDDA is Data Pool parameter SWIR2_VDDA, defined in section 12.1.11 as the SWIR2 VDDA value [AD2].
- SWIR2 VDET is Data Pool parameter SWIR2_VDET, defined in section 12.1.11 as the SWIR2 VDET value [AD2].
- SWIR2 Vvideo is Data Pool parameter SWIR2_Vvideo, defined in section 12.1.11 as the SWIR2 Vvideo value [AD2].
- ADC 16 Ref is Data Pool parameter ADC_16_Ref, defined in section 12.1.11 as the ADC 16 Ref value [AD2].
- TIR VDDA is Data Pool parameter TIR_VDDA, defined in section 12.1.11 as the TIR VDDA value [AD2].
- TIR VDDL is Data Pool parameter TIR_VDDL, defined in section 12.1.11 as the TIR VDDL value [AD2].
- TIR VBUS is Data Pool parameter TIR_VBUS, defined in section 12.1.11 as the TIR VBUS value [AD2].
- TIR VFID is Data Pool parameter TIR_VFID, defined in section 12.1.11 as the TIR VFID value [AD2].
- TIR VSKIMMING is Data Pool parameter TIR_VSKIMMING, defined in section 12.1.11 as the TIR VSKIMMING value [AD2].
- TIR VEB is Data Pool parameter TIR_VEB, defined in section 12.1.11 as the TIR VEB value [AD2].
- TIR Vvideo is Data Pool parameter TIR_Vvideo, defined in section 12.1.11 as the TIR Vvideo value [AD2].
- TIR ADC P is Data Pool parameter TIR_ADC_P, defined in section 12.1.11 as the TIR ADC P value [AD2].
- ADC 24 Ref is Data Pool parameter ADC_24 Ref, defined in section 12.1.11 as the ADC 24 Ref value [AD2].
- VNS VIS Detector Temperature is Data Pool parameter VTEMP_FEE_VIS, defined in section 12.1.5 as the FEE_VIS_VTEMP value [AD2].
- VNS NIR Detector Temperature is Data Pool parameter VTEMP_FEE_NIR, defined in section 12.1.5 as the FEE_NIR_VTEMP value [AD2].
- VNS SWIR1 Detector Temperature is Data Pool parameter VTEMP_FEE_SW1, defined in section 12.1.5 as the FEE_SW1_VTEMP value [AD2].
- VNS SWIR2 Detector Temperature is Data Pool parameter VTEMP_FEE_SW2, defined in section 12.1.5 as the FEE_SW2_VTEMP value [AD2].
- TIR Detector Temperature is Data Pool parameter VTEMP_FEE_TIR, defined in section 12.1.5 as the FEE_TIR_VTEMP value [AD2].

- Spare is unused, 128 bits. Note there is no spare defined in the hose keeping packet , but is written by the software with HK data when the ancilliary packet is written to the science data buffer.

3.4.4 Diagnostic Parameter Report

Service Type Id = 3
Service Sub-Type Id = 26

This report is generated if the corresponding flags are set appropriately. The flag "Report Generation Flag" must read "enabled".

SID	
Parameter 1 (variable)	
Parameter M (variable)	
Parameter N (repeat NREP times)	
Parameter P (repeat NREP times)	

Figure 153: Diagnostic Parameter Report TM Packet Format

Where:

- Parameter 1 (variable)
- Parameter M (variable)
- Parameter N (repeat NREP times)
- Parameter P (repeat NREP times)

3.4.5 HK/Diag Parameter Report Definitions report in Summary Form

Service Type Id = 3
Service Sub-Type Id = 129

TM(3,129) is the response to TC(3,128)

NPAR	SID (repeat NPAR times)
Status (repeat NPAR times)	
Collection Interval (repeat NPAR times)	

Figure 154: HK/Diag Parameter Report Definitions report in Summary Form TM Packet Format

Where:

- NPAR: number of SID's (1….NPAR_MAX)
- SID: Structure ID of the HK/Diag Report Definition to be reported
- Report generation status (1=Enabled / 0=Disabled)
- Collection Interval: Generation period for this HK TM packet expressed in number of cycles (1…65535)

3.5 Service 5 – Normal Progress Report

Service Type Id = 5
Service Sub-Type Id = 1

In all cases indicated below the EID is the Event ID of the represented Event.

3.5.1 Long Duration Command Progress Reporting

A long duration command is considered to be a command that takes greater than 10s to execute. Whilst executing a long duration command, the ASW is required to generate a Normal Progress Report every 10s.

The ASW will generate Progress reports for the following long duration commands:

- TC(6,5) 'Dump Memory Using Absolute Address'; EID = EID_MEMORY_DUMP_IN_PROGRESS
- TC(8,1) Functions 2/4/6 Mode Transition Functions; EID = EID_MODE_TRANSITION_IN_PROGRESS
- TC(239,5/6/7/10) TIROU Mechanism Service: Set to Cold Space View, Set to Black Body View, Set to Nadir View, Command TIROU Mechanism; EID = EID_TIR_OPERATION
- TC(236,5/6/7/8/10) VNSOU Mechanism Service: Set to Solar Diffuser View 1, Solar Diffuser View 1, Set to Dark View, Set to Nadir View, Command VNSOU Mechanism; EID = EID_VNS_OPERATION
- TC(238,11) Start FEE Memory Test; EID = EID_FEE_MEM_TEST_IN_PROGRESS

3.5.2 Time Synchronisation Verification OK

The 'Time Synchronisation Verification OK' is generated at the next PPS Synchronisation pulse following receipt of a TC(9,135). The structure of the 'Time Synchronisation Verification OK' is shown in 155.

EID = EID_TIME_SYNC_OK	
LOBT Coarse Time Field at Reception of TC MS word (16 bits)	
LOBT Coarse Time Field at Reception of TC Field LS word (16 bits)	
LOBT Fine Time Field at Reception of TC MS word (16 bits)	
LOBT Fine Time Field at Reception of TC LS Byte (8bits)	
OBT Coarse Time Field Due at next PPS Sync MS word (16 bits)	
OBT Coarse Time Field Due at next PPS Sync LS word (16 bits)	
OBT Fine Time Field Due at next PPS Sync MS word (16 bits)	
OBT Fine Time Field Due at next PPS Sync LS Byte (8bits)	
new LOBT Coarse Time Field at Reception of PPS Sync MS word (16 bits)	
new LOBT Coarse Time Field at Reception of PPS Sync LS word (16 bits)	
new LOBT Fine Time Field at Reception of PPS Sync MS word (16 bits)	
new LOBT Fine Time Field at Reception of PPS Sync LS Byte (8bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync MS word (16 bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync LS word (16 bits)	
Original LOBT Fine Time Field at Reception of PPS Sync MS word (16 bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync LS byte (8 bits)	

Figure 155: Time Synchronisation Verification OK TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 24 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - LOBT at Reception of TC
  - OBT at next PPS Sync
  - New LOBT at Reception of PPS
  - Original LOBT

3.5.3 Mode Transition Progress Report

The 'Mode Transition Progress Report' is generated every 2s during the execution of a TC(8,1) Mode Transition Function. The structure of the 'Mode Transition Progress Report' is shown in Figure 156.

EID = EID_MODE_TRANSIT	
Destination Mode ID	Source Mode ID
Step ID	

Figure 156: Mode Transition Progress Report TM Packet Format

Where:

- Source Mode ID is defined in Table 12.
- Destination Mode ID is defined in Table 12.
- Step ID is the number of the last executed step within the Transition Procedure.

3.5.4 Perform Self Test Completion Report

The 'Perform Self Test (ASW) Completion Report' is generated at completion of the execution of a TC(8,1) Function 142 Perform Self Test command. The structure of the "Perform Self Test Completion Report' is shown in Figure 157.

EID = EID_COMP_SLF_TST_ASW		
Filler (5 bits)	Self Test Result (3 bits)	

Figure 157: Perform Self Test Completion Report TM Packet Format

Where:

- Self Test Result is a bit field:

  Bit 0 : PWM Scaling Factor test result

  Bit 1 : EQ_SOL test result

  Bit 2: Watchdog test result

3.5.5 FEE Retry Successful

Indicates that an FEE command was successful following a retry.

EID = EID_FEE_RETRY_SUCCESSFUL		
Read/Write flag (8 bits)	Register address (8 bits)	FEE command data (bits 0..7)
FEE command data (16 LS bits)		
Retry_Count (8 bits)		

Figure 158: FEE Retry Successful Event Report TM Packet Format

Where:

- Read/Write flag is bit 31 of the FEE command : 0 = Read; 1 = Write;
- Register address is bits 30..24 of the FEE command;
- FEE Command Data is bits 23..0 of the FEE command sent to the FEE;
- Retry Count is 8 bits, the number of retries performed.

3.5.6 ASW-controlled FEE Memory Test Second Pass

Indicates that the second pass of the ASW-controlled FEE memory test has started.

EID = EID_FEE_MEM_TEST_SECOND_PASS

Figure 159: FEE_MEM_TEST_SECOND_PASS Event Report TM Packet Format

3.5.7 TIR Slew Start

Reports that an autonomous TIR slew has started, e.g. a 'seek' operation as part of a requested slew.

EID = EID_TIR_SLEW_START
TIR Slew Operation (16 bits)

Figure 160: TIR_SLEW_START Event Report TM Packet Format

Where

- TIR Slew Operation has the values defined for TIR_Slew_Operation_typ, i.e.

  1 = TIR_Requested_Slew

  2 = TIR_Pre_Slew_Seek

  3 = TIR_Post_Slew_Seek

  4 = TIR_Slew_Retry

  5 = TIR_Seek_Clockwise

  6 = TIR_Seek_Counter_Clockwise_Attempt_1

  7 = TIR_Seek_Counter_Clockwise_Attempt_2

  8 = TIR_Seek_Counter_Clockwise_Attempt_3

  9 = TIR_Post_Seek_Slew

  10 = TIR_Park_after_Abort

3.5.8 VNS Slew Start

Reports that an autonomous VNS slew has started, e.g. a 'seek' operation as part of a requested slew.

EID = EID_VNS_SLEW_START
VNS Slew Operation (16 bits)

Figure 161: VNS_SLEW_START Event Report TM Packet Format

Where:

- VNS Slew Operation has the values defined for VNS_Slew_Operation_typ, i.e.

  1 = VNS_Requested_Slew

  2 = VNS_Pre_Slew_Seek

  3 = VNS_Post_Seek_Slew

4 = VNS_Post_Slew_Seek

5 = VNS_Slew_Retry

6 = VNS_Park_after_Abort

3.5.9 TIR Operation

Periodic report of an ongoing TIR slew.

EID = EID_TIR_OPERATION

Figure 162: TIR_OPERATION Event Report TM Packet Format

3.5.10 VNS Operation

Periodic report of an ongoing VNS slew.

EID = EID_VNS_OPERATION

Figure 163: VNS_OPERATION Event Report TM Packet Format

3.5.11 VNS Target Position Reached Successfully

Indicates that VNS Virtual Encoder Status Register reports the correct position value and the VNS Position Monitor Register reports the correct shift register sequence for the mechanism position and direction of approach.

EID = EID_VNS_POSITION_OK
VNS_Target_Point : VNS_Target_Point_typ (16 bits)
VNS_Virtual_Encoder_Status (16 bits)
VNS_Position_Monitor (16 bits)

Figure 164: VNS Target Position Reached Successfully Event Report TM Packet Format

Where:

- VNS Target Point has the values defined by VNS_Target_Point_typ, i.e.

  1 = POS_A_NADIR,

  2 = POS_B_SOLAR_DIFFUSER_1,

  3 = POS_C_DARK,

  4 = POS_D_SOLAR_DIFFUSER_2,

  5 = SEEK,

  6 = PROVIDED;
- VNS Virtual Encoder Status is bits 15-0 of the VNS Virtual Encoder Status Register as defined in [AD2];
- VNS Position Monitor is bits 15-0 of the VNS Position Monitor Register as defined in [AD2].

3.5.12 TIR Position Report

Reports the TIR mechanism position after a commanded slew.

EID = EID_TIR_POSITION
TIR_Target_Point : TIR_Target_Point_typ (16 bits)
TIR_Virtual_Encoder_Status (16 bits)
TIR_Position_Monitor (32 bits)

Figure 165: TIR Target Position Event Report TM Packet Format

Where:

- TIR Target Point has the values defined by TIR_Target_Point_typ, i.e.

  1 = COLD_SPACE,

  2 = BLACK_BODY,

  3 = NADIR_EARTH,

  4 = SEEK,

  5 = PROVIDED;
- TIR Virtual Encoder Status is bits 15-0 of the TIR Virtual Encoder Status Register as defined in [AD2];
- TIR Position Monitor is bits 15-0 of the TIR Position Monitor Register as defined in [AD2]. Present_Encoder_Value is represented as 8 bit unsigned intereger value.

3.5.13 Mode Transition Procedure Started Report

The 'Mode Transition Procedure Started Report' is generated at the start of a mode transition procedure. The structure of the 'Mode Transition Procedure Started Report' is shown in Figure 166.

EID = EID_TRANSITION_STARTED	
Mode Transition Procedure Id (8 bits)	

Figure 166 Mode Transition Procedure Started Report

3.5.14 Mode Transition Procedure Completed Report

The 'Mode Transition Procedure Complete Report' is generated on completion of a mode transition procedure. The structure of the 'Mode Transition Procedure Complete Report' is shown in Figure 167.

EID = EID_TRANSITION_COMPLETE	
Mode Transition Procedure Id (8 bits)	

Figure 167 Mode Transition Procedure Complete Report

3.5.15 FEE Memory Test in Progress Report

The 'FEE Memory Test In Progress Report' is generated to report ongoing execution of the FEE memory test. The structure of the 'FEE Memory Test In Progress Report' is shown in Figure 167.

EID = EID_FEE_MEM_TEST_IN_PROGRESS

Figure 168 FEE Memory TestIn Progress Report

3.5.16 Logged Discarded Data

Indicates that TC data read from the Milbus has been discarded and written to the Failure Buffer. The Offset parameter specifies the offset from the start of the buffer at which the data is written.

EID = EID_LOGGED_DISCARDED_TC_DATA
Bytes_Logged (16 bits)
Offset (16 bits)

Figure 169: Logged Discarded Data TM Packet Format

3.6 Service 5 – Error / Anomaly Report – Low Severity

Service Type Id = 5
Service Sub-Type Id = 2

The ASW software will generate an Error/Anomaly report of sub-type 2 for the following event conditions.

In all cases indicated below the EID is the Event ID of the represented Event.

3.6.1 Low Severity Monitored Parameter Range Exceeded Event

The ASW will generate Events when any of the monitored parameters specified in Table 16 exceeds the Low Severity user-defined limits.

The generic structure of the Low Severity Range Exceeded Event reports is shown in Figure 170.

EID	
Monitoring ID (8 bits)	
Parameter ID (32 bits)	
Mask (32 bits)	
Parameter Value (64 bits)	
Limit Crossed (64 bits)	
Previous Checking Status (8 bits)	Current Checking Status (8 bits)
Transition Time - Coarse Time Field MS word (16 bits)	
Transition Time - Coarse Time Field LS word (16 bits)	
Transition Time - Fine Time Field MS word (16 bits)	
Transition Time - Fine Time Field LS Byte (8 bits)	

Figure 170: Generic Low Severity Monitored Parameter Range Exceeded Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID associated with the monitored parameter exceeding the monitored range.
- Monitoring Id is Id of Monitoring Control Table Entry, in range 1..255
- Parameter Id is Id of parameter being monitored. Format is defined in [RD2].
- Mask is bit pattern used when monitoring against an Expected Value. Read as zero for Monitoring entries using Limit Monitoring.
- Parameter value is value of parameter when limit value exceeded. Value is right aligned if the complete field length is not required.
- Limit Crossed is the Limit Value, or Expected Value, that has been crossed. Value is right aligned if the complete field length is not required.
- Previous Checking Status is Monitoring Status before Limit exceeded. Enumerated values of:
    - 0 – Within Limits;
    - 1 – Unchecked;
    - 2 – Invalid;
    - 4 – Below Low Limit;
    - 5 – Above High Limit.
- Current Checking Status is Monitoring Status. Enumerated values same as Previous Checking Status.
- Transition Time is time at Monitoring Event transition.

3.6.2 EDAC Memory Scrubbing Event

The ASW will generate an EDAC Memory Scrubbing Event Report when a Single Bit Error has been detected, and corrected, during memory scrubbing. This event is limited to one event per second.

The structure of the Memory Scrubbing EDAC Event report is shown in Figure 171.

EID = EID_EDAC_ERROR_ASW
Address MS Word (16 bits)
Address LS Word (16 bits)
Total SEU Count MS Word (16 bits)
Total SEU Count LS Word (16 bits)
SEU Count MS Word (16 bits)
SEU Count LS Word (16 bits)

Figure 171: EDAC Memory Scrubbing Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

- Parameter is 12 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Address is absolute byte address of location that caused the SEU error.
  - Total SEU Count is total number of individual single bit errors detected since the last software restart.
  - SEU Count is number of individual single bit errors detected in previous scrub cycle of the defined scrub areas.

3.6.3 Spurious PPS Received Event

The ASW will generate a Spurious PPS Received Event if any spurious PPS signals are received during a PPS period. A PPS signal is considered spurious if it is received in excess of 10ms early from the expected arrival time. This event is limited to one event per expected PPS period, irrespective of the number of spurious signals received.

The structure of the Spurious PPS Received Event report is shown in Figure 172:

EID = EID_PPS_SPURIOUS	
PPS Source	
LOBT Coarse Time Field at Reception of valid PPS MS word (16 bits)	
LOBT Coarse Time at Reception of valid PPS LS word (16 bits)	
LOBT Fine Time Field at Reception of valid PPS MS word (16 bits)	
LOBT Fine Time Field at Reception of valid PPS LS Byte (8 bits)	

Figure 172: Spurious PPS Received Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 10 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - PPS Source is
    - Bit 0 – 13. Not used. Read as zero.
    - Bit 14. PPS disabled. 1 – PPS Disabled, 0 – PPS enabled.
    - Bit 15. PPS Selected. 1 – PPS2 selected, 0 – PPS1 selected.
  - LOBT is the Local Onboard Time at reception of valid PPS

3.6.4 Missing PPS Event

The ASW will generate a missing PPS Event if a PPS signal has not been detected in excess of 10ms after the expected PPS arrival time.

The structure of the Missing PPS Event report is shown in Figure 173:

EID = EID_PPS_MISSING	
PPS Source	
LOBT Coarse Time Field at expected Receipt of PPS MS word (16 bits)	
LOBT Coarse Time at expected Receipt of PPS LS word (16 bits)	
LOBT Fine Time Field at expected Receipt of PPS MS word (16 bits)	
LOBT Fine Time Field at expected Receipt of PPS LS Byte (8bits)	

Figure 173: Missing PPS Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 10 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - PPS Source is
        - Bit 0 – 13. Not used. Read as zero.
        - Bit 14. PPS disabled. 1 – PPS Disabled, 0 – PPS enabled.
        - Bit 15. PPS Selected. 1 – PPS2 selected, 0 – PPS1 selected.
    - LOBT is the Local Onboard Time at reception of valid PPS

3.6.5 PPS Unsynchronised Event

The Application Software will generate a PPS Unsynchronised Event if a PPS signal is received between the Synchronised Limit and Acceptance Limit of its expected arrival time.

The structure of the PPS Unsynchronised Event report is shown in Figure 174:

EID = EID_PPS_UNSYNCHRONISED	
PPS Source	
LOBT Coarse MS word (16 bits)	
LOBT Coarse LS word (16 bits)	
LOBT Fine Time (bits 0..15)	
LOBT Fine Time LS word (bits 16..23)	
PPS period (bits 0..15)	
PPS period (bits 16..31)	

Figure 174: PPS Unsynhronised Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 10 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - PPS Source is

- Bit 0 – 13. Not used. Read as zero.
- Bit 14. PPS disabled. 1 – PPS Disabled, 0 – PPS enabled.
- Bit 15. PPS Selected. 1 – PPS2 selected, 0 – PPS1 selected.

- LOBT is the Local Onboard Time at reception of PPS

3.6.6 Unhandled Trap Event

The ASW will generate an 'Unhandled Trap Event' when an unhandled trap is triggered on the processor.

The structure of the Unhandled Trap Event report is shown in Figure 175.

EID = EID_UNHANDLED_TRAP
Trap Id
Unhandled Trap Count MS Word (16bits)
Unhandled Trap Count LS Word (16bits)

Figure 175: Unhandled Trap Event TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 6 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Trap Id is trap table entry of unhandled trap
  - Unhandled Trap Count is count of all unhandled traps. Clamped at 0xFFFF FFFF.

3.6.7 Memory Write Failure

The ASW will generate a 'Memory Write Failure' Event when a patch to EEPROM has failed.

The structure of the Memory Write Failure report is shown in Figure 176.

EID = EID_MEM_WRITE_FAIL	
Memory Write Failure Reason	
Start Address MS Word (16bits)	
Start Address LS Word (16bits)	
Num SAU MS Word (16bits)	
Num SAU LS Word (16bits)	

Figure 176: Memory Write Failure Event TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 10 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:

- Memory Write Failure Reason is:
  - 0 – EEPROM Write OK,
  - 1 – EEPROM Write Protected
  - 2 – EEPROM Write fail
  - 3 – EEPROM write buffer full
  - 4 – EEPROM write queue full
  - 5 – EEPROM Power off
  - 6 – EEPROM 10.1ms timer flag already set
  - 37 – Address not available.
- Start Address is patch address defined in related TC(6,2)
- Num SAU is length field defined in related TC(6,2)

3.6.8 Science HK SID Truncation Event

The ASW will generate a 'Science HK SID Truncation' Event Report when the commanded HK SID for inclusion in Science Data Packets exceeds the allowed space, and is truncated.

The structure of the Science HK SID Truncation Event report is shown in Figure 177.

EID = EID_HK_SID_TRUNCATE

Figure 177: Science HK SID Truncation Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.6.9 FEE Command Not Ready

FEE Command Ready was not indicated in the USL Monitor Register when an FEE command was sent; the command was sent anyway.

MSISW-1700 requires the ASW to check the 'FEE Command Ready' bit in the 'USL monitor' before sending a command. The event is generatated at the point in time when a command is written to the FEE command register by the method USL_Protocol.Send_Command if the 'ready' bit is not set. Since the FEE interface uses the cyclic scheduler, the interface is always expected to be ready, so the error indicates a system fault.

EID = EID_FEE_COMMAND_NOT_READY

Figure 178: FEE Command Not Ready Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.6.10 FEE State Change

Reports an FEE state change observed in the FEE state.

EID = EID_FEE_STATE_CHANGE	
Current FEE State (8 bits)	Previous FEE state (8 bits)

Figure 179: FEE State Change Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Current FEE State is 2 bits, the current FEE State as defined in [AD5]
  - Previous FEE State is 2 bits, the previous FEE State as defined in [AD5].

3.6.11 USL Error

Reports a USL error during FEE commanding : The USL Monitor Register will indicate Underflow, Overflow, Sync Error or CRC Error.

EID = EID_USL_ERROR
USL Monitor Register (bits 0..15)
USL Monitor Register (bits 16..31)

Figure 180: USL Error Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - USL Monitor Register is 32 bits, the contents of the USL Monitor Register [AD5].

3.6.12 FEE Status Error

An error was reported by the FEE in the FEE Status word. The Status word will indicate one or more of Framing error, Checksum error, Incomplete, Address write error or Address read error.

EID = EID_FEE_STATUS_ERROR	
Read/Write flag (8 bits)	Register address (8 bits)
FEE Command Register setting (bits 0..15)	
FEE Command Register setting (LS 8 bits)	FEE Status Word (bits 0..7)
FEE Status Word (LS 16 bits)	

Figure 181: FEE Status Error Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - FEE Command Register is the command sent to the FEE
  - FEE Status Word is the contents of the FEE Status Register [AD5].

3.6.13 FEE Status Returned Unexpectedly

Indicates that the FEE Status value was returned in response to an FEE command, when the FEE Status was not expected.

EID = EID_FEE_STATUS_RETURNED_UNEXPECTEDLY	
Read/Write flag (8 bits)	Register address (8 bits)
FEE command data (bits 0..15)	
FEE Command Register setting (LS 8 bits)	FEE Status Word (MS 8 bits)
FEE Status Word (LS 16 bits)	

Figure 182: FEE Status Returned Unexpectedly Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - FEE Command is 24 bits, the command sent to the FEE
  - FEE Status is 24 bits, the contents of the FEE Status Register [AD5].

3.6.14 FEE Command Failed due to USL Error

An FEE command failed (after retries) due to a USL error. The USL errors are reported separately.

EID = EID_FEE_FAIL_USL_ERROR

Figure 183: FEE Command Failed due to USL Error Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.6.15 FEE-Controlled External Memory Test Fail

Indicates that an error was detected during the FEE-controlled FEE memory test.

EID = EID_FEE_EXT_MEM_TEST_FAIL	
	Failed address (MS 8 bits)
Failed address (LS 16 bits)	

Figure 184: FEE Memory Test Persistent Error TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - Failed Address is the address at which the FEE-controlled external memory test failed.

3.6.16 FEE-Controlled Internal Memory Test Fail

Indicates that an error was detected during the FEE-controlled FEE memory test.

EID = EID_FEE_INT_MEM_TEST_FAIL
Failed address (16 bits)

Figure 185: FEE Memory Test Persistent Error TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - Failed Address is the address at which the FEE-controlled internal memory test failed.

3.6.17 ASW-Controlled FEE Memory Test Fail (First Pass)

Indicates that an error was detected during the ASW-controlled FEE memory test (first pass).

EID = EID_FEE_MEM_TEST_FAIL_FIRST_PASS	
	Failed address (MS 8 bits)
Failed address (16 LS bits)	
	Expected value (MS 8 bits)
Expected value (LS 16 bits)	
	Actual value (MS 8 bits)
Actual value (16 LS bits)	

Figure 186: FEE Memory Test Fail TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - Failed address is 24 bits, the FEE address at which the memory failure was detected.
    - Expected value is 24 bits, the expected value stored at the Failed address.
    - Actual value is 24 bits, the actual value stored at the Failed address.

3.6.18 ASW-Controlled FEE Memory Test Fail (Second Pass)

Indicates that an error was detected during the ASW-controlled FEE memory test (second pass, before retest).

EID = EID_FEE_MEM_TEST_FAIL_SECOND_PASS	
	Failed address (MS 8 bits)
Failed address (16 LS bits)	
	Expected value (MS 8 bits)
Expected value (LS 16 bits)	
	Actual value (MS 8 bits)
Actual value (16 LS bits)	

Figure 187: FEE Memory Test Fail TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Failed address is 24 bits, the FEE address at which the memory failure was detected.
  - Expected value is 24 bits, the expected value stored at the Failed address.
  - Actual value is 24 bits, the actual value stored at the Failed address.

3.6.19 ASW-Controlled FEE Memory Test Persistent Error

Indicates that an error was detected during the ASW-controlled FEE memory test (second pass, after retest).

EID = EID_FEE_MEM_TEST_FAIL_AFTER_RETRY	
	Failed address (MS 8 bits)
Failed address (16 LS bits)	
	Expected value (MS 8 bits)
Expected value (LS 16 bits)	
	Actual value (MS 8 bits)
Actual value (16 LS bits)	

Figure 188: FEE Memory Test Persistent Error TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Failed address is 24 bits, the FEE address at which the memory failure was detected.

- Expected value is 24 bits, the expected value stored at the Failed address.
- Actual value is 24 bits, the actual value stored at the Failed address.

3.6.20 VNS Target Position Not Reached

Indicates either that VNS Virtual Encoder Status Register reports the incorrect position value and/or the VNS Position Monitor Register reports the incorrect shift register sequence for the mechanism position and direction of approach.

EID = EID_VNS_POSITION_NOK
VNS_Target_Point : VNS_Target_Point_typ (16 bits)
VNS_Virtual_Encoder_Status (16 bits)
VNS_Position_Monitor (16 bits)

Figure 189: VNS Target Position Not Reached Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - VNS Target Position has the values defined by VNS_Target_Point_typ, i.e.

    1 = POS_A_NADIR,

    2 = POS_B_SOLAR_DIFFUSER_1,

    3 = POS_C_DARK,

    4 = POS_D_SOLAR_DIFFUSER_2,

    5 = SEEK,

    6 = PROVIDED;
  - VNS Virtual Encoder is bits 15-0 of the VNS Virtual Encoder Status Register as defined in [AD2];
  - VNS Position Monitor is bits 15-0 of the VNS Position Monitor Register as defined in [AD2].

3.6.21 VNS Position Error (after Correction)

Indicates that a VNS slew was not successful : a position error remained even after an attempted correction.

EID = EID_VNS_POS_ERR_AFTER_CORRECTION
Target_Position : VNS_Target_Point_typ (16 bits)
Actual_Position (LED sequence) (16 bits)

Figure 190: VNS Position Error after Correction TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Target Position has the values defined by VNS_Target_Point_typ, i.e.

    1 = POS_A_NADIR,

    2 = POS_B_SOLAR_DIFFUSER_1,

    3 = POS_C_DARK,

    4 = POS_D_SOLAR_DIFFUSER_2,

    5 = SEEK,

    6 = PROVIDED;
  - Actual Position (LED sequence) is bits 15-0 from the VNS position monitor register, which reports the 15-bit VNS encoder light sample log.

3.6.22 VNS Position Error (after Retry)

Indicates that a VNS slew was not successful : a position error remained even after an attempted retry.

EID = EID_VNS_POS_ERR_AFTER_RETRY
Target_Position : VNS_Target_Point_typ (16 bits)
Actual_Position (LED sequence) (16 bits)

Figure 191: VNS Position Error after Retry TM Packet Format

For parameter details see EID_VNS_POS_ERR_AFTER_CORRECTION.

3.6.23 TIR Seek Failed

Indicates that a TIR seek operation was not successful : the position validity criterion was not met – the Cold_Space_Datum_Encountered bit in the TIR Virtual Encoder Status Register does not indicate 'Encountered'.

EID = EID_TIR_SEEK_FAILED

Figure 192: TIR Seek Failed TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.6.24 VNS Seek Failed

Indicates that a VNS seek operation was not successful : the position validity criteria were not met – the VNS mechanism validity flags are the 'position A/B/C/D encountered' bits in the VNS 'virtual encoder status' register. This error indicates that the hardware has not encountered a VNS mechanism reference point.

EID = EID_VNS_SEEK_FAILED

Figure 193: VNS Seek Failed TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.6.25 Truncation Occurred

Indicates that a truncation occurred during a slew profile construction for either TIR or VNS.

EID = EID_TRUNCATION_OCCURRED	
Mechanism ID (8 bits)	Coast Step S (bits 0..7)
Coast Step S (bits 8..23)	
Coast Steps (bits 24..31)	Total Steps (bits 0..7)
Total steps (bits 8..23)	
Total Steps (bits 24-31)	

Figure 194: Truncation Occurred TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 9 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Mechanism ID is 8 bits
  - Coast Steps S is 32 bits.
  - Total Steps is 32 bits.

  Total required steps is 16 bits, the calculated total required steps for the constructed slew profile, prior to truncation.

3.6.26 Inconsistent Final Deceleration

Indicates that, during the SCT coherency check, the ASW detected an inconsistency between the master SCT profile data and the data pool value for the number of steps in the final deceleration segment of a speed profile, 'T'. The master SCT profile data was used.

EID = EID_INCONSISTENT_FINAL_DECEL (2 bytes)	
Mechanism ID (8 bits)	Master_Final_Decel_Steps (bits 0..7)
Master_Final_Decel_Steps (bits 8..23)	
Master_Final_Decel_Steps (bits 24..31)	Final Steps T (bits 0..7)
Final Steps T (bits 8..23)	
Final Steps T (bits 24..31)	

Figure 195: Inconsistent Final Deceleration TM Packet Format

3.6.27 DPRAM Error Status Event

The Application Software will generate a 'DPRAM Double Bit Error Event Report when the DPRAM Error Status register contents are read as non zero.

EID = EID_DPRAM_ERROR_STATUS
DPRAM Error Status

Figure 196: DPRAM Double Bit Error Event

Where:

DPRAM Error Status is

Bits 8 – 0 unused

Bit 9 – ADC latchup double bit error

Bit 10 – Buffer F: ADC3 analogue double bit error

Bit 11 – Buffer E: ADC 1 or 2 analogue double bit error

Bit 12 – Buffer D: Flat Field double bit error

Bit 13 – Buffer C: FEE Science Pkt buffer double bit error

Bit 14 – Buffer B: WCT double bit error

Bit 15 – Buffer A: SCT double bit error

3.6.28 TIR Reference Set Not Loaded

Raised during a mode transition to NOM_OBS to indicate the TIR reference set specified in the TC cannot be loaded as it is not valid.

EID = EID_TIR_REFERENCE_SET_NOT_LOADED

Figure 197: TIR Reference Set Not Loaded Event

3.6.29 VNS Reference Set Not Loaded

Raised during a mode transition to NOM_OBS to indicate the VNS reference set specified in the TC cannot be loaded as it is not valid.

EID = EID_VNS_REFERENCE_SET_NOT_LOADED

Figure 198: VNS Reference Set Not Loaded Event

3.6.30 TIR Null Slew Requested

The ASW will generate a 'TIR Null Slew requsted' Event Report when a TIR mechanism command would result in a Slew to the current position (so no Slew is performed)

EID = EID_TIR_NULL_SLEW_REQUESTED
Current Position

Figure 199: TIR Null Slew Requsted TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter Cuurent Position is the current step position of the TIR mechanism (as read from Virtual Encoder Register)

3.6.31 VNS Null Slew Requested

The ASW will generate a 'VNS Null Slew requsted' Event Report when a VNS mechanism command would result in a Slew to the current position (so no Slew is performed)

EID = EID_VNS_NULL_SLEW_REQUESTED
Current Position

Figure 200: VNS Null Slew Requsted TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter Cuurent Position is the current step position of the VNS mechanism (as read from Virtual Encoder Register)

3.7 Service 5 – Error / Anomaly Report – Medium Severity

Service Type Id = 5
Service Sub-Type Id = 3

The ASW will generate an Error/Anomaly report of sub-type 3 for the following supported event conditions.

In all cases indicated below EID is the Event ID of the represented Event.

3.7.1 VNS Timeout Event

The Application Software will generate a 'VNS Timeout' Event if a VNS sloew times outl.

The structure of the VNS Timeout report is shown in Figure 208.

EID = EID_VNS_TIMEOUT

Figure 201 : EID VNS Timeout Event Report

3.7.2 Thermal Control Loop Primary Sensor Failure

Indicates that the primary temperature sensor for a thermal control loop has recorded an out-of-range temperature.

EID = EID_INVALID_PRIMARY_TEMPERATURE	
Thermal control loop ID (8 bits)	Primary temperature sensor ID (8 bits)

Figure 202: Truncation Occurred TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Thermal Control Loop ID – 8 bit identifier of thermal control loops
- Primary temperature sensor ID – 8 bit identifier of primary temperature sensor used in the identified control loop

3.7.3 Thermal Control Loop Secondary Sensor Failure

Indicates that the secondary temperature sensor for a thermal control loop has recorded an out-of-range temperature.

EID = EID_INVALID_SECONDARY_TEMPERATURE	
Thermal control loop ID (8 bits)	Secondary temperature sensor ID (8 bits)

Figure 203: Truncation Occurred TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Thermal Control Loop ID – 8 bit identifier of thermal control loops
- Secondary temperature sensor ID – 8 bit identifier of secondary temperature sensor used in the identified control loop

Note: As the TEC (Peltier Cooler) Thermal Control Loop has only one temperature sensor, this Event cannot occur for the TEC Loop.

3.7.4 Invalid Source Band Report

The 'Invalid Source Band Report' is generated if an invalid source band is read from the Science Data Interface when processing the FEE Science Packet Buffer full interrupt.

.

EID = EID_Invalid_Source_Band	
Source_Band_Id	

Figure 204 Invalid Source Band Report

3.7.5 Mode Procedure Fail Event

The Application Software will generate a 'Mode Procedure Fail' Event Report when a failure in the execution of a mode transition procedure step is detected.

The structure of the Mode Procedure Fail Event report is shown in Figure 205.

EID = EID_PROCEDURE_FAIL	
Procedure ID	Procedure Error Code
Procedure Step Offset	

Figure 205: Mode Procedure Fail Event Report

Where:

Procedure ID is the ID of the executing mode transition procedure.

Procedure Error Code is;

1 = Syntax Error

2 = IF Error

3 = ELSE error

4 = END_IF Error

5 = TC Error

6 = WAIT Error

7 = Event Error

8 = Begin Error

9 = Data Pool Error

10 = Condition Operator Error

11 = While Error

12 = Until Error

13 = WAIT_FOR Error

14 = Parameter ID Error

15 = PTC Invalid

16 = PFC Invalid

Procedure Step Offset is the octet offset from the start of the procedure of the failed instruction.

3.7.6 Mode Procedure Load Initialisation Fail Event

The Application Software will generate a 'Mode Procedure Load Initialisation Fail Event Report when the number of mode transition procedures defined in the Procedure IDs list is not consistent with the number of procedures loaded.

The structure of the Mode Procedure Load Initialisation Fail Event report is shown in Figure 206.

EID = EID_PROCEDURE_LOAD_INIT_FAIL	
Number of Procedure IDs	Number of Procedures

Figure 206: Mode Procedure Load Initialisation Fail Event Report

Where:

Number of Procedure ID is the number of procedure IDs defined in the Procedure IDs list.

Number of Procedures is the number of loaded procedures. A procedure is defined by a Procedure 'BEGIN' tag and 'Procedure Length' octets.

3.7.7 Mode Procedure Priority Initialisation Fail Event

The Application Software will generate a 'Mode Procedure Priority Initialisation Fail Event Report when any of the mode transition priorities are out of range.

The structure of the Mode Procedure Priority Initialisation Fail Event report is shown in Figure 207.

EID = EID_PROCEDURE_PRIORITY_INIT_FAIL	
Procedure Priority Index	Procedure Priority Value

Figure 207: Mode Procedure Priority Initialisation Fail Event Report

3.7.8 API Fail Event

The Application Software will generate an 'API Fail' Event if an unexpected failure status is retuned from an API call.

The structure of the API Fail Event report is shown in Figure 208.

EID = EID_API_FAIL

Figure 208 : API Fail Event Report

3.7.9 TC Internal Queue Overflow Event

The Application Software will generate a TC Internal Queue Overflow Event when there is insufficient space in the Internal TC Receive Queue to accept the latest Internal TC.

The structure of the TC Internal Queue Overflow Event report is shown in Figure 209

EID = EID_ OVERFLOW_ INTERNAL_TC_Q

Figure 209 : TC Internal Queue Overflow Event Report

3.7.10 Default Event Action Initialisation Failure Event

The Application Software will generate a Default Event Action Initialisation Failure Event when a default event action can not be added to the event action queue at initialisation.

The structure of the Default Event Action Initialisation Failure Event report is shown in Figure 210

EID = EID_DEFAULT_EA_INIT_FAIL	
EID of the first failing default event action entry	
Number of failures detected in default list	

Figure 210 : Default Event Action Initialisation Event Report

3.7.11 Default Monitor Initialisation Failure Event

The Application Software will generate a Default Monitor Initialisation Failure Event when a default monitor can not be added to the monitor list at initialisation.

The structure of the Default Monitor Initialisation Failure Event report is shown in Figure 211

EID = EID_DEFAULT_MONITOR_INIT_FAIL	
Monitor ID of the first failing default monitor entry	Number of failures detected in default list

Figure 211 : Default Monitor Initialisation Event Report

3.7.12 Milbus TX Queue Failure Event

The Application Software will generate an Milbus TX Queue Failure Event if the TX Queue has either overflowed or become corrupted or if an attempt has been made to free a data block which is not the tail.

The structure of the Milbus TX Queue Failure Event report is shown in Figure 212

EID = EID_MILBUS_TX_QUEUE_FAIL	
Milbus_TX_Queue_Failures	

Figure 212: Milbus TX Queue Failure Event Report

Where:

Milbus_TX_Queue_Failures are 1 – MB_TX_Queue_Corrupted;
2 – MB_TX_TC_Copy_Error;
3 – MB_TX_Block_Allocation_Fail;
4 – MB_TX_Bad_Free_Request.

3.7.13 Milbus RX Illegal Frame Header Pointer Event

The Application Software will generate a Milbus RX Illegal Frame Header Pointer Event if the frame pointer has an illegal value.

The structure of the Milbus RX Illegal Frame Header Pointer Event report is shown in Figure 213

EID = EID_MILBUS_RX_ILLEGAL_FHP
First_Header_Index

Figure 213: Milbus RX Illegal Frame Header Event Report

3.7.14 Milbus Message Decode Failure Event

The Application Software will generate a Milbus Message Decode Failure Event if an error is detected during the decoding of the received message.

The structure of the Milbus Message Decode Failure Event report is shown in Figure 214

EID = EID_MILBUS_MSG_DECODE_FAIL	
Message_Kind	Milbus_RX_Failure_ID

Figure 214: Milbus Message Decode Failure Event Report

Where:

Message_Kind is 1 – MB_ATC_MSG;
2 – MB_DTD_MSG;
3 – MB_DATA_BLOCK_LENGTH;
4 – MB_DATA_BLOCK_HDR;
5 – MB_DATA_BLOCK;
6 – MB_BROADCAST_TIME.

Milbus_RX_Failure_Id is 1 – MB_RX_NO_BAC;
2 – MB_RX_UNEXPECTED_WORD_COUNT;
3 – MB_RX_ERROR_BIT_SET;
4 – MB_RX_LENGTH_ERROR;
5 – MB_RX_UNEXPECTED_ERROR.

3.7.15 Milbus RX TC CRC Fail Event

The Application Software will generate a Milbus RX TC CRC Fail Event if the CRC check of the received TC fails.

The structure of the Milbus RX TC CRC Fail Event report is shown in Figure 215

EID = EID_MILBUS_RX_TC_CRC_FAIL

TC_Length

Figure 215: Milbus RX TC CRC Fail Event Report

where the TC_Length is the length of the TC over which the CRC is calculated.

3.7.16 Milbus RX TC Read Fail Event

The Application Software will generate a Milbus RX TC Read Fail Event if the length of the received TC is corrupted.

The structure of the Milbus RX TC Read Fail Event report is shown in Figure 216

EID = EID_MILBUS_RX_TC_READ_FAIL
TC_Length

Figure 216: Milbus RX TC Read Fail Event Report

where the TC_Length is the length of the TC byte stream which can not be read from MIL-BUS buffer.

3.7.17 Milbus Device Error Event

The Application Software will generate an Milbus Device Error Event on receipt of a Milbus failure interrupt.

The structure of the Milbus Device Error Event report is shown in Figure 217

EID = EID_MILBUS_DEVICE_ERROR
Contents of the Summit Pending Interrupt register

Figure 217 : Milbus Device Error Event Report

Where the bits in the Summit Pending Interrupt register are defined as follows:

Bit(s)	Mnemonic	Description
0-6	N/A	Filler.
7	ILLCMD	Illegal Command Interrupt
8	IXEQ0	Index Equal Zero Interrupt
9	BDRCV	Broadcast Command Received Interrupt
10	SUBAD	Subaddress Accessed Interrupt
11	MERR	Message Error Interrupt
12	BITF	BIT Fail Interrupt

13	TAPF	Terminal Address Parity Fail Interrupt
14	WRAPF	Wrap Fail Interrupt
15	DMAF	DMA Fail Interrupt

3.7.18 TM Transmit Queue Overflow Event

The ASW will generate a TM Transmit Queue Overflow Event when there is insufficient space in the TM Transmit Queue to accept the latest TM.

The structure of the TM Transmit Queue Overflow Event report is shown in Figure 218

EID = EID_OVERFLOW_TM_Q

Figure 218: TM Transmit Queue Overflow Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.7.19 Rx Session Layer Circular Buffer Overflow Event

The ASW will generate a Rx Session Layer Circular Buffer Overflow Event when there is insufficient space in the Session Layer buffer to accept the latest TM.

The structure of the Rx Session Layer Circular Buffer Overflow Event report is shown in Figure 219.

EID = EID_OVERFLOW_RX_SESS

Figure 219: Rx Session Layer Circular Buffer Overflow Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.7.20 Cyclic Schedule Overrun Event

The ASW will generate a Cyclic Schedule Overrun Event if the cyclic scheduler is still running at the time the next cycle is due to start.

The structure of the Cyclic Schedule Overrun Event report is shown in Figure 220.

EID = EID_OVERFLOW_CYCLIC
Schedule Period

Figure 220: Cyclic Schedule Overrun Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 2 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - Schedule Period is cyclic schedule period number that over ran

3.7.21 Event Queue Occupancy Threshold Event

The Application Software will generate an Event Queue Occupancy Threshold Event if the Event Queue occupancy for any given interrupt level exceeds a predefined threshold.

Note there are four possible event queues with different capacities. The event will be issued if a queue becomes full (including the Event Queue Ocupancy event itself).

The structure of the Event Queue Occupancy Threshold Event report is shown in Figure 221

EID = EID_EQ_OCCUPANCY	
Event Queue Id	

Figure 221: Event Queue Occupancy Threshold Event Report

Where:

Event Queue Id (capacity) is

0 – IL_Background (5);

1 – IL_Cyclic_Schedule (11);

2 – IL_Milbus_ISR (11);

3 - IL_Sync_Trap_Handler (5)

3.7.22 Medium Severity Monitored Parameter Range Exceeded Events

The ASW will generate Events when any of the monitored parameters specified in Table 16 exceeds the Medium Severity user-defined limits.

The generic structure of the Medium Severity Range Exceeded Event reports is specified in section 3.6.1.

3.7.23 Mode Transition Fail Event

The ASW will generate a 'Mode Transition Fail' Event Report when the TC commanded Mode Transition fails to complete within the allotted time.

The structure of the Mode Transition Fail Event report is shown in Figure 222.

EID = EID_MODE_TRANSIT_FAIL	
Destination Mode	Source Mode
Step Details	
Fail Type	

Figure 222: Mode Transition Fail Event Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- The other fields provide complementary information about the event as described below
  - Destination Mode is TC commanded destination ICU mode.

- Source Mode is current ICU Mode.
- Fail_Type identifies the type of failure, the possible values are –
  - PROC_FAILURE – Failure detected in Onboard Control Procedure – the possible failures are identified in the Procedure Specification, included in [RD8]
  - PROC_EXEC_ENGINE_FAILURE – Failure detected in Procedure execution Engine. It is expected that such a failure will only occur if the Procedure Definition in RAM is invalid.
  - MODE_TRANS_TIMEOUT – Mode transition aborted due to a transition timeout.
- Step_Details – If Fail_Type is PROC_FAILURE this is the step number at which the failure occurred.This corresponds to the step number listed the Procedure Specification, included in [RD8]. For other failure types this is the step offset in RAM at which the failure occurred.

3.7.24 Science Packet Error Count Event

The ASW will generate a 'Science Packet Error Count' Event if the monitored Science Packet Sequence Counter has not been incremented since the previous monitor interval.

The structure of the Science Packet Error Count Event report is shown in Figure 223.

EID = EID_SCI_PKT_ERROR
Current Count

Figure 223: Science Packet Error Count Report TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 2 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Current Count is LS Word of IF FPGA Packet Sequence Counter Register as defined [AD2].

3.7.25 Time Synchronisation Verification Fail

The ASW will generate the 'Time Synchronisation Verification Fail' after a Synchronisation failure at the next PPS Synchronisation pulse following receipt of a TC(9,135).

The structure of the 'Time Synchronisation Verification Fail' is shown in Figure 224.

EID = EID_TIME_SYNC_FAIL	
LOBT Coarse Time Field at Reception of TC MS word (16 bits)	
LOBT Coarse Time at Reception of TC Field LS word (16 bits)	
LOBT Fine Time Field at Reception of TC MS word (16 bits)	
LOBT Fine Time Field at Reception of TC LS Byte (8 bits)	
OBT Coarse Time Field Due at next PPS Sync MS word (16 bits)	
OBT Coarse Time Field TC Due at next PPS Sync LS word (16 bits)	
OBT Fine Time Field Due at next PPS Sync MS word (16 bits)	
OBT Fine Time Field Due at next PPS Sync LS Byte (8 bits)	
new LOBT Coarse Time Field at Reception of PPS Sync MS word (16 bits)	
new LOBT Coarse Time Field at Reception of PPS Sync LS word (16 bits)	
new LOBT Fine Time Field at Reception of PPS Sync MS word (16 bits)	
new LOBT Fine Time Field at Reception of PPS Sync LS Byte (8bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync MS word (16 bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync LS word (16 bits)	
Original LOBT Fine Time Field at Reception of PPS Sync MS word (16 bits)	
Original LOBT Coarse Time Field at Reception of PPS Sync LS byte (8 bits)	

Figure 224: Time Synchronisation Verification Fail TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 24 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - LOBT at Reception of TC
  - OBT at next PPS Sync
  - New LOBT at Reception of PPS
  - Original LOBT

3.7.26 FEE Register Value Mismatch

MSISW-1813

The ASW will generate the 'FEE Register Value Mismatch' after a mismatch is detected between the internal and returned FEE register values, following receipt of a FEE Check Register TC (238,8).

The structure of the 'FEE Register Value Mismatch' is shown in Figure 225.

EID = EID_FEE_REGISTER_VALUE_MISMATCH	
Register Address (8 bits)	Internal Register Value MS word (8 bits)
Internal Register Value LS word (16 bits)	
	Returned Register Value MS word (8 bits)
Returned Register Value LS word (16 bits)	

Figure 225: FEE Register Value Mismatch TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 8 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Register Address – 7 bits, as defined in [AD2].
  - Internal Register Value – 24 bits, as defined in [AD2], the expected FEE register value.
  - Returned Register Value – 24 bits, as defined in [AD2], the actual FEE register value returned from the FEE.

3.7.27 FEE Detector Latchup

MSISW-1874

The ASW will generate the 'FEE Detector Latchup' after a detector latchup is detected as being flagged in the FEE Status Register.

The structure of the 'FEE Detector Latchup' is shown in Figure 226.

EID = EID_FEE_DETECTOR_LATCHUP	
	FEE Status Register bits 17, 16 (8 bits)
FEE Status Register Value LS word (16 bits)	

Figure 226: FEE Detector Latchup TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Latch Up Detector Value – 18 bits, as defined in [AD2], containing the bits indicating which detectors are latched up.

3.7.28 FEE Detector Latchup Not Cleared

MSISW-1875

The ASW will generate the 'FEE Detector Latchup Not Clear' after a detector latchup clear in the FEE Status Register fails.

The structure of the 'FEE Detector Latchup Not Cleared' is shown in Figure 227.

EID = EID_FEE_DETECTOR_LATCHUP_NOT_CLEARED	
	FEE Status Register bits 17, 16 (8 bits)
FEE Status Register Value LS word (16 bits)	

Figure 227: FEE Detector Latchup Not Cleared TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - Latch Up Detector Value – 18 bits, as defined in [AD2], containing the bits indicating which detectors latchups weren't cleared.

3.7.29 FEE EDAC Double Error

MSISW-1876

The ASW will generate the 'FEE EDAC Double Error' after an EDAC Double Error is detected as being flagged in the FEE Status Register.

The structure of the 'FEE Detector Latchup' is shown in Figure 228.

EID = EID_FEE_EDAC_DOUBLE_ERROR	
	INT_RAM_EDAC_Counts Register Value MS word (8 bits)
INT_RAM_EDAC_Counts Register Value LS word (16 bits)	
	INT_RAM_EDAC_Error_Address Register Value MS word (8 bits)
INT_RAM_EDAC_Error_Address Register Value LS word (16 bits)	
	INT_RAM_EDAC_Error_Data Register Value MS word (8 bits)
INT_RAM_EDAC_Error_Data Register Value LS word (16 bits)	
	INT_RAM_EDAC_Error_Parity Register Value MS word (8 bits)
INT_RAM_EDAC_Error_Parity Register Value LS word (16 bits)	

Figure 228: FEE EDAC Double Error TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 16 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
    - INT_RAM_EDAC_Counters Register Value – 24 bits, as defined in [AD2], containing the value of the FEE register.
    - INT_RAM_EDAC_Error_Address Register Value – 24 bits, as defined in [AD2], containing the value of the FEE register.
    - INT_RAM_EDAC_Error_Data Register Value – 24 bits, as defined in [AD2], containing the value of the FEE register.

- INT_RAM_EDAC_Error_Parity Register Value – 24 bits, as defined in [AD2], containing the value of the FEE register.

3.7.30 FEE Command Failed

MSISW-1969

The ASW will generate the 'FEE Command Failed' after a command send to the FEE has failed the configured number of resend times.

The structure of the 'FEE Command Failed' is shown in Figure 229.

EID = EID_FEE_COMMAND_FAILED

Figure 229: FEE Command Failed TM Packet Format

3.7.31 FEE Command Queue Full Error Event

The ASW will generate a 'FEE Command Queue Full Error' Event if the FEE manager attempts to add a command to the Single Command Queue and it is full

The structure of the FEE Command Queue Full Error Event report is shown below.

EID = EID_FEE_COMMAND_QUEUE_FULL_ERROR

Figure 230: FEE Command Queue Full TM Packet Format

3.7.32 Default SID Initialisation Failure Event

The Application Software will generate a Default SID Initialisation Failure Event when a default SID contains errors and can not be added to the HK SID list at initialisation. The parameters checked are; 'default SID' range, status, collection interval, nrep and parameter IDs. The structure of the Default SID Initialisation Failure Event report is shown below

EID = EID_DEFAULT_SID_INIT_FAIL	
SID	Failing parameter index

Figure 231 Default SID Initialisation Event Report

3.7.33 TIR Seek Failed

Indicates that a TIR seek operation was not successful : the position validity criterion was not met – the Cold_Space_Datum_Encountered bit in the TIR Virtual Encoder Status Register does not indicate 'Encountered'.

EID = EID_TIR_SEEK_FAILED

Figure 232: TIR Seek Failed TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.7.34 TIR Slew Time-out

Indicates that the duration of a slew of the TIR mechanism exceeded the defined time-out.

EID = EID_TIR_TIMEOUT

Figure 233: TIR Slew Time-out TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.7.35 TIR Position Error After Retry Occurred

Indicates that a TIR slew was not successful : a position error remained even after a seek operation and an attempted retry.

EID = EID_TIR_POS_ERR_AFTER_RETRY
Target_Position (16 bits)
Actual_Position (16 bits)

Figure 234: TIR Position Error TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Parameter is 4 bytes and is a structured field providing complementary information about the event. Parameter is made up of the following fields:
  - Target Position : 1 = COLD_SPACE, 2 = BLACK_BODY, 3 = NADIR_EARTH;
  - Actual Position is step count in the range 0..3999

3.7.36 TIR Encoder Value not Zero

Indicates that Present Encoder Value field in the TIR Position Monitor Register is was not '00' after the 1000-step CW slew during a 'seek' operation.

EID = EID_TIR_ENCODER_NOT_00

Figure 235: TIR Encoder Value not Zero TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.

3.7.37 Milbus RX TC Len Fail

TC Packet header **Packet Length** field out of range. The Length parameter holds the value of the Packet length field received,

EID = EID_MILBUS_RX_TC_LEN_FAIL
Length (16 bits)

Figure 236: Milbus RX TC Len Fail

3.8 Service 5 – Error / Anomaly Report – High Severity

Service Type Id = 5
Service Sub-Type Id = 4

The ASW will generate an Error/Anomaly report of sub-type 4 for the following supported event conditions.

In all cases indicated below the EID is the Event ID of the represented Event.

3.8.1 High Severity Monitored Parameter Range Exceeded Events

The ASW will generate Events when any of the monitored parameters specified in Table 16 exceeds the High Severity user-defined limits.

The generic structure of the High Severity Range Exceeded Event reports is defined in section 3.6.1.

3.8.2 Major Mode Transition Failed

The ASW will generate the 'Major Mode Transition Failed' if the transition to INS-IDR fails.

The structure of the 'Major Mode Transition Failed' is shown below

EID = EID_MAJOR_MODE_TRANSIT_FAIL	
Destination Mode	Source Mode
Step_Details	
Fail_Type	

Figure 237: Major Mode Transition Failed

Where:

- EID is 2 bytes and is the Event ID.
- The other fields provide complementary information about the event as described below
  - Destination Mode is TC commanded destination ICU mode.
  - Source Mode is current ICU Mode.
  - Fail_Type identifies the type of failure, the possible values are –
    - PROC_FAILURE – Failure detected in Onboard Control Procedure – the possible failures are identified in the Procedure Specification, included in [RD8]
    - PROC_EXEC_ENGINE_FAILURE – Failure detected in Procedure execution Engine. It is expected that such a failure will only occur if the Procedure Definition in RAM is invalid.
    - MODE_TRANS_TIMEOUT – Mode transition aborted due to a transition timeout.
  - Step_Details – If Fail_Type is PROC_FAILURE this is the step number at which the failure occurred.This corresponds to the step number listed the Procedure

Specification, included in [RD8]. For other failure types this is the step offset in RAM at which the failure occurred.

3.8.3 Heater Main and Secondary Thermistors Failed

The ASW will generate the 'Heater Main and Secondary Thermistors Failed' if the heater main and secondary Thermistors are detected as having failed.

The structure of the 'Heater Main and Secondary Thermistors Failed' is shown in Figure 238.

EID = EID_NO_VALID_TEMPERATURE
Thermal control loop ID (8 bits)
Primary temperature sensor ID (8 bits)
Secondary temperature sensor ID (8 bits)

Figure 238: Heater Main and Secondary Thermistors Failed TM Packet Format

Where:

- EID is 2 bytes and is the Event ID.
- Thermal Control Loop ID – 8 bit identifier of thermal control loops
- Invalid Primary temperature sensor ID – 8 bit identifier of primary temperature sensor used in the identified control loop.
- Invalid Secondary temperature sensor ID – 8 bit identifier of secondary temperature sensor used in the identified control loop

3.8.4 Floating Point Exception Event

The Application Software will generate a Floating Point Exception Event when a FPU exception trap is detected.

The structure of the Floating Point Exception Event report is shown in Figure 239

EID = EID_FPU_EXCEPTION

Figure 239 : TC Receive Queue Overflow Event Report

3.9 Service 5 – Disabled EIDs Report

TM(5,134) is response to TC(5,133).

NEID (16 bits)
EID (16 bits)

Figure 240: Disabled EIDs Report TM Packet Format

Where:

- NEID: Number of EID's following (0…NEID MAX)
- EID: Event packet Structure Identifier

3.10 Service 6 – Memory Management Service

3.10.1 Memory Dump using Absolute Addresses Report

Service Type Id = 6
Service Sub-Type Id = 6

TM(6,6) is the response to TC(6,5). In case the amount of data to be down linked exceeds the max. size of a TM(6,6), as many TM(6,6) packets as requested by TC(6,5) shall be generated. Each of these TM packets will be self-contained, i.e. Start Address and Length of dump are consistent with the dumped data presented in the related TM dump packet. The bandwidth for the amount of TM(6,6) packets may be reduced (bandwidth adjustment mechanism).

Memory ID
Start Address MS word (16 bits)
Start Address LS word (16 bits)
Length MS word (16 bits)
Length LS word (16 bits)
Data (variable)

Figure 241: Memory Dump using Absolute Addresses Report TM Packet Format

Where:

- Memory ID: Identification Number of the on board memory block
- Start Address: 32 bits, Start Address (in smallest Addressable Units, with count starting from zero)
- Length: 32 bits, Length of data block (in Smallest Addressable Units, with count starting from zero)
- Data: dump data

3.10.2 Memory Check using Absolute Addresses Report

Service Type Id = 6
Service Sub-Type Id = 10

TM(6,10) is the response to TC(6,9).

Memory ID
Start Address MS word (16 bits)
Start Address LS word (16 bits)
Length MS word (16 bits)
Length LS word (16 bits)
Checksum

Figure 242: Memory Check using Absolute Addresses Report TM Packet Format

Where:

- Memory ID: Identification Number of the on board memory block
- Start Address: 32 bits, Start Address (in smallest Addressable Units, with count starting from zero)
- Length: 32 bits, Length of data block (in Smallest Addressable Units, with count starting from zero)
- Checksum: CRC 16 bit checksum (according to [ND-154])

3.11 Service 8 – Function Management Service

3.11.1 Function Status Report

Service Type Id = 8
Service Sub-Type Id = 145

TM(8,145) is the response to TC(8,144).

N	Function Id	
Execution Status (8 bits)	Filler (7 bits)	Execution Enabled (1 bit)
Arming Status (8 bits)	Filler (7 bits)	Arming Enabled (1 bit)

Figure 243: Function Status Report TM Packet Format

Where:

- N: Number of Function IDs to follow
- Function ID: Identification number of the Function
- Execution Status: Defines whether the execution of the function is enabled or disabled (1 bit, 0=Disabled/1=Enabled)
- Autoreset Status: Defines whether the autoreset mechanism is enabled or disabled (1 bit, 0=Disabled/1=Enabled)

3.12 Service 12 – On Board Parameter Monitoring

3.12.1 Current Monitoring List Report

Service Type Id = 12
Service Sub-Type Id = 9

TM(12,9) is the response to TC(12,8).

Monitoring	Maximum Reporting Delay
N	Monitoring ID
Parameter ID MS word	
Parameter ID LS word	
&Validity Parameter MS word	
&Validity Parameter LS word	
Parameter Monitoring Interval	
Rep	Monitoring

NOL	
Limit Monitoring	Low Limit[0] MS word
Limit Monitoring	Low Limit[0] LS word
Limit Monitoring	Low Limit[1] MS word
Limit Monitoring	Low Limit[1] LS word
Limit Monitoring	EID
Limit Monitoring	High Limit[0] MS word
Limit Monitoring	High Limit[0] LS word
Limit Monitoring	High Limit[1] MS word
Limit Monitoring	High Limit[1] LS word
Limit Monitoring	EID
NOE	
Expected Value	Mask MS word
Expected Value	Mask LS word
Expected Value	Expected Value MS word
Expected Value	Expected Value LS word
Expected Value	EID

Figure 244: Current Monitoring List Report TM Packet Format

Where:

- Monitoring: Indicates whether the overall monitoring is enabled (0=disabled/1=enabled)
- Maximum reporting Delay: The maximum reporting delay for the check transition report
- N: Repetition count for the following fields
- Monitoring ID: ID of Monitoring Control Table Entry (1…255)
- Parameter ID: Unique identification of the parameter to monitor
- &Validity Parameter: A Boolean parameter whose value determines whether a parameter is valid or not
- Parameter Monitoring interval: Defines the number of cycles in between two subsequent monitorings (1…65636)
- Rep: Repetition Interval (1…255)
- Monitoring Status: The Boolean parameter whose value determines whether monitoring of this entry is applied (0 disabled/ 1 enabled)
- NOL: Presence of limit check definition
- Low Limit: Low limit
- EID: Event ID associated with the low limit of the monitoring description
- High Limit: high limit
- EID: Event ID associated with the high limit of the monitoring description
- NOE: Presence of expected value check definition

- Mask: Bit mask used to monitor only selected bits from a composite parameter
- Expected Value: Expected value
- EID: Event ID associated with the monitoring description

3.13 Service 17 – Test Service

3.13.1 Link Connection Report

Service Type Id = 17
Service Sub-Type Id = 2

The report informs the TC source about the successful reception of the TC by the receiving onboard application (PRID).

3.14 Service 19 – Event/Action service

3.14.1 Event Detection List Report

Service Type Id = 19
Service Sub-Type Id = 7

TM(19,7) is the response to TC(19,6).

N	Filler (1 bit)	PRID
E ID		
Action Status		
TC Header[0] MS word		
TC Header[0] LS word		
TC Header[1] MS word		
TC Header[1] MS word		
TC Header[2] LS word		

Figure 245: Event Detection List Report TM Packet Format

Where:

- N: Repetition count (0…MAX)
- PRID: Application Process ID
- EID: Event Identifier
- Action Status: Event Action Status for given PRID/EID (0=Disabled/1=Enabled)
- TC Header: Telecommand packet header plus Data Field Header

3.14.2 Single Event Detection Entry Report

Service Type Id = 19
Service Sub-Type Id = 131

TM(19,131) is the response to the TC(19,130).

Filler (1 bit)	PRID
E ID	
Action Status	
TC	

Figure 246: Single Event Detection Entry Report TM Packet Format

Where:

- PRID: Application Process ID
- EID: Event Identifier
- Action Status: Event Action Status for given PRID/EID (0=Disabled, 1=Enabled)
- TC: Complete telecommand packet

3.15 Service 140 – Parameter Management

3.15.1 Parameter Report

Service Type Id = 140
Service Sub-Type Id = 3

TM(140,3) is the response to TC(140,2).

NPAR	
Parameter ID MS word	
Parameter ID LS word	
Parameter Value (variable)	

Figure 247: Parameter Report TM Packet Format

Where:

- NPAR: Amount of parameters in report
- Parameter ID: Number uniquely identifying a parameter out of a list
- Parameter Value: actual parameter value

4. SERVICE 149 – THERMAL CONTROL

The ASW will support the following TC/TM messages within the Thermal Control Service.

4.1 Start Thermal Control

Service Type Id = 149
Service Sub-Type Id = 130

MSISW-1105, MSISW-1650

The Source Packet Data Field for the 'Start Thermal Control' TC is shown below in Figure 248.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 130						Source ID
Packet Error Control.						

Figure 248: Start Thermal Control TC Packet Format

4.2 Stop Thermal Control

Service Type Id = 149
Service Sub-Type Id =131

MSISW-1110, MSISW-1650

The Source Packet Data Field for the 'Stop Thermal Control' TC is shown below in Figure 249.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 131						Source ID
Packet Error Control.						

Figure 249: Stop Thermal Control TC Packet Format

4.3 Enable Thermal Control Loop

Service Type Id = 149
Service Sub-Type Id = 132

MSISW-1884, MSISW-1650

The Source Packet Data Field for the 'Enable Thermal Control Loop' TC is shown below in Figure 250.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 132						Source ID
Thermal Control Loop ID (8 bits)						Enable / Disable Flag (bit 0)
Packet Error Control.						

Figure 250: Enable Thermal Control Loop TC Packet Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops

- 1: OB resistive PWM heater
- 2-3: TIR resistive PWM heaters
- 4-7: VNS resistive PWM heaters
- 8: TEC (Peltier) for TIR detector
- 0, 9-255: Not used

- Enable / Disable Flag (1 bit):
  - 0 to disable control loop
  - 1 to enable control loop
  - 2-255: Not used

4.4 Update Thermal Control Loop Parameters

Service Type Id = 149
Service Sub-Type Id = 133

MSISW-1759

The Source Packet Data Field for the 'Update Thermal Control Loop Parameters' TC is shown below in Figure 251.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 133						Source ID
Thermal Control Loop ID (8 bits)						
Thermal Set Point over the Specified Range (16 bits)						
Proportional (P) parameter MS Word (16 bits)						
Proportional (P) parameter LS Word (16 bits)						
Integrative (I) parameter MS Word (16 bits)						
Integrative (I) parameter LS Word (16 bits)						
Derivative (D) parameter MS Word (16 bits)						
Derivative (D) parameter LS Word (16 bits)						
Maximum Power for Limitation of Calculated Power MS Word (16 bits)						
Maximum Power for Limitation of Calculated Power LS Word (16 bits)						
Packet Error Control.						

Figure 251: Update Thermal Control Loop Parameters TC Packet Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops
  - 1: OB resistive PWM heater
  - 2-3: TIR resistive PWM heaters
  - 4-7: VNS resistive PWM heaters
  - 8: TEC (Peltier) for TIR detector

- 0, 9-255: Not used

- Thermal Set Point over the Specified Range – 16 bit raw setpoint temperature value
- Proportional (P) parameter – 32 bit signed IEEE format floating point (valid range -50.0 to 50.0)
- Integrative (I) parameter – 32 bit signed IEEE format floating point (valid range -50.0 to 50.0)
- Derivative (D) parameter – 32 bit signed IEEE format floating point (valid range -50.0 to 50.0)
- Maximum Power for limitation of calculated power – 32 bit signed IEEE format floating point (valid range 0.001 to 20.0)

4.5 Report Thermal Control Loop Parameters

Service Type Id = 149
Service Sub-Type Id = 134

MSISW-1952

The Source Packet Data Field for the 'Report Thermal Control Loop Parameters' TC is shown below in Figure 252.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 134						Source ID
Thermal Control Loop ID (8 bits)						
Packet Error Control.						

Figure 252: Report Thermal Control Loop Parameters TC Packet Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops
  - 1: OB resistive PWM heater
  - 2-3: TIR resistive PWM heaters
  - 4-7: VNS resistive PWM heaters
  - 8: TEC (Peltier) for TIR detector
  - 0, 9-255: Not used

4.6 Thermal Control Loop Parameters Report

Service Type Id = 149
Service Sub-Type Id = 135
PCAT = 3

MSISW-1953

The Thermal Control Loop Parameters Report is generated in response to TC(149,133) Report Thermal Control Loop Parameters. The format for the Report is shown below in Figure 253.

Thermal Control Loop ID (8 bits)	
Thermal Set Point over the Specified Range (16 bits)	
Proportional (P) parameter MS Word (16 bits)	
Proportional (P) parameter LS Word (16 bits)	
Integrative (I) parameter MS Word (16 bits)	
Integrative (I) parameter LS Word (16 bits)	
Derivative (D) parameter MS Word (16 bits)	
Derivative (D) parameter LS Word (16 bits)	
Maximum Power for Limitation of Calculated Power MS Word (16 bits)	
Maximum Power for Limitation of Calculated Power LS Word (16 bits)	

Figure 253: Thermal Control Loop Parameters Report Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops
  - 1: OB resistive PWM heater
  - 2-3: TIR resistive PWM heaters
  - 4-7: VNS resistive PWM heaters
  - 8: TEC (Peltier) for TIR detector
- Thermal Set Point over the Specified Range – 16 bit raw setpoint temperature value
- Proportional (P) parameter – 32 bit signed IEEE format floating point
- Integrative (I) parameter – 32 bit signed IEEE format floating point
- Derivative (D) parameter – 32 bit signed IEEE format floating point
- Maximum Power for Limitation of Calculated Power – 32 bit signed IEEE format floating point

4.7 Update Thermal Control Loop Temperature Pair

Service Type Id = 149
Service Sub-Type Id = 136

MSISW-1886, MSISW-1650

The Source Packet Data Field for the 'Update Thermal Control Loop Temperature Pair' TC is shown below in Figure 254.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 136						Source ID
Thermal Control Loop ID (8 bits)						
Temperature 1 ID (8 bits)						Temperature 2 ID (8 bits)
Packet Error Control.						

Figure 254: Update Thermal Control Loop Temperature Pair TC Packet Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops
  - 1: OB resistive PWM heater
  - 2-3: TIR resistive PWM heaters
  - 4-7: VNS resistive PWM heaters
  - 8: TEC (Peltier) for TIR detector
  - 0, 9-255: Not used
- Temperature 1 ID – 8 bit identifier of 1st temperature to use in the identified control loop
  - 1: VNS SW2 Therm 1 (channel 132)
  - 2: VNS SW2 Therm 2 (channel 133)
  - 3: VNS OU Therm 1 (channel 134)
  - 4: VNS OU Therm 2 (channel 136)
  - 5: VNS SW2 PRT 1 (channel 160)
  - 6: VNS SW2 PRT 2 (channel 161)
  - 7: VNS Rad PRT 1 (channel 162)
  - 8: TIR BNCH Therm 1 (channel 139)
  - 9: TIR BNCH Therm 2 (channel 140)
  - 10: TIR RO Therm 1 (channel 141)
  - 11: TIR RO Therm 2 (channel 142)
  - 12: TIR MSK Therm 1 (channel 144)
  - 13: TIR MSK Therm 2 (channel 145)
  - 14: TIR LNS2 Therm 1 (channel 146)
  - 15: TIR RBB Therm 1 (channel 147)
  - 16: OB Therm 1 (channel 130)
  - 17: OB Therm 2 (channel 131)
  - 18: FEE Therm 1 (channel 128)
  - 19: TIR CBB PRT 1 (channel 163)
  - 20: TIR CBB PRT 2 (channel 164)
  - 21: VTEMP TIR (channel 172)
  - 22: Spare Temp 1 (channel 135)
  - 23: Spare Temp 2 (channel 143)
  - 24: VNS Cal 1 (channel 137)
  - 25: VNS Cal 2 (channel 138)
  - 26: Therm_FEE_TIR_Base (channel 129)

- 0, 27-255: Not used

- Temperature 2 ID – 8 bit identifier of 2nd temperature to use in the identified control loop
  - 0: No sensor (used for Peltier control loop)
  - 1-26: as for Temperature 1 ID
  - 27-255: Not used

4.8 Set Peltier Cooler Constant Current

Service Type Id = 149
Service Sub-Type Id = 138

MSISW-1113, MSISW-1650

The Source Packet Data Field for the 'Set Peltier Cooler Constant Current' TC is shown below in Figure 255.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 138						Source ID
Filler (7 bits)			Polarity (bit 0)			
Constant Current (16 bits)						
Packet Error Control.						

Figure 255: Set Peltier Cooler Constant Current TC Packet Format

Where:

- Polarity(1 bit):
  - 0: positive current (cooling)
  - 1: negative current (heating)
  - 2-255: Not used
- Constant Current – 16 bits, -250 mA – 250 mA with resolution of 0.01 mA
  - 0-32767: current setting
  - 32768-65535: Not used

4.9 Set Heater Constant Power

Service Type Id = 149
Service Sub-Type Id = 140

MSISW-1752

The Source Packet Data Field for the 'Set Heater Constant Power' TC is shown below in Figure 256.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 149
Service Sub Type = 140						Source ID
Thermal Control Loop (8 bits)						
Power (16 bits)						
Packet Error Control.						

Figure 256: Set Heater Constant Power TC Packet Format

Where:

- Thermal Control Loop ID – 8 bit identifier of thermal control loops
  - 1: OB resistive PWM heater
  - 2-3: TIR resistive PWM heaters
  - 4-7: VNS resistive PWM heaters
  - 0, 8-255: Not used
- Power – 16 bits
  - 0-32767: power setting
  - 32768-65535: Not used

5. PRIVATE SERVICE 239 – TIROU MECHANISM

The ASW will support the following TC/TM messages within the TIROU Mechanism Service.

5.1 Power On TIROU Mechanism Encoders

Service Type Id = 239
Service Sub-Type Id = 1

MSISW-1722

The Source Packet Data Field for the 'Power On TIROU Mechanism Encoders' TC is shown below in Figure 257.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 1						Source ID
Packet Error Control.						

Figure 257: Power On TIROU Mechanism Encoders TC Packet Format

5.2 Power Off TIROU Mechanism Encoders

Service Type Id = 239
Service Sub-Type Id = 2

MSISW-1723

The Source Packet Data Field for the 'Power Off TIROU Mechanism Encoders' TC is shown below in Figure 258.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 2						Source ID
Packet Error Control.						

Figure 258: Power Off TIROU Mechanism Encoders TC Packet Format

5.3 Set TIROU Mechanism to Cold Space View

Service Type Id = 239
Service Sub-Type Id = 5

MSISW-1724

The Source Packet Data Field for the 'Set TIROU Mechanism to Cold Space View' TC is shown below in Figure 259.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 5						Source ID
Packet Error Control.						

Figure 259: Set TIROU Mechanism to Cold Space View TC Packet Format

5.4 Set TIROU Mechanism to Black Body View

Service Type Id = 239
Service Sub-Type Id = 6

MSISW-1725

The Source Packet Data Field for the 'Set TIROU Mechanism to Black Body View' TC is shown below in Figure 260.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 6						Source ID
Packet Error Control.						

Figure 260: Set TIROU Mechanism to Black Body View TC Packet Format

5.5 Set TIROU Mechanism to Nadir View

Service Type Id = 239
Service Sub-Type Id = 7

MSISW-1726

The Source Packet Data Field for the 'Set TIROU Mechanism to Nadir View' TC is shown below in Figure 261.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 7						Source ID
Packet Error Control.						

Figure 261: Set TIROU Mechanism to Nadir View TC Packet Format

5.6 Command TIROU Mechanism

Service Type Id = 239
Service Sub-Type Id = 10

MSISW-1907

The Source Packet Data Field for the 'Command TIROU Mechanism' TC is shown below in Figure 262.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 10						Source ID
Step Number (16 bits)						
Packet Error Control.						

Figure 262: Command TIROU Mechanism TC Packet Format

Where:

- Step Number – 16 bits, valid range 0..3999 (NB: Not 'Number of Steps' as in MSISW-1907; c.f. MSISW-1595)

5.7 Report TIROU Mechanism Position

Service Type Id = 239
Service Sub-Type Id = 11

MSISW-1727

The Source Packet Data Field for the 'Report TIROU Mechanism Position' TC is shown below in Figure 263.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 11						Source ID
Packet Error Control.						

Figure 263: Report TIROU Mechanism Position TC Packet Format

5.8 TIROU Mechanism Position Report

Service Type Id = 239
Service Sub-Type Id = 12
PCAT = 3

MSISW-1728

The TIROU Mechanism Position Report is generated in response to TC(239,11) Report TIROU Mechanism Position and supplies the contents of the accessed register. The format for TIROU Mechanism Position Report is shown below in Figure 264.

Filler (4 bits)	TIR Virtual Encoder Count (12 bits)
Packet Error Control.	

Figure 264: TIROU Mechanism Position Report TM Packet Format

Where:

- TIR Virtual Encoder Count, 12 bits

5.9 Set TIROU Mechanism Final Deceleration Phase

Service Type Id = 239
Service Sub-Type Id = 15

MSISW-1944

The Source Packet Data Field for the 'Set TIROU Mechanism Final Deceleration Phase' TC is shown below in Figure 265.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 15						Source ID
Number of Steps (16 bits)						
Packet Error Control.						

Figure 265: Set TIROU Mechanism Final Deceleration Phase TC Packet Format

Where:

- Number of Steps – 16 bits, valid range 1..4000

5.10 Set TIROU Mechanism Low Speed Coasting Phase

Service Type Id = 239
Service Sub-Type Id = 16

MSISW-1945

The Source Packet Data Field for the 'Set TIROU Mechanism Low Speed Coasting Phase' TC is shown below in Figure 266.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 16						Source ID
Number of Steps (16 bits)						
Packet Error Control.						

Figure 266: Set TIROU Mechanism Low Speed Coasting Phase TC Packet Format

Where:

- Number of Steps – 16 bits, valid range 0..64

5.11 Abort TIR Mechanism Operation

Service Type Id = 239
Service Sub-Type Id = 13

MSISW-2001

The Source Packet Data Field for the 'Abort TIR Mechanism Operation' TC is shown below in Figure 283.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 13						Source ID
Packet Error Control.						

Figure 267: Abort TIR Mechanism Operation TC Packet Format

5.12 Start TIR Mechanism Seek

Service Type Id = 239
Service Sub-Type Id = 20

MSISW-1990

The Source Packet Data Field for the 'Start TIR Mechanism Seek' TC is shown below in Figure 283.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 20						Source ID
Packet Error Control.						

Figure 268: Start TIR Mechanism Seek TC Packet Format

5.13 Generate TIR Reference Set

Service Type Id = 239
Service Sub-Type Id = 21

The Source Packet Data Field for the 'Generate TIR Reference Set' TC is shown below in Figure 269.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 21						Source ID
Packet Error Control.						

Figure 269: Generate TIR Reference Set TC Packet Format

Note that it is expected that this TC will be invoked from the OBCP interpreter.

In this context is is assumed that prior to the invocation of this TC, the TIR Reference Set ID will have been supplied by setting the Default TIR Reference Set ID attribute of the Calibration Manager.

5.14 Dwell at TIR Cold Space View

Service Type Id = 239
Service Sub-Type Id = 22

The Source Packet Data Field for the 'Dwell at TIR Black Body' TC is shown below in Figure 271.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 22						Source ID
Packet Error Control.						

Figure 270: Dwell at TIR Black Body TC Packet Format

Note that it is expected that this TC will be invoked from the OBCP interpreter.

5.15 Dwell at TIR Black Body View

Service Type Id = 239
Service Sub-Type Id = 23

The Source Packet Data Field for the 'Dwell at TIR Black Body' TC is shown below in Figure 271.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 23						Source ID
Packet Error Control.						

Figure 271: Dwell at TIR Black Body TC Packet Format

Note that it is expected that this TC will be invoked from the OBCP interpreter.

.

5.16 Set TIR Pointing Direction

Service Type Id = 239
Service Sub-Type Id = 24

The Source Packet Data Field for the 'Set TIR Pointing Direction' TC is shown below in Figure 271.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 239
Service Sub Type = 24						Source ID
Filler (8 bits)						TIR Pointing Direction (8 bits)
Packet Error Control.						

Figure 272: Set TIR Pointing Direction TC Packet Format

Where:

- TIR Pointing Direction takes the values defined by TIR_Pointing_Direction_typ, i.e. :

  1 = TIR_Earth

  2 = TIR_Moving

  4 = TIR_Space_View_Offset_Data_Collection

  5 = TIR_Calibration_Black_Body

  0, 3, 6-255 Not used.

Note that it is expected that this TC will be invoked from the OBCP interpreter.

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6. PRIVATE SERVICE 236 – VNSOU MECHANISM

The ASW will support the following TC/TM messages within the VNSOU Mechanism Service.

6.1 Power On VNSOU Mechanism Encoders

Service Type Id = 236
Service Sub-Type Id = 1

MSISW-1720

The Source Packet Data Field for the 'Power On VNSOU Mechanism Encoders' TC is shown below in Figure 273.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 1						Source ID
Packet Error Control.						

Figure 273: Power On VNSOU Mechanism Encoders TC Packet Format

6.2 Power Off VNSOU Mechanism Encoders

Service Type Id = 236
Service Sub-Type Id = 2

MSISW-1721

The Source Packet Data Field for the 'Power Off VNSOU Mechanism Encoders' TC is shown below in Figure 274.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 2						Source ID
Packet Error Control.						

Figure 274: Power Off VNSOU Mechanism Encoders TC Packet Format

6.3 Set VNSOU Mechanism to Solar Diffuser View 1

Service Type Id = 236
Service Sub-Type Id = 5

MSISW-1729

The Source Packet Data Field for the 'Set VNSOU Mechanism to Solar Diffuser View 1' TC is shown below in Figure 275.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 5						Source ID
Packet Error Control.						

Figure 275: Set VNSOU Mechanism to Solar Diffuser View 1 TC Packet Format

6.4 Set VNSOU Mechanism to Solar Diffuser View 2

Service Type Id = 236
Service Sub-Type Id = 6

MSISW-1730

The Source Packet Data Field for the 'Set VNSOU Mechanism to Solar Diffuser View 1' TC is shown below in Figure 276.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 6						Source ID
Packet Error Control.						

Figure 276: Set VNSOU Mechanism to Solar Diffuser View 2 TC Packet Format

6.5 Set VNSOU Mechanism to Dark View

Service Type Id = 236
Service Sub-Type Id = 7

MSISW-1731

The Source Packet Data Field for the 'Set VNSOU Mechanism to Dark View' TC is shown below in Figure 277.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 7						Source ID
Packet Error Control.						

Figure 277: Set VNSOU Mechanism to Dark View TC Packet Format

6.6 Set VNSOU Mechanism to Nadir View

Service Type Id = 236
Service Sub-Type Id = 8

MSISW-1732

The Source Packet Data Field for the 'Set VNSOU Mechanism to Nadir View' TC is shown below in Figure 278.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 8						Source ID
Packet Error Control.						

Figure 278: Set VNSOU Mechanism to Nadir View TC Packet Format

6.7 Command VNSOU Mechanism

Service Type Id = 236
Service Sub-Type Id = 10

MSISW-1909

The Source Packet Data Field for the 'Command VNSOU Mechanism' TC is shown below in Figure 279.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 10						Source ID
Step Number (16 bits)						
Packet Error Control.						

Figure 279: Command VNSOU Mechanism TC Packet Format

Where:

- Step Number – 16 bits, valid range is 0 to 199 (NB: Not 'Number of Steps' as in MSISW-1909; c.f. MSISW-1597)

6.8 Report VNSOU Mechanism Position

Service Type Id = 236
Service Sub-Type Id = 11

MSISW-1733

The Source Packet Data Field for the 'Report VNSOU Mechanism Position' TC is shown below in Figure 280.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 11						Source ID
Packet Error Control.						

Figure 280: Report VNSOU Mechanism Position TC Packet Format

6.9 VNSOU Mechanism Position Report

Service Type Id = 236
Service Sub-Type Id = 12
PCAT = 3

MSISW-1734

The VNSOU Mechanism Position Report is generated in response to TC(236,11) Report VNSOU Mechanism Position and supplies the contents of the accessed register. The format for VNSOU Mechanism Position Report is shown below in Figure 281.

Filler (8 bits)	VNS Virtual Encoder Count (8 bits)
Packet Error Control.	

Figure 281: VNSOU Mechanism Position Report TM Packet Format

Where:

- VNS Virtual Encoder Count, 8 bits

6.10 Set VNSOU Mechanism Final Deceleration Phase

Service Type Id = 236

Service Sub-Type Id = 15

MSISW-1946

The Source Packet Data Field for the 'Set VNSOU Mechanism Final Deceleration Phase' TC is shown below in Figure 282.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 15						Source ID
Number of Steps (16 bits)						
Packet Error Control.						

Figure 282: Set VNSOU Mechanism Final Deceleration Phase TC Packet Format

Where:

- Number of Steps – 16 bits, valid range 1..200

6.11 Set VNSOU Mechanism Low Speed Coasting Phase

Service Type Id = 236
Service Sub-Type Id = 16

MSISW-1947

The Source Packet Data Field for the 'Set VNSOU Mechanism Low Speed Coasting Phase' TC is shown below in Figure 283.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 16						Source ID
Number of Steps (16 bits)						
Packet Error Control.						

Figure 283: Set VNSOU Mechanism Low Speed Coasting Phase TC Packet Format

Where:

- Number of Steps – 16 bits, valid range 0..16

6.12 Abort VNS Mechanism Operation

Service Type Id = 236
Service Sub-Type Id = 13

MSISW-2000

The Source Packet Data Field for the 'Abort VNS Mechanism Operation' TC is shown below in Figure 284.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 13						Source ID
Packet Error Control.						

Figure 284: Abort VNS Mechanism Operation TC Packet Format

6.13 Start VNS Mechanism Seek

Service Type Id = 236
Service Sub-Type Id = 20

MSISW-1991

The Source Packet Data Field for the 'Start VNS Mechanism Seek' TC is shown below in Figure 285.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 20						Source ID
Packet Error Control.						

Figure 285: Start VNS Mechanism Seek TC Packet Format

6.14 Generate VNS Reference Set

Service Type Id = 236
Service Sub-Type Id = 21

The Source Packet Data Field for the 'Generate VNS Reference Set' TC is shown below in Figure 286.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 21						Source ID
Packet Error Control.						

Figure 286: Generate VNS Reference Set TC Packet Format

Note that it is expected that this TC will be invoked from the OBCP interpreter.

In this context is is assumed that prior to the invocation of this TC, the VNS Reference Set ID will have been supplied by setting the Default VNS Reference Set ID attribute of the Calibration Manager.

6.15 Set VNS Pointing Direction

Service Type Id = 236
Service Sub-Type Id = 22

The Source Packet Data Field for the 'Set VNS Pointing Direction' TC is shown below in Figure 271.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 236
Service Sub Type = 22						Source ID
Filler (8 bits)						VNS Pointing Direction (8 bits)
Packet Error Control.						

Figure 287: Set VNS Pointing Direction TC Packet Format

Where:

- VNS Pointing Direction takes the values defined by VNS_Pointing_Direction_typ, i.e. :
  - 1 = VNS_Earth
  - 2 = VNS_Moving
  - 3 = VNS_Dark
  - 4 = VNS_Dark_Offset_Data_Collection
  - 5 = VNS_Diffuser_1
  - 6 = VNS_Diffuser_2
  - 0, 7-255 Not used.
- Note that it is expected that this TC will be invoked from the OBCP interpreter.

.

7. PRIVATE SERVICE 237 – FLAT FIELD

The ASW will support the following TC/TM messages within the Flat Field Service.

7.1 Load TIR Flat Field Reference Set

Service Type Id = 237
Service Sub-Type Id = 1

MSISW-1735

The Source Packet Data Field for the 'Load TIR Flat Field Reference Set' TC is shown below in Figure 288.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 1						Source ID
						TIR Flat Field Reference Set ID (8 bits)
Packet Error Control.						

Figure 288: Load TIR Flat Field Reference Set TC Packet Format

Where:

- TIR Flat Field Reference Set ID is 8 bits, valid values 0 – 31

7.2 Load VNS Flat Field Reference Set

Service Type Id = 237
Service Sub-Type Id = 2

MSISW-1736

The Source Packet Data Field for the 'Load VNS Flat Field Reference Set' TC is shown below in Figure 289.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 2						Source ID
						VNS Flat Field Reference Set ID (8 bits)
Packet Error Control.						

Figure 289: Load VNS Flat Field Reference Set TC Packet Format

Where:

- VNS Flat Field Reference Set ID is 8 bits, valid values 0 – 31

7.3 Set Flat Field Average Number

Service Type Id = 237
Service Sub-Type Id = 3

MSISW-1737

The Source Packet Data Field for the 'Set Flat Field Average Number' TC is shown below in Figure 290.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 3						Source ID
						Average Number (8 bits)
Packet Error Control.						

Figure 290: Set Flat Field Average Number TC Packet Format

Where:

- Average Number is 8 bits, being a selection from the set of available numbers of packets to be added together into a new set of Flat Field reference numbers. The encoding of the set is as follows:
  - 0: 16 packets added together;
  - 1: 32 packets added together;
  - 2: 64 packets added together:
  - 3: 128 packets added together:
  - 4: 256 packets added together;
  - 5-255: Not used.

7.4 Dump Flat Field Band

Service Type Id = 237
Service Sub-Type Id = 4

MSISW-1738

The Source Packet Data Field for the 'Dump Flat Field Band' TC is shown below in Figure 291.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 4						Source ID
Flat Field Reference Set ID (8 bits)						Band ID (8 bits)
Packet Error Control.						

Figure 291: Dump Flat Field Band TC Packet Format

Where:

- Flat Field Reference Set ID is 8 bits, valid values 0 – 31
- Band ID is 8 bits,
  - 0 = B1
  - 1 = B2
  - 2 = B3
  - 3 = B4
  - 4 = B7
  - 5 = B8

- 6 = B9
- 7 = RB
- 8-255 not used

7.5 Read Flat Field Band from FPGA

Service Type Id = 237
Service Sub-Type Id = 5

MSISW-1739

The Source Packet Data Field for the 'Read Flat Field Band from FPGA' TC is shown below in Figure 292.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 5						Source ID
						Band ID (8 bits)
Packet Error Control.						

Figure 292: Read Flat Field Band from FPGA TC Packet Format

Where:

- Band ID is 8 bits,
  - 0 = B1
  - 1 = B2
  - 2 = B3
  - 3 = B4
  - 4 = B7
  - 5 = B8
  - 6 = B9
  - 7 = RB
  - 8-255 not used

7.6 Flat Field Band Report

Service Type Id = 237
Service Sub-Type Id = 6
PCAT = 3

MSISW-1740

The Flat Field Band Report is generated in response to TC(237,4) Dump Flat Field Band and TC(237,5) Read Flat Field Band from FPGA, and supplies the contents of the accessed flat field. The format for Flat Field Band Report is shown below in Figure 293.

Flat Field. …

…

Figure 293: Flat Field Band Report TM Packet Format

Where:

- Flat Field is 32 bits x 384 words of the requested Flat Field Offset data, of which only the lowest 24 bits of each word are valid.

7.7 Load TIR Default Flat Field Reference Set

Service Type Id = 237
Service Sub-Type Id = 7

The Source Packet Data Field for the 'Load TIR Default Flat Field Reference Set' TC is shown below in Figure 294.

Note that it is expected that this TC will be invoked from the OBCP interpreter.

In this context is is assumed that prior to the invocation of this TC, the TIR Reference Set ID will have been supplied by setting the Default TIR Reference Set ID attribute on the Calibration Manager.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 7						Source ID
Packet Error Control.						

Figure 294: Load TIR Default Flat Field Reference Set TC Packet Format

7.8 Load VNS Default Flat Field Reference Set

Service Type Id = 237
Service Sub-Type Id = 8

The Source Packet Data Field for the 'Load VNS Default Flat Field Reference Set' TC is shown below in Figure 295.

Note that it is expected that this TC will be invoked from the OBCP interpreter.

In this context is is assumed that prior to the invocation of this TC, the VNS Reference Set ID will have been supplied by setting the Default VNS Reference Set ID attribute on the Calibration Manager.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 237
Service Sub Type = 8						Source ID
Packet Error Control.						

Figure 295: Load VNS Default Flat Field Reference Set TC Packet Format

8. PRIVATE SERVICE 238 – FEE

The ASW will support the following TC/TM messages within the FEE Service.

8.1 Power On FEE

Service Type Id = 238
Service Sub-Type Id = 1

MSISW-1051

The Source Packet Data Field for the 'Power On FEE' TC is shown below in Figure 296.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 1						Source ID
Packet Error Control.						

Figure 296: Power On FEE TC Packet Format

8.2 Power Off FEE

Service Type Id = 238
Service Sub-Type Id = 2

MSISW-1054

The Source Packet Data Field for the 'Power Off FEE' TC is shown below in Figure 297.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 2						Source ID
Packet Error Control.						

Figure 297: Power Off FEE TC Packet Format

8.3 Set Timing Pulse Interval

Service Type Id = 238
Service Sub-Type Id = 3

MSISW-1749

The Source Packet Data Field for the 'Set Timing Pulse Interval' TC is shown below in Figure 298.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 3						Source ID
						Pulse Interval (0..7 bits)
Pulse Interval (8..23 bits)						
Packet Error Control.						

Figure 298: Set Timing Pulse Interval TC Packet Format

Where:

- Pulse Interval – 24 bits, setting the FEE Sync Period Register, defined in [AD2]. Valid range 503316-671088 these raw values correspond to 60-80 milliseconds

8.4 Write FEE Register

Service Type Id = 238
Service Sub-Type Id = 4

MSISW-1743

The Source Packet Data Field for the 'Write FEE Register' TC is shown below in Figure 299.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 4						Source ID
Filler (1 bit)	Register Address (7 bits)					Register Value MS word (8 bits)
Register Value LS word (16 bits)						
Packet Error Control.						

Figure 299: Write FEE Register TC Packet Format

Where:

- Register Address – 7 bits, as defined in [AD5]
- Register Value – 24 bits, as defined in [AD5]

8.5 Read FEE Register

Service Type Id = 238
Service Sub-Type Id = 5

MSISW-1744

The Source Packet Data Field for the 'Read FEE Register' TC is shown below in Figure 300.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 5						Source ID
Filler (1 bit)	Register Address (7 bits)					
Packet Error Control.						

Figure 300: Read FEE Register TC Packet Format

Where:

- Register Address – 7 bits, as defined in [AD5].

8.6 FEE Register Response

Service Type Id = 238
Service Sub-Type Id = 6
PCAT = 4

MSISW-1745

The FEE Register Response is generated in response to TC(238,5) Read FEE Register and supplies the contents of the accessed register. The format for FEE Register Response is shown below in Figure 301.

Filler (1 bit)	Register Address (7 bits)	Register Value MS word (8 bits)
Register Value LS word (16 bits)		
Packet Error Control.		

Figure 301: FEE Register Response TM Packet Format

Where:

- Register Address – 7 bits, as defined in [AD5].
- Register Value – 24 bits, as defined in [AD5].

8.7 FEE Load Register

Service Type Id = 238
Service Sub-Type Id = 7

MSISW-1805

The Source Packet Data Field for the 'FEE Load Register' TC is shown below in Figure 302.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 7						Source ID
Packet Error Control.						

Figure 302: FEE Load Register TC Packet Format

8.8 FEE Check Register

Service Type Id = 238
Service Sub-Type Id = 8

MSISW-1811

The Source Packet Data Field for the 'FEE Check Register' TC is shown below in Figure 302.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 8						Source ID
Packet Error Control.						

Figure 303: FEE Check Register TC Packet Format

8.9 FEE Status Register Request

Service Type Id = 238
Service Sub-Type Id = 9

MSISW-1863

The Source Packet Data Field for the 'FEE Status Register Request' TC is shown below in Figure 304.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 9						Source ID
Filler (7 bits)				Enable / Disable Flag (1 bit)		Acquisition Interval (8 bits)
Packet Error Control.						

Figure 304: FEE Status Register Request TC Packet Format

Where:

- Enable / Disable Flag:
  - 0 – Disabled
  - 1 – Enabled
- Acquisition Interval – 8 bits in units of T_CYCLE,
  - "Disabled" case:
    - 0-255 (value ignored)
  - "Enabled" case:
    - 2-255
    - 0-1, Not used

8.10 FEE Internal Voltage Register Request

Service Type Id = 238
Service Sub-Type Id = 10

MSISW-1865

The Source Packet Data Field for the 'FEE Internal Voltage Register Request' TC is shown below in Figure 305.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 10						Source ID
Filler (7 bits)				Enable / Disable Flag (1 bit)		Acquisition Interval (8 bits)
Packet Error Control.						

Figure 305: FEE Internal Voltage Register Request TC Packet Format

Where:

- Enable / Disable Flag:
  - 0 – Disabled
  - 1 – Enabled
- Acquisition Interval – 8 bits in units of T_CYCLE,
  - "Disabled" case:

- 0-255 (value ignored)

- "Enabled" case:
  - 16-255
  - 0-15, Not used

8.11 Start FEE Memory Test

Service Type Id = 238
Service Sub-Type Id = 11

MSISW-1881, MSISW-1882. This relates to the ASW-controlled FEE memory test. For the FEE-controlled memory test see section 8.16. The FEE registers accessed by this ASW procedure are detailed in [AD5]. The procedure generates test data using a Linear Feedback Shift Register (LFSR) in Fibonacci configuration.

The Source Packet Data Field for the 'Start FEE Memory Test' TC is shown below in Figure 306.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 11						Source ID
Memory Type Flag (1 bit)	Filler (7 bits)	Start Address (bits 0..7)				
Start Address (8..23 bits)						
End Address (bits 0..15)						
End Address (bits 16..23)						
Packet Error Control						

Figure 306: FEE Memory Test TC Packet Format

Where:

- Memory Type Flag is 1 bit:
  - 0 – EXT RAM
  - 1 – INT RAM
- Start Address is 24 bits (24 bits written to register but only 20 bits are used):
  - "EXT RAM" case:
    - 0x00000 – 0xFFFFF
  - "INT RAM" case:
    - 0x00000 – 0x00FFF is valid
    - 0x01000 – 0xFFFFF not used
- End Address is 24 bits:
  - "EXT RAM" case:
    - 0x00000 – 0xFFFFF
  - "INT RAM" case:
    - 0x00000 – 0x00FFF is valid

- 0x01000 – 0xFFFFF not used

8.12 FEE Clear EDAC Error

Service Type Id = 238
Service Sub-Type Id = 14

MSISW-1901

The Source Packet Data Field for the 'FEE Clear EDAC Error' TC is shown below in Figure 307.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 14						Source ID
Packet Error Control.						

Figure 307: FEE Clear EDAC Error TC Packet Format

8.13 Enable FEE Memory Test

Service Type Id = 238
Service Sub-Type Id = 12

MSISW-1881, MSISW-2002

This relates to the ASW-controlled FEE memory test (ref. MSISW-1881).

The Source Packet Data Field for the 'Enable FEE Memory Test' TC is shown below in Figure 308.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 12						Source ID
Filler (7 bits)				Enable / Disable Flag (1 bit)		
Packet Error Control.						

Figure 308: Enable FEE Memory Test TC Packet Format

Where:

- Enable / Disable Flag:
  - 0 – Disabled
  - 1 – Enabled

8.14 Abort FEE Memory Test

Service Type Id = 238
Service Sub-Type Id = 13

MSISW-404, MSISW-407, MSISW-2003

This relates to the ASW-controlled FEE memory test (ref. MSISW-1881).

The Source Packet Data Field for the 'Abort FEE Memory Test' TC is shown below in Figure 309.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 13						Source ID
Packet Error Control.						

Figure 309: Abort FEE Memory Test TC Packet Format

8.15 FEE Register Test

Service Type Id = 238
Service Sub-Type Id = 15

MSISW-1878

The Source Packet Data Field for the 'FEE Register Test' TC is shown below in Figure 310.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 15						Source ID
Packet Error Control.						

Figure 310: FEE Register Test TC Packet Format

Note that it is expected that this TC will be invoked from the OBCP interpreter.

8.16 Start FEE-Controlled FEE Memory Test

Service Type Id = 238
Service Sub-Type Id = 16

Relates to MSISW-2004 and is used in the command sequence for 'Perform FEE memory test' in MSISW-1465 (transition from STANDBY to IDLE mode).

Note that it is expected that this TC will be invoked from the OBCP interpreter.

The Source Packet Data Field is shown below in Figure 311.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 238
Service Sub Type = 16						Source ID
Packet Error Control.						

Figure 311: Start FEE-Controlled FEE Memory Test TC Packet Format

9. PRIVATE SERVICE 199 – INSTRUMENT REPORTS

The ASW will support the following TC/TM messages within the Instrument Reports.

9.1 Reset Boot Report

Service Type Id = 199
Service Sub-Type Id = 1

MSISW-1171

The Source Packet Data Field for the 'Reset Boot Report' TC is shown below in Figure 312.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 199
Service Sub Type = 1						Source ID
Packet Error Control.						

Figure 312: Reset Boot Report

9.2 Dump Boot Report

Service Type Id = 199
Service Sub-Type Id = 2

MSISW-1173

The Source Packet Data Field for the 'Dump Boot Report' TC is shown below in Figure 313.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 199
Service Sub Type = 2						Source ID
Packet Error Control.						

Figure 313: Dump Boot Report

9.3 Boot Report

Service Type Id = 199
Service Sub-Type Id = 3
PCAT = 3

MSISW-1175

The Source Telemetry Data Field for the 'Boot Report' TM is shown below in Figure 314.

Boot Report[1] …
Boot Report[2] …
Boot Report[3] …

Figure 314: Boot Report

Where:

- Boot Report[n] structure is defined in the BSW ICD [AD7].

9.4 Dump Death Report

Service Type Id = 199
Service Sub-Type Id = 4

MSISW-1177

The Source Packet Data Field for the 'Dump Death Report' TC is shown below in Figure 315.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 199
Service Sub Type = 4						Source ID
Packet Error Control.						

Figure 315: Dump Death Report

9.5 Death Report

Service Type Id = 199
Service Sub-Type Id = 5
PCAT = 3

MSISW-1179

The Source Telemetry Data Field for the 'Death Report' TM is shown below in Figure 316.

Death Report. … …

Figure 316: Death Report

Where:

- Death Report is a structure described in the BSW ICD [AD7]

9.6 Reset History Area

Service Type Id = 199
Service Sub-Type Id = 6

MSISW-1181

The Source Packet Data Field for the 'Reset History Area' TC is shown below in Figure 317.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 199
Service Sub Type = 6						Source ID
Packet Error Control.						

Figure 317: Reset History Area

9.7 Dump History Area

Service Type Id = 199

Service Sub-Type Id = 7

MSISW-1183

The Source Packet Data Field for the 'Dump History Area' TC is shown below in Figure 318.

0	TC PUS Version Number = 001	AC	0	0	ER	Service Type = 199
Service Sub Type = 7						Source ID
Packet Error Control.						

Figure 318: Dump History Area

9.8 History Area Report

Service Type Id = 199
Service Sub-Type Id = 8
PCAT = 3

MSISW-1185

The Source Telemetry Data Field for the 'History Area Report' TM is shown below in Figure 319.

History Area Circular Buffer. … …
Number History Area Entries
History_Area Entry[n] … …

Figure 319: History Area Report

Where:

- History Area Circular buffer is an array of the 10 most recent entries received in the History_Area. The structure for the History Area Entry is shown in Table 2.
- Number History_Area Entries indicates the number of History Area Entries from the History Array Buffer that are included in this TM packet. Range 0..Maximum History Buffer Size.
- History Area Entry is a variable length array, capped to the maximum History Buffer size, of History_Area entries received since the last cold reset or History Buffer reset command. The History Area entries are presented in reverse chronological order. History Area Entry is shown in Table 2.

The structure of the History_Area_Entry is described in Table 2.

Field Name	Size (bits)	Comment
Coarse_OBT	32	Integer seconds part of Local On-Board Time
Fine_OBT	24	Sub-second part of Local On-Board Time
Entry_Code	8	0 – Empty, 1 – TC, 2 – Event, 3 – Mode Transition

Parameter1	8	Value dependent upon Entry Code value
Parameter2	8	Value dependent upon Entry Code value
Parameter3	8	Value dependent upon Entry Code value
Parameter4	8	Value dependent upon Entry Code value
Parameter5	8	Value dependent upon Entry Code value

Table 2: History Area Entry

10. MIL-STD-1553B RT HEALTH MESSAGE

The ASW, acting as a MIL-STD-1553B RT equipment, is required to transmit a Health Message on SA01T. The format of this message is described in Figure 320.

Word Number	Data	Description
0	RT_Health Data Word	Refer to Figure 321
1	Latest Received Communication Frame	Minor Frame Number
2 .. 14	RT_Health & Monitoring Data	Refer to Figure 322
15 .. 31	RT Configuration Monitoring Data	Refer to Figure 323

Figure 320: SA01R Health Message

The RT Health Data Word, Word 0 within the SA01R Health Message, is described in Figure 321.

Bit Number	Report	Trigger
0	Initialisation Complete	Entry to INS-SBY mode
1	Initialisation Fail	Bootstrap Test Failure at initialisation
2	Hardware Test Fail	Self Test Failure (excluding Bootstrap RAM test)
3	SW Failure	Recoverable failure
4	Real Time Execution Fail	Unrecoverable
5	Watchdog Set	Reboot caused by watchdog reset
6	Sensor Fail	Not used by MSI (set to 0)
7	Secondary Voltage Fail	Monitored Secondary Rail Failure, one of: • ICU Secondary Supply 1 (+5V) Digital fine/wide • ICU Secondary Supply 2 (+12V) Analogue fine/wide • ICU Secondary Supply 3 (-12V) Analogue fine/wide • ICU Secondary Supply 4 (+3.3V) Motor & Heater fine/wide
8	I/O Fail	API Layer device fail
9	Internal I/F Fail	API Layer general failure
10	Temporary Data Fail	Error detected in TC contents as indicated by one of the events provided in word 12 of the RT Health Complementary Information. Note: both enabled and disabled events are reported.
11	RT Not Synchronised	PPS Synchronisation failure indicated by time synchronisation not in OSS_WAIT_PPS or OSS_WAIT_SA29 state.
12	Not Used	-
13	Not Used	-
14	Not Used	-
15	Not Used	-

Figure 321: RT Health Data Word Definition

If a trigger condition is met, then the corresponding bit will be set to 1. The bit will be cleared to 0 at reset, and on reception of the Reset_RT_Health Command on SA01T. Unused bits will be read as zero.

The RT Health & Monitoring Data, words 2..14 within the SA01R RT_Health Message, is shown in Figure 322.

Word Number	Data
2	Initialisation Status
3	HW Test Status
4	BSW Restart Count
5	SW Failure Status
6	SW Failure Data
7	ATC Timeout Count and ATC Error Count
8	EID of Secondary Voltage Failure
9	Secondary Voltage Failure Data
10	I/O Failure Data
11	Mil Bus Test Status
12	Temporary Failure on Data Status
13	Mil Bus Protocol Status
14	Mil Bus Protocol Error Count

Figure 322: RT Health & Monitoring Data

Where:

- Initialisation Status is a copy of PS FPGA Reset Status Register and is taken from the Boot Report:
  - Bit 15 – Power On Reset (active high)
  - Bit 14 – Watchdog Reset Occurred (active high, low following power on reset)
  - Bit 13 – EQ_SOL occurred (active high, low following power on reset)
  - Bit 12 – Software Reset Occurred (active high, low following power on reset)
  - Bits 0 to 11 – Not used. Read as zero
- HW Test Status is applicable if the Hardware Test Fail bit of the RT_Health data word is set is taken from the Boot Report:
  - Bit 15 – CPU test fail
  - Bit 14 – Non Destructive RAM test fail
  - Bit 13 – Procedure Bus test fail
  - Bit 12 – Destructive RAM test fail
  - Bit 11 – Destructive DPRAM test fail
  - Bit 10 – EEPROM test fail
  - Bit 9 – PROM test fail

- Bit 8 – CPU Timer test fail
- Bit 7 – Milbus BIT fail
- Bit 6 – EDAC test fail
- Bit 5 to 0 – Not used

- BSW Restart Count is taken from the Boot Report and is the number of times BSW has executed
- SW Failure Status & Software Failure Data is applicable if the SW Failure bit of the RT_Health data word is set and is taken from the Death Report:
  - 0 – No_SW_Failure
    - Software Failure Data = N/A
  - 1 – SW_Fail_Unexpected_Trap
    - Software Failure Data = Trap ID
  - 2 – SW_Fail_Queue_Overflow
    - Software Failure Data:
      - EID_OVERFLOW_TM_Q (ASW);
      - EID_OVERFLOW_RX_SESSION (ASW);
      - EID_EQ_OCCUPANCY (ASW);
      - EID_MILBUS_TX_QUEUE_FAIL (ASW);
      - EID_OVERFLOW_INTERNAL_TC_Q;
      - EID_MEM_WRITE_FAIL (_ASW) when error codes indicate EEPROM write buffer full or EEPROM write queue full
  - 3 – SW_Fail_Fallback
    - Software Failure Data (TC Source ID) indicates fallback reason;
      - 0 – Ground;
      - 136 – MSI Event Action
  - 4 – SW_Fail_List_Initialisation
    - Software Failure Data:
      - EID_PROCEDURE_LOAD_INIT_FAIL;
      - EID_PROCEDURE_PRIORITY_INIT_FAIL;
      - EID_DEFAULT_MONITOR_INIT_FAIL;
      - EID_DEFAULT_EA_INIT_FAIL
  - 5 – SW_Fail_Procedures
    - Software Failure Data contains the procedure ID in which the parsing failure occurred.
  - 6 – SW_Fail_Overrun

        - Software Failure Data contains the Slot Number
    - 7 – SW_Fatal_Trap
        - Software Failure Data = Trap ID
- ATC Timeout Count and ATC Error Count:
    - Bits 8 to 15 –– ATC Timeout count, a wraparound count of the number of 'wait for ATC timeouts' since ASW start.
    - Bits 0 to 7 –– ATC Error count, a wraparound count of the number of times ATC data block Error_Flag is set since ASW start.
- EID of Secondary Voltage Failure is EID of the secondary voltage failure triggered by an out-of-limit event, either:
    - EID_VMON_ICU_P_5_FINE or EID_VMON_ICU_P_5_WIDE triggered by fine or wide out-of-limits event of ICU Secondary Supply 1 (+5V) Digital
    - EID_VMON_ICU_P_12_FINE or EID_VMON_ICU_P_12_WIDE triggered by fine or wide out-of-limits event of ICU Secondary Supply 2 (+12V) Analogue
    - EID_VMON_ICU_N_12_FINE or EID_VMON_ICU_N_12_WIDE triggered by fine or wide out-of-limits event of ICU Secondary Supply 3 (-12V) Analogue
    - EID_VMON_ICU_P_3_3_FINE or EID_VMON_ICU_P_3_3_WIDE triggered by fine or wide out-of-limits event of ICU Secondary Supply 4 (+3.3V) Motor & Heater
    - Applicable if the Secondary Voltage Fail bit of the RT_Health data word is set
- Secondary Voltage Failure Data is 16-bit value of the monitored parameter that triggered the out-of-limit event
    - Applicable if the Secondary Voltage Fail bit of the RT_Health data word is set
- I/O Failure Data is applicable if the I/O Fail bit of the RT_Health data word is set:
    - 1 – EEPROM Write Protected;
    - 2 – EEPROM Write fail;
    - 5 – EEPROM Power off;
    - 17 – RAM Write fail;
    - 37 – Address not available
- Mil Bus Test Status is the Milbus BIT word
- Temporary Failure on Data Status is applicable if the Temporary Data Fail bit of the RT_Health data word is set:
    - EID_MILBUS_RX_ILLEGAL_FHP_ASW;
    - EID_MILBUS_RX_TC_CRC_FAIL_ASW;
    - EID_MILBUS_RX_TC_READ_FAIL_ASW;
    - EID_MILBUS_RX_TC_LEN_FAIL;
    - EID_MILBUS_MSG_DECODE_FAIL_ASW
- Mil Bus Protocol Status is taken from the Boot Report:

- Bits 12 to 15 – Tx_State where:
  - 0 – INIT
  - 1 – IDLE
  - 2 – WAIT_ATC
  - 3 – WAIT_RESET_ACK
  - 4 – WAIT_RESET_DTD
- Bits 8 to 11 – Rx_State where:
  - 0 – IN_SYNC
  - 1 – RESYNCING
- Bits 0 to 7 – Value of the Minor Frame Count. This is a wraparound count of valid received minor frame sync messages. *This is not the same as the Minor Frame Count.* This value can be used for frozen data detection.

- Mil Bus Protocol Error Count:
  - Bits 8 to 15 – Tx error count
  - Bits 0 to 7 – Rx error count

The RT Configuration Monitoring Data, words 14..31 within the SA01R RT_Health Message, is shown in Figure 323.

Word Number	Data
15	Coarse Time MS Word (16bits)
16	Coarse Time LS Word (16bits)
17	FineTime MS Word (16bits) N.B. MS 8 bits set to zero
18	Fine Time LS Word (16bits)
19	Refuse Mode Id
20	Source Mode Id
21	Commanded fallback Pkt Sequence Control
22	FEE Status Register (bit 15-0)
23	FEE Status Register (bit 23-16) (MSB) FEE State register (bit 23, bit 20-16, bit 1-0) (LSB)
24	FEE ADC_01 (bit 11-4) (MSB) FEE ADC_05 (bit (11-4) (LSB)
25	FEE ADC_09 (bit 11-4) (MSB) FEE ADC_13 (bit (11-4) (LSB)
26	FEE ADC_17 (bit 11-4) (MSB) FEE ADC_24 (bit (11-4) (LSB)
27	FEE temp (8 bits) (MSB) Vis VTEMP (8 bits) (LSB)
28	NIR VTEMP (8 bits) (MSB) SWIR1 VTEMP (8 bits) (LSB)
29	SWIR2 VTEMP (8 bits) (MSB) TIR VTEMP (8 bits) (LSB)
30	TIROU Temp2 (Optical Bench sensor 1) (8 bits) (MSB) VNSOU Temp3 (OU sensor 1) (8 bits) (LSB)
31	TIROU Temp3 (Optical Bench sensor 2) (8 bits) (MSB) VNSOU Temp4 (OU sensor 2) (8 bits) (LSB)

Figure 323: RT Configuration Monitoring Data

Where the following registers are defined in the MSI FEE Register List [AD5]
:

- FEE Status Register
- FEE State Register
- FEE ADC_01 (FEE Internal Voltage Monitor Register)
- FEE ADC_05 (FEE Internal Voltage Monitor Register)
- FEE ADC_09 (FEE Internal Voltage Monitor Register)
- FEE ADC_13 (FEE Internal Voltage Monitor Register)

- FEE ADC_17 (FEE Internal Voltage Monitor Register)
- FEE ADC_24 (FEE Internal Voltage Monitor Register)

NOTE: all these fields are valid when the FEE is powered and acquisitions are enabled.

Where the following registers are defined in the Hardware Software ICD [AD2] (section 9.2) HK Buffer:

- FEE temp
- Vis VTEMP
- NIR VTEMP
- SWIR1 VTEMP
- SWIR2 VTEMP
- TIR VTEMP
- TIROU Temp2
- VNSOU Temp3
- TIROU Temp3
- VNSOU Temp4

N.B. The MIL BUS Protocol Specification [RD5] specifies that the RT shall use the Subsystem Flag and Terminal Flag in the Milbus status word bits (Summit register 9) to indicate a RT/subsystem fault condition via the 1553 status word. However, no RT/subsystem fault conditions were identified that would lead to these bits being set (hence they are not used), since there are many more specific RT/subsystem fault condition signalling routes.

11. SHARED RAM AREA

See BSW ICD [AD7].

12. DATA TABLES

The following section detail identification values and constants used by the ASW TM.

12.1 Data Pool Parameters

MSIASW-190, MSIASW-287, MSIASW-290, MSIASW-304

Data Pool groups are defined and described in the ASW SDD section 6.1 [RD2].

In the tables below, the 'Short Description' (PCF_DESCR) is as used in the database; the 'Full Description' will appear in the HTML appendix to the SUM. Note that PCF_DESCR is limited to 16 characters.

For each data pool parameter, Database Names of the form AAAnnnn, numerical Parameter IDs, Byte Offsets and Bit Offsets will be assigned during the implementation phase and documented in the ASW SUM [RD8].

Where Parameter types are shown as 'enum' or 'struct', enumerations and structures will be defined in detail during the implementation phase and documented in the ASW SUM [RD8]. Where Parameter types are shown as 'bool', an enumeration Binary_Two_State_Truth is used with values BN_FALSE (0) and BN_TRUE (1).

12.1.1 Calibration Manager Parameters

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Average_Number	Average Number (power of 2 only)	Uint	8	Calibration_Manager
B1TruncatnFactor	B1 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B2TruncatnFactor	B2 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B3TruncatnFactor	B3 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B4TruncatnFactor	B4 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B7TruncatnFactor	B7 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B8TruncatnFactor	B8 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
B9TruncatnFactor	B9 Truncation Factor (3 bits)	Uint	8	Calibration_Manager
BandID1FFMapping	Band ID 1 Flat Field Mapping	Uint	8	Calibration_Manager
BandID2FFMapping	Band ID 2 Flat Field Mapping	Uint	8	Calibration_Manager
BandID3FFMapping	Band ID 3 Flat Field Mapping	Uint	8	Calibration_Manager
BandID4FFMapping	Band ID 4 Flat Field Mapping	Uint	8	Calibration_Manager
BandID5FFMapping	Band ID 5 Flat Field Mapping	Uint	8	Calibration_Manager
BandID6FFMapping	Band ID 6 Flat Field Mapping	Uint	8	Calibration_Manager
BandID7FFMapping	Band ID 7 Flat Field Mapping	Uint	8	Calibration_Manager
BandID8FFMapping	Band ID 8 Flat Field Mapping	Uint	8	Calibration_Manager
Baseline_Value	Baseline value subtracted from average FEE pixel values	Uint	24	Calibration_Manager

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
RefBandTruncFact	Reference Band Truncation Factor (3 bits)	Uint	8	Calibration_Manager
TIRreferencSetID	TIR Reference Set ID	Uint	8	Calibration_Manager
VNSReferencSetID	VNS Reference Set ID	Uint	8	Calibration_Manager
TIRTDICalibDelay	TIR TDI Calibration Delay	Uint	16	Calibration_Manager
Default TIRreferencSetID	TIR Reference Set ID being generated	Uint	8	Calibration_Manager
Default VNSreferencSetID	VNS Reference Set ID being generated	Uint	8	Calibration_Manager

12.1.2 Calibration Manager HK

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
CalibrationState	Calibration State	Enum	8	Calibration_Manager

Calibration_State_typ : Idle (0), Acc_TIR_Data (1), Acc_VNS_Data (2), TIR_Data_Acc (3), VNS_Data_Acc (4), DwlTIRCldVw (5), DwlTIRCldVwCpt (6), DwlTIRBBVw (7), DwlTIRBBVwCpt (8)

12.1.3 Calibration Manager TC Exec Status

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Calib_TC_Exec_Status	Calibration Manager TC execution status (of last TC) (0=Ongoing; 1=Succeeded; 2=Failed)	Enum	8	Mechanism_Control

12.1.4 Dispatcher Control

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Busiest_Period	Dispatcher control busiest slot number since startup.	Uint	8	Dispatcher
Busiest_Period _Processor_Usage	Dispatcher control processor usage (%) for Busiest_Period.	Uint	8	Dispatcher
Last_Period	Dispatcher control slot previous to the one where the TM is generated.	Uint	8	Dispatcher
Last_Period_Processor_Usage	Dispatcher control processor usage (%) for Last_Period.	Uint	8	Dispatcher

12.1.5 Engineering Data

Ref.1 : 'HK parameter list v2a.xls'

In all cases the Source component is HK_Acquisition. The order in the table reflects the ordering by channel ID (0..191) in Ref.1. This allows the data to be acquired as a contiguous block and written to the data ppol. The data pool interface overlays a structure with individual entries identified as per the 'short description').

'Full Description' is as per the 'Parameter' label in Ref.1. 'HW Parameter Name' reflects the 'Suggested HK Parameter ID' in Ref.1 and also the 'HW Parameter Name' in [AD3].

Channels 0..191 are divided into 3 blocks as follows :

- Channels 0..63 HK Buffer E : ADC 1 : Analogue Acquisitions Module (AAM)
- Channels 64..127 HK Buffer F : ADC 2 : Power Drive Module (PDM)
- Channels 128..191 HK Buffer G : ADC 3 : 16 bit ADC on the AAM

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
VMON_ICU_P_12	+12V_Monitor	VMON_ICU_P_12	0	Uint	16
VMON_ICU_P_20	+20V_Mon	VMON_ICU_P_20	1	Uint	16
VMON_VNS_ENC	VNS_Enc_Monitor	VMON_VNS_ENC	2	Uint	16
VMON_ICU_P_3V3	+3V3_Monitor	VMON_ICU_P_3V3	3	Uint	16
VMON_ADC16_P_2V5	ADC16_2V5_Ref	VMON_ICU_ADC16_P_2V5	4	Uint	16
VMON_ADC16_P_5	ADC16_5V_Ref	VMON_ICU_ADC16_P_5	5	Uint	16
VMON_ADC12_P_5	ADC12_5V_Ref	VMON_ICU_ADC12_P_5	6	Uint	16
VMON_ICU_N_12	-12V_Monitor	VMON_ICU_N_12	7	Uint	16
VMON_TIR_ENC	TIR_Enc_Monitor	VMON_TIR_ENC	8	Uint	16
IMON_HTR	Htr_I_Mon	IMON_HTR	9	Uint	16
TIR_MIRROR_IMON	TIR_Mirror_I_Mon	TIR_MIRROR_IMON	10	Uint	16
VNS_CAL_IMON	VNS_Cal_I_Mon	VNS_CAL_IMON	11	Unit	16
VMON_ICU_P_24	+24V_Mon	VMON_ICU_P_24	12	Uint	16

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
VMON_FEE_P_4	+4V_FEE_Secondary	VMON_FEE_P_4	13	Uint	16
VMON_FEE_P_7	+7V_FEE_Secondary	VMON_FEE_P_7	14	Uint	16
VMON_ICU_P_5	+5V_Monitor	VMON_ICU_P_5	15	Uint	16
VMON_ICU_SPARE_3	ADC12_BP_Spare_1	VMON_ICU_SPARE_3	16	Uint	16
VMON_ICU_SPARE_4	ADC12_BP_Spare_2	VMON_ICU_SPARE_4	17	Uint	16
VMON_ICU_SPARE_5	ADC12_BP_Spare_3	VMON_ICU_SPARE_5	18	Uint	16
VMON_ICU_SPARE_6	ADC12_BP_Spare_4	VMON_ICU_SPARE_6	19	Uint	16
VMON_ICU_SPARE_7	ADC12_BP_Spare_5	VMON_ICU_SPARE_7	20	Uint	16
VMON_ICU_SPARE_8	ADC12_BP_Spare_6	VMON_ICU_SPARE_8	21	Uint	16
VMON_ICU_SPARE_9	ADC12_BP_Spare_7	VMON_ICU_SPARE_9	22	Uint	16
VMON_ICU_SPARE10	ADC12_BP_Spare_8	VMON_ICU_SPARE_10	23	Uint	16
VMON_ICU_SP11C0	ADC12_Spare_1	VMON_ICU_SPARE_11	24	Uint	16
VMON_ICU_SP11C1	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	25	Uint	16
VMON_ICU_SP11C2	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	26	Uint	16
VMON_ICU_SP11C3	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	27	Uint	16
VMON_ICU_SP11C4	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	28	Uint	16
VMON_ICU_SP11C5	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	29	Uint	16
VMON_ICU_SP11C6	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	30	Uint	16
VMON_ICU_SP11C7	ADC12_Spare_1 (copy)	VMON_ICU_SPARE_11	31	Uint	16
VMON_ICU_SP12C0	ADC12_Spare_2	VMON_ICU_SPARE_12	32	Uint	16
VMON_ICU_SP12C1	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	33	Uint	16
VMON_ICU_SP12C2	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	34	Uint	16
VMON_ICU_SP12C3	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	35	Uint	16
VMON_ICU_SP12C4	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	36	Uint	16
VMON_ICU_SP12C5	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	37	Uint	16
VMON_ICU_SP12C6	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	38	Uint	16
VMON_ICU_SP12C7	ADC12_Spare_2 (copy)	VMON_ICU_SPARE_12	39	Uint	16
VMON_ICU_SP13C0	ADC12_Spare_3	VMON_ICU_SPARE_13	40	Uint	16
VMON_ICU_SP13C1	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	41	Uint	16
VMON_ICU_SP13C2	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	42	Uint	16
VMON_ICU_SP13C3	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	43	Uint	16
VMON_ICU_SP13C4	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	44	Uint	16
VMON_ICU_SP13C5	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	45	Uint	16
VMON_ICU_SP13C6	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	46	Uint	16
VMON_ICU_SP13C7	ADC12_Spare_3 (copy)	VMON_ICU_SPARE_13	47	Uint	16
VMON_ICU_SP14C0	ADC12_Spare_4	VMON_ICU_SPARE_14	48	Uint	16
VMON_ICU_SP14C1	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	49	Uint	16
VMON_ICU_SP14C2	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	50	Uint	16
VMON_ICU_SP14C3	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	51	Uint	16

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
VMON_ICU_SP14C4	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	52	Uint	16
VMON_ICU_SP14C5	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	53	Uint	16
VMON_ICU_SP14C6	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	54	Uint	16
VMON_ICU_SP14C7	ADC12_Spare_4 (copy)	VMON_ICU_SPARE_14	55	Uint	16
VMON_ICU_SP15C0	ADC12_Spare_5	VMON_ICU_SPARE_15	56	Uint	16
VMON_ICU_SP15C1	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	57	Uint	16
VMON_ICU_SP15C2	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	58	Uint	16
VMON_ICU_SP15C3	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	59	Uint	16
VMON_ICU_SP15C4	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	60	Uint	16
VMON_ICU_SP15C5	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	61	Uint	16
VMON_ICU_SP15C6	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	62	Uint	16
VMON_ICU_SP15C7	ADC12_Spare_5 (copy)	VMON_ICU_SPARE_15	63	Uint	16
IMON_BUS_PRIM_C0	Bus_I_Monitor	IMON_BUS_PRIMARY	64	Uint	16
IMON_BUS_PRIM_C1	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	65	Uint	16
IMON_BUS_PRIM_C2	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	66	Uint	16
IMON_BUS_PRIM_C3	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	67	Uint	16
IMON_BUS_PRIM_C4	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	68	Uint	16
IMON_BUS_PRIM_C5	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	69	Uint	16
IMON_BUS_PRIM_C6	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	70	Uint	16
IMON_BUS_PRIM_C7	Bus_I_Monitor (copy)	IMON_BUS_PRIMARY	71	Uint	16
VMON_BUS_PRIM_C0	Bus_V_Monitor	VMON_BUS_PRIMARY	72	Uint	16
VMON_BUS_PRIM_C1	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	73	Uint	16
VMON_BUS_PRIM_C2	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	74	Uint	16
VMON_BUS_PRIM_C3	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	75	Uint	16
VMON_BUS_PRIM_C4	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	76	Uint	16
VMON_BUS_PRIM_C5	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	77	Uint	16
VMON_BUS_PRIM_C6	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	78	Uint	16
VMON_BUS_PRIM_C7	Bus_V_Monitor (copy)	VMON_BUS_PRIMARY	79	Uint	16
VMON_MTR_HTR_C0	Mtr_Htr_Bus_V_Mon	VMON_BUS_MTR_HTR	80	Uint	16
VMON_MTR_HTR_C1	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	81	Uint	16
VMON_MTR_HTR_C2	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	82	Uint	16
VMON_MTR_HTR_C3	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	83	Uint	16
VMON_MTR_HTR_C4	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	84	Uint	16
VMON_MTR_HTR_C5	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	85	Uint	16
VMON_MTR_HTR_C6	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	86	Uint	16
VMON_MTR_HTR_C7	Mtr_Htr_Bus_V_Mon (copy)	VMON_BUS_MTR_HTR	87	Uint	16
IMON_MTR_HTR_C0	Mtr_Htr_Bus_I_Mon	IMON_BUS_MTR_HTR	88	Uint	16
IMON_MTR_HTR_C1	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	89	Uint	16
IMON_MTR_HTR_C2	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	90	Uint	16

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
IMON_MTR_HTR_C3	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	91	Uint	16
IMON_MTR_HTR_C4	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	92	Uint	16
IMON_MTR_HTR_C5	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	93	Uint	16
IMON_MTR_HTR_C6	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	94	Uint	16
IMON_MTR_HTR_C7	Mtr_Htr_Bus_I_Mon (copy)	IMON_BUS_MTR_HTR	95	Uint	16
IMON_BUS_ICU_C0	ICU_Bus_I_Mon	IMON_BUS_ICU	96	Uint	16
IMON_BUS_ICU_C1	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	97	Uint	16
IMON_BUS_ICU_C2	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	98	Uint	16
IMON_BUS_ICU_C3	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	99	Uint	16
IMON_BUS_ICU_C4	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	100	Uint	16
IMON_BUS_ICU_C5	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	101	Uint	16
IMON_BUS_ICU_C6	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	102	Uint	16
IMON_BUS_ICU_C7	ICU_Bus_I_Mon (copy)	IMON_BUS_ICU	103	Uint	16
IMON_BUS_FEE_C0	FEE_Bus_I_Mon	IMON_BUS_FEE	104	Uint	16
IMON_BUS_FEE_C1	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	105	Uint	16
IMON_BUS_FEE_C2	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	106	Uint	16
IMON_BUS_FEE_C3	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	107	Uint	16
IMON_BUS_FEE_C4	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	108	Uint	16
IMON_BUS_FEE_C5	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	109	Uint	16
IMON_BUS_FEE_C6	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	110	Uint	16
IMON_BUS_FEE_C7	FEE_Bus_I_Mon (copy)	IMON_BUS_FEE	111	Uint	16
VMON_BUS_FEE_C0	FEE_Bus_V_Mon	VMON_BUS_FEE	112	Uint	16
VMON_BUS_FEE_C1	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	113	Uint	16
VMON_BUS_FEE_C2	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	114	Uint	16
VMON_BUS_FEE_C3	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	115	Uint	16
VMON_BUS_FEE_C4	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	116	Uint	16
VMON_BUS_FEE_C5	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	117	Uint	16
VMON_BUS_FEE_C6	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	118	Uint	16
VMON_BUS_FEE_C7	FEE_Bus_V_Mon (copy)	VMON_BUS_FEE	119	Uint	16
SPARE_PDM_C0	PDM_Spare_Monitor	SPARE_PDM	120	Uint	16
SPARE_PDM_C1	PDM_Spare_Monitor (copy)	SPARE_PDM	121	Uint	16
SPARE_PDM_C2	PDM_Spare_Monitor (copy)	SPARE_PDM	122	Uint	16
SPARE_PDM_C3	PDM_Spare_Monitor (copy)	SPARE_PDM	123	Uint	16
SPARE_PDM_C4	PDM_Spare_Monitor (copy)	SPARE_PDM	124	Uint	16
SPARE_PDM_C5	PDM_Spare_Monitor (copy)	SPARE_PDM	125	Uint	16
SPARE_PDM_C6	PDM_Spare_Monitor (copy)	SPARE_PDM	126	Uint	16
SPARE_PDM_C7	PDM_Spare_Monitor (copy)	SPARE_PDM	127	Uint	16
THERM_FEE	FEE_Thermistor	THERM_FEE	128	Uint	16
TH_FEE_TIR_BASE	FEE_TIR_Base_Thermistor	THERM_FEE_TIR_BASE	129	Uint	16

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
THERM_OB_1	OB_Thermistor_1	THERM_OB_1	130	Uint	16
THERM_OB_2	OB_Thermistor_2	THERM_OB_2	131	Uint	16
TH_VNS_SW2_BRL_1	VNS_SW2_Barrel_Thermistor_1	THERM_VNS_SW2_BARREL_1	132	Uint	16
TH_VNS_SW2_BRL_2	VNS_SW2_Barrel_Thermistor_2	THERM_VNS_SW2_BARREL_2	133	Uint	16
THERM_VNS_OU_1	VNS_OU_Thermistor_1	THERM_VNS_OU_1	134	Uint	16
VMON_ICU_SPARE16	ADC16_Spare_1	VMON_ICU_SPARE_16	135	Uint	16
THERM_VNS_OU_2	VNS_OU_Thermistor_2	THERM_VNS_OU_2	136	Uint	16
THERM_VNS_CAL_1	VNS_Cal_Thermistor_1	THERM_VNS_CAL_1	137	Uint	16
THERM_VNS_CAL_2	VNS_Cal_Thermistor_2	THERM_VNS_CAL_2	138	Uint	16
TH_TIR_BENCH_1	TIR_Bench_Thermistor_1	THERM_TIR_BENCH_1	139	Uint	16
TH_TIR_BENCH_2	TIR_Bench_Thermistor_2	THERM_TIR_BENCH_2	140	Uint	16
TH_TIR_LENS8_1	TIR_Lens8_Thermistor_1	THERM_TIR_LENS8_1	141	Uint	16
TH_TIR_LENS8_2	TIR_Lens8_Thermistor_2	THERM_TIR_LENS8_2	142	Uint	16
VMON_ICU_SPARE17	ADC16_Spare_2	VMON_ICU_SPARE_17	143	Uint	16
TH_TIR_MASK_TOP	TIR_Mask_Top_Thermistor	THERM_TIR_MASK_TOP	144	Uint	16
TH_TIR_MASK_BTTM	TIR_Mask_Bottom_Thermistor	THERM_TIR_MASK_BOTTOM	145	Uint	16
THERM_TIR_LENS2	TIR_Lens2_Thermistor	THERM_TIR_LENS2	146	Uint	16
THERM_TIR_RBB	TIR_RBB_Thermistor	THERM_TIR_RBB	147	Uint	16
THERM_ICU_AAM	AAM_Thermistor	THERM_ICU_AAM	152	Uint	16
TH_ICU_CHASSIS	Chassis_Thermistor	THERM_ICU_CHASSIS	154	Uint	16
TEST_V1_78	Test_1.78V	1.78V Test	149	Uint	16
VMON_ICU_SPARE20	ADC16_Spare_5	VMON_ICU_SPARE_20	151	Uint	16
THERM_ICU_PDM_1	PDM_Thermistor_1	THERM_ICU_PDM_1	155	Uint	16
THERM_ICU_PDM_2	PDM_Thermistor_2	THERM_ICU_PDM_2	156	Uint	16
THERM_ICU_PDM_3	PDM_Thermistor_3	THERM_ICU_PDM_3	157	Uint	16
THERM_ICU_ICP	ICP_Thermistor	THERM_ICU_ICP	153	Uint	16
THERM_ICU_SPARE1	ICU_Thermistor_Spare_1	THERM_ICU_SPARE_1	148	Uint	16
TH_ICU_SPARE_2	ICU_Thermistor_Spare_2	THERM_ICU_SPARE_2	148	Uint	16
TH_ICU_SPARE_3	ICU_Thermistor_Spare_3	THERM_ICU_SPARE_3	158	Uint	16
ICU_Thermistor_Spare_4	ICU_Thermistor_Spare_4	THERM_ICU_SPARE_4	159	Uint	16
PRT_VNS_SW2_1	VNS_SW2_Cold_PT1000_1	PRT_VNS_SW2_1	160	Uint	16
PRT_VNS_SW2_2	VNS_SW2_Cold_PT1000_2	PRT_VNS_SW2_2	161	Uint	16
PRT_VNS_RAD	VNS_Rad_PT1000	PRT_VNS_RAD	162	Uint	16
PRT_CBB_PT_1	TIR_CBB_PT_1	PRT_CBB_PT_1	163	Uint	16
PRT_CBB_PT_2	TIR_CBB_PT_2	PRT_CBB_PT_2	164	Uint	16
VMON_ADC16_VREF	ADC16_5V_Ref	VMON_ICU_ADC16_VREF	165	Uint	16
VMON_ICU_SPARE21	ADC16_Spare_6	VMON_ICU_SPARE_21	166	Uint	16
VMON_ICU_SPARE22	ADC16_Spare_7	VMON_ICU_SPARE_22	167	Uint	16

Short Description (PCF_DESCR)	Full Description	HW Parameter Name	Ch ID	Type	Len. (bits)
VTEMP_FEE_VIS	FEE_VIS_VTEMP	VTEMP_FEE_VIS	168	Uint	16
VTEMP_FEE_NIR	FEE_NIR_VTEMP	VTEMP_FEE_NIR	169	Uint	16
VTEMP_FEE_SW1	FEE_SW1_VTEMP	VTEMP_FEE_SW1	170	Uint	16
VTEMP_FEE_SW2	FEE_SW2_VTEMP	VTEMP_FEE_SW2	171	Uint	16
VTEMP_FEE_TIR	FEE_TIR_VTEMP	VTEMP_FEE_TIR	172	Uint	16
VMON_ICU_SPARE23	ADC16_Spare_8	VMON_ICU_SPARE_23	173	Uint	16
VMON_ICU_SPARE24	ADC16_Spare_9	VMON_ICU_SPARE_24	174	Uint	16
VMON_ICU_SPARE25	ADC16_Spare_10	VMON_ICU_SPARE_25	175	Uint	16
VMON_ICU_SPARE26	ADC16_Spare_11	VMON_ICU_SPARE_26	176	Uint	16
VMON_ICU_SPARE27	ADC16_Spare_12	VMON_ICU_SPARE_27	177	Uint	16
VMON_ICU_SPARE28	ADC16_Spare_13	VMON_ICU_SPARE_28	178	Uint	16
VMON_ICU_SPARE29	ADC16_Spare_14	VMON_ICU_SPARE_29	179	Uint	16
VMON_ICU_SPARE30	ADC16_Spare_15	VMON_ICU_SPARE_30	180	Uint	16
VMON_ICU_SPARE31	ADC16_Spare_16	VMON_ICU_SPARE_31	181	Uint	16
VMON_ICU_SPARE32	ADC16_Spare_17	VMON_ICU_SPARE_32	182	Uint	16
VMON_ICU_SPARE33	ADC16_Spare_18	VMON_ICU_SPARE_33	183	Uint	16
VMON_ICU_SP34C0	ADC16_Spare_19	VMON_ICU_SPARE_34	184	Uint	16
VMON_ICU_SP34C1	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	185	Uint	16
VMON_ICU_SP34C2	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	186	Uint	16
VMON_ICU_SP34C3	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	187	Uint	16
VMON_ICU_SP34C4	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	188	Uint	16
VMON_ICU_SP34C5	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	189	Uint	16
VMON_ICU_SP34C6	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	190	Uint	16
VMON_ICU_SP34C7	ADC16_Spare_19 (copy)	VMON_ICU_SPARE_34	191	Uint	16

12.1.6 Event Manager

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Low_Sev_ErrCount	Count of low severity errors	Uint	32	Event_Manager
Med_Sev_ErrCount	Count of medium severity errors	Uint	32	Event_Manager
HighSev_ErrCount	Count of high severity errors	Uint	32	Event_Manager
CRC_Error_Count	Count of TCs received with CRC errors present	Uint	8	Event_Manager
TC_Failure_and_Event_Count	Error Count is count of all TM(1,2) (1,8) plus low, medium and high severity events. Counter wraps at 255 to 0.	Uint	8	Event_Manager
Last_event_Error_ID	Last failing event ID (5,2 5,3 or 5,4)	Uint	16	Event_Manager
Event_Action_En	Is the event actions service enabled	Bool	8	Event_Action_Manager

12.1.7 FEE Control Registers

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
FEE_Command_Reg	FEE Command Register	Uint	32	FEE_Manager
FEEMonitoringReg	FEE Monitoring Register	Uint	32	FEE_Manager
FEEUSLMonitorReg	FEE USL Monitor Register (8 LS bits)	Uint	8	HK_Acquisition

12.1.8 FEE Manager HK

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
FEE_State	FEE state (only bottom 2 bits used, reflects 2-bit field in the FEE State register; NB: needed for access by ISW procedures)	Enum	8	FEE_Manager

FEE_State_typ : Idle_1 (00), Idle_2 (11), Normal (01)

12.1.9 FEE Manager Parameters

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
FEEADCRegReqRate	FEE ADC Registers Request Rate	Uint	8	FEE_Manager
FEEADCReqEnState	FEE ADC Registers Request Enabled state	Bool	8	FEE_Manager
FEENumberResends	FEE number of command resends	Uint	8	FEE_Manager
FEEStsRegReqRate	FEE Status Register Request Rate	Uint	8	FEE_Manager
FEEStsReqEnState	FEE Status Register Request Enabled state	Bool	8	FEE_Manager

12.1.10 FEE Registers

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Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
FEE_Status_Reg	FEE Status Register	Uint	24	FEE_Manager
FEE_State_Reg	FEE State Register	Uint	24	FEE_Manager
DPC_Status_1	DPC_Status_1	Uint	24	FEE_Manager
ADC_08_Ref	FEE ADC 08 ADC Ref	Uint	16	FEE_Manager
NIR_VDDA	NIR VDDA	Uint	16	FEE_Manager
NIR_VDET	NIR VDET	Uint	16	FEE_Manager
NIR_Vvideo	NIR Vvideo	Uint	16	FEE_Manager
ADC_24_Ref	FEE ADC 24 ADC Ref	Uint	16	FEE_Manager
SWIR1_VDDA	SWIR1 VDDA	Uint	16	FEE_Manager
SWIR1_VDET	SWIR1 VDET	Uint	16	FEE_Manager
SWIR1_Vvideo	SWIR1 Vvideo	Uint	16	FEE_Manager
ADC_16_Ref	FEE ADC 16 ADC Ref	Uint	16	FEE_Manager

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
SWIR2_VDDA	SWIR2 VDDA	Uint	16	FEE_Manager
SWIR2_VDET	SWIR2 VDET	Uint	16	FEE_Manager
SWIR2_Vvideo	SWIR2 Vvideo	Uint	16	FEE_Manager
TIR_ADC_P	TIR ADC P	Uint	16	FEE_Manager
TIR_VBUS	TIR VBUS	Uint	16	FEE_Manager
TIR_VDDA	TIR VDDA	Uint	16	FEE_Manager
TIR_VDDL	TIR VDDL	Uint	16	FEE_Manager
TIR_VEB	TIR VEB	Uint	16	FEE_Manager
TIR_VFID	TIR VFID	Uint	16	FEE_Manager
TIR_VSKIMMING	TIR VSKIMMING	Uint	16	FEE_Manager
TIR_Vvideo	TIR Vvideo	Uint	16	FEE_Manager
Filter_7V_P	7V Filter P	Uint	16	FEE_Manager
Vis_VDDA	Vis VDDA	Uint	16	FEE_Manager
Vis_VDET	Vis VDET	Uint	16	FEE_Manager
Vis_Vvideo	Vis Vvideo	Uint	16	FEE_Manager

Note that the analogue data is actually 12-bit value stored in a 16-bit field (most significant 4 bits will be 0).

12.1.11 HK Acquisition

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Acqn_Coarse_Time	HK Acquisition coarse time	Uint	32	HK_Acquisition
Acqn_Fine_Time	HK Acquisition fine time	Uint	24	HK_Acquisition

12.1.12 ICU Support

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Software_Version	Software version	Uint	32	HK_Acquisition
MTU_Size	MTU Size	Uint	16	HK_Acquisition

12.1.13 ICU Support Registers

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Reset_Register	Reset Register	Uint	16	HK_Acquisition
EEPROM_Status	EEPROM Bank Health (Struct)	Struct	16	HK_Acquisition
EEPROM_Write_Counter	EEPROM Bank Health (Detail): Write Counter	Uint	13	HK_Acquisition
EEPROM_Bank_Id	EEPROM Bank Health (Detail): Bank ID	Enum	1	HK_Acquisition

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Power_State	EEPROM Bank Health (Detail): Power State	Enum	1	HK_Acquisition
Write_State	EEPROM Bank Health (Detail): Write State	Enum	1	HK_Acquisition
PowerControl_Reg	Power Control Status (LS 16 bits)	Struct	16	HK_Acquisition
OverCurrent_Sts	Over-current status register (LS 16 bits)	Struct	16	HK_Acquisition
SEE_Error_Status	SEE Error Status Register (LS 8 bits)	Struct	8	HK_Acquisition
PS_FPGA_Version	PS FPGA Version number	Uint	16	HK_Acquisition
IF_FPGA_Version	IF FPGA Version number	Uint	16	HK_Acquisition
FPGA_Intr_Mask	FPGA Interrupt Mask Register (LS 8 bits)	Struct	8	HK_Acquisition
InstBoard_Config	Instrument Board Configuration (i.e. nominal / redundant) from the Instrument Configuration Monitor register	Enum	8	HK_Acquisition
InstConfig_Valid	Instrument Configuration Monitor Register valid	Bool	8	HK_Acquisition
Reset_Reg_Valid	Reset Register contents valid	Bool	8	HK_Acquisition
EQSOL_Control_Register	Contents of the EQSOL register	Uint	8	HK_Acquisition
WatchdogStatus	Watchdog Status	Enum	8	HK_Acquisition
Watchdog_Timer_Register	The content of the watchdog timer register, in units of ½^20	U24	24	HK_Acquisition

12.1.14 Mechanisms Control Parameters

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
TIR_S_CoastSteps	TIR low speed coasting base value	Uint	16	Mechanism_Control
VNS_S_CoastSteps	VNS low speed coasting base value	Uint	16	Mechanism_Control
TIR_S_EV_Windup	Additional low speed coasting steps when approaching TIR earth view	Uint	16	Mechanism_Control
TIR_T_FinalSteps	Remaining deceleration steps after low speed coast for TIR	Uint	16	Mechanism_Control
VNS_T_FinalSteps	Remaining deceleration steps after low speed coast for VNS	Uint	16	Mechanism_Control
TIR_M_AccelSteps	Number of acceleration steps for TIR	Uint	16	Mechanism_Control
VNS_M_AccelSteps	Number of acceleration steps for VNS	Uint	16	Mechanism_Control
Max_Positn_Error	Threshold for position check (steps)	Uint	16	Mechanism_Control

TIRSeekCWReqStps	TIR Seek Clockwise Required Steps	Uint	16	Mechanism_Control
TIRSeekCCWRqStps	TIR Seek Counter Clockwise Required Steps	Uint	16	Mechanism_Control
VNSSeekCWReqStps	VNS Seek Clockwise Required Steps	Uint	16	Mechanism_Control
TIR_Mech_Timeout	TIR Mechanism Timeout (task cycles)	Uint	16	Mechanism_Control
VNS_Mech_Timeout	VNS Mechanism Timeout (task cycles)	Uint	16	Mechanism_Control
TIR_Cold_Space_Pos	TIR cold space position step count.	Uint	16	Mechanism_Control
TIR_Black_Body_Pos	TIR black body position step count.	Uint	16	Mechanism_Control
TIR_Nadir_Earth_Pos	TIR earth view/nadir position step count.	Uint	16	Mechanism_Control

12.1.15 Mechanisms Control HK

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
TIR_Slew_State	TIR Slew State	Enum	8	Mechanism_Control
VNS_Slew_State	VNS Slew State	Enum	8	Mechanism_Control
TIR_Virt_Enc_Sts	TIR Virtual Encoder Status (16 LS bits)	Uint	16	Mechanism_Control
VNS_Virt_Enc_Sts	VNS Virtual Encoder Status (16 LS bits)	Uint	16	Mechanism_Control
TIR_Position_Mon	TIR Position Monitor (16 LS bits)	Uint	16	Mechanism_Control
VNS_Position_Mon	VNS Position Monitor (16 LS bits)	Uint	16	Mechanism_Control
TIR_Pointing_Dir	TIR Pointing Direction	Enum	8	Mechanism_Control
VNS_Pointing_Dir	VNS Pointing Direction	Enum	8	Mechanism_Control
Mtr_Ctrl_Setting	Motor Drive Control register setting	Uint	16	Mechanism_Control
Mtr_PWM_ScalFact	Motor PWM Scaling Factor setting	Uint	16	Mechanism_Control
Mtr_PWM_Ctrl_Reg	Motor PWM Control register setting	Uint	16	Mechanism_Control
Mstep_PerRpt_Reg	Microstep Period Repeat Register	Uint	8	Mechanism_Control

TIR_Slew_State_typ: TIR_IDLE(0), TIR_TC_PENDING(1), TIR_PRESLSEEK (2), TIR_SLEWING (3), TIR_POSTSLSEEK (4), TIR_RETRYSLEW (5), TIR_SEEK_TC (6), TIR_ABORTING (7), TIR_PARKING (8)

VNS_Slew_State_typ: VNS_IDLE (0), VNS_TC_PENDING (1), VNS_PRESLSEEK (2), VNS_SLEWING (3), VNS_CORRECTING (4), VNS_POSTSLSEEK (5), VNS_RETRYSLEW (6), VNS_SEEK_TC (7), VNS_ABORTING (8), VNS_PARKING (9)

TIR_Pointing_Direction_typ:TIR_INVALID (0), TIR_EARTH (1), TIR_MOVING (2), TIR_SPACE_VIEW_OFFSET_DATA_COLLECTION (4), TIR_CALIBRATION_BLACK_BODY (5)

VNS_Pointing_Direction_typ:VNS_INVALID (0), VNS_EARTH (1), VNS_MOVING (2), VNS_DARK (3), VNS_DARK_OFFSET_DATA_COLLECTION (4), VNS_DIFFUSER_1 (5) , VNS_DIFFUSER_2 (6)

12.1.16 Mechanisms Control TC Exec Status

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Mech_TC_Exec_Status	Mechanism control TC execution status (of last	Enum	8	Mechanism_Control

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
	TC) (0=Ongoing; 1=Succeeded; 2=Failed)			

12.1.17 Memory Scrubbing

The contents of this data pool group are maintained by the background Memory Scrubbing software. A dedicated HK_Acquisition component acquires this data and updates this complete data pool group at 10Hz.

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Total_SEU_Count	Total SEU Count	Uint	32	HK_Acquisition
Last_SEU_Address	Address of last detected SEU	Uint	32	HK_Acquisition
SEU_Count_Last_Scr	Count of SEU in last memory scrub	Uint	16	HK_Acquisition
Scrubbing_Enabled	Indicates if scrubbing currently enabled	enum	8	HK_Acquisition
ScrubRate	Scrubbing Rate	Uint	16	HK_Acquisition
Memory_Id_1	Scrubbing memory ID configured by TC	Uint	8	HK_Acquisition
Memory_Id_2	Scrubbing memory ID configured by TC	Uint	8	HK_Acquisition
Memory_Id_3	Scrubbing memory ID configured by TC	Uint	8	HK_Acquisition
Memory_Id_4	Scrubbing memory ID configured by TC	Uint	8	HK_Acquisition

12.1.18 Mil-Bus Interface Registers

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Status_Register	SuMMIT Operational Status Register – see [AD2] for a description of this register	Uint	16	HK_Acquisition

12.1.19 Mode Control HK

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Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Mode_Trxn_Status	Mode Transition Status	Enum	8	Mode_Control
Current_Mode	Current Mode	Enum	8	Mode_Control
Current_SubMode	Current Sub-Mode	Enum	8	Mode_Control
Previous_Mode	Previous Mode	Enum	8	Mode_Control
Previous_SubMode	Previous Sub-Mode	Enum	8	Mode_Control
TC_Exec_Status	TC Execution Status (as checked by Instrument Procedures) : Ongoing, Completed_Successfully, Completed_Failed	Enum	8	Mode_Control

Mode_Trxn_Status_typ MT_STEADY (0) MT_IN_TRANSITION (1) MT_STABILISING (2)

Instrument_Mode_typ INS_OFF (0) INS_INI (1) INS_SBY (2) INS_SBR (3) INS_IDL (4) INS_IDR (5) INS_DEC (6) INS_NOM (7)

Instrument_Sub_Mode_Type INSS_NA (0), INSS_NOM_OBS (1), INSS_NOM_RAW (2), INSS_NOM_TIR (3), INSS_NOM_VNS1 (4), INSS_NOM_VNS2 (5)

TC_Exe_Status_typ TC_ONGOING (0), TC_COMPLETED_SUCCESSFULLY (1), TC_COMPLETED_FAILED (2)

12.1.20 Mode Preconditions

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
INS_IDL_Ready	INS-IDL Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_Ready	INS-NOM Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_OBS_Ready	INS-NOM-OBS Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_RAW_Ready	INS-NOM-RAW Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_TIR_Ready	INS-NOM-TIR Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_VNS1_Ready	INS-NOM-VNS1 Ready mode transition preconditions met	Bool	8	Mode_Control
INS_NOM_VNS2_Ready	INS-NOM-VNS2 Ready mode transition preconditions met	Bool	8	Mode_Control

12.1.21 Science Data Processing

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Sci_SSC_Error	Science Packet Source Sequence Count Error Occurred	Bool	8	Science_Data_ Processing
SciPktSSCerrCnt	Count of Science Packet Source Sequence Count Errors	Uint	32	Science_Data_ Processing

12.1.22 Science Data Registers

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
Packet_Seq_Cntr	Packet Sequence Counter	Uint	16	HK_Acquisition
GL_Sync_Period	Ground Line Sync Period	Uint	24	HK_Acquisition
Science_Proc_Mon	Science Processing Monitor	Uint	8	HK_Acquisition
Science_ErrorSts	Science Error Status	Uint	8	HK_Acquisition
Packetiser_Monit	Packetiser Monitor	Enum	8	HK_Acquisition
SciDataModeCtrl	Science Data Mode Control Register	Enum	8	HK_Acquisition
Instrument_Mode	Instrument Mode (from Instrument Configuration register)	Uint	8	HK_Acquisition
Instrum_SubMode	Instrument sub-mode (from Instrument Configuration register)	Uint	8	HK_Acquisition
TIR_FF_Offset_ID	TIR Flat Field Offset ID (from Instrument Configuration register)	Uint	8	HK_Acquisition

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
VNS_FF_Offset_ID	VNS Flat Field Offset ID (from Instrument Configuration register)	Uint	8	HK_Acquisition
TIR_Pointing_Dir	TIR Pointing Direction (from Instrument Configuration register)	Uint	8	HK_Acquisition
VNS_Pointing_Dir	VNS Pointing Direction (from Instrument Configuration register)	Uint	8	HK_Acquisition

12.1.23 Spares

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Spare1	Spare DP parameter 1	Enum	8	HK_Acquisition
Spare2	Spare DP parameter 2	Enum	16	HK_Acquisition
Spare3	Spare DP parameter 3	Enum	16	HK_Acquisition
Spare4	Spare DP parameter 4	Enum	16	HK_Acquisition
Spare5	Spare DP parameter 5	Enum	16	HK_Acquisition

12.1.24 TC Manager

Short Description (PCF_DESCR)	Full Description	Type	Length (bits)	Source component
MCMD_Count	TC Command count	Uint	8	TC_Manager
LastAccServiceId	Last accepted TC Service Id	Uint	8	TC_Manager
LastAccSubservId	Last accepted TC Sub-service Id	Uint	8	TC_Manager
LastAcc_Funct_Id	Last accepted Service 8 Function Id	Uint	8	TC_Manager
Last_Error_Id	Last reported error id	Uint	16	Event_Manager

12.1.25 Thermal Control Status

Short Description (PCF_DESCR)	Full Description	Type	Len (bits)	Source component
ThControl_Status	Thermal Control Status – [Started | Stopped]	Enum	8	Thermal_Control
TEC_Status	TEC Status – [Enabled | Disabled]	Enum	8	Thermal_Control
OB_Htr_Status	OB Heater Status – [Enabled | Disabled]	Enum	8	Thermal_Control
OB_Htr_Temp_Diff	OB Temperature Difference	Uint	16	Thermal_Control
TIR_H1_Status	TIROU Heater 1 Status – [Enabled | Disabled]	Enum	8	Thermal_Control
TIR_H1_Temp_Diff	TIROU Heater 1 Temperature Difference	Uint	16	Thermal_Control
TIR_H2_Status	TIROU Heater 2 Status – [Enabled | Disabled]	Enum	8	Thermal_Control
TIR_H2_Temp_Diff	TIROU Heater 2 Temperature Difference	Uint	16	Thermal_Control
VNS_H1_Status	VNSOU Heater 1 Status – [Enabled | Disabled]	Enum	8	Thermal_Control

Short Description (PCF_DESCR)	Full Description	Type	Len (bits)	Source component
VNS_H1_Temp_Diff	VNSOU Heater 1 Temperature Difference	Uint	16	Thermal_Control
VNS_H2_Status	VNSOU Heater 2 Status – [Enabled | Disabled]	Enum	8	Thermal_Control
VNS_H2_Temp_Diff	VNSOU Heater 2 Temperature Difference	Uint	16	Thermal_Control
VNS_H3_Status	VNSOU Heater 3 Status – [Enabled | Disabled]	Enum	8	Thermal_Control
VNS_H3_Temp_Diff	VNSOU Heater 3 Temperature Difference	Uint	16	Thermal_Control
VNS_H4_Status	VNSOU Heater 4 Status – [Enabled | Disabled]	Enum	8	Thermal_Control
VNS_H4_Temp_Diff	VNSOU Heater 4 Temperature Difference	Uint	16	Thermal_Control
TEC_Mode	TEC Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
OB_Heater_Mode	OB Heater Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
TIROU_Htr_1_Mode	TIROU Heater 1 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
TIROU_Htr_2_Mode	TIROU Heater 2 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
VNSOU_Htr_1_Mode	VNSOU Heater 1 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
VNSOU_Htr_2_Mode	VNSOU Heater 2 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
VNSOU_Htr_3_Mode	VNSOU Heater 3 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control
VNSOU_Htr_4_Mode	VNSOU Heater 4 Mode – [Constant Power | PID Loop]	Enum	8	Thermal_Control

Note: As the TEC (Peltier Cooler) Thermal Control Loop has only one temperature sensor, no temperature difference is available for it.

12.1.26 Thermal Control Sensors

Short Description (PCF_DESCR)	Full Description	Type	Len (bits)	Source component
TEC_Prim_Sensor	TEC Heater Primary Temperature Sensor	Enum	8	Thermal_Control
OB_Prim_Sensor	OB Heater Primary Temperature Sensor	Enum	8	Thermal_Control
OB_Sec_Sensor	OB Heater Secondary Temperature Sensor	Enum	8	Thermal_Control
TIR1_Prim_Sensor	TIROU Heater 1 Primary Temperature Sensor	Enum	8	Thermal_Control
TIR1_Sec_Sensor	TIROU Heater 1 Secondary Temperature Sensor	Enum	8	Thermal_Control
TIR_2_Prim_Sensor	TIROU Heater 2 Primary Temperature Sensor	Enum	8	Thermal_Control
TIR_2_Sec_Sensor	TIROU Heater 2 Secondary Temperature Sensor	Enum	8	Thermal_Control
VNS_1_Prim_Sensor	VNSOU Heater 1 Primary Temperature Sensor	Enum	8	Thermal_Control
VNS_1_Sec_Sensor	VNSOU Heater 1 Secondary Temperature Sensor	Enum	8	Thermal_Control
VNS_2_Prim_Sensor	VNSOU Heater 2 Primary Temperature Sensor	Enum	8	Thermal_Control
VNS_2_Sec_Sensor	VNSOU Heater 2 Secondary Temperature Sensor	Enum	8	Thermal_Control
VNS_3_Prim_Sensor	VNSOU Heater 3 Primary Temperature Sensor	Enum	8	Thermal_Control

Short Description (PCF_DESCR)	Full Description	Type	Len (bits)	Source component
VNS_3_Sec_Sensor	VNSOU Heater 3 Secondary Temperature Sensor	Enum	8	Thermal_Control
VNS_4_Prim_Sensor	VNSOU Heater 4 Primary Temperature Sensor	Enum	8	Thermal_Control
VNS_4_Sec_Sensor	VNSOU Heater 4 Secondary Temperature Sensor	Enum	8	Thermal_Control

Note: The TEC (Peltier Cooler) Thermal Control Loop has only one temperature sensor.

12.1.27 Thermal Control Settings

Short Description (PCF_DESCR)	Full Description	Type	Len (bits)	Source component
DeconHtr_Control	Decontamination Heater Control Register	Uint	8	HK_Acquisition
TEC_PWM_Control	TEC PWM Control Register	Uint	16	HK_Acquisition
Htr1_PWM_Control	Heater 1 PWM Control Register	Uint	16	HK_Acquisition
Htr2_PWM_Control	Heater 2 PWM Control Register	Uint	16	HK_Acquisition
Htr3_PWM_Control	Heater 3 PWM Control Register	Uint	16	HK_Acquisition
Htr4_PWM_Control	Heater 4 PWM Control Register	Uint	16	HK_Acquisition
Htr5_PWM_Control	Heater 5 PWM Control Register	Uint	16	HK_Acquisition
Htr6_PWM_Control	Heater 6 PWM Control Register	Uint	16	HK_Acquisition
Htr7_PWM_Control	Heater 7 PWM Control Register	Uint	16	HK_Acquisition
TEC_Const_Power	TEC Constant Power	Uint	16	Thermal_Control
OB_HtrConstPower	OB Heater Constant Power	Uint	16	Thermal_Control
TIR_H1ConstPower	TIROU Heater 1 Constant Power	Uint	16	Thermal_Control
TIR_H2ConstPower	TIROU Heater 2 Constant Power	Uint	16	Thermal_Control
VNS_H1ConstPower	VNSOU Heater 1 Constant Power	Uint	16	Thermal_Control
VNS_H2ConstPower	VNSOU Heater 2 Constant Power	Uint	16	Thermal_Control
VNS_H3ConstPower	VNSOU Heater 3 Constant Power	Uint	16	Thermal_Control
VNS_H4ConstPower	VNSOU Heater 4 Constant Power	Uint	16	Thermal_Control

12.1.28 Time Manager Control

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Time_Sync_State	Time Synchronisation status	Enum	8	Time_Manager
PPS_Status	PPS Source is valid	Unit	8	HK_Acquisition
PPS_Status_Valid	PPS Status Register is valid	Enum	8	HK_Acquisition
Inactivity_Counter	Inactivity counter	Uint	32	Time_Manager

Time_Acceptance_Limit	Current PPS Acceptance Limit [us]	Uint	32	Time_Manager
Time_Sync_Limit	Current PPS synchronisation limit [us]	Uint	32	Time_Manager

12.1.29 Timing Control Registers

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
LOBT_PPSArr_Crse	LOBT coarse time at PPS arrival	Uint	32	HK_Acquisition
LOBT_PPSArr_Fine	LOBT fine time at PPS arrival	Uint	24	HK_Acquisition
PPS_Control	PPS Control register	Uint	8	HK_Acquisition
PPS1_Period	PPS 1 period	Uint	32	HK_Acquisition
PPS2_Period	PPS 2 period	Uint	32	HK_Acquisition
PPS_Source_Valid	PPS Source Valid	Enum	8	HK_Acquisition

12.1.30 HK and Monitoring Validity

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
Valid_1	HK Monitoring Validity (Struct)	Struct	8	HK_Acquisition
Bit3	HK Monitoring Validty (Detail): ICU Redundancy Selection	Enum	1	HK_Acquisition
Bit4	HK Monitoring Validty (Detail): Reset Register Contents Valid	Enum	1	HK_Acquisition
Bit5	HK Monitoring Validty (Detail): MSI Instrument Config Valid	Enum	1	HK_Acquisition
Bit6	HK Monitoring Validty (Detail): PPS Source Valid	Enum	1	HK_Acquisition
Bit7	HK Monitoring Validty (Detail): PPS Status Valid	Enum	1	HK_Acquisition
Valid_2	FEE Power status (HK validity)	Enum	8	HK_Acquisition
Valid_3	Copy of Valid1 (HK validity)	Struct	8	HK_Acquisition
Bit3	HK Monitoring Validty (Detail): ICU Redundancy Selection	Enum	1	HK_Acquisition
Bit4	HK Monitoring Validty (Detail): Reset Register Contents Valid	Enum	1	HK_Acquisition
Bit5	HK Monitoring Validty (Detail): MSI Instrument Config Valid	Enum	1	HK_Acquisition
Bit6	HK Monitoring Validty (Detail): PPS Source Valid	Enum	1	HK_Acquisition
Bit7	HK Monitoring Validty (Detail): PPS Status Valid	Enum	1	HK_Acquisition
Mode_NOM	Mode is INS-NOM (Monitoring validity parameter)	Enum	8	Mode_Manager
Mode_IDL_NOM_DEC	Mode is INS-IDL or INS-NOM or INS-DEC (Monitoring validity parameter)	Enum	8	Mode_Manager
IDL_NOM_DEC_IDR	Mode is INS-IDL or INS-NOM or INS-DEC or INS-IDR (Monitoring validity parameter)	Enum	8	Mode_Manager
Milbus_Dma_Busy	Mil Bus DMA busy	Enum	8	HK_Acquisition
FEE_Status_Validity	FEE status register HK validity	Enum	8	FEE_Manager
FEE_State_Validity	FEE state register HK validity	Enum	8	FEE_Manager

Where Valid 1 and Valid 3 are defined as follows:

- Bits 0 – 2. Not used. Read as zero.
- Bit 3. ICU redundancy selection. 1 – Red, 0 – Nom

  Derived from bit 0 of the Instrument Configuration Monitor register
- Bit 4. Reset Register contents valid. 1 – Valid, 0 – invalid.

  Derived from the value Reset Contents Valid in the Transition Log Data Area

- Bit 5. MSI Instrument Config valid. 1 – valid, 0 – invalid.
- Bit 6. PPS Source valid. 1 – valid, 0 – invalid.
- Bit 7. PPS Status valid. 1 – valid, 0 – invalid.

  This is set if either of the PPS1 or PPS 2 bits of the PPS Status register are set.

Bits 5 and 6 shall be set to invalid following an unsuccessful call to the Timing Control Interface API. Otherwise they are set to valid.

12.1.31 Watchdog

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
WatchdogStatus	Current status of the watchdog (TRUE=enabled, FALSE=disabled)	Bool	8	Watchdog

12.1.32 PM Services

Short Description (PCF_DESCR)	Full Description	Type	Len. (bits)	Source component
History_Area_Usage	History Area Usage (percentage)	Uint	8	History_Area

12.2 ASW TC Verification Fault IDs

Table 3 lists the Fault Identifier values, specific to the ASW, for use with TC Acceptance and TC Execution Failure TM reports. Note that the FIDs are automatically generated by the XcoG tool during the implementation phase except where the ASW uses the standard Fault Identifiers, applicable to the supported TCs, as detailed in EarthCARE PUS [AD6]section A.7. Parameter1 and Parameter2 values are 32 bit data fields.

Note that that the actual FID values can be found in Appendix A of [RD8].

FID (dec)	Short Name	Report Type	Generating Service	Comment
1	FID_INCOMPLETE_INVALID_TC_LENGTH	TM(1,2)	all	
2	FID_INCORRECT_CHECKSUM	TM(1,2)	all	
256	FID_ILLEGAL_VERSION	TM(1,2)	all	
257	FID_ILLEGAL_P_TYPE	TM(1,2)	all	
258	FID_ILLEGAL_DFHF	TM(1,2)	all	
259	FID_UNKNOWN_PID	TM(1,2)	all	
260	FID_ILLEGAL_PCAT	TM(1,2)	all	
261	FID_ILLEGAL_SF	TM(1,2)	all	
266	FID_ILLEGAL_SHF	TM(1,2)	all	
267	FID_ILLEGAL_TC_PUS	TM(1,2)	all	
268	FID_UNKNOWN_STYPE	TM(1,2)	all	
269	FID_UNKNOWN_S_SUBTYPE	TM(1,2)	All apart from Service 8,1 TCs	
262	FID_INVALID_NPAR	TM(1,8)	TC(140,1), TC(140,2), TC(140,4)	
264	FID_LENGTH_DISCREP	TM(1,8)	all	
273	FID_MTU_TOO_SMALL	TM(1,8)	TC(5,133), TC(6,5), TC(8,144), TC(12,8), TC(19,6), TC(140,2)	
274	FID_REPORT_ABORTED	TM(1,8)	TC(5,134), TC(6,5), TC(6,9), TC(8,144), TC(12,8), TC(19,6), TC(140,2), TC(231,2)	
277	FID_TC_POOL_OVERFLOW	TM(1,8)	TC (19,1), TC(19,2), TC(19,130)	
510	FID_API_FAILURE	TM(1,8)	all calling API procedures	
512	FID_DIRECT_IO_FAIL	TM(1,8)	TC(2,132)	
768	FID_INVALID_SID	TM(1,8)	TC(3,..), TC(8,1,54)	
769	FID_INVALID_COLL_INT	TM(1,8)	TC(3,1), TC(3,2), TC(3,130), TC(3,131)	

FID (dec)	Short Name	Report Type	Generating Service	Comment
770	FID_INVALID_NPAR_HK	TM(1,8)	TC(3,1-2), TC(3,138)	
771	FID_NPAR_LEN_DISCREP	TM(1,8)	TC(3,1), TC(3,2), TC(3,138)	
772	FID_INVALID_PAR_ID	TM(1,8)	TC(3,1), TC(3,2), TC(3,138)	
773	FID_N1_N2_LENGTH_DISCREP	TM(1,8)	TC(3,2)	
775	FID_MAX_TOTAL_SID_NB	TM(1,8)	TC(3,1), TC(3,2)	
776	FID_NREP_INCO_INTERVAL	TM(1,8)	TC(3,2), TC(3,131)	
777	FID_SID_ENABLED	TM(1,8)	TC(3,1), TC(3,3), TC(3,4), TC(3,130), TC(3,138)	
778	FID_UNKNOWN_SID	TM(1,8)	TC(8,1,54), TC(3,3), TC(3,4), TC(3,5), TC(3,6), TC(3,7), TC(3,8), TC(3,9), TC(3,11), TC(3,130), TC(3,131), TC(3,136), TC(3,138)	
779	FID_SID_INVALID_EID	TM(1,8)	TC(3,139)	
781	FID_TM_SIZE_EXCEEDED	TM(1,8)	TC(3,1), TC(3,2), TC(3,138)	
784	FID_TOTAL_NPAR_EXCEEDED	TM(1,8)	TC(3,138)	
785	FID_INVALID_NFA	TM(1,8)	TC(3,2)	
1280	FID_INVALID_NEID	TM(1,8)	TC(5,5), TC(5,6)	
1281	FID_NEID_LEN_DISCREP	TM(1,8)	TC(5,5), TC(5,6)	
1282	FID_UNKNOWN_EID	TM(1,8)	TC(5,5), TC(5,6)	
1536	FID_INVALID_MEM_ID	TM(1,8)	TC(6,..), TC(8,1,31)	
1537	FID_INVALID_ADDRESS	TM(1,8)	TC(6,..), TC(8,1,31)	
1538	FID_INVALID_LENGTH	TM(1,8)	TC(6,..), TC(8,1,31)	
1539	FID_DATA_LEN_DISCREP	TM(1,8)	TC(6,2), TC(6,5), TC(6,9)	
1540	FID_FAILED_MEM_ACCESS	TM(1,8)	TC(6,2), TC(6,5), TC(6,9)	
1544	FID_MEM_QUEUE_OVERFLOW	TM(1,8)	TC(6,2), TC(6,5), TC(6,9)	
1616	FID_NON_ALIGNED_ACCESS	TM(1,8)	TC(6,..)	
2048	FID_UNKNOWN_FUNC_ID	TM(1,8)	TC(8,1)	
2049	FID_INVALID_N_FUNC_ID	TM(1,8)	TC(8,140), TC(8,141), TC(8,142), TC(8,143), TC(8,144)	

FID (dec)	Short Name	Report Type	Generating Service	Comment
2050	FID_FUNC_ID_LEN_DISCREP	TM(1,8)	TC(8,140), TC(8,141), TC(8,142), TC(8,143), TC(8,144)	
2055	FID_FUNCTION_FAIL	TM(1,8)	all	
2056	FID_FUNCTION_DIS	TM(1,8)	TC(8,1)	
2060	FID_INVALID_MODE_TRANSIT	TM(1,8)	TC(8,1)	See section 3.2.3.1
2304	FID_TIME_SYNC_FAIL	TM(1,8)	TC(9,135), TC(9,136)	
3073	FID_MON_ID_LEN_DISCREP	TM(1,8)	TC(12,1), TC(12,2), TC(12,5), TC(12,6)	
3074	FID_UNKNOWN_MON_ID	TM(1,8)	TC(12,1), TC(12,2), TC(12,6)	
3079	FID_INVALID_MON_ID	TM(1,8)	TC(12,1), TC(12,2), TC(12,5), TC(12,6)	
3080	FID_UNKNOWN_MON_PAR	TM(1,8)	TC(12,5)	
3081	FID_UNKNOWN_VAL_PAR	TM(1,8)	TC(12,5)	
3084	FID_INVALID_REP_INTERVAL	TM(1,8)	TC(12,5)	
3085	FID_INVALID_MON_INTERVAL	TM(1,8)	TC(12,5)	
3087	FID_INVALID_CHK_TYPE	TM(1,8)	TC(12,5)	
3088	FID_UNKNOWN_MON_EID	TM(1,8)	TC(12,5)	
3091	FID_MON_ACTIVE	TM(1,8)	TC(12,5)	
3092	FID_MON_STAT_INVALID	TM(1,8)	TC(12,5)	
3096	FID_MON_SERVICE_ENABLED	TM(1,8)	TC(12,4)	
3099	FID_INVALID_NPAR_MON	TM(1,8)	TC(12,1), TC(12,2), TC(12,5)	
3100	FID_LIMIT_VALUE_OUT_OF_RANGE	TM(1,8)	TC(12,5)	
32769	FID_PAR_LENGTH_DISCREP	TM(1,8)	TC(140,1), TC(140,2), TC(140,4)	
32770	FID_UNKNOWN_PAR_ID	TM(1,8)	TC(140,2), TC(140,4)	
32771	FID_ILLEGAL_PAR_SET	TM(1,8)	TC(140,1)	
32773	FID_INVALID_MEM_ADDR	TM(1,8)	TC(140,4)	
4865	FID_ACT_SERVICE_ENABLED	TM(1,8)	TC(19,3)	
4869	FID_UNKNOWN_ACTION	TM(1,8)	TC(19,1), TC(19,2), TC (19,4), TC(19,5), TC(19,130)	
4870	FID_ACTION_ACTIVE	TM(1,8)	TC(19,1), TC(19,2), TC(19,4), TC(19,130)	
4871	FID_EA_UNKNOWN_EID	TM(1,8)	TC(19,1), TC(19,2), TC(19,4), TC(19,130)	

FID (dec)	Short Name	Report Type	Generating Service	Comment
4872	FID_EA_INVALID_PID	TM(1,8)	TC(19,1), TC(19,2), TC(19,4), TC(19,130)	
10109	FID_WR_FEE_INV_REG_ID	TM(1,8)	TC(238,4)	See section 3.2.3.2
10110	FID_WR_FEE_NOT_POWERED	TM(1,8)	TC(238,4)	See section 3.2.3.3
10108	FID_RD_FEE_INV_REG_ID	TM(1,8)	TC(238,5)	See section 3.2.3.4
10114	FID_RD_FEE_NOT_POWERED	TM(1,8)	TC(238,5)	See section 3.2.3.5
10112	FID_TEST_FEE_REG_ERRORS	TM(1,8)	TC(238,15)	See section 3.2.3.6
10107	FID_CHECK_FEE_REG_ERRORS	TM(1,8)	TC(238,8)	See section 3.2.3.7
10116	FID_FEE_CMD_FAILED	TM(1,8)	TC(238,4), TC(238,5)	See section 3.2.3.8
10101	FID_FEE_TEST_CMD_FAILED	TM(1,8)	TC(238,15)	See section 3.2.3.9
10102	FID_FEE_LOAD_CMD_FAILED	TM(1,8)	TC(238,7)	See section 3.2.3.10
10103	FID_FEE_CHECK_CMD_FAILED	TM(1,8)	TC(238,8)	See section 3.2.3.11
10104	FID_FEE_EXT_MEM_CMD_FAILED	TM(1,8)	TC(238,11)	See section 3.2.3.12
10105	FID_FEE_INT_MEM_CMD_FAILED	TM(1,8)	TC(238,11)	See section 3.2.3.13
10106	FID_FEE_FEE_MEM_CMD_FAILED	TM(1,8)	TC(238,16)	See section 3.2.3.14
10113	FID_FEE_MEM_TEST_NOT_ENABLED	TM(1,8)	TC(238,11)	See section 3.2.3.15
10100	FID_FEE_MEM_TEST_ABORTED	TM(1,8)	TC(238,11)	See section 3.2.3.16
10024	FID_TIR_SLEW_IN_PROGRESS	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14), TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.17
10025	FID_VNS_SLEW_IN_PROGRESS	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14), TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.18
10022	FID_MECHANISM_POWER_IS_OFF	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14), TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.19

FID (dec)	Short Name	Report Type	Generating Service	Comment
10023	FID_ENCODER_POWER_IS_OFF	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14), TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.20
10019	FID_TIR_STEP_COUNT_OUT_OF_RANGE	TM(1,8)	TC(239,6)	See section 3.2.3.21
10013	FID_TIR_SLEW_PROHIBITED_INVALID_SCT	TM(1,8)	TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.22
10014	FID_TIR_SEEK_FAILED_POSITION_INVALID	TM(1,8)	TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.23
10015	FID_TIR_SEEK_FAILED_UNEXPECTED_ENCODER_VALUE	TM(1,8)	TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.24
10016	FID_TIR_MECHANISM_TIMEOUT	TM(1,8)	TC(239,3), TC(239,4), TC(239,5), TC(239,6), TC(239,14)	See section 3.2.3.25
10033	FID_VNS_STEP_COUNT_OUT_OF_RANGE	TM(1,8)	TC(236,7)	See section 3.2.3.26
10027	FID_VNS_SLEW_PROHIBITED_INVALID_SCT	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14)	See section 3.2.3.27
10028	FID_VNS_SEEK_FAILED_POSITION_INVALID	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14)	See section 3.2.3.28
10031	FID_VNS_MECHANISM_TIMEOUT	TM(1,8)	TC(236,3), TC(236,4), TC(236,6), TC(236,5), TC(236,7), TC(236,14)	See section 3.2.3.29

FID (dec)	Short Name	Report Type	Generating Service	Comment
10020	FID_MECHANISM_ABORT_IN_PROGRESS	TM(1,8)	TC(236,13), TC(239,13)	See section 3.2.3.30
10018	FID_MECHANISM_SLEW_ABORTED	TM(1,8)	TC(236,5), TC(236,6), TC(236,7), TC(236,8), TC(236,10), TC(236,20), TC(239,5), TC(239,6), TC(239,7), TC(239,10), TC(239,20)	See section 3.2.3.31
10017	FID_PARK_POSITION_NOT_REACHED	TM(1,8)	TC(236,13), TC(239,13)	See section 3.2.3.32
10000	FID_INVALID_MODE_FOR_TC	TM(1,8)	TC(239,21)	See section 3.2.3.33
10001	FID_TC_IN_THE_Q	TM(1,8)	TC(239,21), TC(239,22), TC(239,23), TC(239,24), TC(236,22)	See section 3.2.3.34
10002	FID_INVALID_TIR_POINTING_DIRECTION_FOR_TC	TM(1,8)	TC(239,21)	See section 3.2.3.35
10003	FID_INVALID_REFERENCE_SET_ID	TM(1,8)	TC(239,21), TC(236,21), TC(237,1), TC(237,2), TC(237,4), TC(237,7), TC(237,8)	See section 3.2.3.36
10004	FID_INVALID_VNS_POINTING_DIRECTION_FOR_TC	TM(1,8)	TC(236,21)	See section 3.2.3.37
10005	FID_FLAT_FIELD_REFERENCE_SET_INVALID	TM(1,8)	TC(237,1), TC(237,2)	See section 3.2.3.38
10006	FID_INVALID_BAND_ID	TM(1,8)	TC(237,4), TC(237,5)	See section 3.2.3.39
10007	FID_INVALID_FF_AVERAGE_NUMBER	TM(1,8)	TC(237,3)	See section 3.2.3.40
10008	FID_INVALID_FLAT_FIELD_ID	TM(1,8)	TC(8,1,55), TC(8,1,60)	See section 3.2.3.41
10009	FID_INVALID_TRUNCATION_FACTOR	TM(1,8)	TC(8,1,60)	See section 3.2.3.42
10010	FID_INVALID_CALIBRATION_STATE	TM(1,8)	TC(237,1), TC(237,2), TC(237,7), TC(237,8)	See section 3.2.3.43
10011	FID_INVALID_TIR_POINTING_DIRECTION	TM(1,8)	TC(239,21), TC(239,24)	See section 3.2.3.44
10012	FID_INVALID_VNS_POINTING_DIRECTION	TM(1,8)	TC(236,21), TC(236,22)	See section 3.2.3.45
10021	FID_INVALID_NUM_OF_FINAL_STEPS	TM(1,8)	TC(236,11), TC(239,15)	See section 3.2.3.46
10034	FID_TIR_SLEW_FAILED	TM(1,8)	TIR slew commands	See section 3.2.3.47
10035	FID_VNS_SLEW_FAILED	TM(1,8)	VNS slew commands	See section 3.2.3.48

FID (dec)	Short Name	Report Type	Generating Service	Comment
10117	FID_FEE_COMMAND_QUEUE_FULL		TC(238,4), TC(238,5), TC(238,14), TC(8,1)	See section 3.2.3.49
10118	FID_FEE_OPERATION_IN_PROGRESS		TC(238,15)	See section 3.2.3.50
10119	FID_FEE_REGISTER_ACQUIS_RATE_INVALID		TC(238,9), TC(238,10)	See section 3.2.3.51
10120	FID_FEE_RESEND_ATTEMPTS_INVALID		TC(8,1)	See section 3.2.3.52
10121	FID_FEE_INVALID_TIMING_PULSE	TM(1,8)	TC(238,3)	See section 3.2.3.53
10036	FID_CALIB_TC_TIMEOUT	TM(1,8)	TC(237,1), TC(237,2), TC(237,7), TC(237,8)	See section 3.2.3.54
10200	FID_THERMAL_PARAMETER	TM(1,8)	TC(149,140)	See section 3.2.3.55
10037	FID_TIR_CURR_POS_INV	TM(1,8)	TIR slew commands	See section 3.2.3.56

Table 3: ASW Fault Identifiers

12.2.1 Function Failure Codes

Table 4 lists the function failure reasons to be supplied as Parameter 2 for the FID_FUNCTION_FAIL Execution Failure Report.

Error Code	Description	Generating Function Id.
0	No error code provided for this failure	-
1	Alternate EEPROM Bank already enabled	151
2 – 6	Reserved for Boot Software Failure Codes	-
7	EEPROM Write currently active	157
8	EEPROM Power indicator set	157
9	EEPROM Power indicator clear	156
10 – 31	Reserved for Boot Software Failure Codes	-
32	Invalid Transit Step Id	140
33	Transition Procedure Active	1 – 7
34	Mode Precondition Fail	1 – 7
35	Mode Transition Aborted	1 – 7

Table 4: Function Failure Code Identifiers

12.3 ASW Housekeeping Structure IDs

Table 5 lists the default Structure Identifiers specific to the ASW.

SID (dec)	Description
1	MSI Short HKTM Packet. Refer to section 3.4.3.1
2	MSI ICU HKTM Packet. Refer to section 3.4.3.2
10	MSI HKTM Packet
61	MSI ANC Packet

Table 5: ASW Structure Identifiers

12.4 ASW Event IDs

Table 9 lists the Event Identifiers (EIDs) specific to the ASW.

Note that the EIDs are automatically generated by the XCoG tool during the implementation phase and the actual EID values can be found in Appendix A of [RD8]

12.4.1 Normal Events

Short Name	Description	Comment
EID_COMP_SLF_TST_ASW	Perform Self Test (ASW) Completion Report	Refer to section 3.5.4
EID_FEE_MEM_TEST_IN_PROGRESS	FEE memory test in progress	Refer to section 3.5.1
EID_FEE_RETRY_SUCCESSFUL	FEE command was successful after a retry	Refer to section 3.5.5
EID_MODE_TRANSIT	Mode Transition Progress Report	Refer to section 3.5.3
EID_MODE_TRANSITION_IN_PROGRESS	Mode transition in progress	Refer to section 3.5.1
EID_TIME_SYNC_OK	Time Synchronisation Success Report	Refer to section 3.5.2
EID_TIR_OPERATION	TIR operation in progress	Refer to section 3.5.1
EID_VNS_OPERATION	VNS operation in progress	Refer to section 3.5.1
EID_VNS_POSITION_OK	VNS Target Position Reached Successfully	Refer to section 3.5.11
EID_TIR_POSITION	TIR mechanism position report	Refer to section 3.5.12
EID_TRANSITION_STARTED	Procedure transition started	Refer to section 3.5
EID_TRANSITION_COMPLETE	Procedure transition completed	Refer to section 3.5
EID_FEE_MEM_TEST_IN_PROGRESS	FEE memory test ongoing	Refer to section 3.5
EID_LOGGED_DISCARDED_TC_DATA	Records number of discarded bytes logged to TC failure buffer	Refer to section 3.5

Table 6: ASW Normal Event Identifiers

12.4.2 Low Severity Errors

Short Name	Description	Comment
EID_EDAC_ERROR_ASW	Scrubbing/EDAC error	Limited to one event generated per second. Refer to section 3.6.2.

Short Name	Description	Comment
EID_FEE_COMMAND_NOT_READY	FEE USL monitor indicates 'Command not Ready'	Refer to section 3.6.9
EID_FEE_EXT_MEM_TEST_FAIL	FEE-Controlled External Memory Test Fail	Refer to section 3.6.15
EID_FEE_FAIL_USL_ERROR	FEE Command Failed due to USL Error	Refer to section 3.6.14
EID_FEE_INT_MEM_TEST_FAIL	FEE-Controlled Internal Memory Test Fail	Refer to section 3.6.16
EID_FEE_MEM_TEST_FAIL_AFTER_RETRY	ASW-controlled FEE Memory Test Persistent Error	Refer to section 3.6.19
EID_FEE_MEM_TEST_FAIL_FIRST_PASS	ASW-controlled FEE Memory Test Fail (First Pass)	Refer to section 3.6.17
EID_FEE_MEM_TEST_FAIL_SECOND_PASS	ASW-controlled FEE Memory Test Fail (Second Pass)	Refer to section 3.6.18
EID_FEE_STATE_CHANGE	FEE State change	MSIASW-163 Refer to section 3.6.10
EID_FEE_STATUS_ERROR	FEE Status Register (bit 0 to 15)	Refer to section 3.6.12
EID_FEE_STATUS_RETURNED_UNEXPECTEDLY	FEE status returned unexpectedly	Refer to section 3.6.13
EID_INCONSISTENT_FINAL_DECEL	Inconsistent Final Deceleration segment in SCT profile	Refer to section 3.6.26
EID_MEM_WRITE_FAIL_ASW	Memory Write Failure	Refer to section 3.6.7
EID_ ADC_08_REF_FINE	FEE ADC 08 Ref (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_NIR_VDDA_FINE	NIR VDDA (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_NIR_VDET _FINE	NIR VDET (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_NIR_VVIDEO_FINE	NIR Vvideo (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_7V_FILTER_P_FINE	FEE 7V FILTER P (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_VIS_DDA_FINE	VIS DDA (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_VIS_VDET _FINE	VIS VDET (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_VIS_VVIDEO_FINE	VIS Vvideo (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_ ADC_24_REF_FINE	FEE ADC 08 Ref (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_SWIR1_VDDA_FINE	SWIR1 VDDA (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_SWIR1_VDET _FINE	SWIR1 VDET (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1

Short Name	Description	Comment
EID_SWIR1_VVIDEO_FINE	SWIR1 Vvideo (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_ADC_16_REF_FINE	FEE ADC 16 Ref (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_SWIR2_VDDA_FINE	SWIR2 VDDA (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_SWIR2_VDET _FINE	SWIR2 VDET (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_SWIR2_VVIDEO_FINE	SWIR2 Vvideo (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VBUS_FINE	TIR VBUS (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VDDA_FINE	TIR VDDA (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VDDL_FINE	TIR VDDL (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VEB_FINE	TIR VEB (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VFID_FINE	TIR VFID (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VSKIMMING_FINE	TIR VSKIMMING (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_VVIDEO_FINE	TIR Vvideo (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_TIR_ADC_P_FINE	TIR ADC P (fine) monitoring limits exceeded	MSIASW-79 Refer to section 3.6.1
EID_THERM_FEE_TIR_BASE_FINE	TIROU Temp 1 (Detector hot side temperature sensor) (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_LENS2_FINE	TIROU Temp 8 (Ge Lens 2) (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_MASK_BOTTOM_FINE	TIROU Temp 7 (Filter Mask Bottom) (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_MASK_TOP_FINE	TIROU Temp 6 (Filter Mask Top) (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_RBB_FINE	TIROU Temp 9 (Internal Reference RBB) (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_PTR_CBB_PT_1_FINE	TIROU CBB Temp 1 (Calibration BB1) (fine) monitoring limits exceeded	Refer to section 3.6.1
EID_PTR_CBB_PT_2_FINE	TIROU CBB Temp 2 (Calibration BB2 (fine) monitoring limits exceeded	Refer to section 3.6.1

Short Name	Description	Comment
EID_TIR_ENCODER_NOT_00	TIR encoder value not zero	Refer to section 3.7.36
EID_TIR_POS_ERR_AFTER_RETRY	TIR Mechanism position not reached	Refer to section 3.7.35
EID_TIR_SEEK_FAILED	TIR Mechanism Validity Flag not encountered	Refer to section 3.6.22
EID_TIR_TIMEOUT	TIR Slew Time-out	Refer to section 3.7.34
EID_UNHANDLED_TRAP_ASW	Unhandled Trap	Refer to section 3.6.6
EID_USL_ERROR	FEE USL Monitor	Refer to section 3.6.11
EID_VMON_ICU_N_12_FINE	ICU Secondary Supply 3 (-12V) Analogue (fine) monitoring limits exceeded	MSIASW-119 Refer to section 3.6.1
EID_VMON_ICU_P_12_FINE	ICU Secondary Supply 2 (+12V) Analogue (fine) monitoring limits exceeded	MSIASW-119 Refer to section 3.6.1
EID_VMON_ICU_P_20_FINE	ICU +20V Heater Monitor (fine) monitoring limits exeeded	Refer to section 3.6.1
EID_VMON_ICU_P_24_FINE	ICU +24V Motor Monitor (fine) monitoring limits exceeded	Refer to section 3.6.1
EID_VMON_ICU_P_3_3_FINE	ICU Secondary Supply 4 (+3.3V) Motor & Heater (fine) monitoring limits exceeded	MSIASW-119 Refer to section 3.6.1
EID_VMON_ICU_P_5_FINE	ICU Secondary Supply 1 (+5V) Digital (fine) monitoring limits exceeded	MSIASW-119 Refer to section 3.6.1
EID_VNS_POSITION_NOK	VNS Virtual Encoder Status Register reports incorrect position value and/or VNS Position Monitor Register reports incorrect shift register sequence for mechanism position and direction of approach	Refer to section 3.6.20
EID_VNS_POS_ERR_AFTER_CORRECTION	VNS Mechanism position not reached after attempted slew correction	Refer to section 3.6.21
EID_VNS_POS_ERR_AFTER_RETRY	VNS Mechanism position not reached after attempted slew retry	Refer to section 3.6.22
EID_VNS_SEEK_FAILED	VNS Mechanism Validity Flag not encountered	Refer to section 3.6.24
EID_VNS_TIMEOUT	VNS Slew Time-out	Refer to section 3.7.1
EID_TRUNCATION_OCCURRED	Truncation occurred during a slew profile construction for either TIR or VNS	Refer to section 3.6.25
EID_VTEMP_FEE_NIR_FINE	VNS NIR Detector Temperature (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_VTEMP_FEE_SW1_FINE	VNS SWIR1 Detector Temperature (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_VTEMP_FEE_SW2_FINE	VNS SWIR2 Detector Temperature (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_VTEMP_FEE_VIS_FINE	VNS VIS Detector Temperature (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_VTEMP_TIR_FINE	TIR Detector Temperature (fine) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_CPU_CYCLE	CPU Cycle Limit	Refer to section 3.6.1

Short Name	Description	Comment
EID_PPS_SPURIOUS	Spurious PSS Receive Event	Refer to section 3.6.3
EID_PPS_MISSING	Missing PSS Event	Refer to section 3.6.4
EID_PPS_UNSYNCHRONISED	Unsynchronised PPS received	Refer to section 3.6.5
EID_HISTORY_AREA_LOADING_THRESHOLD	History Area Used Bytes Threshold	Refer to section 3.6.1
EID_DPRAM_Double_Bit_Error	DPRAM double bit error	Refer to section 3.6
EID_TIR_REFERENCE_SET_NOT_LOADED	TIR reference set not loaded	Refer to section 3.6
EID_VNS_REFERENCE_SET_NOT_LOADED	VNS reference set not loaded	Refer to section 3.6
EID_TIR_NULL_SLEW_REQUESTED	Slew requested to current position	Refer to section 3.6
EID_VNS_NULL_SLEW_REQUESTED	Slew requested to current position	Refer to section 3.6
EID_TCL_OB_HTR_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_TCL_TIR_H1_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_TCL_TIR_H2_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_TCL_VNS_H2_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_TCL_VNS_H3_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_TCL_VNS_H4_TEMP_DIFF_FINE	Difference in heater loop primary/secondary sensors exceeds fine limits	Refer to section 3.6.1
EID_THERM_TIR_BENCH_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_TIR_BENCH_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_TIR_LENS8_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_TIR_LENS8_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_OB_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_OB_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_FEE_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_VNS_SW2_BARREL_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_VNS_SW2_BARREL_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_VNS_OU_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_VNS_OU_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_THERM_VNS_CAL_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1

Short Name	Description	Comment
EID_THERM_VNS_CAL_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_PRT_VNS_SW2_1_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_PRT_VNS_SW2_2_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1
EID_PRT_VNS_RAD_FINE	Fine limits exceeded for applicable temperature sensor.	MSIASW-160 Refer to section 3.8.1

Table 7: ASW Low Severity Event Identifiers

12.4.3 Medium Severity Errors

Short Name	Description	Comment
EID_OVERCURRENT	Overcurrent Status Word LS	Refer to section 3.7.22
EID_SCI_PKT_ERROR	Science Packet Sequence Counter	Refer to section 3.7.24
EID_TIME_SYNC_FAIL	Time Synchronisation Failure Report	Refer to section 3.7.25
EID_MODE_TRANSIT_FAIL	Mode Transition Fail	Refer to section 3.7.23
EID_OVERFLOW_TC_Q_ASW	TC Receive Queue overflow	Refer to section 3.7.9
EID_OVERFLOW_TM_Q_ASW	TM Transmit Queue overflow	Refer to section 3.7.18
EID_OVERFLOW_RX_SESS_ASW	Rx Session Layer Circular Buffer overflow	Refer to section 3.7.19
EID_OVERFLOW_CYCLIC_ASW	Cyclic Scheduler overrun	Refer to section 3.7.20
EID_FEE_REGISTER_VALUE_MISMATCH	FEE Register Value Mismatch	Refer to section 3.7.26
EID_FEE_DETECTOR_LATCHUP	FEE Detector Latchup	Refer to section 3.7.27
EID_FEE_DETECTOR_LATCHUP_NOT_CLEARED	FEE Detector Latchup Not Cleared	Refer to section 3.7.28
EID_FEE_EDAC_DOUBLE_ERROR	FEE EDAC Double Error	Refer to section 3.7.29
EID_FEE_COMMAND_FAILED	FEE Command Failed	Refer to section 3.7.30
EID_INVALID_PRIMARY_TEMPERATURE	Thermal Control Loop primary thermistor failure	Refer to section 3.7
EID_INVALID_SECONDARY_TEMPERATURE	Thermal Control Loop secondary thermistor failure	Refer to section 3.7
EID_VNS_TIMEOUT	VNS Seek timeout	Refer to section 3.7
EID_Invalid_Source_Band	Invalid source band read	Refer to section 3.7
EID_PROCEDURE_FAIL	Procedure execution failure	Refer to section 3.7
EID_PROCEDURE_LOAD_INIT_FAIL	Procedure load failure	Refer to section 3.7
EID_PROCEDURE_PRIORITY_INIT_FAIL	Procedure execution failure	Refer to section 3.7
EID_API_FAIL	API call failure	Refer to section 3.7
EID_DEFAULT_EA_INIT_FAIL	Failure initialising default event actions	Refer to section 3.7
EID_DEFAULT_MONITOR_INIT_FAIL	Failure initialising default monitors	Refer to section 3.7
EID_MILBUS_TX_QUEUE_FAIL	MilBus TX queue failure	Refer to section 3.7
EID_MILBUS_RX_ILLEGAL_FHP	MilBus RX failure	Refer to section 3.7
EID_MILBUS_MSG_DECODE_FAIL	MilBus message decode failure	Refer to section 3.7
EID_MILBUS_RX_TC_CRC_FAIL	MilBus CRC failure	Refer to section 3.7
EID_MILBUS_RX_TC_READ_FAIL	MilBis read failure	Refer to section 3.7
EID_MILBUS_DEVICE_ERROR	MilBus device error	Refer to section 3.7
EID_EQ_OCCUPANCY	Event Queue Occupancy Threshold Event	Refer to section 3.7
EID_FEE_COMMAND_QUEUE_FULL_ERROR	FEE command queue full	Refer to section 3.7
EID_DEFAULT_SID_INIT_FAIL	Initialisation of default SID failure	Refer to section 3.7
EID_TIR_SEEK_FAILED	TIR seek failure	Refer to section 3.7
EID_TIR_TIMEOUT	TIR slew timeout	Refer to section 3.7
EID_TIR_POS_ERR_AFTER_RETRY	TIR position incorrect after slew retry	Refer to section 3.7
EID_TIR_ENCODER_NOT_00	TIR encoder not 00 during seek	Refer to section 3.7

EID_MILBUS_RX_TC_LEN_FAIL	Records number of discarded bytes logged	Refer to section 3.7

Table 8: ASW Medium Severity Event Identifiers

12.4.4 High Severity Errors

Short Name	Description	Comment
EID_MAJOR_MODE_TRANSIT_FAIL	IDR Mode Transition Fail	Refer to section 3.8.2
EID_IMON_BUS_FEE	FEE Bus I Monitor monitoring limits exceeded	Refer to section 3.8.1
EID_IMON_HTR	HTR I Monitor monitoring limits exceeded	Refer to section 3.8.1
EID_ ADC_08_REF_WIDE	FEE ADC 08 Ref (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_NIR_VDDA_WIDE	NIR VDDA (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_NIR_VDET _WIDE	NIR VDET (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_NIR_VVIDEO_WIDE	NIR Vvideo (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_ ADC_24_REF_WIDE	FEE ADC 24 Ref (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR1_VDDA_WIDE	SWIR1 VDDA (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR1_VDET _WIDE	SWIR1 VDET (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR1_VVIDEO_WIDE	SWIR1 Vvideo (coarse) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_ ADC_16_REF_WIDE	FEE ADC 16 Ref (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR2_VDDA_WIDE	SWIR2 VDDA (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR2_VDET _WIDE	SWIR2 VDET (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_SWIR2_VVIDEO_WIDE	SWIR2 Vvideo (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_ADC_P_WIDE	TIR ADC Ref (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VBUS_WIDE	TIR VBUS (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VDDA_WIDE	TIR VDDA (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1

Short Name	Description	Comment
EID_TIR_VDDL_WIDE	TIR VDDL (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VEB_WIDE	TIR VEB (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VFID_WIDE	TIR VFID (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VSKIMMING_WIDE	TIR VSKIMMING (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_TIR_VVIDEO_WIDE	TIR Vvideo (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_7V_FILTER_P_WIDE	FEE 7V_FILTER_P (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_VIS_VDDA_WIDE	VIS VDDA (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_VIS_VDET _WIDE	VIS VDET (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_VIS_VVIDEO_WIDE	VIS Vvideo (wide) monitoring limits exceeded	MSIASW-79 Refer to section 3.8.1
EID_THERM_FEE_WIDE	FEE Temp 1 (coarse) monitoring limits exceeded	MSIASW-160 Refer to section 3.8.1
EID_PTR_CBB_PT_1_WIDE	TIROU CBB Temp 1 (Calibration BB1) (fine) monitoring limits exceeded	Refer to section 3.8.1
EID_PTR_CBB_PT_2_WIDE	TIROU CBB Temp 2 (Calibration BB2 (fine) monitoring limits exceeded	Refer to section 3.8.1
EID_TCL_OB_HTR_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_TCL_TIR_H1_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_TCL_TIR_H2_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_TCL_VNS_H2_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_TCL_VNS_H3_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_TCL_VNS_H4_TEMP_DIFF_WIDE	Difference in heater loop primary/secondary sensors exceeds wide limits	Refer to section 3.8.1
EID_VMON_BUS_FEE	FEE Bus V Monitor monitoring limits exceeded	Refer to section 3.8.1
EID_VMON_FEE_P_4	FEE 4V Electronics Monitor monitoring limits exceeded	Refer to section 3.8.1

Short Name	Description	Comment
EID_VMON_FEE_P_7	FEE 7V Detector Monitor monitoring limits exceeded	Refer to section 3.8.1
EID_VMON_ICU_N_12_WIDE	ICU Secondary Supply 3 (-12V) Analogue (coarse) monitoring limits exceeded	MSIASW-119 Refer to section 3.8.1
EID_VMON_ICU_P_20_WIDE	ICU +20V Heater Monitor (coarse) monitoring limits exceeded	Refer to section 3.8.1
EID_VMON_ICU_P_24_WIDE	ICU +24V Motor Monitor (coarse) monitoring limits exceeded	Refer to section 3.8.1
EID_VMON_ICU_P_3_3_WIDE	ICU Secondary Supply 4 (+3.3V) Motor & Heater (coarse) monitoring limits exceeded	MSIASW-119 Refer to section 3.8.1
EID_VMON_ICU_P_5_WIDE	ICU Secondary Supply 1 (+5V) Digital (coarse) monitoring limits exceeded	MSIASW-119 Refer to section 3.8.1
EID_VMON_ICU_P_V_WIDE	ICU Secondary Supply 2 (+12V) Analogue (coarse) monitoring limits exceeded	MSIASW-119 Refer to section 3.8.1
EID_VTEMP_FEE_NIR_WIDE	VNS NIR Detector Temperature (coarse) monitoring limits exceeded	MSIASW-160 Refer to section 3.8.1
EID_VTEMP_FEE_SW1_WIDE	VNS SWIR1 Detector Temperature (coarse) monitoring limits exceeded	MSIASW-160 Refer to section 3.8.1
EID_VTEMP_FEE_SW2_WIDE	VNS SWIR2 Detector Temperature (coarse) monitoring limits exceeded	MSIASW-160 Refer to section 3.8.1
EID_VTEMP_FEE_TIR_WIDE	TIR Detector Temperature (coarse) monitoring limits exceeded	MSIASW-160 Refer to section 3.8.1
EID_VTEMP_FEE_VIS_WIDE	VNS VIS Detector Temperature (coarse) monitoring limits exceeded	MSIASW-160Refer to section 3.8.1
EID_THERM_TIR_BENCH_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_TIR_BENCH_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_TIR_LENS8_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_TIR_LENS8_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_OB_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_OB_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_FEE_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_VNS_SW2_BARREL_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_VNS_SW2_BARREL_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_VNS_OU_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1

Short Name	Description	Comment
EID_THERM_VNS_OU_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_VNS_CAL_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_THERM_VNS_CAL_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_PRT_VNS_SW2_1_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_PRT_VNS_SW2_2_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_PRT_VNS_RAD_WIDE	Wide limits exceeded for applicable temperature sensor.	MSIASW-160Refer to section 3.8.1
EID_NO_VALID_TEMPERATURE	Failure of heater main and secondary Thermistors	Refer to section 3.8.3
EID_FPU_EXCEPTION	Floating point error occurred	Refer to section 3.8
EID_THERM_FEE_TIR_BASE_WIDE	TIROU Temp 1 (Detector hot side temperature sensor) (wide) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_LENS2_WIDE	TIROU Temp 8 (Ge Lens 2) (wide) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_MASK_BOTTOM_WIDE	TIROU Temp 7 (Filter Mask Bottom) (wide) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_MASK_TOP_WIDE	TIROU Temp 6 (Filter Mask Top) (wide) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1
EID_THERM_TIR_RBB_WIDE	TIROU Temp 9 (Internal Reference RBB) (wide) monitoring limits exceeded	MSIASW-160 Refer to section 3.6.1

Table 9: ASW High Severity Event Identifiers

12.5 Memory Identifiers

Table 10 lists the Memory Identifiers available on the ASW for use with PUS [AD6]Service 6.

Memory ID	Description	Database Mnemonic	Start Address (hex)	Length (bytes)
1	PROM	Prom08	0000 0000	128K
11	EEPROM	Eeprm08	6000 0000	1024K
21	Processor RAM	Ram08	4000 0000	2048K
51	IO Space	Iospac08	2000 0000	262144K
61	General Registers	Generalreg08	8000 0000	641
71	DSU Registers	Dsureg08	9000 0000	32
81	Trace Registers	Tracereg08	9001 0000	64K
91	Special registers	Specialreg08	9008 0000	32

Table 10: PUS Service Memory Identifiers

Table 11 lists the additional Memory Identifiers used to partition the Processor RAM area, for use as Memory Scrubbing block identifiers.

Memory ID	Description	Database Mnemonic	Start Address (hex)	Length (bytes)
24	BSW RAM	BswRam	4000 0000	384k
25	ASW RAM	AswSwRam	4006 3000	1652k
26	Shared RAM bank 0	SharedRamBank0	4006 0000	8k
27	Shared RAM bank 1	SharedRamBank1	4006 2000	4k

Table 11: Memory Id Partitions within Processor RAM

12.6 Instrument Modes

MSISW-1570

Table 12 lists the Instrument Modes available to the Software.

Mode ID	Instrument Mode	Description
0	INS-OFF	Off
1	INS-INI	Initialisation
2	INS-SBY	Standby
3	INS-SBR	Standby-Refuse
4	INS-IDL	Idle
5	INS-IDR	Idle-Refuse
6	INS-DEC	Decontamination
7	INS-NOM	Normal Operation

Table 12: Instrument Modes

MSISW-1685

Table 13 lists the Instrument Nominal Mode Sub-Modes available to the Software.

Mode ID	Instrument Sub-Mode	Description
8	INS-NOM-OBS	Nominal Observation Data
9	INS-NOM-RAW	Raw Observation Data
10	INS-NOM-TIR	TIR Calibration
11	INS-NOM-VNS1	VNS Calibration (per orbit)
12	INS-NOM-VNS2	VNS Calibration (monthly)

Table 13: Instrument Nominal Mode Sub-Modes

12.7 Instrument Mode Transitions

MSISW-1379

Error! Reference source not found. lists the Instrument Mode Transitions permitted by the ASW with procedure ID number for those that are permitted.

Src \ Dest	SBY	SBR	IDL	IDR	DEC	NOM_OBS	NOM_RAW	NOM_TIR	NOM_VNS1	NOM_VNS2
SBY	0	2	3	0	8	0	0	0	0	0
SBR	10	0	0	0	0	0	0	0	0	0
IDL	1	2	0	6	0	4	0	0	0	0
IDR	0	2	7	0	0	0	0	0	0	0
DEC	9	2	0	0	0	0	0	0	0	0
NOM_OBS	0	2	5	6	0	0	11	13	14	15
NOM_RAW	0	2	5	6	0	12	0	0	0	0
NOM_TIR	0	2	0	6	0	0	0	0	0	0
NOM_VNS1	0	2	0	6	0	0	0	0	0	0
NOM_VNS2	0	2	0	6	0	0	0	0	0	0

Table 14 Instrument Mode Transitions

13. RAM MEMORY MAP

The MSI ICU RAM is a 32bit wide device occupying 512K words of the processor address space. The use of this memory area is further partitioned as shown in Table 15.

Start Address (hex)	End Address (hex)	Description	Length (bytes)
4000 0000	4001 FFFF	Boot Software Code Space	128k
4002 0000	4003 FFFF	Boot Software Data Space	128k
4004 0000	4004 1FFF	Shared RAM Data Space Bank 0	8k
4004 2000	4004 2FFF	Shared RAM Data Space Bank 1	4k
4004 3000	400C 2FFF	ASW Code Space	512k
400C 3000	401F FFFF	ASW Data Space	1268k

Table 15: RAM Memory Map

14. DEFAULT MONITORING IDS

The list of default Monitoring IDs used within the ASW is shown in the table below. All default Monitoring IDs are initially identified as 'Added' and 'Enabled', and have a Monitoring interval set to 1Hz.

For range checks, the High and Low Limit values for each Monitoring ID are defined in FDIR Monitoring & Limits [RD1] and reproduced here (TBDs in the table below reflect TBDs in [RD1]). A 'N/A' in the "Low Limit" column represents monitoring of a high limit only, conversely a 'N/A' in the "High Limit" column represents monitoring of a low limit only. The "Expected" column is not used. The specified Event ID is generated irrespective of whether the 'high' or 'low' limit was violated.

For digital checks, the Expected value for each Monitoring ID is used. The "Low Limit" and "High Limit" columns are not used.

Note that the Monitoring IDs are automatically generated by the XCoG tool during the implementation phase.

MSIASW-169, MSIASW-185, MSIASW-186, MSIASW-187, MSIASW-188, MSIASW-224, MSIASW-235, MSIASW-283

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
1	All modes	3	53623	62560	N/A	EID_VMON_ICU_P_5_FINE	ICU Secondary Supply 1 (+5V) Digital (fine)
2	All modes	3	38913	47559	N/A	EID_VMON_ICU_P_3_3_FINE	ICU Secondary Supply 4 (+3.3V) Motor & Heater (fine)
3	All modes	3	53168	62028	N/A	EID_VMON_ICU_P_12_FINE	ICU Secondary Supply 2 (+12V) Analogue (fine)
4	All modes	3	46703	57081	N/A	EID_VMON_ICU_N_12_FINE	ICU Secondary Supply 3 (-12V) Analogue (fine)
5	IDL, IDR, NOM	3	47175	57657	N/A	EID_VMON_ICU_P_24_FINE	ICU +24V Motor Monitor (fine)
6	IDL, IDR, NOM, DEC	3	45651	55795	N/A	EID_VMON_ICU_P_20_FINE	ICU +20V Heater Monitor (fine)
7	All modes	1	N/A	179	N/A	EID_CPU_CYCLE	CPU Cycle Limit (179 high limit corresponds to 70% - value held in 1 byte with maximum value of 255 corresponding to 100%)
8	All modes	1	N/A	716	N/A	EID_HISTORY_AREA_LOADING_THRESHOLD	History Area Used Bytes Threshold

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
9	NOM	1	N/A	N/A	0	EID_FEE_PACKET_HANDLER_STATUS_ERROR	MSIASW-50 FEE Packet Handler Status (Science packet header field or CRC error)
10	NOM	3	13466	55778	N/A	EID_THERM_FEE_TIR_BASE_FINE	TIROU Temp 1 (Detector hot side temperature sensor) (fine), NOM MSIASW-198, MSIASW-199
11	IDR,IDL	3	13466	55778	N/A	EID_THERM_FEE_TIR_BASE_FINE	TIROU Temp 1 (Detector hot side temperature sensor) (fine), IDR, IDL MSIASW-198, MSIASW-199
12	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_MASK_TOP_FINE	TIROU Temp 6 (Filter Mask Top) (fine)
13	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_MASK_BOTTOM_FINE	TIROU Temp 7 (Filter Mask Bottom) (fine)
14	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_LENS2_FINE	TIROU Temp 8 (Ge Lens 2) (fine)
15	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_RBB_FINE	TIROU Temp 9 (Internal Reference RBB) (fine)
16	NOM	3	8341	61196	N/A	EID_PTR_CBB_PT_1_FINE	TIROU CBB Temp 1 (Calibration BB1) (fine)
17	IDR, IDL	3	8341	61196	N/A	EID_PTR_CBB_PT_1_FINE	TIROU CBB Temp 1 (Calibration BB1) (fine)
18	NOM	3	8341	61196	N/A	EID_PTR_CBB_PT_2_FINE	TIROU CBB Temp 2 (Calibration BB2 (fine)
19	IDR, IDL	3	8341	61196	N/A	EID_PTR_CBB_PT_2_FINE	TIROU CBB Temp 2 (Calibration BB2 (fine)
20	Voltage acq enb*	3	0	3260	N/A	EID_VIS_VDDA_FINE	VIS VDDA (fine)
21	Voltage acq enb*	3	0	2320	N/A	EID_VIS_VDET _FINE	VIS VDET (fine)
22	Voltage acq enb*	3	0	3636	N/A	EID_VIS_VVIDEO_FINE	VIS Vvideo (fine)
23	Voltage acq enb*	3	466	506	N/A	EID_7V_FILTER_P_FINE	7V FILTER P (fine)
24	Voltage acq enb*	3	0	3260	N/A	EID_NIR_VDDA_FINE	NIR VDDA (fine)
25	Voltage acq enb*	3	0	2320	N/A	EID_NIR_VDET _FINE	NIR VDET (fine)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
26	Voltage acq enb*	3	0	3636	N/A	EID_NIR_VVIDEO_FINE	NIR Vvideo (fine)
27	Voltage acq enb*	3	1467	1592	N/A	EID_ADC_08_REF_FINE	ADC 08 Ref (fine)
28	Voltage acq enb*	3	0	3260	N/A	EID_SWIR1_VDDA_FINE	SWIR1 VDDA (fine)
29	Voltage acq enb*	3	0	2320	N/A	EID_SWIR1_VDET _FINE	SWIR1 VDET (fine)
30	Voltage acq enb*	3	0	3636	N/A	EID_SWIR1_VVIDEO_FINE	SWIR1 Vvideo (fine)
31	Voltage acq enb*	3	1467	1592	N/A	EID_ADC_24__REF_FINE	ADC 24 Ref (fine)
32	Voltage acq enb*	3	0	3260	N/A	EID_SWIR2_VDDA_FINE	SWIR2 VDDA (fine)
33	Voltage acq enb*	3	0	2320	N/A	EID_SWIR2_VDET _FINE	SWIR2 VDET (fine)
34	Voltage acq enb*	3	0	3636	N/A	EID_SWIR2_VVIDEO_FINE	SWIR2 Vvideo (fine)
35	Voltage acq enb*	3	1467	1592	N/A	EID_ADC_16_REF_FINE	ADC 16 Ref (fine)
36	Voltage acq enb*	3	0	3260	N/A	EID_TIR_VDDA_FINE	TIR VDDA (fine)
37	Voltage acq enb*	3	0	2132	N/A	EID_TIR_VDDL_FINE	TIR VDDL (fine)
38	Voltage acq enb*	3	0	2069	N/A	EID_TIR_VBUS_FINE	TIR VBUS (fine)
39	Voltage acq enb*	3	0	3135	N/A	EID_TIR_VFID_FINE	TIR VFID (fine)
40	Voltage acq enb*	3	0	3448	N/A	EID_TIR_VSKIMMING_FINE	TIR VSKIMMING (fine)
41	Voltage acq enb*	3	0	3009	N/A	EID_TIR_VEB_FINE	TIR VEB (fine)
42	Voltage acq enb*	3	0	3636	N/A	EID_TIR_VVIDEO_FINE	TIR Vvideo (fine)
43	Voltage acq enb*	3	0	4095	N/A	EID_TIR_ADC_P_FINE	TIR ADC P (fine)
44	IDL, IDR, NOM	3	16908	37184	N/A	EID_VTEMP_FEE_VIS_FINE	VNS VIS Detector Temperature (fine)
45	IDL, IDR, NOM	3	16908	37184	N/A	EID_VTEMP_FEE_NIR_FINE	VNS NIR Detector Temperature (fine)
46	IDL, IDR, NOM	3	16908	37184	N/A	EID_VTEMP_FEE_SW1_FINE	VNS SWIR1 Detector Temperature (fine)
47	IDL, IDR, NOM, DEC modes	3	16908	50644	N/A	EID_VTEMP_FEE_SW2_FINE	VNS SWIR2 Detector Temperature (fine)
48	NOM	3	23726	35017	N/A	EID_VTEMP_TIR_FINE	TIR Detector Temperature (fine)
49	IDR, IDL	3	23726	35017	N/A	EID_VTEMP_TIR_FINE	TIR Detector Temperature (fine)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
50	Loop 1 Enb State*	1	0	3572	N/A	EID_TCL_OB_HTR_TEMP_DIFF	OB Temperature Difference Refer to Section 3.6.1
51	Loop 2 Enb State*	1	0	3273	N/A	EID_TCL_TIR_H1_TEMP_DIFF	TIROU Heater 1 Temperature Difference (Refer to Section 3.6.1)
52	Loop 3 Enb State*	1	0	3468	N/A	EID_TCL_TIR_H2_TEMP_DIFF	TIROU Heater 2 Temperature Difference (Refer to Section 3.6.1)
53	Loop 5 Enb State*	1	0	3197	N/A	EID_TCL_VNS_H2_TEMP_DIFF	VNSOU Heater 2 Temperature Difference (Refer to Section 3.6.1)
54	Loop 6 Enb State*	1	0	3179	N/A	EID_TCL_VNS_H3_TEMP_DIFF	VNSOU Heater 3 Temperature Difference (Refer to Section 3.6.1)
55	Loop 7 Enb State*	1	0	3179	N/A	EID_TCL_VNS_H4_TEMP_DIFF	VNSOU Heater 4 Temperature Difference (Refer to Section 3.6.1)
56	All modes	1	N/A	N/A	0	EID_OVERCURRENT	Overcurrent Status Word LS, mask = 2047.
57	NOM	3	0	0	N/A	EID_SCI_PKT_ERROR	Science Packet Sequence Counter
58	IDL, IDR, NOM, DEC	5	0	50536	N/A	EID_IMON_HTR	HTR I Monitor
60	All modes	3	36751	49721	N/A	EID_VMON_ICU_P_3_3_WIDE	ICU Secondary Supply 4 (+3.3V) Motor & Heater (coarse)
59	All modes	3	50644	65520	N/A	EID_VMON_ICU_P_5_WIDE	ICU Secondary Supply 1 (+5V) Digital (coarse)
61	All modes	3	50214	65520	N/A	EID_VMON_ICU_P_12_WIDE	ICU Secondary Supply 2 (+12V) Analogue (coarse)
62	All modes	3	44109	59675	N/A	EID_VMON_ICU_N_12_WIDE	ICU Secondary Supply 3 (-12V) Analogue (coarse)
63	IDL, IDR, NOM	3	44554	60278	N/A	EID_VMON_ICU_P_24_WIDE	ICU +24V Motor Monitor (coarse)
64	IDL, IDR, NOM, DEC	3	43115	58331	N/A	EID_VMON_ICU_P_20_WIDE	ICU +20V Heater Monitor (coarse)
66	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_FEE_BASE_WIDE	TIROU Temp 1 (Detector hot side temperature sensor) (wide)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
67	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_MASK_TOP_WIDE	TIROU Temp 6 (Filter Mask Top) (wide)
68	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_MASK_BOTTOM_WIDE	TIROU Temp 7 (Filter Mask Bottom) (wide)
69	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_LENS2_WIDE	TIROU Temp 8 (Ge Lens 2) (wide)
70	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_RBB_WIDE	TIROU Temp 9 (Internal Reference RBB) (wide)
71	NOM	3	0	65535	N/A	EID_PTR_CBB_PT_1_WIDE	TIROU CBB Temp 1 (Calibration BB1) (coarse)
72	IDR,IDL	3	0	65535	N/A	EID_PTR_CBB_PT_1_WIDE	TIROU CBB Temp 1 (Calibration BB1) (coarse)
73	NOM	3	0	65535	N/A	EID_PTR_CBB_PT_2_WIDE	TIROU CBB Temp 2 (Calibration BB2) (coarse)
74	IDR,IDL	3	0	65535	N/A	EID_PTR_CBB_PT_2_WIDE	TIROU CBB Temp 2 (Calibration BB2) (coarse)
75	IDL, IDR, NOM	3	51645	65520	N/A	EID_VMON_FEE_P_7	FEE 7V Detector Monitor
76	IDL, IDR, NOM	3	44566	60294	N/A	EID_VMON_FEE_P_4	FEE 4V Electronics Monitor
77	IDL, IDR, NOM	3	0	19050	N/A	EID_IMON_BUS_FEE	FEE Bus I Monitor
78	IDL, IDR, NOM	3	46336	62688	N/A	EID_VMON_BUS_FEE	FEE Bus V Monitor
79	Voltage acq enb*	3	0	3762	N/A	EID_VIS_VDDA_WIDE	VIS VDDA (wide)
80	Voltage acq enb*	3	0	3762	N/A	EID_VIS_VDET _WIDE	VIS VDET (wide)
81	Voltage acq enb*	3	0	3762	N/A	EID_VIS_VVIDEO_WIDE	VIS Vvideo (wide)
82	Voltage acq enb*	3	0	3583	N/A	EID_7V_FILTER_P_WIDE	7V FILTER P (wide)
83	Voltage acq enb*	3	0	3762	N/A	EID_NIR_VDDA_WIDE	NIR VDDA (wide)
84	Voltage acq enb*	3	0	3762	N/A	EID_NIR_VDET _WIDE	NIR VDET (wide)
85	Voltage acq enb*	3	0	3762	N/A	EID_NIR_VVIDEO_WIDE	NIR Vvideo (wide)
86	Voltage acq enb*	3	0	3762	N/A	EID_ADC_08 REF_WIDE	ADC 08 Ref (wide)
87	Voltage acq enb*	3	0	3762	N/A	EID_SWIR1_VDDA_WIDE	SWIR1 VDDA (wide)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
88	Voltage acq enb*	3	0	3762	N/A	EID_SWIR1_VDET _WIDE	SWIR1 VDET (wide)
89	Voltage acq enb*	3	0	3762	N/A	EID_SWIR1_VVIDEO_WIDE	SWIR1 Vvideo (wide)
90	Voltage acq enb*	3	0	3762	N/A	EID_ ADC_24_REF_WIDE	ADC 24 Ref (wide)
91	Voltage acq enb*	3	0	3762	N/A	EID_SWIR2_VDDA_WIDE	SWIR2 DDA (wide)
92	Voltage acq enb*	3	0	3762	N/A	EID_SWIR2_VDET _WIDE	SWIR2 VDET (wide)
93	Voltage acq enb*	3	0	3762	N/A	EID_SWIR2_VVIDEO_WIDE	SWIR2 Vvideo (wide)
94	Voltage acq enb*	3	0	3762	N/A	EID_ ADC_16 REF_WIDE	ADC 16 Ref (wide)
95	Voltage acq enb*	3	0	3762	N/A	EID_TIR_VDDA_WIDE	TIR VDDA (wide)
96	Voltage acq enb*	3	0	2257	N/A	EID_TIR_VDDL_WIDE	TIR VDDL (wide)
97	Voltage acq enb*	3	0	2257	N/A	EID_TIR_VBUS_WIDE	TIR VBUS (wide)
98	Voltage acq enb*	3	0	3762	N/A	EID_TIR_VFID_WIDE	TIR VFID (wide)
99	Voltage acq enb*	3	0	3762	N/A	EID_TIR_VSKIMMING_WIDE	TIR VSKIMMING (wide)
100	Voltage acq enb*	3	0	3762	N/A	EID_TIR_VEB_WIDE	TIR VEB (wide)
101	Voltage acq enb*	3	0	3762	N/A	EID_TIR_VVIDEO_WIDE	TIR Vvideo (wide)
102	Voltage acq enb*	3	0	4095	N/A	EID_TIR_ADC_P_WIDE	TIR ADC P (wide)
103	IDL, IDR, NOM	3	2980	41705	N/A	EID_VTEMP_FEE_VIS_WIDE	VNS VIS Detector Temperature (wide)
104	IDL, IDR, NOM	3	2980	41705	N/A	EID_VTEMP_FEE_NIR_WIDE	VNS NIR Detector Temperature (wide)
105	IDL, IDR, NOM	3	2980	41705	N/A	EID_VTEMP_FEE_SW1_WIDE	VNS SWIR1 Detector Temperature (wide)
106	IDL, IDR, NOM	3	2980	53078	N/A	EID_VTEMP_FEE_SW2_WIDE	VNS SWIR2 Detector Temperature (wide)
107	NOM	3	18080	40663	N/A	EID_VTEMP_FEE_TIR_WIDE	TIR Detector Temperature (wide)
108	IDR, IDL	3	18080	40663	N/A	EID_VTEMP_FEE_TIR_WIDE	TIR Detector Temperature (wide)
109	Loop 1 Enb State*	1	0	7124	N/A	EID_TCL_OB_HTR_TEMP_DIFF_WIDE	OB Temperature Difference (Refer to Section 3.8.1)
110	Loop 2 Enb State*	1	0	6524	N/A	EID_TCL_TIR_H1_TEMP_DIFF_WIDE	TIROU Heater 1 Temperature Difference (Refer to Section 3.8.1)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
111	Loop 3 Enb State*	1	0	6919	N/A	EID_TCL_TIR_H2_TEMP_DIFF_WIDE	TIROU Heater 2 Temperature Difference (Refer to Section 3.8.1)
112	Loop 5 Enb State*	1	0	6347	N/A	EID_TCL_VNS_H2_TEMP_DIFF_WIDE	VNSOU Heater 2 Temperature Difference (Refer to Section 3.8.1)
113	Loop 6 Enb State*	1	0	6347	N/A	EID_TCL_VNS_H3_TEMP_DIFF_WIDE	VNSOU Heater 3 Temperature Difference (Refer to Section 3.8.1)
114	Loop 7 Enb State*	1	0	6347	N/A	EID_TCL_VNS_H4_TEMP_DIFF_WIDE	VNSOU Heater 4 Temperature Difference (Refer to Section 3.8.1)
115	All Modes	1	0	600	N/A	EID_MIL_INACTIVE	Milbus Inactivity
116	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_BENCH_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
117	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_BENCH_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
118	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_LENS8_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
119	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_TIR_LENS8_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
120	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_OB_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
121	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_OB_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
122	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_FEE_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
123	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_SW2_BARREL_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
124	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_SW2_BARREL_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
125	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_OU_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
126	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_OU_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
127	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_CAL_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
128	IDL, IDR, NOM	3	10075	59553	N/A	EID_THERM_VNS_CAL_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
129	IDL, IDR, NOM	3	30471	65535	N/A	EID_PRT_VNS_SW2_1_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
130	IDL, IDR, NOM	3	30471	65535	N/A	EID_PRT_VNS_SW2_2_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
131	IDL, IDR, NOM	3	28480	65535	N/A	EID_PRT_VNS_RAD_WIDE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
132	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_BENCH_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
133	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_BENCH_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
134	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_LENS8_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
135	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_TIR_LENS8_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
136	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_OB_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
137	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_OB_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
138	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_FEE_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
139	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_SW2_BARREL_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
140	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_SW2_BARREL_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
141	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_OU_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
142	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_OU_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
143	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_CAL_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
144	IDL, IDR, NOM	3	13466	55778	N/A	EID_THERM_VNS_CAL_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
145	IDL, IDR, NOM	3	28480	63192	N/A	EID_PRT_VNS_SW2_1_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)

Monitoring ID	Validity	Rep	Low Limit	High Limit	Expected	Event ID	Description
146	IDL, IDR, NOM	3	28480	63192	N/A	EID_PRT_VNS_SW2_2_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)
147	IDL, IDR, NOM	3	28480	63192	N/A	EID_PRT_VNS_RAD_FINE	Temperture limit exceeded for applicable sensor (Refer to Section 3.8.1)

Table 16: Default Monitoring List

* "Loop n Enb State" implies the validity status is the datapool Boolean status for the applicable heater control loop Enable status, "Voltage acq enb" imlplies the validity status is the datapool boolean enables status for FEE voltage acquisitions.

15. DEFAULT EVENT ACTIONS

The list of default Event Actions used within the ASW is shown in Table 17. All default Event Actions are initially identified as 'Added' and 'Enabled'.

MSIASW-283, MSIASW-287, MSIASW-290, MSIASW-291, MSIASW-292, MSIASW-297, MSIASW-319

Event ID	Description	Action	TC Command
EID_OVERCURRENT	Overcurrent Status Register	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_SCI_PKT_ERROR	Science Packet Sequence Counter	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_TIME_SYNC_FAIL	Time Synchronisation Failure Report	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_MODE_TRANSIT_FAIL	Mode transition fail	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_OVERFLOW_TC_Q_ASW	TC Receive Queue overflow	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_OVERFLOW_TM_Q_ASW	TM Transmit Queue overflow	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_OVERFLOW_RX_SESS_ASW	Rx Session Layer Circular Buffer overflow	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_OVERFLOW_CYCLIC_ASW	Cyclic Scheduler overrun	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_FEE_REGISTER_VALUE_MISMATCH	FEE Register Value Mismatch	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_FEE_DETECTOR_LATCHUP_NOT_CLEARED	FEE Detector Latchup Not Cleared	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_FEE_COMMAND_FAILED	FEE Command Failed	Transition to INS-IDR	TC(8,1) Function Id: 5
EID_MIL_INACTIVE	Milbus inactivity limit reached.	Rest MIL bus inactivity	TC(8,1) Function Id: 48
EID_IMON_HTR	HTR I Monitor monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_P_3_3_WIDE	ICU Secondary Supply 4 (+3.3V) Motor & Heater (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_P_5_WIDE	ICU Secondary Supply 1 (+5V) Digital (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_P_12_WIDE	ICU Secondary Supply 2 (+12V) Analogue (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_N_12_WIDE	ICU Secondary Supply 3 (-12V) Analogue (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_P_24_WIDE	ICU +24V Motor Monitor (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_ICU_P_20_WIDE	ICU +20V Heater Monitor (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_FEE_BASE_WIDE	Temp sensor out of wide limits	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_TIR_MASK_TOP_WIDE	Temp sensor out of wide limits	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_TIR_MASK_BOTTOM_WIDE	Temp sensor out of wide limits	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_TIR_LENS2_WIDE	Temp sensor out of wide limits	Transition to INS-SBR	TC(8,1) Function Id: 3

Event ID	Description	Action	TC Command
EID_THERM_TIR_RBB_WIDE	Temp sensor out of wide limits	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_PTR_CBB_PT_1_WIDE	ADC16 2V5 Reference monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_PTR_CBB_PT_2_WIDE	ADC16 5V Reference (ADC12) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_OB_HTR_TEMP_DIFF_WIDE	ADC12 5V Reference monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_TIR_H1_TEMP_DIFF_WIDE	ADC16 5V Reference (ADC16) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_TIR_H2_TEMP_DIFF_WIDE	TIR Encoder Reference monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_VNS_H2_TEMP_DIFF_WIDE	AAM Thermistor monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_VNS_H3_TEMP_DIFF_WIDE	ICP Thermistor monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TCL_VNS_H4_TEMP_DIFF_WIDE	Chassis Thermistor monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_FEE_P_7	FEE_7V_Electronics Monitor (VMON_FEE_P_7)	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_FEE_P_4	FEE_4V_Detector Monitor (VMON_FEE_P_4)	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_IMON_BUS_FEE	FEE Bus I Monitor (IMON_BUS_FEE)	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VMON_BUS_FEE	FEE BUS V Monitor (VMON_BUS_FEE)	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VIS_DDA_WIDE	VIS DDA (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VIS_VDET_WIDE	VIS VDET (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VIS_VVIDEO_WIDE	VIS Vvideo (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VIS_ADC_REF_WIDE	VIS ADC Ref (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_NIR_DDA_WIDE	NIR DDA (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_NIR_VDET_WIDE	NIR VDET (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_NIR_VVIDEO_WIDE	NIR Vvideo (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_NIR_ADC_REF_WIDE	NIR ADC Ref (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR1_DDA_WIDE	SWIR1 DDA (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR1_VDET_WIDE	SWIR1 VDET (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR1_VVIDEO_WIDE	SWIR1 Vvideo (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR1_ADC_REF_WIDE	SWIR1 ADC Ref (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3

Event ID	Description	Action	TC Command
EID_SWIR2_DDA_WIDE	SWIR2 DDA (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR2_VDET_WIDE	SWIR2 VDET (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR2_VVIDEO_WIDE	SWIR2 Vvideo (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_SWIR2_ADC_REF_WIDE	SWIR2 ADC Ref (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VDDA_WIDE	TIR VDDA (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VDDL_WIDE	TIR VDDL (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VBUS_WIDE	TIR VBUS (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VFID_WIDE	TIR VFID (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VSKIMMING_WIDE	TIR VSKIMMING (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VEB_WIDE	TIR VEB (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_VVIDEO_WIDE	TIR Vvideo (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_TIR_ADC_REF_WIDE	TIR ADC Ref (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VTEMP_FEE_VIS_WIDE	VNS VIS Detector Temperature (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VTEMP_FEE_NIR_WIDE	VNS NIR Detector Temperature (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VTEMP_FEE_SW1_WIDE	VNS SWIR1 Detector Temperature (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VTEMP_FEE_SW2_WIDE	VNS SWIR2 Detector Temperature (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_VTEMP_FEE_TIR_WIDE	TIR Detector Temperature (coarse) monitoring limits exceeded	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_NO_VALID_TEMPERATURE	Failure of heater main and secondary Thermistors	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_MAJOR_MODE_TRANSIT_FAIL	MAJOR_ Mode Transition Failure	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_FEE_TIR_BASE_FINE	TIROU Temp 1 (Detector hot side temperature sensor) (fine) monitoring limits exceeded	Set Peltier Cooler Constant Current to 0mA	TC(149,138) Constant Current = 0mA
EID_THERM_TIR_BENCH_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_TIR_BENCH_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_TIR_LENS8_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3

Event ID	Description	Action	TC Command
EID_THERM_TIR_LENS8_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_OB_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_OB_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_FEE_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_SW2_BARREL_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_SW2_BARREL_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_OU_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_OU_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_CAL_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_THERM_VNS_CAL_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_PRT_VNS_SW2_1_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_PRT_VNS_SW2_2_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3
EID_PRT_VNS_RAD_WIDE	Monitoring limit exceeded for applicable sensor.	Transition to INS-SBR	TC(8,1) Function Id: 3

Table 17: Default Event Action List

16. ASW TC DOORS IDENTIFIERS

This section lists the DOORS Identifiers assigned to each ASW TC packet and used for requirements tracing specified in [RD9].

MSI ASW ICD ID	Telecommand
1	Not Used
2	Direct I/O
4	Perform Function
5	Reset Commanding
6	Initiate Transition to INS-SBY
7	Initiate Transition to INS-SBR
8	Initiate Transition to INS-IDL
9	Initiate Transition to INS-IDR
10	Initiate Transition to INS-NOM
11	Initiate Transition to INS-DEC
12	Reset ICU
13	Scrubbing Configuration
14	BWL Parameter Setting
15	EEPROM Write Protection Unlock
16	EEPROM Write Protection Lock
17	Power EEPROM On
18	Power EEPROM Off
19	Transition to OBS Submode
20	Transition to RAW Submode
21	Start TIR Calibration
22	Start VNS Calibration 1
23	Start VNS Calibration 2
24	Enable Science Data Processing
25	Disable Science Data Processing
26	Not Used
27	Not Used
28	Band Mapping
29	Perform Self Test
30	Watchdog Enable
31	Watchdog Inhibit
33	Set TIR TDI Calibration Delay
34	Set FEE LBR VNS Day
35	Set FEE LBR VNS Night
36	SID ID for Science Ancillary Packets
37	Load Waveform Control Table
38	Set WCT Scaling Factor
39	Command Resend
40	Mechanism Power Supply On
41	Mechanism Power Supply Off
42	Start Thermal Control
43	Stop Thermal Control
44	Enable Thermal Control Loop
45	Update Thermal Control Loop Parameters
46	Report Thermal Control Loop Parameters

MSI ASW ICD ID	Telecommand
47	Thermal Control Loop Parameters Report
48	Update Thermal Control Loop Temperature Pair
49	Set Peltier Cooler Constant Current
53	Set Heater Constant Power
54	Power On TIROU Mechanism Encoders
55	Power Off TIROU Mechanism Encoders
56	Set TIROU Mechanism to Cold Space View
57	Set TIROU Mechanism to Black Body View
58	Set TIROU Mechanism to Nadir View
59	Command TIROU Mechanism
60	Report TIROU Mechanism Position
61	TIROU Mechanism Position Report
62	Set TIROU Mechanism Final Deceleration Phase
63	Set TIROU Mechanism Low Speed Coasting Phase
64	Power On VNSOU Mechanism Encoders
65	Power Off VNSOU Mechanism Encoders
66	Set VNSOU Mechanism to Solar Diffuser View 1
67	Set VNSOU Mechanism to Solar Diffuser View 2
68	Set VNSOU Mechanism to Dark View
69	Set VNSOU Mechanism to Nadir View
70	Command VNSOU Mechanism
71	Report VNSOU Mechanism Position
72	VNSOU Mechanism Position Report
73	Set VNSOU Mechanism Final Deceleration Phase
74	Set VNSOU Mechanism Low Speed Coasting Phase
75	Load TIR Flat Field Reference Set
76	Load VNS Flat Field Reference Set
77	Set Flat Field Average Number
78	Dump Flat Field Band
79	Read Flat Field Band from FPGA
80	Flat Field Band Report
81	Power On FEE
82	Power Off FEE
83	Set Timing Pulse Interval
84	Write FEE Register
85	Read FEE Register
86	FEE Register Response
87	FEE Load Register
88	FEE Check Register
89	FEE Status Register Request
90	FEE Internal Voltage Register Request
91	FEE Memory Test
92	FEE Clear EDAC Error
93	Reset Boot Report
94	Dump Boot Report
95	Boot Report
96	Dump Death Report
97	Death Report

MSI ASW ICD ID	Telecommand
98	Reset History Area
99	Dump History Area
100	History Area Report
101	Select Time Synchronisation Reference
105	SID 1 - Default Housekeeping Report (Nominal Short Format)
106	SID 2 - Default Housekeeping Report (Extended Format)
107	Set Truncation Factor
108	Enable FEE Memory Test
109	Abort Fee Memory Test
110	Clear HK Parameter Report Definitions
143	Connection Test
142	Report Current Monitoring List
141	Delete Parameters from Monitoring List
144	Add Events to Detection List
140	Add Parameters to Monitoring List
139	Clear Monitoring List
138	Disable monitoring of Parameters
145	Delete Events from Detection List
137	Enable monitoring of Parameters
136	Not Used
135	Trigger Time Synchronisation Verification
134	Report Function Status
133	Disable Autoreset of Execution Enable Flag
131	Disable Function Execution
130	Enable Function Execution
132	Enable Autoreset of Execution Enable Flag
122	Add HK Parameters to existing HK Parameter Report
123	Report Snapshot HK Parameter Anomaly Report
124	Enable Event Packet Generation
126	Report Disabled EIDs
127	Load Memory Using Absolute Address
128	Dump Memory Using Absolute Address
129	Check Memory Using Absolute Address
125	Disable Event Packet Generation
118	Report HK/Diagnostic Parameter Report Summary
121	Request HK Parameter Report
120	Define Diagnostic Parameter Report Collection Interval
119	Define HK Parameter Report Collection Interval
117	Report Diagnostic Parameter Report Definitions
116	Report HK Parameter Report Definitions
115	Disable Diagnostic Parameter Report Generation
114	Enable Diagnostic Parameter Report Generation
113	Disable HK Parameter Report Generation
111	Clear Diagnostic Parameter Report Definitions
112	Enable HK Parameter Report Generation
146	Clear Event Detection List
147	Enable Actions
148	Disable Actions

MSI ASW ICD ID	Telecommand
149	Report Event Detection List
150	Report Single Event Detection List
151	Set N Parameters
152	Get N Parameters
153	Define Onboard Parameter
154	Update Spacecraft State Vector
155	Not Used
156	Abort TIR Mechanism Operation
157	Start TIR Mechanism Seek
158	Abort VNS Mechanism Operation
159	Start VNS Mechanism Seek
160	Not Used
161	Not Used
162	Start FEE-Controlled FEE Memory Check
163	FEE Register Test
164	Generate TIR Reference Set
165	Generate VNS Reference Set
166	Dwell at TIR Black Body View
167	Define new HK parameter report
168	Define new Diagnostic parameter report
169	Not used
170	Set TIR Pointing Direction
171	Set VNS Pointing Direction
173	Switch Off Decontamination Heater
172	Switch On Decontamination Heater
174	Dwell at TIR Cold Space View
175	Load TIR Default Flat Field Reference Set
176	Load VNS Default Flat Field Reference Set
178	Enable MilBus Inactivity Reset
177	Disable MilBus Inactivity Reset
179	Set PPS Acceptance Limit
180	Set PPS Sync Limit
181	Reset ICU Milbus Inactivity

Table 18: TC DOORS Identifiers