S1 Specific Packet Utilisation Standard
(SC-23)

Written by	Responsibility
M. MASCI	S/C Command & Control Engineering
Verified by	
G. CAMPOLO	Head of Avionics Dept
Approved by	
A. PANETTI	System Manager
G. MONTANARI	Product Assurance Manager
F. SPATARO	Satellite Program Manager
F. SANETTI	Configuration Manager
A. QUINTILLI	Documentation Manager
R. TORRES	ESA Approval

Approval evidence is kept within the documentation management system

DOCUMENT CHANGE LOG

Issue	Date	Sections affected	Reason for change
01	18.04.08	All sections	First formal issue.
02	30.07.08	§ 3.2	Updated AU tail length. Added note in Sequence Flag description to highlight that the max TC packet size supported by AVS is 512 bytes which requires three TC Segments to uplink. Also the re-assembled TC packet is made transparent to the addressed PID.
		§ 3.3	Note added to provide a possible use of the CPDU TC Packet with multiple HPC instructions. Also the capability for Ground to Time-Tag or Position Tag HPC commands through AVS TC (2,144). Updated max CPDU TC Packet size linked to max TC Segment Data Field size which in turn is linked to AU Tail length.
		§ 3.7	Added a note to state that TC aggregation is not supported, but instead TC (134,1) is supported with the added advantages. Additional notes added on TC(134,1) to clarify the execution order of the embedded telecommands.
		§ 3.8	TC packet nesting updated to remove the nesting of C-SAR and PDHT TT-TC which are no longer applicable.
		§ 4.1	Included short description of the content of each VC. Part of PDR RID OP-179 disposition.
		§ 4.3	TM Data Field Header modified as per System PDR RID OP-146 disposition. OBT Status 2-bit field added replacing the 1-bit DM. Only applicable to AVS.
		§ 4.4	Added a note to state that “Idle” TM packets are generated by the ASW.
		§ 4.5	Added S/C OBT Status field to Time TM packet as per PDR RID OP-179 disposition. Added a note to state that the Time TM packet has no DFH, hence TM(9,2) not supported.
		§ 5.2	Added a note describing the differences between TC(2,144) and TC(2,3). TC(2,3) is not supported.
		§ 5.3	PUS service TC(3,2), TC(3,4), TC(3,7), TC(3,8), TC(3,11), TM(3,12) and TM(3,26) of TCU deleted to simplify TCU design. Added TC(3,129) and TM(3,130) to ICM, TCU and DSHA. Part of PDR RID OP-179 disposition.
		§ 5.4	PUS service TC(4,1), TM(4,2) and TM(4,3) of SM ASW deleted in the scope of simplifying SM ASW. AVS TC(4,6), TC(4,7) and TM(4,9) services are implemented with specific AVS TC(4,144), TC(4,145) and TM(4,146) respectively.
		§ 5.5	PUS services TC(5,5), TC(5,6), TC(5,129) and TM(5,130) of TCU deleted in the scope of simplifying TCU design. The generation (instead of output) of event reports can be suppressed by TCU service 12.

Issue	Date	Sections affected	Reason for change
		§ 5.6	Note added to describe the differences between TM(6,145) and TM(6,4) where TM(6,4) is not supported.
		§ 5.7	Service 8 set not applicable to ICM and GPS as covered by specific service type.
		§ 5.9	Service 11 removed from SES and DSHA as per PDR RID OP-145 disposition.
		§ 5.10	PUS services TC(12,5), TC(12,6), TC(12,10) and TM(12,11) of TCU deleted to simplify TCU design. Added a note to Service 12 to describe the link with Service 5 as per PDR RID OP-179 point 8 disposition.
		§ 5.12	SM ASW Service 14 deleted as considered not essential in the scope to simply SM ASW as per System PDR disposition.
		§ 5.13	Added a note to Service 15 describing the on-board managed Packet Stores including the System Log. Added TC(15,228) to request the downlink of PDHT Packet Store(s).
		§ 5.17	A description of the AVS mission specific service types added as per PDR RID OP-179 disposition.
		§ 6	All section 6 updated to define the Sentinel-1 reference PUS services data structures as per PDR OPS-178 disposition. The Sentinel-1 Type/Subtype reference data structure is specified reporting any known deviations. Where “none” is indicated there are no deviations. Where left blank it must be considered TBC as some harmonisation activity might be required.
		§ 8.1.2	Specified the use of Packet Category 6 : Auxiliary as per OIRD requirement.
		§ 8	Added sections 8.4 and 8.5 for the allocation of mission specific service type / subtype and RID numbering to the packet terminals
03	**07.01.09**		All modifications with respect to issue 2 are shown with revision marks. Changes linked to ESOC dispositions agreed at OPS meetings and documented in “S1 PUS – ESOC Comments” Excel spreadsheet S1-TN-ESC-FS-6000 are referred to as ESOC-xxx-yyy where xxx refers to the comment category (e.g. GEN, S12, S18) and yyy is the comment number.
		§ 3.2	Updated AU tail length and max TC Segment Data field length.
		§ 3.3	Added description of CPDU function processing times.
		§ 3.4	Added clarification notes on max and min TC Packet sizes.
		§ 3.7	Modified TC(134,1) description to clarify order of execution of TC (134,1) embedded telecommands.
		§ 4.3	Added note to state constraints on fixed length TM packets as per ESOC-GEN-67
		§ 4.5	Modified Time Packet description to state that Time service covers TM(9,2).

Issue	Date	Sections affected	Reason for change
		§ 4.6	- Added info on HPTM generation rate as per ESOC-GEN-64. - Updated HPTM format.
		§ 5.1	Added TC(1,128) and TC(1,129) which are only applicable to AVS as per ESOC-S1-38.
		§ 5.2	Deleted TC (2,147) and TC(2,150) as the function covered by TC(2,145) and TC(2,148) respectively.
		§ 5.3	- TC(3,129) set not applicable to ASW as Diagnostic packet size changes if collection interval is changed due to super-commutation parameters. Refer to ESOC-S3-80. - TC(3,5) and TC(3,6) not applicable to GPS as same function performed through private GPS service. Covers part of ESOC-GEN-86.
		§ 5.4	- TC(4,4) and TC(4,5) modified to enable/disable statistics function as per ESOC-S4-39. - TC(4,6), TC(4,7) and TM(4,9) set not applicable to NM ASW as implemented with private subtypes TC(4,144), TC(4,145) and TM (4,146) respectively which have been added.
		§ 5.5	- TC(5,5) and TC(5,6) set not applicable to GPS as function covered by private subtypes TC(5,210) and TC(5,211) respectively. Covers part of ESOC-GEN-86. - TC(5,129) and TM(5,130) set not applicable to ASW as Event status is included in TM(19,153) and requested through TC(19,152). - TC(5,5) and TC(5,6) set not applicable to ASW as controlled through private subtype TC(19,146). - Added TC(5,210), TC(5,211), TC(5,212) and TM(5,213) specific to GPS only. Part of GPS commonality agreements between Sentinels. Covers part of ESOC-GEN-86.
		§ 5.6	- TC(6,2), TC(6,5), TM(6,6), TC(6,9) and TM(6,10) set not applicable to GPS as function covered by private subtypes. - Added TC(6,210), TC(6,212), TC(6,215), TM(6,216), TC(6,219) and TM(6,218) specific to GPS. Part of GPS commonality agreements between Sentinels. Covers part of ESOC-GEN-86. - Added clarification note on Dump TM packets generation. - TC(6,7) and TM(6,8) set not applicable ASW as they are covered by TC(6,9) and TM(6,10) and the availability of the physical address reported through TM(6,144). - Added TC(6,224) and TC(6,225) for DSHA SW boot and configuration update in EEPROM as per PDHT PDR RID PH-33 disposition.

Issue	Date	Sections affected	Reason for change
		§ 5.8	- TM(9,1) set not applicable to ASW as it is not envisaged to change the Time report rate in flight. - TM(9,2) set applicable to ASW noting the fact that TM(9,2) has no PUS Data Field Header. As per ESOC-S9-32.
		§ 5.10	- Deleted erroneous duplicated text as per ESOC-S12-114. - TC(12,1) and TC(12,2) are not applicable to ASW as enable/disable is performed using MDS concept. ESOC-S12-115. - TC(12,10) set applicable to ASW. - Added TC(12,153), TC(12,154) and TM(12,155) applicable to NM and SM ASW. - Deleted superseded notes as per ESOC-S12-56.
		§ 5.12	- TC(14,1), TC(14,2), TC(14,3), TM(14,4), TC(14,9), TC(14,10), TC(14,11) and TM(14,12) set applicable to SM ASW as per ESOC-S14-57. - TC(14,13), TC(14,14), TC(14,15) and TM(14,16) set not applicable to ASW as filtering of event reports not supported. - Added Note 3 on telemetry downlink rate.
		§ 5.13	- TC(15,11) set not applicable to DSHA. - TC(15,144) changed to Set Packet Store Configuration. - TC(15,145) deleted. - Added TC(15,229) applicable to DSHA.
		§ 5.15	- Added TC(18,130), TM(18,145), TM(18,162) and TM(18,224) to request and report the detailed definition of an OBOP where TC(18,130) applicable to ASW, ICM and DSHA; TM(18,145) applicable to ASW; TM(18,162) applicable to ICM; TM(18,224) applicable to DSHA. As per ESOC-S18-153.
		§ 5.16	- Corrected erroneous subtype numbering of now TM(19,155), TC(19,156) and TC(19,157) - Added TC(19,128) and TM(19,129) applicable to ICM and DSHA to request and report the single Event Action associated with a specific RID as per ESOC-S19-151A.
		§ 6.1.2	- Added clarification note on “complementary information” of TM (1,2) which is also applicable to TM(1,4), TM(1,6), and TM(1,8). - Updated TM(1,2) format deviations table.
		§ 6.1.8	Updated TM(1,8) format deviations table.
		§ 6.1.9 & § 6.1.10	Added description of TC(1,128) and TC(1,129) function as per ESOC-S1-74.
		§ 6.2	- Added notes on CPDU TC and 1553B low level commands as per ESOC-S2-48 and ESOC-S2-75.
		§ 6.2.1	Updated TC(2,144) description.
		§ 6.2.2	Modified TC(2,145) to cover both RX and TX 1553B requests.
		§ 6.2.3	Updated TM(2,146) description to reflect the reporting of both RX and TX requests

Issue	Date	Sections affected	Reason for change
		§ 6.2.4	TC(2,148) function changed to cover both TX and RX 1553B low level commands.
		§ 6.2.5	Updated TM(2,149) description to reflect the reporting of both RX and TX requests.
		§ 6.3	As per MOM S1-MN-ASD-PL-0101, spare bytes removed by extending parameters size (e.g. SID, N, NPAR). Covers also ESOC-S3-79.
		§ 6.3.1	TC(3,1) format changed removing parameter over-sampling part as per ESOC-S3-80.
		§ 6.3.2	TC(3,2) format changed as for TC(3,1). TC(3,2) description updated to reflect capability to support super-commutation.
		§ 6.3.3	TC(3,3) format changed deleting padding byte, increased SID size to 1 word.
		§ 6.3.4	TC(3,4) format changed as for TC(3,3).
		§ 6.3.5	TC(3,5) format changed as for TC(3,3).
		§ 6.3.6	TC(3,6) format changed as for TC(3,3).
		§ 6.3.7	TC(3,7) format changed as for TC(3,3).
		§ 6.3.8	TC(3,8) format changed as for TC(3,3).
		§ 6.3.9	TC(3,9) format changed as for TC(3,3).
		§ 6.3.10	TM(3,10) format changed as for TC(3,1).
		§ 6.3.11	TC(3,11) format changed as for TC(3,3).
		§ 6.3.12	TM(3,12) format changed as for TC(3,1).
		§ 6.3.13	- TM(3,25) format changed as for TC(3,3). - Added note to specify TM(3,25) SID constraint on single packet as per ESOC-GEN-67 - Added GPS TM(3,25) format showing deviation.
		§ 6.3.14	- TM(3,26) format changed as for TC(3,3). - Added note to specify TM(3,26) SID constraint on single packet as per ESOC-GEN-67
		§ 6.3.15	TC(3,128) format changed as for TC(3,3).
		§ 6.3.16	TC(3,129) format changed as for TC(3,3). TC(3,129) not supported by ASW as packet size changes if collection interval is changed due to super-commutation. Refer to ESOC-S3-80.
		§ 6.3.18	TM(3,131) format changed deleting padding bytes, increased NSID and SID size to 1 word.
		§ 6.3.20	TM(3,133) format changed as for TM(3,131).
		§ 6.4.2	Added “Last Packet” and “Report Integrity Counter” fields to TM(4,2) as the report could be composed of multiple packets.
		§ 6.4.4	TC(4,4) changed from “Enable Periodic Parameter Statistics Reporting” to “Enable Statistics Function” as per ESOC-S4-39.
		§ 6.4.5	- TC(4,5) changed from “Disable Periodic Parameter Statistics Reporting” to “Disable Statistics Function” as per ESOC-S4-39.

Issue	Date	Sections affected	Reason for change
		§ 6.4.9	- Added “Last Packet” and “Report Integrity Counter” fields to TM(4,9) as the report could be composed of multiple packets. Sampling interval field deleted as per ESOC-S4-84.
		§ 6.4.11	Added AVS TC(4,144) which is AVS specific of TC(4,6).
		§ 6.4.12	Added AVS TC(4,145) which is AVS specific of TC(4,7).
		§ 6.4.13	Added AVS TM(4,146) which is AVS specific of TM(4,9).
		§ 6.5.1	Added GPS TM(5,1) format showing deviation from standard S1 TM(5,1).
		§ 6.5.2	Added GPS TM(5,2) format showing deviation from standard S1 TM(5,2).
		§ 6.5.3	Added GPS TM(5,3) format showing deviation from standard S1 TM(5,3).
		§ 6.5.4	Added GPS TM(5,4) format showing deviation from standard S1 TM(5,4).
		§ 6.6.1	TC(6,1) format changed, increased Memory ID and N size to 1 word.
		§ 6.6.2	- TC(6,2) format changed as for TC(6,1). - Added ASW TC(6,2) format showing deviation with respect to standard S1 TC(6,2) format.
		§ 6.6.3	TC(6,3) format changed as for TC(6,1).
		§ 6.6.4	- TC(6,5) format changed, increased Memory ID and N size to 1 word and Length_6_5 to 2 words. - Added ASW TC(6,5) format showing deviation with respect to standard S1 TC(6,5) format.
		§ 6.6.5	TM(6,6) format changed. Increased Memory ID to 1 word and added Length field.
		§ 6.6.6	TC(6,9) format changed, increased Memory ID size to 1 word and Length_6_9 to 2 words.
		§ 6.6.7	TM(6,10) format changed as for TC(6,9).
		§ 6.6.9	TC(6,145) format changed, increased Memory ID size to 1 word.
		§ 6.6.10	TC(6,146) description added and format changed, increased N size to 1 word. Covers part of ESOC-S6-94.
		§ 6.6.12	Added TM (6,148) format.
		§ 6.6.13	Added TC (6,149) format.
		§ 6.6.14	Added TC (6,150) format.
		§ 6.6.15	Added TM (6,151) format.
		§ 6.6.17	TC(6,162) description extended to cover operational use as part of ESOC-S6-94.
		§ 6.6.18	Added TC(6,210)
		§ 6.6.19	Added TC(6,212)
		§ 6.6.20	Added TC(6,215)
		§ 6.6.21	Added TM(6,216)
		§ 6.6.22	Added TC(6,219)
		§ 6.6.23	Added TM(6,218)

Issue	Date	Sections affected	Reason for change
		§ 6.6.24	Added TC(6,224) format applicable to DSHA as part of PDHT PDR RID PH-33 disposition.
		§ 6.6.25	Added TC(6,225) format applicable to DSHA as part of PDHT PDR RID PH-33 disposition.
		§ 6.8.1	TC(9,1) format deleted as TC(9,1) not supported by ASW. Time packet generation rate is configurable as an SMU Mission PROM parameter. Covers ESOC-S9-96.
		§ 6.8.2	New section added to cover TM(9,2).
		§ 6.8.3	Added description of TC(9,144) function as per ESOC-S9-97.
		§ 6.8.4	Added description of TC(9,145) function as per ESOC-S9-98.
		§ 6.8.5	Added description of TC(9,146) function as per ESOC-S9-99.
		§ 6.8.6	Added description of TC(9,147) function as per ESOC-S9-100.
		§ 6.8.7	Added description of TC(9,148) function as per ESOC-S9-100.
		§ 6.8.8	Updated description of TC(9,129) to clarify use as per ESOC-S9-103.
		§ 6.8.10	TM(9,160) field corrected to TCM Current Time.
		§ 6.9.1	Added cases N1 = 0 and N2 = 0 to TC(11,1) as per ESOC-S11-106.
		§ 6.9.2	Added cases N1 = 0 and N2 = 0 to TC(11,2) as per ESOC-S11-106.
		§ 6.9.6	Deleted “Number of Telecommands” field from TC(11,6). Added case N1 = 0 of TC(11,6) as per ESOC-S11-108.
		§ 6.9.7	Deleted “Number of Telecommands” field from TC(11,144). Added case N1 = 0 of TC(11,6) as per ESOC-S11-108.
		§ 6.9.9	Added case N1 = 0 of TC(11,8) as per ESOC-S11-109.
		§ 6.9.10	Added case N1 = 0 of TC(11,145) as per ESOC-S11-109.
		§ 6.9.17	- Corrected TM(11,19) adding the missing repetition loops. - Added note as per ESOC-S11-112.
		§ 6.10.1	- TC(12,1) format changed deleting padding byte, N size increased to 1 word. - Added note on global enable when N set to 0 as per ESOC-S3-118.
		§ 6.10.2	- TC(12,2) format changed as for TC(12,1). - Added note on global disable when N set to 0 as per ESOC-S3-118.
		§ 6.10.3	Added TC(12,5) format as per ESOC-S12-41 and also covers part of ESOC-S12-116.
		§ 6.10.4	TC(12,6) format changed as for TC(12,1).
		§ 6.10.5	TC(12,7) format changed deleting padding bytes. N, NOL and NOE sizes increased to 1 word.
		§ 6.10.7	Added missing TM(12,9) format.

Issue	Date	Sections affected	Reason for change
		§ 6.10.8	TC(12,10) set applicable also to NM ASW and SM ASW
		§ 6.10.9	TM(12,11) format changed deleting padding byte. N size increased to 1 word.
		§ 6.10.10	Added TC(12,144) format. Covers part of ESOC-S12-43.
		§ 6.10.11	Added TC(12,145) format.
		§ 6.10.12	Added TC(12,146) format.
		§ 6.10.13	Added TC(12,147) format.
		§ 6.10.14	Added TC(12,148) format.
		§ 6.10.15	Added TC(12,149) format.
		§ 6.10.16	Added TC(12,150) format.
		§ 6.10.17	Added TC(12,151) format.
		§ 6.10.18	Added TC(12,152) format. Covers part of ESOC-S12-43.
		§ 6.10.20	Added TC(12,154) format
		§ 6.10.23	Added TC(12,161) format. Covers part of ESOC-S12-43.
		§ 6.10.24	Added TM(12,162) format. Covers part of ESOC-S12-43.
		§ 6.12.1	- TC(14,1) format changed. Deleted padding byte and increased N2 and N3 size to 1 word. Added padding byte for both Type and Subtype as per ESOC-S14-120. - TC(14,1) set applicable also to SM ASW.
		§ 6.12.2	- TC(14,2) format changed as for TC(14,1) and ESOC-S14-120. - TC(14,2) set applicable also to SM ASW.
		§ 6.12.3	TC(14,3) set applicable also to SM ASW
		§ 6.12.4	- Added “Last Packet” and “Report Integrity Counter” fields to TM(14,4) as the report could be composed of multiple packets. Added padding bytes to Type and Subtype as per ESOC-S14-120. - TC(14,4) set applicable also to SM ASW
		§ 6.12.5	- TC(14,144) format changed deleting padding byte. N2 and SID sizes increased to 1 word as per ESOC-S14-120. - TC(14,144) set applicable also to SM ASW
		§ 6.12.6	- TC(14,145) format changed as for TC(14,144). - TC(14,145) set applicable also to SM ASW
		§ 6.12.7	TC(14,7) set applicable also to SM ASW
		§ 6.12.8	- TM(14,146) format changed deleting padding byte. N2 and SID sizes increased to 1 word as per ESOC-S14-120 - TM(14,146) set applicable also to SM ASW
		§ 6.12.9	- TC(14,147) format changed as for TM(14,146). - TC(14,147) set applicable also to SM ASW
		§ 6.12.10	- TC(14,148) format changed as for TM(14,146). - TC(14,148) set applicable also to SM ASW
		§ 6.12.11	TC(14,11) set applicable also to SM ASW

Issue	Date	Sections affected	Reason for change
		§ 6.12.12	- TM(14,149) format changed deleting padding bytes. N2 and SID sizes increased to 1 word as per ESOC-S14-120. - TM(14,149) set applicable also to SM ASW
		§ 6.13.3	TC(15,3) format changed. Type and subtype nesting chosen. Covers ESOC-S15-123.
		§ 6.13.4	TC(15,4) format changed. Type and subtype nesting chosen. Covers ESOC-S15-123.
		§ 6.13.6	TM(15,6) format changed.
		§ 6.13.9	Added TC(15,12) format
		§ 6.13.11	Added TC(15,129) format
		§ 6.13.12	Changed TC(15,144) format
		§ 6.13.16	Added TM (15,224). Part of ESOC-S15-34.
		§ 6.13.17	Added TC (15,225). Part of ESOC-S15-34.
		§ 6.13.18	Added TC (15,226). Part of ESOC-S15-34.
		§ 6.13.19	Added TC (15,227). Part of ESOC-S15-34.
		§ 6.13.20	Added TC (15,228)
		§ 6.15.11	Added TC(18,130) format.
		§ 6.15.12	Added TM(18,145) format.
		§ 6.15.13	Added TM(18,162)
		§ 6.15.14	Added TM(18,224)
		§ 6.16.1	TC(19,1) format changed deleting padding byte. N size increased to 1 word.
		§ 6.16.2	TC(19,2) format changed as for TC(19,1).
		§ 6.16.3	TC(19,4) format changed as for TC(19,1).
		§ 6.16.4	TC(19,5) format changed as for TC(19,1).
		§ 6.16.6	TM(19,7) format changed as for TC(19,1).
		§ 6.16.7	Added TC(19,128) format.
		§ 6.16.8	Added TM(19,129) format.
		§ 6.16.23	TC(19,160) format changed as for TC(19,1).
		§ 6.17.3.1	Added cases N1 = 0 and N2 = 0 of TC(132,1) as per ESOC-S132-143.
		§ 6.17.3.2	Added cases N1 = 0 and N2 = 0 of TC(132,2) as per ESOC-S132-143.
		§ 6.17.3.6	Deleted “Number of Telecommands” field from TC(132,6).
		§ 6.17.3.7	Deleted “Number of Telecommands” field from TC(132,144).
		§ 6.17.3.13	Corrected TM(132,19) adding the missing repetition loops.
		§ 6.17.5.1	TC(134,1) format changed deleting padding byte. P size increased to 1 word.
		§ 8.1.1	Assigned GPS and SES PID
		§ 8.4	Updated allocation of Types 5, 6 and 8 subtypes to GPS (as per Sentinels commonality agreements) and Type 8 subtypes to C-SAR (C-SAR uses mission specific Type for function management).
		§ 8.5	Report ID (RID) category assignment modified.

Issue	Date	Sections affected	Reason for change
		§ 8.6	Added Structure Identification (SID) parameter structure in order to achieve unique SID definitions. Same structure adopted as for RID.
04	**16.04.10**		All modifications with respect to issue 3 are shown with revision marks. Changes linked to ESOC dispositions agreed at OPS meetings and documented in "S1 PUS – ESOC Comments" Excel spreadsheet S1-TN-ESC-FS-6000 are referred to as ESOC-xxx-yyy where xxx refers to the comment category (e.g. GEN, S12, S18) and yyy is the comment number.
		§ 2.3	Added reference documents [RD.02] to [RD.09].
		§ 3.1	Specified S-1A & S-1B SC ID as per ESOC-GEN-6 and ESOC-GEN-162
		§ 3.2	Updated MAP assignments, added clarification notes and AU tail definition. Added clarification note on TC segmentation in Sequence Flag description as per ESOC-TC SEG-163. Added clarification statement on max size TC Segment Data field and AU Tail presence as per ESOC-TC SEG-165 Added AU function summary description with reference to [RD.08] and AU Tail structure and fields description as per ESOC-TC SEG-166
		§ 3.3	Updated CPDU description to reflect SMU TMTCMM module design. Added clarification on CPDU timer time-out period as per ESOC-CPDU TC-167
		§ 3.4	Added clarification note to TC packet PEC field description. Added info on DHF flag as per ESOC-DFH_FLAG-237
		§ 3.5	TC(11,4) Sub-schedule ID size increased from 8-bits to 11-bits as per ESOC request. N° of TC Packets size reduced to 5 bits.
		§ 3.6	Similarly, TC(132,4) Sub-schedule ID size increased from 8-bits to 11-bits as per ESOC request. N° of TC Packets size reduced to 5 bits.
		§ 4.1	Corrected Packet Store to VC mapping as per ESOC comment ESOC-TM FRAME-183 Specified S-1A & S-1B SC ID. Part of ESOC-TM FRAME-182
		§ 4.3	Added clarification note to TC packet PEC field description. Corrected Grouping Flag which is set to 11 to indicate self-contained TM packets as per ESOC-TM PACKET-185 Added clarification notes on Packet Length and minimum size as per ESOC-TM PACKET-186
		§ 4.4	Source Sequence Count value changed from 3FFF to 0000 as per ESOC comment ESOC-IDLE-246

Issue	Date	Sections affected	Reason for change
		§ 4.5	Added info of Time Pkt generation rate which is fixed for the mission. Corrected Time TM Pkt Length value as per ESOC-TIME-248.
		§ 4.6	Updated HPTM format. Part of ESOC-GEN-63.
		§ 5.1	Added TC(1,160) to reflect ICM design. Added LCT Service 1 subtypes.
		§ 5.2	Deleted TC(2,145), TM(2,146), TC(2,148) and TM(2,149) as replaced by remote RT specific low level commands
		§ 5.3	Set TC(3,1) and TC(3,3) also applicable to SM ASW making Service 3 identical to both NM ASW and SM ASW. Set TC(3,2) TC(3,4) TC(3,7) TC(3,8) TC(3,9) TM(3,10) TC(3,11) TM(3,12) TM(3,26) TC(3,129) TC(3,130 TM(3,131) TC(3,132) TM(3,133) not applicable to DSHA Added TC(3,160) and TC(3,161) to reflect ICM and TCU design. Added TM(3,144) and TM(3,145) for AVS which could require multiple packet report. Added LCT Service 3 subtypes.
		§ 5.4	TC(4,3) set not applicable to ICM where statistics are reset with TC(4,1). TC(4,6) and TM(4,9) set not applicable to ICM as replaced with TC(4,161) and TM(4,162) respectively. Added TC(4,160) required by ICM. Added TC(4,161) and TM(4,162) replacing TC(4,6) and TM(4,9) respectively.
		§ 5.5	Added TC(5,160) required by ICM. Added LCT Service 5 subtypes.
		§ 5.6	Added TC(6,161) and TC(6,162) to reflect TCU design. Added LCT Service 6 subtypes.
		§ 5.7	Added TC(8,217) to TC(8,222) to reflect TCU design. Added TC(8,225) to TC(8,232) applicable to DSHA Added LCT Service 8 TC(8,240) to TM(8,245).
		§ 5.8	Added LCT Service 9 subtypes.
		§ 5.10	Set TC(12,7) not applicable to ICM as replaced by TC(12,163) Set TC(12,160) applicable to TCU Added TC(12,225) TC(12,227) TM(12,229) applicable to DSHA. TC(12,225) replaces TC(12,5). TC(12,7) and TC(12,9) no longer applicable to DSHA. Added TC(12,163) applicable to ICM
		§ 5.13	Added TC(15,149) applicable to NM ASW and SM ASW Added TC(15,229), TC(15,230), TC(15,231) , TC(15,232), TC(15,233) and TC(15,234) applicable to DSHA. Set TC(15,128) and TC(15,129) not applicable to DSHA..

Issue	Date	Sections affected	Reason for change
		§ 5.14	Added LCT Service 17
		§ 5.15	Set all Service 18 not applicable to DSHA. ESOC-S18-45 no longer applicable. Set TC(18,8) not applicable to ASW as replaced with TC(18,145) Set TC(18,8) not applicable to ICM as replaced with TC(18,162) Added TM(18,163) applicable to ICM. Added TC(18,145), TC(18,146), TC(18,147), TC(18,148), TC(18,149) and TC(18,151) applicable to ASW. Set TC(18,10) and TM(18,11) not applicable to ICM as combined service provided by TC(18,162) and TM(18,163) Added note on add, modify and delete OBOP as per ESOC-S18-132
		§ 5.16	Set Service 19 not applicable to DSHA.
		§ 5.17.1	Added ASW Service 130 Command DB Management list of subtypes
		§ 5.17.6	Added ASW Service 135 S/C Management list of subtypes
		§ 5.17.7	Added ASW Service 136 SM AOCS Management list of subtypes
		§ 5.17.8	Added ASW Service 137 NM AOCS Management list of subtypes
		§ 5.17.9	Added ASW Service 160 RM Oscillator list of subtypes
		§ 5.17.10	Added ASW Service 161 Common Resources list of subtypes
		§ 5.17.11	Added ASW Service 162 EPS-TCS Management list of subtypes
		§ 5.17.12	Added ASW Service 163 Payload Management list of subtypes
		§ 5.18.1	Added Service 152 SES Function Management with list of subtypes
		§ 5.19.1	Added Service 176 PDHT Mode Transitions list of subtypes
		§ 5.19.2	Added Service 177 PDHT Configuration list of subtypes
		§ 5.19.3	Added Service 178 PDHT Function Management list of subtype services
		§ 5.20.1	Added GPSR Service 210 Mode Service subtype
		§ 5.20.2	Added GPSR Service 211 Parameter Service subtypes
		§ 5.20.3	Added GPSR Service 212 Science Data Service subtype
		§ 5.20.4	Added GPSR Service 213 Periodical Memory Service subtypes
		§ 5.21.1	Added LCT Service 248 Parameter Management list of subtypes
		§ 5.21.2	Added LCT Service 249 Unit Mode Transitions list of subtypes
		§ 5.21.3	Added LCT Service 250 Standby Mode list of subtypes

Issue	Date	Sections affected	Reason for change
		§ 5.21.4	Added LCT Service 251 Acquisition and Communications Mode list of subtypes
		§ 5.21.5	Added LCT Service 252 Table Management list of subtypes
		§ 5.21.6	Added LCT Service 253 Commanded Functional Test Mode list of subtypes
		§ 5.21.7	Added LCT Service 255 Launch Lock Release Mode list of subtypes
		§ 6	Added a note in each of the TM report which could be composed of multiple TM packets to state that each TM packet must be self consistent as per ESOC-GEN-68.
		§ 6.1.11	Added TC(1,160) section, description and format for ICM.
		§ 6.2	Deleted TC(2,145), TM(2,146), TC(2,148) and TM(2,149) formats as replaced by ASW specific low level commands for each 1553B RT
		§ 6.3.21	Added TM(3,144)
		§ 6.3.22	Added TM(3,145)
		§ 6.3.23	Added TC(3,160) section, description and format for ICM.
		§ 6.3.24	Added TC(3,161) section, description and format for ICM.
		§ 6.4.14	Added TC(4,160) section, description and format for ICM.
		§ 6.4.15	Added TC(4,161) section, description and format for ICM.
		§ 6.4.16	Added TM(4,162) section, description and format for ICM.
		§ 6.5.9	Added TC(5,160) section, description and format for ICM.
		§ 6.5.10	Added TC(5,210) section and description for GPSR
		§ 6.5.11	Added TC(5,211) section and description for GPSR
		§ 6.5.12	Added TC(5,212) section and description for GPSR
		§ 6.5.13	Added TC(5,213) section and description for GPSR
		§ 6.6.5	Added TCU specific TM(6,6) format showing variation wrt other packet terminal TM(6,6) format.
		§ 6.6.16	TC(6,161) set applicability to TCU.
		§ 6.6.17	TC(6,162) set applicability to TCU.
		§ 6.7.1	Added TC(8,217) section, description and format for TCU.
		§ 6.7.2	Added TC(8,218) section, description and format for TCU.
		§ 6.7.3	Added TC(8,219) section, description and format for TCU.
		§ 6.7.4	Added TC(8,220) section, description and format for TCU.
		§ 6.7.5	Added TC(8,221) section, description and format for TCU.
		§ 6.7.6	Added TC(8,222) section, description and format for TCU.

Issue	Date	Sections affected	Reason for change
		§ 6.7.7	Added TC(8,225) section, description and format for DSHA.
		§ 6.7.8	Added TC(8,226) section, description and format for DSHA.
		§ 6.7.9	Added TC(8,227) section, and description for DSHA.
		§ 6.7.10	Added TC(8,228) section, description and format for DSHA.
		§ 6.7.11	Added TC(8,229) section, description and format for DSHA.
		§ 6.7.12	Added TC(8,230) section and description for DSHA.
		§ 6.7.13	Added TC(8,231) section, description and format for DSHA.
		§ 6.7.14	Added TC(8,232) section and description for DSHA.
		§ 6.8.10	Added Figure 6.8.10-2 to define Time formats in TM(9,160) as per ESOC-S9-104
		§ 6.9.1	Changed Sub-Schedule ID size and APID replaced with PID in TC(11,1)
		§ 6.9.2	Changed Sub-Schedule ID size and APID replaced with PID in TC(11,2)
		§ 6.9.5	Replaced APID with PID in TC(11,5)
		§ 6.9.6	Changed Sub-Schedule size in TC(11,6)
		§ 6.9.7	Replaced APID with PID in TC(11,144)
		§ 6.9.8	Replaced APID with PID in TC(11,7)
		§ 6.9.9	Changed Sub-Schedule size in TC(11,8)
		§ 6.9.10	Replaced APID with PID in TC(11,145)
		§ 6.9.11	Changed Sub-Schedule size in TM(11,10)
		§ 6.9.12	Changed Sub-Schedule size in TM(11,13)
		§ 6.9.14	Replaced APID with PID in TC(11,16)
		§ 6.9.17	Changed Sub-Schedule ID size and APID replaced with PID in TM(11,19)
		§ 6.10.7	Set TC(12,9) applicable to TCU
		§ 6.10.10	Modified TC(12,144) format
		§ 6.10.19	Added TM(12,153) description and format
		§ 6.10.21	Added TM(12,155) description and format
		§ 6.10.22	Set TC(12,160) applicable to TCU
		§ 6.10.24	Modified TC(12,162) format
		§ 6.10.25	Added TC(12,163) section, description and format for ICM.
		§ 6.12.1	Replaced APID with PID in TC(14,1)
		§ 6.12.2	Replaced APID with PID in TC(14,2)
		§ 6.12.4	Replaced APID with PID in TM(14,4)
		§ 6.13.3	Replaced APID with PID in TC(15,3)
		§ 6.13.4	Replaced APID with PID in TC(15,4)
		§ 6.13.6	Replaced APID with PID in TM(15,6)
		§ 6.13.16	Added TC(15,149) description and format.
		§ 6.13.17	Added TM(15,224) description and format for DSHA as per ESOC-S15-44
		§ 6.13.18	Added TC(15,225) description and format for DSHA as per ESOC-S15-44

Issue	Date	Sections affected	Reason for change
		§ 6.13.19	Added TC(15,226) description and format for DSHA as per ESOC-S15-44
		§ 6.13.20	Added TC(15,227) description and format for DSHA as per ESOC-S15-44
		§ 6.13.21	Added TC(15,228) description and format for DSHA as per ESOC-S15-44
		§ 6.13.22	Added TC(15,229) description and format for DSHA
		§ 6.13.23	Added TC(15,230) description and format for DSHA
		§ 6.13.24	Added TC(15,231) description and format for DSHA
		§ 6.13.25	Added TC(15,232) description and format for DSHA
		§ 6.13.26	Added TC(15,233) description and format for DSHA
		§ 6.13.27	Added TC(15,234) description and format for DSHA
		§ 6.15.1	Updated TC(18,144) format
		§ 6.15.2	Updated TC(18,160) format
		§ 6.15.6	Updated TC(18,162) subtype
		§ 6.15.7	Added TC(18,145) description and format
		§ 6.15.8	Updated TM(18,146) subtype
		§ 6.15.9	Added TM(18,163) description and format for ICM.
		§ 6.15.11	Added TC(18,149)
		§ 6.15.13	Added TC(18,151)
		§ 6.15.14	Added TC(18,147) description and format for ASW
		§ 6.15.15	Added TC(18,148) description and format for ASW
		§ 6.15.16	Added TM(18,164) description and format for ICM
		§ 6.16.8	Modified TM(19,129) to add missing 'Last Packet' and Report Integrity Counter' fields. Also added 'Length' field
		§ 6.16.9	Added TC(19,144) description and format as per ESOC-S19-46
		§ 6.16.10	Added TC(19,145) format as per ESOC-S19-46
		§ 6.16.11	Added TC(19,146) format as per ESOC-S19-46
		§ 6.16.12	Added TC(19,147) format as per ESOC-S19-46
		§ 6.16.14	Added TM(19,149) format as per ESOC-S19-46
		§ 6.16.15	Added TC(19,150) format as per ESOC-S19-46
		§ 6.16.16	Added TM(19,151) format as per ESOC-S19-46
		§ 6.16.17	Added TC(19,152) format as per ESOC-S19-46
		§ 6.16.18	Added TM(19,153) format as per ESOC-S19-46
		§ 6.16.19	Added TC(19,154) format
		§ 6.16.20	Added TM(19,155) format
		§ 6.16.21	Added TC(19,156) format
		§ 6.16.22	Added TC(19,157) format
		§ 6.17.1.1 to 6.17.1.10	Added for ASW specific Service 130 subtypes description and formats
		§ 6.17.3.1	Changed Sub-Schedule ID size and APID replaced with PID in TC(132,1)
		§ 6.17.3.2	Changed Sub-Schedule ID size and APID replaced with PID in TC(132,2)
		§ 6.17.3.5	Replaced PID with PID in TC(132,5)
		§ 6.17.3.6	Changed Sub-Schedule ID size in TC(132,6)
		§ 6.17.3.7	Replaced PID with PID in TC(132,144)
		§ 6.17.3.8	Changed Sub-Schedule ID size in TM(132,10)

Issue	Date	Sections affected	Reason for change
		§ 6.17.3.9	Changed Sub-Schedule ID size in TM(132,13)
		§ 6.17.3.10	Replaced PID with PID in TC(132,16)
		§ 6.17.3.13	Changed Sub-Schedule ID size and APID replaced with PID in TM(132,19)
		§ 6.17.4.3	Modified TM(133,3) format.
		§ 6.18.1	Section added for GPSR specific Service 210: Mode Service
		§ 6.18.1.1	Added Service 210 sub-type description. The formats and parameter details are specified in [RD.04].
		§ 6.18.2	Section added for GPSR specific Service 211: Parameter Service
		§ 6.18.2.1 to 6.18.2.3	Added Service 211 sub-types description. The formats and parameter details are specified in [RD.04].
		§ 6.18.3	Section added for GPSR specific Service 212: Science Data Service
		§ 6.18.3.1	Added Service 212 sub-type description. The formats and parameter details are specified in [RD.05].
		§ 6.18.4	Section added for GPSR specific Service 213: Periodic Memory Service
		§ 6.18.4.1 to 6.18.4.3	Added Service 213 sub-types description. The formats and parameter details are specified in [RD.04].
		§ 6.19.1	Section added for C-SAR specific Service 152: SES Function Management
		§ 6.19.1.1 to 6.19.1.67	Added all Service 152 specific sub-types 160 to 226 description. The formats and parameter details are specified in [RD.02].
		§ 6.20.1	Section added for PDHT specific Service 176: PDHT Mode Transitions
		§ 6.20.1.1 to 6.20.1.5	Added Service 176 sub-types description. The formats and parameter details are specified in [RD.06].
		§ 6.20.2	Section added for PDHT specific Service 177: PDHT Configuration
		§ 6.20.2.1 to 6.20.2.4	Added Service 177 sub-types description. The formats and parameter details are specified in [RD.06].
		§ 6.20.3	Section added for PDHT specific Service 178 PDHT Function Management
		§ 6.20.3.1 to 6.20.3.7	Added Service 178 sub-types description. The formats and parameter details are specified in [RD.06].
		§ 8.1.1	Assigned different APID for SMU TM-1 HPTM and SMU TM-2 HPTM. Assigned PID to ASW applications for both NM and SM Assigned PID to LCT
		§ 8.3.2	Added AVS Parameter # structure definition
		§ 8.3.3	Added C-SAR SES Parameter # structure definition
		§ 8.3.4	Added C-SAR SAS Parameter # structure definition
		§ 8.4	Assigned mission specific service type/subtype ranges to LCT Assigned additional mission specific service type ranges to ASW.
		§ 8.5	Updated RID range assignments

Issue	Date	Sections affected	Reason for change
		§ 8.6	Updated SID range assignments
		§ 9	Added Service Parameter Definition section. Parameter type column included in each Service Type table defining the parameters as per ESOC-GEN-158
05	**22.10.10**		All modifications with respect to issue 4 are shown with revision marks.
		§ 1.2.3	Added new section on TM & TC Packet Layout Convention as per SYS CDR AI S1-CDR-OP128-091.
		§ 3.3	RM CPDU and RM SGM TC packet formats added as per ESOC-TC PKT-171.
		§ 3.5-6	Corrected the note on the deletion of expired TT-TC / PT-TC when the expired TT-TC is disabled. ESOC-S11-175 and ESOC-S132-179 query.
		§ 3.8	Added a clarification note on embedded TC with respect to PEC and SSC.
		§ 4.3	Added note on the use of the Error Flag as per ESOC-EF Flag-244.
		§ 5.4	Added “AVS” to title of TM(4,146) & added “SES” to title of TM(4,146), TM(4,161) and TM(4,162). Also updated corresponding § 6 as per ESOC-S4-210.
		§ 5.5	Deleted TC(5,240) and TM(5,241) as LCT now implements TC(5,129) and TM(5,130) as per ESOC-S5-195
		§ 5.7	Added “LCT” or “TCU” to service 8 subservices titles as applicable, as proposed by ESOC-S8-216. Also modified the same subservice titles in § 6.7.
		§ 5.18.1	TC(152,215) “Reset ICM” is also set applicable to ICM Boot.
		§ 6	Corrected Figure 6-2.
		§ 6.1.9-10	Clarified the meaning of “hard-coded TC” in TC(1,128) and TC(1,129) as per ESOC-S1-205.
		§ 6.4.16	Deleted Last Packet and Report Integrity Counter fields from SES TM(4,162) as only a single packet report is applicable. This is reflected in Issue 11 of the SES TM/TC Definitions Document.
		§ 6.5.10-13	Added “GPSR” to TC(5,210), TC(5,211), TC(5,212) and TM(5,213) as per ESOC-S5-212.
		§ 6.6.2	Added ICM Boot restriction on TC(6,2) to state that only the load of one contiguous area of memory is supported.
		§ 6.6.4	Added ICM Boot restriction on TC(6,5) to state that only the dump of a single contiguous memory area is supported.
		§ 6.6.5	Updated description of TCU deviations on TM(6,6).
		§ 6.6.8	Corrected TM(6,144) description as per ESOC-S6-284.
		§ 6.6.19	Clarified that TC(6,212) is also used to write in EEPROM as per ESOC-S6-280.
		§ 6.6.26	Added TC(6,241) format
		§ 6.6.27	Added TC(6,242) format
		§ 6.6.28	Added TC(6,243) format

Issue	Date	Sections affected	Reason for change
		§ 6.10.5	Deleted the statement “size depends on Parameter #” in TC(12,7) as not applicable.
		§ 6.10.9	Deleted the statement “size depends on Parameter #” in TM(12,11) as not applicable.
		§ 6.10.25	Deleted the statement “size depends on Parameter #” in TC(12,163) as not applicable.
		§ 6.13.4	TC(15,4) renamed “Remove Packets from Storage Definition” as per ESOC-S15-220.
		§ 6.15.9	Removed “Last packet”, “Report Integrity Counter” and “NPROC” in TM(18,163) as SES always lists the status of the 32 possible OBOPs, so TM(18,163) is a fixed structure with 32 data sets and there is no need for multiple packets. This is reflected in Issue 10 (or later) of the SES TM/TC Definitions Document
		§ 6.15.11	Added clarification note to TC(18, 149) description on the Gound capability to use TC(18, 149) as per SYS CDR AI S1-CDR-OP73-127.
		§ 6.15.12	Added TM(18,150) format. As per ESOC-S18-222.
		§ 6.17.3	Added the meaning of setting subschedule ID to 0 (i.e. means all SSID) to TC(132,1), TC(132,2) and TC(132,6) as per ESOC-S132-226.
		§ 6.19.1.5	Added TC(152,164) Perform Measurement format when sent by Ground as a position-tag TC through AVS TC(132,4) as per SYS CDR AI S1-CDR-OP111-018.
		§ 6.19.1.43	Updated TC(152,204).
		§ 8.1.2	Updated Table 8.1.2-2 to add two new TM packet categories used by the GPSR to enable the GPSR SW to deliver the TM packets based on priority and at the same time respect the Source Sequence Count order of delivery. An agreement between the Sentinels to resolve a GPSR SW CDR major discrepancy.
		§ 8.5	Changed RID assignment to GPSR as GPSR SW has used the range 5000 to 5999 decimal. Hence allocated GPSR the range 1300 to 17FF hex and the ASW the ranges 1000 to 12FF hex and 1800 to 1FFF hex.
		§ 8.6	Added a note to GPSR SID range assignment to indicate how to map the [RD.04] reported values to the S-1 SID value as per SYS CDR AI S1-CDR-OP117-088.
		§ 9.10	Modified description of “Mode” parameter of TC(12,148) and TC(12,149) as per ESOC-S12-277.
		§ 9.14	Service 19 parameters description updated to provide a clearer description of some parameters as per SYS CDR AI S1-CDR-OP77-131.
		§ 9.9	Added the meaning of SSID=0 (i.e. all SSID) to Subschedule ID definition for TC(11,1), TC(11,2) and TC(11,6) as per ESOC-S11-218.
06	**30.03.11**		All modifications with respect to issue 5 are shown with revision marks.

Issue	Date	Sections affected	Reason for change
		§ 3.6	Added definition of “Orbit Number” and “Orbit Angle” as per ESOC-TC POS-240.
		§ 5.17.9	Added TC(160,11)
		§ 5.17.10	Added TC(161,14) TC(161,15) TC(161,81) TC(161,101) to TC(161,112)
		§ 5.17.12	Changed and added subtypes for the management of PDHT (i.e. TC(163,1) to TC(163,16)). Changed and added subtypes for the management of C-SAR (i.e. TC(163,21) to TC(163,36)). Added TC(163,41) to TM(163,56) for LCT management.
		§ 5.21.1	LCT service type number change from 248 to 240
		§ 5.21.2	LCT service type number change from 249 to 241
		§ 5.21.3	LCT service type number change from 250 to 242
		§ 5.21.4	LCT service type number change from 252 to 244
		§ 5.21.5	LCT service type number change from 253 to 245
		§ 5.21.6	LCT service type number change from 254 to 246
		§ 5.21.7	LCT service type number change from 255 to 247
		§ 6.2.1	Added clarification note to TC(2,144) format on the two different CPDU commands. Response to ESOC-s2-289.
		§ 6.3.2	Added clarification note to TC(3,2) on Collection Interval, NREP and NPAR2 constraints imposed by ASW and ICM. Response to ESOC-s3-263.
		§ 6.3.10	Added a generic note applicable to all multiple TM packet reports
		§ 6.3.25	Added TC(3,240) format. Part of ESOC-s3-288.
		§ 6.3.26	Added TC(3,241) format. Part of ESOC-s3-288
		§ 6.6.3	Corrected TC(6,3) format where “Base ID” was erroneously shown not part of the block R1 repeated “N” times.
		§ 6.6.13	TC(6,149) format changes to align to implementation. Part of ESOC-s6-265
		§ 6.6.14	TC(6,150) format changes to align to implementation. Part of ESOC-s6-265
		§ 6.6.15	TM(6,151) format changes to align to implementation. Part of ESOC-s6-265
		§ 6.6.26	Added TC(6,240) format as per ESOC-s6-285.
		§ 6.7.1	LCT TC(8,1) description added and format aligned to that specified in SEN1-TESAT-LCT-SPE-15230. Part of ESOC-s8-286.
		§ 6.7.8	Added LCT TC(8,240) format. Part of ESOC-s8-286.
		§ 6.7.9	Added LCT TC(8,241) format. Part of ESOC-s8-286.
		§ 6.7.10	Added LCT TC(8,242) format. Part of ESOC-s8-286.
		§ 6.7.11	Added LCT TC(8,243) format. Part of ESOC-s8-286.
		§ 6.7.12	Added LCT TC(8,244) format. Part of ESOC-s8-286.
		§ 6.7.13	Added LCT TC(8,245) format. Part of ESOC-s8-286.

Issue	Date	Sections affected	Reason for change
		§ 6.8.8	Added LCT TC(9,149) format
		§ 6.9.2	Clarified TC(11,2) format for case N1>0 and N2>0
		§ 6.9.6	Clarified TC(11,6) format for case N1>0
		§ 6.9.7	Clarified TC(11,144) format for case N1>0
		§ 6.9.13	Added Time Offset format of TC(11,15) as per ESOC-s11-258.
		§ 6.10.9	Clarified TM(12,11) format for case N_12_11 = 0.
		§ 6.10.19	Added clarification note to TM(12,153) on OOL value reporting. Response to ESOC-s12-256.
		§ 6.10.25	TC(12,163) format corrected as per SES TMTC ICD - [RD.02] definition
		§ 6.10.21	Added clarification note to TM(12,155) on MDS status being reported in ASW HK periodic TM. Response to ESOC-s12-257.
		§ 6.15.16	Deleted NSTEPS = 0 of TM(18,164) as it is not valid.
		§ 6.16.5	Added case N = 0 for TM(19,7) format.
		§ 6.16.10	Corrected “First RID” to “First Event” in TC(19,146) as per ESOC-s19-278.
		§ 6.21	LCT service type numbers changed as per § 6.7.8 to § 6.7.13
		§ 6.21.6	Deleted LCT TC(246,1), TC(246,2), TC(246,3) and TC(246,9) which were required to update target trajectory parameters. Added LCT TC(246,12) as single command to update target trajectory parameters.
		§ 8.1.1	Added DSHA SW PID and LCT SW PID values.
		§ 8.3.1	Changed AVS Parameter Number range. Added LCT Parameter Number range.
		§ 8.3.2	Aligned ASW Parameter Number assignments to the ASW design.
		§ 8.3.5	Added LCT Parameter Number structure.
		§ 8.7	New section specifying dedicated SID to be associated to non-real time HK (i.e. PCAT = 8) as per ESOC-GEN-301.
		§ 9.3	Updated and added missing service 3 parameter descriptions. Covers part of ESOC-GEN-383.
		§ 9.6	Added missing service 6 parameter descriptions and Memory ID types tagged as E. As per ESOC-s6-264. Also covers part of ESOC-s6-265, ESOC-s6-386 and ESOC-GEN-383.
		§ 9.8	Added missing service 9 parameter description. The resolution of the PDHT time report added as per ESOC-s9-17.
		§ 9.9	Added some detail description of E and AT type parameters. Covers part of ESOC-s6-265

Issue	Date	Sections affected	Reason for change
		§ 9.10	Updated definition of “Parameter Value” and “Limit Crossed” of TM(12,11) to cover the case when size is less than 32-bit as per ESOC-s12-255. Added “remark” to Low Threshold and High Threshold on how to achieve Expected Value as per ESOC-s12-276.
		§ 9.12	Updated some detail information on some AT type parameters. Covers part of ESOC-s6-265
		§ 9.13	Added a clarification note to the OBOP ID description on the different use and assignment of OBOP ID between ICM and ASW. Response to ESOC-s18-266.
		§ 9.15	Section added for the definition of Service 130 parameters as per ESOC-PARDEF-227.
		§ 9.16	Section added for the definition of Service 131 parameters as per ESOC-PARDEF-227.
		§ 9.17	Section added for the definition of Service 132 parameters as per ESOC-PARDEF-227. Also covers part of ESOC-s6-265
		§ 9.18	Section added for the definition of Service 133 parameters as per ESOC-PARDEF-227.
		§ 9.19	Section added for the definition of Service 134 parameters as per ESOC-PARDEF-227.
07	**05.04.12**		All modifications with respect to issue 6 are shown with revision marks.
		§ 1.3	Added the definitions of commonly used terms as per ESOC-GEN-392.
		§ 2.3	Added [RD.10] ASW Specific Services Description as per ESOC-s137-382
		§ 3.2	Added description of MAP 4 and MAP 5 TC Decoder control commands. Covers ESOC-GEN-401.
		§ 3.3	Corrected HPC ID parameter range as per ESOC-HPC_ID-329. Corrected max RM Memory Load TC packet length as per ESOC-RM_ML_TC-330.
		§ 3.4	Added note to state that when PEC Flag = 0 no CRC check is performed. This is applicable to on-board stored TC. Covers ESOC-TC PEC-331. Corrected list of TC packets having no DFH by removing AU TC packets from the list as per ESOC-GEN-393. Added generic TC Packet format for AU control commands as per ESOC-TC PKT-171.
		§ 4.3	Added a clarification note on the setting of the “Destination ID” field. Covers ESOC-TM_PACKET-332. Corrected reference to Figure 4.3-2 as per ESOC-GEN-394.
		§ 3.9	New section to report the TC formats of the special AVS services for SAR Measurement and image store / pass through as part of ESA CR-13 implementation. The TC are TC(163,71), TC(163,72) and TC(163,73).

Issue	Date	Sections affected	Reason for change
		§ 5.5	Added TM(5,145) and TM(5,146) event reports generated by both NM and SM ASW. Added TC(5,240) and TM(5,241) applicable to LCT whereas TC(5,129) and TM(5,130) are no longer applicable as per ESOC S1 OCP I/F CDR RID IAN-S-0143 disposition.
		§ 5.13	Updated description of SMU Packet Stores A, B, C and D. Covers ESOC-GEN-378. Added set of service 15 subtypes for the initialisation and configuration of the SMU Mass Memory applicable to both NM and SM ASW with were originally part of service 161. The subtypes added are from TC(15,150) to TM(15,162).
		§ 5.15	Added note to state that TC(18,149) and TC(18,151) can only be part of an ASW OBOP. Covers ESOC-GEN-328.
		§ 5.16	Added missing TC(19,158) applicable to NM & SM ASW. Covers ESOC-s19-377.
		§ 5.17.1	Added TC(130,11) and TM(130,12) to request and report the enable/disable status of TC of the OBCD. Part of ESA CR-13 implementation.
		§ 5.17.2	Deleted Service 131 Orbit Management Service. Refer to § 6.17.2 for description on how Obit Number is set by Ground.
		§ 5.17.7	Added TC(136,10) and TC(136,11) applicable to SM ASW. Corrected TM(136,12) subtype. Deleted from (136,51) to (136,61) of SM AOCN SMSS management. Deleted TC(136,78) and TC(136,79) of SMRCT management. Deleted TC(136,105), TC(136,108) and TC(136,110) of SM AOCN Diagnostic. Deleted TM(136,25) of SM AOCN Dynamic DB management.
		§ 5.17.8	Added to NM AOCS Management Services TC(137,7), TC(137,8), TC(137,9) and TC(137,23). Covers ESOC-s137-380. Modified the name of TC(137,31), TC(137,32) and TM(137,33).
		§ 5.17.9	Set TC(160,5) also applicable to SM ASW.
		§ 5.17.11	Added TC(162,78) applicable to both NM and SM ASW. Changed from TC(162,91) to TM(162,112) only applicable to SM ASW. Added the equivalent set of services from TC(162,121) to TM(162,142) only applicable to NM ASW.

Issue	Date	Sections affected	Reason for change
		§ 5.17.12	Added TC(163,71), TC(163,72) and TC(163,73) as AVS special services for SAR Measurement commanding with Data Store or Data Pass Through specifying Image Start Position instead of Measurement Start Time. Part of ESA CR-13 implementation. Added TC(163,100), TC(163,101) TC(163,102) and TM(163,103) applicable only to SM ASW.
		§ 5.22	Added section to report list of AU control commands as per ESOC-TC PKT-171.
		§ 6.2	Deleted note referring to On/Off commands through 1553B Bus as requested by ESOC-s2-337.
		§ 6.2.1	Added clarification note requested by ESOC-s2-336 on TC(2,144).
		§ 6.3.18	Added note to state that LCT TM(3,131) does not support “Collection Offset” and has “Spare” instead.
		§ 6.3.20	Added note to state that LCT TM(3,133) does not support “Collection Offset” and has “Spare” instead
		§ 6.4.9	Added “Sampling Interval” parameter to TM(4,9).
		§ 6.5.10	Changed “NRID” to “Number of Event ID” in TC(5,210) as per ESOC-s5-213.
		§ 6.5.14	Added TM(5,145) description and format.
		§ 6.5.15	Added TM(5,146) description and format.
		§ 6.5.16	Added TC(5,240) description and format.
		§ 6.5.17	Added TM(5,241) description and format.
		§ 6.6.28	Format of “Memory Page ID” in TC(6,242) changed from 1 word to 1 byte to align to LCT design.
		§ 6.6.29	Added note to state that the response to TC(6,243) is TM(6,6). Covers ESOC-s6-396.
		§ 6.9.1	Added clarification note to TC(11,1) description for cases N1=0 and N2=0. Covers ESOC-s11-351. Same note added to TC(11,2)
		§ 6.9.2	Same note as TC(11,1) added to TC(11,2).
		§ 6.9.5	Corrected in service 11 the incorrect reference to APID instead of PID (i.e. APID changed to PID) as per ESOC-s11-397. Corrected description of TC(11,5) as per implementation and OIRD requirement, that is the deletion is according to the PID Sequence Count order and not to the execution time order.
		§ 6.9.7	As per § 6.9.5, changed APID to PID in TC(11,144) title as per ESOC-s11-397.
		§ 6.9.8	As per § 6.9.5, changed APID to PID as per ESOC-s11-397.
		§ 6.9.10	As per § 6.9.5, changed APID to PID in TC(11,145) and text as per ESOC-s11-397.
		§ 6.10.10	TC(12,144) “HK Filter” size changed from 1 byte to 3 bytes.
		§ 6.10.11	Changed format of word 8 of TC(12,145)
		§ 6.10.14	Corrected word 6 format of TC(12,148)

Issue	Date	Sections affected	Reason for change
		§ 6.10.15	Corrected word 6 format of TC(12,149)
		§ 6.10.21	TM(12,155) “HK Filter” size changed from 1 byte to 3 bytes.
		§ 6.10.25	Re-named parameters to “ICM Check Position” and “ICM Check Selection”. Part of ESOC-s12-358.
		§ 6.12.4	Corrected description of case when N2 = 0 in TM(14,4).
		§ 6.12.7	Corrected TM(14,146) as the response to TC(14,7) as per ESOC-s14-390.
		§ 6.12.11	Corrected TM(14,149) as the response to TC(14,11) as per ESOC-s14-391
		§ 6.13.12	Changed format of TC(15,144) to align to design.
		§ 6.13.17	Added TC(15,150) description and format
		§ 6.13.18	Added TC(15,151) description and format
		§ 6.13.19	Added TC(15,152) description and format
		§ 6.13.20	Added TC(15,153) description and format
		§ 6.13.21	Added TC(15,154) description and format
		§ 6.13.22	Added TC(15,155) description and format
		§ 6.13.23	Added TC(15,156) description and format
		§ 6.13.24	Added TC(15,157) description and format
		§ 6.13.25	Added TC(15,158) description and format
		§ 6.13.26	Added TC(15,159) description and format
		§ 6.13.27	Added TM(15,160) description and format
		§ 6.13.28	Added TM(15,161) description and format
		§ 6.13.29	Added TM(15,162) description and format
		§ 6.13.32	Updated TC(15,227) format and re-named parameters. Part of ESOC-s15-365.
		§ 6.13.34	Modified TC(15,229) format as part of ESA CR-13 and re-named parameters. Part of ESOC-s15-365.
		§ 6.13.37	TC(15,232) description modified to state that it aborts one operation at a time. Covers ESOC-s15-367.
		§ 6.13.38	Changed TC(15,233) ‘Sector Shift’ parameter size from 2 words to 1 word.
		§ 6.15.1	Corrected description of TC(18,144) as per ESOC-s18-370.
		§ 6.15.12	Corrected format error in TM(18,150). Covers part of ESOC-s18-398.
		§ 6.16.10	TC(19,146) word 10 “Spare” bit changed to Nominal/Recovery flag bit as per design.
		§ 6.16.11	Corrected parameter “First RID” to “First Event” in TC(19,147)
		§ 6.16.17	TM(19,153) word 14 “Spare” bit changed to Nominal/Recovery flag bit as per design.
		§ 6.16.22	Added missing TC(19,158) format and description. Covers ESOC-s19-377.
		§ 6.17.1.11	Added TC(130,11) description and format
		§ 6.17.1.12	Added TM(130,12) description and format

Issue	Date	Sections affected	Reason for change
		§ 6.17.2	Deleted Service 131: Orbit Management Service. Added note to state that Orbit Number is now set using TC(137,24), TC(137,25) and TC(137,27). Refer to OPS MOM
		§ 6.17.3	Added clarification note to TC(132,1) for cases N1=0 and N2=0. Covers ESOC-s132-400. Same note added to TC(132,2)
		§ 6.17.3.5	Corrected description of TC(132,5) as per implementation and OIRD requirement, that is the deletion is according to the PID Sequence Count order and not to the execution order.
		§ 6.17.3.7	Corrected erroneous reference to APID instead of PID as per ESOC-s132-399.
		§ 6.19.1.5	Updated TC(152,164) Perform Measurement description on the available AVS services for scheduling and dispatching to SES to reflect the ESA CR-13 implementation.
		§ 6.21.3	Deleted LCT TC(242,13) and TC(242,14) as not applicable to S1
		§ 6.21.7	Deleted LCT TC(247,2) as not applicable to S1
		§ 8.1.1	Added missing PID value for AU control commands. Covers ESOC-s255-381.
		§ 8.2	Added Source ID code for Ground Security in AU control commands Added Source ID codes and corresponding Destination ID codes for embedded C-SAR and PDHT TCs in AVS Service 163 P/L Management as per ESOC request (Ian Shurmer e-mail AI 1294_12 and CR13 of 21/03/12).
		§ 8.3.2 to § 8.3.5	Added granularity of Parameter # for AVS, SES, SAS and LCT as per ESOC-GEN-262.
		§ 9	Added range of values to parameters which are specific to one application. Covers ESOC-GEN-340 and ESOC-s6-386. Added/corrected info as per ESOC-GEN-383.
		§ 9.3	Improved description of “Collection Interval” and “Collection Offset”. Covers ESOC-s3-338 and ESOC-s3-339 respectively.
		§ 9.4	Improved description of “Sampling Interval” as per ESOC-s4-341. Improved description of “Statistics Table Offset” as per ESOC-s4-342. Improved description of “Data Format” as per ESOC-s4-343. Improved description of “Acquisition Slice” as per ESOC-s4-344. Added reference to time format to each Time parameter as per ESOC-GEN-352.
		§ 9.5	Added missing TC(1,160) parameters to service 1 parameter descriptions as per ESOC-s1-334.
		§ 9.5	Updated missing subtypes to service 5 parameter descriptions.

Issue	Date	Sections affected	Reason for change
		§ 9.6	Added missing parameters and Improved description of Service 6 parameters. 'Length' parameter expressed in SAU. 'Memory Page ID' values added. Covers ESOC-s6-403, ESOC-s6-345, ESOC-s6-346, ESOC-s6-347, ESOC-s6-348, ESOC-s6-349 and part of ESOC-GEN-383.
		§ 9.8	Added TM(9,241) parameter to service 9 parameter description as per ESOC-s9-350.
		§ 9.9	Added description of "N° of TC Packet Words" parameter as per ESOC-s11-353.
		§ 9.10	Added note to "Check Position" parameter description on the fact that the TCU supports only one check per parameter as per ESOC-s12-354. Added bit correspondence to "ICM Check Selection" parameter description as per ESOC-s12-355. Added note to state how expected-value check can be obtained with TC(12,144). Covers ESOC-s12-276. Added values for "Out-of-Limit Status" as per ESOC-s12-357. Added values for "Parameter Monitoring Interval" as per ESOC-s12-356.
		§ 9.11	Changed N2 to N for SID. Covers ESOC-s14-359.
		§ 9.12	Added TC(15,150) to TM(15,162) parameters to service 15 parameter descriptions. Updated TC(15,229) parameters as part of ESA CR-13. Added values for "Mode" parameter. Covers ESOC-s15-360. Corrected to "Overwrite Status" the TC(15,224) parameter. Covers ESOC-s15-362. Added unit of measure to "Max Size" and "Size" parameters. Covers ESOC-s15-363 and ESOC-s15-361. Used same name "Store ID – Pol-V" and "Store ID – Pol.H" in both TC(15,227) and TC(15,229). Also re-named parameters with two polarisations as per ESOC-s15-364 and ESOC-s15-365.
		§ 9.13	Added TM(18,150) parameters to service 18 parameter description. Covers ESOC-s18-398. Improved description as per ESOC-s18-375. 'OBOP (i) Status' parameter calibration added as per ESOC-s18-373. Improved description of TC(18,149) parameters as per ESOC-s18-374. Added missing parameters of TM(18,150) as per ESOC-s18-375.
		§ 9.14	Added TC(19,146), TM(19,147) and TM(19,153) parameters to service 19 parameter description.Added TC(19,158) parameters. Improved description of parameters. Covers ESOC-s19-387, ESOC-s19-388 and ESOC-s19-389.

Issue	Date	Sections affected	Reason for change
		§ 9.15	Added TM(130,12) parameters to service 130 parameter description
08	**09.10.12**		All modifications with respect to issue 7 are shown with revision marks.
		§ 3.4	Corrected Source ID value of AU Control TC in Figure 3.4-2 which was incorrectly reported as 0 instead of A hex as per Table 8.2-1 assignment.
		§ 4.5	Changed Time TM packet, shown in Figure 4.5-1, to report S/C OBT instead of the Frozen SMU OBT as requested by ESOC.
		§ 3.9.1	TC(163,71) format changed. Covers CCN 184 change.
		§ 3.9.2	TC(163,72) format changed. Covers CCN 184 change.
		§ 3.9.3	TC(163,73) format changed. Covers CCN 184 change.
		§ 5.6	Added LCT TC(6,244) as per [RD.09] issue E.
		§ 5.17.10	Removed applicability of TC(161,14) and TC(161,15) to SM-ASW as only applicable to NM-ASW.
		§ 5.17.11	Removed applicability of TC(162,78) to NM-ASW as only applicable to SM-ASW.
		§ 5.17.12	Removed applicability of TC(163,11), TC(163,12), TM(163,13), TC(163,31), TC(163,32) and TM(163,33) to SM-ASW as only supported by NM-ASW. While SM-ASW covers the equivalent services with TC(163,101), TC(163,102) and TM(163,103).
		§ 5.19.1	Removed applicability of TC(176,1) to DSHA application SW as only applicable to DSHA boot SW.
		§ 5.21.3	Deleted LCT TC(242,13) and TC(242,14) as no longer applicable.
		§ 5.21.5	Deleted LCT TC(245,38) and TC(245,39) as no longer applicable.
			Added LCT TC(245,44) and TC(245,45) as per [RD.09] issue E.
		§ 5.21.7	Deleted LCT TC(247,2), TC(247,3) and TM(247,5) as no longer applicable.
		§ 6.6.26	Changed size of parameter “Length of Data Block” of TC(6,240) from 1 word to 2 words as per LCT design.
		§ 6.6.30	Added description and format of LCT TC(6,244).
		§ 6.13.19	TC(15,152) format changed (added two parameters).
		§ 6.13.27	TM(15,160) format changed (added ten parameters)
		§ 6.13.28	TM(15,161) format changed (added one parameter)
		§ 6.13.29	TM(15,162) format changed (added one parameter)
		§ 6.21.5.30	Added TC(245,44) description
		§ 6.21.5.31	Added TC(245,45) description.
		§ 6.21.7	Deleted LCT TC(247,2), TC(247,3) and TM(247,5) as no longer applicable.
		§ 9.12	Updated Service 15 parameters description.
09	**22.03.13**		All modifications with respect to issue 8 are shown with revision marks.

Issue	Date	Sections affected	Reason for change
		§ 3.6	Added ASW constraint of maximum 10 TT-TC that can be embedded in a TC(11,4). That is, “N° of TC Packets” = 1 to 10 max.
		§ 3.7	Added ASW constraint of maximum 10 PT-TC that can be embedded in a TC(132,4). That is, “N° of TC Packets” = 1 to 10 max.
		§ 5.6	Added new ASW TM Data Pool service TC(6,152). Added new ASW TC(6,153), TM(6,154) and TC(6,155) for Micro-Camera System command and control.
		§ 6.6.10	Aligned ASW TC(6,146) format to design.
		§ 6.6.16	Added TC(6,152) format.
		§ 6.6.17	Added TC(6,153) format.
		§ 6.6.18	Added TM(6,154) format.
		§ 6.6.19	Added T(6,155) format.
		§ 9.6	Added TC(6,152), TC(6,153), TM(6,154) and TC(6,155) parameters descriptions

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 SCOPE

This document provides the Sentinel-1 Space Segment Specific Packet Utilization Standard services and related interfaces with the Ground Segment.

The detailed implementation of the telecommand and telemetry packets will be defined in the satellite data base

1.2 CONVENTIONS

1.2.1 Services Numbering Convention

Service class and function is provided by Service type and Service subtype, included in the data field header of the packet.

To make identification simpler, Service Type and Service Sub-Type are represented by two numbers, separated by a comma.

- For Telecommand: TC (Service Type number, Service Sub-Type number),
- For Telemetry: TM (Service Type number, Service Sub-Type number).

As an example:

- TC (1,1) is a telecommand packet type 1, subtype 1
- TM (1,2) is a telemetry packet type 1, subtype 2.

Subtype numbers within a service are unique.

1.2.2 1553B Bus Data Transfer Convention

The relationships between processor memory location (least significant word (LSW) to most significant word (MSW)) and word bit assignments (least significant bit (LSB) to most significant bit (MSB)) as they relate to word order and bit order on the S/C Data Bus is reported below.

1553B Bus Word Order:

1553B Command Word	Data Word 1	Data Word 2	•••	Data Word 32

1553B Bus Bit Order:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Sync Bits			Data Word Bits																Parity Bit

Corresponding HW Data Bit Relationships:

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	MSB															LSB	

Figure 1.2.2-1: S/C Data Bus - Data Convention

The first data word on the 1553B Bus is the lowest word in memory. That is, the LSW in Figure 1.2.2-1 will be the first data word on the bus. In the RT memory, it will be written to the lowest location (address) allocated for that data. Likewise, the MSW will be the last data word on the bus and will appear in the RT memory in the highest location (address) allocated for that data. The rest of the words on the bus and in RT memory will be in consecutive order.

As shown in Figure 1.2.2-1, the first bit of the data word on the bus is the most significant bit (MSB). The least significant bit (LSB) comes just before the parity bit. The 1553B command word, which is used for control, should not be confused with spacecraft commands that are sent as 1553B data words (up to 32 per message).

1.2.3 TM & TC Packet Layout Convention

The general layout used for the definitions of individual telecommand and telemetry packets is shown in Figure 1.2.3-1 and Figure 1.2.3-2 respectively. The details of the Packet Header is omitted while the Data Field Header is simplified showing only the values of the Service Type and Service Subtype numbers. The main focus is on the relevant Application Data field structure of the telecommand packet and the Source Data field structure of the telemetry packet.

For readability reasons the message parameters are shown in a list format to provide equal space to each parameter regardless of its actual size. The parameter position in the message is given by the word number on the left, while the parameter size is given on the right.

The list format has the parameters of a packet in order from most-significant (MS) to least-significant (LS) where Word 1 is the MS-word of the packet.

The parameter is left-justified, that is, stacked on the most significant side of the word.

As example, a series of bit fields described as:

11	Status	1 bit
11	Spare = 0	4 bits
11	Sub-Schedule ID	11 bits

Is mapped as:

	MSB							Word 11								LSB
Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Status	**Spare**				**Sub-Schedule ID**										

Also the data is right aligned within any TM or TC data filed. As example, Sub-Schedule ID = 2 would be (MSB) 00000000010 (LSB) where the MSB is the first bit transmitted.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (Type, Subtype)**	2 words
	Application Data	variable
M	**Packet Error Control**	1 word

Figure 1.2.3-1: Telecommand Packet General Layout

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (Type, Subtype)**	5 words
	Source Data	variable
M	**Packet Error Control**	1 word

Figure 1.2.3-2: Telemetry Packet General Layout

1.3 DEFINITIONS

Application Process	Usually an application process can be associated with a subsystem or instrument. An application process can receive TC packets and/or generate TM packets
Application Data	Data destined to an on-board application process, encapsulated in a TC packet.
Application ID	An 11 bits field. The Application Process ID (APID) is divided into Process ID (PID - first 7 bits) and Packet Category (PCAT - last 4 bits). The APID of a TM packet identifies the application process, which generated the packet. The APID of a TC packet identifies the application process, which will receive the packet. An APID is unique across the system
Channel	Physical input or output line(s).
Packet Category	Packet Category (PCAT) is a 4-bit field. The PCAT identifies different categories of TM packets which Ground typically processes in different ways and for which separate accounting (i.e. source sequence counts) is required to be kept. The PCAT for TC are not used and set to a fixed value.
Packet Terminal	On-board user, which decodes TC packets and encodes TM packets.
Non-Packet Terminal	On-board user, which does not decode TC packets or encode TM packets.
Parameter ID	That uniquely identifies a parameter across the system. The same PID may not be used by different APID
Process ID	Process ID (PID) is a 7-bit field and together with the Packet Category (PCAT)

	forms the Application Process ID (APID). The PID forms a base address which identifies the process to which the TC packet is addressed or generating the TM packet.
Report ID	Report ID (RID) identifies an event report packet definition. The RID together with the APID implicitly defines the presence, structure and interpretation of the associated parameters field.
Sequence Count	Sequence Count identifies a telecommand packet so that it can be traced within the end-to-end telecommand system. A separate sequence count is maintained for each APID. When an acknowledgement of a packet is generated the Packet Sequence Control field is included in the telemetry acknowledge packet as the identifier of the telecommand being acknowledged.
SID Structure Identifier	Defines the structure of the parameter field in the packet. The same SID may be used by different APID
Source Data	Data generated by an on-board application process, encapsulated in a TM packet
Source Sequence Count	Source Sequence Count field in the telemetry packet header provides the order of release of packets by the source and enables the destination, that is Ground, to detect missing packets. A separate source sequence count is maintained by each PID for each PCAT (i.e. a counter for each APID) and incremented by one whenever it releases a packet.

1.4 LIST OF ACRONYMS AND ABBREVIATIONS

The Sentinel-1 acronyms are reported in [RD.01]. For reader convenience, acronyms used in this document are also listed below.

ASW	Avionics Onboard Software (resident and executed by the SMU PM)
AVS	Avionics Subsystem
BOL	Beginning Of Life
bps	bit per second
CCSDS	Consultative Committee for Space Data Systems
CLTU	Command Link Transmission Unit
CLCW	Command Link Control Word
COTS	Commercial Off The Shelf
CSCI	Computer Software Configuration Item
EOL	End Of Life
FAR	Frame Analysis Report
FDIR	Failure Detection Isolation and Recovery
GPS	Global Position System
GSE	Ground Support Equipment
HK	House Keeping
HL	High Level
HW	Hardware
I/F	Interface
LSB	Least Significant Bit
MSB	Most Significant Bit
OBS	On-Board Software
P/F	Platform
P/L	Payload
PM	Processor Module (SMU core module)
PROM	Programmable Read Only Memory
QA	Quality Assurance

RAM	Random Access Memory
RS	Reed Solomon
S/C	Spacecraft
S/L	Satellite
S/S	Subsystem
SMU	Spacecraft Management Unit
SSU	Spacecraft Security Unit
SW	Software
TBC	To Be Confirmed
TBD	To Be Defined
TC	Telecommand
TX	Transmitter
VCDU	Virtual Channel Data Unit

2 DOCUMENTATION

2.1 PARENT DOCUMENTS

The Sentinel-1 Specific PUS services and functions are in line with the following parent documents requirements. Any deviations are justified in this document.

[PD 01] GMES Sentinel-1 System Requirements Document (SRD)
S1-RS-ESA-SY-0001

[PD 02] GMES Sentinel-1 Operational Interface Requirements Document (OIRD)
S1-RS-ESA-SY-0006

2.2 NORMATIVE DOCUMENTS

2.2.1 Sentinel-1 Applicable Documents

[AD.01] Command & Control Specification for Avionics S/S - **Only Applicable to AVS**
S1-RS-TASI-SC-0092

[AD.02] Command & Control Specification for C-SAR Instrument - **Only Applicable to C-SAR**
S1-RS-TASI-SC-0071

[AD.03] Command & Control Specification for PDHT S/S - **Only Applicable to PDHT**
S1-RS-TASI-SC-0093

[AD.04] LCT Req Spec Volume 4: LCT Command & Control - **Only Applicable to LCT**
S1-RS-TASI-SC-0169 Volume 4

2.2.2 Applicable Standards

The following documents are applicable standards:

[AS.01] Telemetry and Telecommand Packet Utilization Standard (PUS)
ECSS-E-70-41A

[AS.02] Digital Time Division Command/Response Multiplex Data Bus Standard
MIL-STD-1553B Notice 4

[AS.03] Packet Telecommand Standard
ESA PSS-04-107

[AS.04] Packet Telemetry Standard
ESA PSS-04-106

2.3 REFERENCE DOCUMENTS

[RD.01] S1 Acronym List
S1-LI-TASI-SY-0006

[RD.02] S1 SES TMTC Packet Definition
S1-DD-ASU-PL-0002

[RD.03] S1 TCU TMTC Packet Definitions
S1-IF-ASD-PL-0008

[RD.04] Sentinel GPSR Command and Housekeeping Data Interface
S1-IF-AAE-SC-0001

[RD.05] Sentinel GPSR Measurement Data Interface
S1-IF-AAE-SC-0002

[RD.06] S1 PDHT S/S Interface & Budgets
Volume 5 – TC & TM ICD
S1-IF-TASI-SC-0011

[RD.07] Authentication Unit User Manual
P-ASIC-NOT-00325-RSE

[RD.08] Sentinel-1 Space to Ground Interface Control Document
Volume 3 : TC/TM Data Handling (S-Band)
S1-IF-TASI-SY-0004 Volume 3

[RD.09] Sentinel-1 LCT Packet Utilization Standard
SEN1-TESAT-LCT-SPE-15230

[RD.10] Sentinel-1 Avionics Software Specific Services Description
S1-IF-TASI-SC-0038

3 TELECOMMAND STRUCTURE

3.1 TC TRANSFER FRAME

The TC Transfer Frame shall conform to the structure defined in [AS.03]. The TC Transfer Frame structure is shown in Figure 3.1-1 below.

TC Frame Header								TC Frame Data	TC Frame Error Control
Version Number	Bypass Flag	Control Command Flag	Spare	Spacecraft ID	Virtual Channel ID	Frame Length	Frame Sequence Number		
2	1	1	2	10	6	10	8	Max 249 bytes	2 bytes
2 bytes					2 bytes		1 byte		

Figure 3.1-1 TC Transfer Frame Structure

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be set to 0 for all
Bypass Flag	Defines usage of sequence control mechanism	0 = sequence control is used (type A) 1 = sequence control not used (type B)
Control Command Flag	Defines the type of the transfer frame	0 = Data Frame (i.e. AD or BD Frame) 1 = Control Frame (i.e. BC Frame containing control command)
Spare		Must be set to 0
Spacecraft ID	Sentinel-1 S/C ID	EQM: 3FF Hex Sentinel-1A PFM: 22B Hex Sentinel-1B FM2: 22D Hex
Virtual Channel ID	Identification of the S/C Telecommand chain. TC Decoder 1 and TC Decoder 2 are addressed through the VC ID field.	0 = TC Decoder 1 7 = TC Decoder 2
Frame Length	Number of bytes in that frame minus 1	Min 7 (5 byte header +1 byte in the data field + 2 byte error control -1) Max 255 (5 byte header +249 byte in the data field + 2 byte error control -1)
Frame Sequence Number	Denoted as N(S) is set to different values depending	For AD Transfer Frames: Set to FOP V(S) – refer to [AS.03].

PARAMETER	DESCRIPTION	RANGE OR VALUE
	on the type of Transfer Frame.	For BC and BD Transfer Frames: Set to all zeros.
TC Frame Data	Contains a TC Segment.	Refer to section 3.2 for the structure of the TC Segment.
TC Frame Error Control	A Frame Check Sequence as specified in [AS.03]	0 to $2^{16} – 1$

3.2 TC SEGMENT

The TC Segment shall conform to the structure defined in [AS.03]. The TC Segment structure is shown below.

Segment Header		Segment Data	
Sequence Flag	**MAP ID**	**Segment Data Field**	**Authentication Tail**
2 bit	6 bit		
1 byte		Max **226** bytes	**22** bytes

Figure 3.2-1 TC Segment Structure

The TC Segment is routed according to the value of the MAP ID.

Refer to [RD.08] section 3.1 for the command uplink routing and in particularly Figure 3-2 in [RD.08] where the MAP routing and cross-strapping is illustrated.

The MAP ID is used to address the SMU Processor Module (MAP 2 and MAP 3); TC Decoder (MAP 4 and MAP 5); TC Command Pulse Distribution Unit (CPDU) (MAP 0); RM SGM (MAP 6 and MAP 8); RM CPDU (MAP 7 and MAP 9) and AU (MAP 63) for AU control TCs. TC Segments which address the TC Decoder, AU, TC CPDU, RM SGM, RM CPDU are executed without involvement of the SMU resident software, referred to as the Avionics SW (ASW).

PARAMETER	DESCRIPTION	RANGE OR VALUE
Sequence Flag	Used by segmentation protocol to indicate the sequential position of the segment relative to the complete TC Packet. Only the TCs to the SMU PM support segmentation while the TCs to the TC Decoder (i.e. Control TCs), HPC CPDU, RM CPDU, TRM SGM and AU Control TCs cannot be segmented. Note: Max TC Packet size supported by AVS is 512 bytes which requires three TC Segments to uplink a max TC packet size. The segmented TC packet is re-assembled and verified by the ASW and the re-assembled TC packet process is	01: First segment 00: Continuation segment 10: Last segment 11: Un-segmented

PARAMETER	DESCRIPTION	RANGE OR VALUE
	transparent to the addressed PID.	
MAP ID	Multiplexed Access Point Identifier	MAP 0: CPDU MAP 1: reserved. MAP 2: local PM (i.e. to ASW). MAP 3: partner PM. MAP 4: TC Decoder control command MAP 5: TC Decoder control command MAP 6: local RM SGM MAP 7: local RM CPDU MAP 8: partner RM SGM MAP 9: partner RM CPDU MAP 63: AU control commands
Segment Data Field	Contains either a complete TC Packet or part of a TC Packet. The max size TC Segment Data field is 226 bytes. The max size limit is established with AU in Secure Mode. For simplicity, the max limit is also maintained when in Clear Mode where no AU Tail must be present for Normal TC (i.e. not AU control TC).	
AU Tail	Composed of Key ID, LAC anti-replay and message authentication code (MAC). Refer to Figure 3.2-2 below. AU Tail is present in all TC Segments when commanding in Secure mode. The AU Tail must not be present on Normal TC when commanding in Clear Mode. AU control TCs always has an AU Tail in either AU Secure or Clear Mode.	

MAP 4 and MAP 5 TC Decoder control commands are:

- '**Set TC Only**' control command is composed of a TC Segment with header only and MAP ID set to 4. The 'Set TC Only' places the addressed TC Decoder CPDM Selector in TC Only mode for 16 seconds giving Ground CPDU commands exclusive access (i.e. excludes SMU RM and AVS SW CPDU commands) for the time-out period. The Set TC Only command affects only the SMU TMTCMM board which received the command.
- '**Re-Init**' control command is composed of a TC Segment with header only and MAP ID set to 5. The 'Re-Init' control command performs a re-initialisation of the SMU TMTCMM TME module functions to its power-on state. The command does not affect the TC Decoder operation. The Re-Init control command affects only the SMU TMTCRM board which received the command.

The supported authentication technique is a "plain-text-with-appended-MAC" system. It consists of appending a digital MAC (Message Authentication Code) at the end of the TC Segment. The MAC is a 16-octet value generated from a secret key, the TC Segment and a LAC Counter value. The onboard Authentication Unit regenerates the MAC for the received TC Segment, and the command is only accepted if the two MACs match. Three different LAC Counters are supported for anti-replay protection, one for each type of command (i.e. Normal, Control and Recovery).

For Normal commands the AU function operates in two different modes, Secure or Clear mode. In Secure mode all Normal commands are processed by the authentication function, and if accepted, routed to the segment distribution, while in Clear mode all normal commands by-pass the authentication function.
The AU function is configured via AU control commands which are always authenticated and can be sent to the AU independently of the AU mode.

The MAP ID in the TC Segment is used to separate the AU Control commands from the Normal commands.

The Authentication Unit uses two different types of keys: Master keys and Session keys. Session keys are used for authentication of all Normal commands and AU Control commands. Master keys are used for decryption of encrypted session keys in session key upload commands. Also Master keys are used for authentication of commands to the AU function in emergency situations where the master key is referred to as a Recovery key. Hence AU Control commands can be authenticated using either Session keys or Master keys.

The AU supports 1024 Master keys and 4096 Session keys. The Session keys can be reprogrammed by the use of a dedicated upload session key command.

Refer to [RD.08] for detailed information on the AU function including operational aspects. Figure 3.2-2 below shows the TC Segment AU Tail structure.

Key Info Field		**Logical Authentication Channel (LAC)**		**Message Authentication Code**
Key Type	**Reserved**	**Reserved**	**LAC Counter**	**MAC**
1 bit	15 bits	2 bits	30 bits	128 bits
22 octets				

Figure 3.2-2 AU Tail Structure

PARAMETER	DESCRIPTION	RANGE OR VALUE
Key Type flag	Defines in conjunction with the MAP ID the Authentication Key to be used by the Authentication Processor. Note: The MAP ID is used to determine if the processed command is a normal command or an AU control command. The Authentication Key (KeyID) in use is enabled by a dedicated control command (Activate New Authentication Key). Refer to RD[07] for a more detailed description.	0: Session Key 1: Master Key
'Reserved' field of Key Info	No checks are performed onboard on these bits. Recommended to be set to zero.	Set to zero.
'Reserved' field of LAC	Not used	Set to zero.

PARAMETER	DESCRIPTION	RANGE OR VALUE
LAC Counter	A LAC counter is used to associate every TC Segment with an authentication sequence number, to ensure that identical TC Segments will not produce the same MAC (except at large intervals of time). On-board the selected LAC counter is set to the received value plus one every time a TC Segment is successfully authenticated. A positive sliding window for the LAC counters is supported. The width of the window is set by a dedicated control command. It allows a TC segment to be accepted as long as the LAC value in the tail is within the current window for the addressed LAC counter in the AU. Three LAC counters are provided (i.e. Normal, Control and Recovery).	
MAC	Message Authentication Code is computed using an algorithm called CMAC. Refer to [RD.08] section 4.4.1 for more detailed information.	

3.3 CPDU TELECOMMAND

TC CPDU:

The TC CPDU function is implemented in hardware and integrated in an ASIC. Once the TC CPDU function receives a TC Packet compliant to the CPDU TC format it will start the execution of the HPC instructions which includes generation a pulse of duration equal to that specified in the instruction, then it moves on to the next instruction until it completes all instructions. The total duration is roughly the sum of all the pulse durations. The delay between completion of one instruction and the start of the next instruction is relatively short compared to the pulse duration. The TC CPDU contains a timer to ensure that all pulses terminate. If the pulse timer expires, the CPDU will immediately stop the ongoing pulse output. The TC CPDU TC Packet execution will stop with an error and the remaining command instructions will not be executed. A pulse duration ranges from D to 128.D where D is set to 15 ms.

The execution time of a HPC CPDU packet can be calculated from the following formula:

$$ExecutionTime = 4 + \sum_{i=1}^{N} P_i * D + (N-1) * d \quad ms$$

Where:

N is the number of pulses to execute
P_i is the commanded pulse length factor for command (i.e. 2^L where $0 \leq L \leq 7$)
D is the duration parameter which is set to 15 ms
d is the delay between commands which is set to 5.9 ms

The total execution time must not exceed 16 s (PROM configurable value).

The TC CPDU may receive TC segments containing a CPDU packet from three sources:

- TC Decoder (i.e. Ground)
- Reconfiguration Module

- Active Processor Module (i.e. ASW)

The requests are prioritised such that the Reconfiguration Module requests always have the highest priority. The Processor Module requests always have the lowest priority.

Refer to [RD.08] for more information on TC CPDU command function including selection, priority and Ground override capability through Set TC Only command.

The TC CPDU TC Packet format is shown in Figure 3.3-1. The TC Packet has a minimum length of 10 bytes and a maximum length equal to 226 bytes as CPDU TCs cannot be segmented and the max TC Segment Data field size is applicable.

The Application Data of the CPDU consist of at least one HPC instruction or several HPC instructions up to the maximum allowed. When there is more than one HPC instruction in the Packet, each instruction is executed one after the other, in the original sequence.

Ground is able to predict the duration of the CPDU TC Packet execution from the specified number of HPC instructions and the specified Pulse Time parameter.

The AVS Software (ASW) supports TC (2,144) Distribute CPDU TC Packet(s) which allows Ground to Time-Tag or Position-tag HPC commands through TC (11,4) and TC (132,4) respectively.

The format of the HPC Instruction is shown in Figure 3.3-2.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
Packet Header (48-bits)	VN			T	DFH = 0	APID											1
	SF	Sequence Count															2
	Packet Length																3
	HPC Instruction 1																4
	HPC Instruction 2																5
	:																:
	:																:
	:																:
	HPC Instruction M																N-1
	Packet Error Control																N

Figure 3.3-1: CPDU TC Packet Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be 000
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be 1
APID		TC-1 CPDU APID: 021 H TC-2 CPDU APID: 022 H
Data Field Header (DFH) flag	Indicates the presence of a data field header (when set to 1)	Must be 0
Sequence Flag (SF)	Only stand-alone packets are supported	Must be set to 11
Sequence Count	Wrap around counter used to count each TC packet from a certain APID. Not verified by CPDU, only reported in CPDU Status Report to indicate last TC Packet successfully processed.	0 to $2^{14} – 1$,
Packet Length	Number of bytes contained in the packet data field minus 1	Max CPDU TC packet size is 226 bytes which is linked to the maximum TC Segment Data Field size. Hence M = 109 HPC max
HPC Instruction	The format is shown in Figure 3.3-2.	
Packet Error Control (PEC)	The PEC is a CRC used by the CPDU to verify the integrity of the complete TC packet. After initialising the encoder to all ones, it is generated over the entire CPDU Packet (except the Packet Error Control field) using the polynomial g(x) = x16 + x12 + x5 + 1	0 to $2^{16} – 1$

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HPC ID								Spare = 00000					Pulse Time		

Figure 3.3-2: HPC Instruction Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
HPC ID	Specifies HPC channel	0 to 255
Pulse Time	Specifies the duration of the Command Pulse to be issued.	000 = 1 x D, where D (Duration) is a fixed value which will be in the range 10 to 15 ms. D is set to 15 ms. 001 = 2 x D 010 = 4 x D 011 = 8 x D 100 = 16 x D 101 = 32 x D 110 = 64 x D

PARAMETER	DESCRIPTION	RANGE OR VALUE
		111 = 128 x D

RM CPDU:

The RM CPDU TC Packet format is shown in Figure 3.3-3, note that it has the same format as the TC CPDU TC Packet. The format of the HPC Instruction is shown in Figure 3.3-4.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
Packet Header (48-bits)	VN			T	DFH = 0	APID											1
	SF		Sequence Count														2
	Packet Length																3
	HPC Instruction 1																4
	HPC Instruction 2																5
	:																:
	:																:
	:																:
	HPC Instruction M																N-1
	Packet Error Control																N

Figure 3.3-3: RM CPDU TC Packet Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be 000
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be 1
Data Filed Header (DFH) flag	Indicates the presence of a data filed header (when set to 1)	Must be 0
APID	Application Process ID	RM-1 CPDU APID = 031 H RM-2 CPDU APID = 032 H
Sequence Flag (SF)	Only stand-alone packets are supported	Must be set to 11
Sequence Count	Wrap around counter used to count each TC packet from a certain APID. Not verified by CPDU, only reported in CPDU Status Report accessible by ASW to indicate last TC Packet successfully processed.	0 to $2^{14} – 1$,
Packet Length	Number of bytes contained in the packet data field minus 1	Max RM CPDU TC packet size is **32** bytes provides 12 HPC Instruction capability (i.e. M = 12 max.).
HPC Instruction	The format is shown in Figure 3.3-4.	

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Error Control (PEC)	Provides an error detection code used by the CPDU to verify the integrity of the complete TC packet.	0 to $2^{16} - 1$

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HPC ID								Spare = 00000					Pulse Time		

Figure 3.3-4: HPC Instruction Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
HPC ID	Specifies HPC channel	0 to 255
Pulse Time	Specifies the duration of the Command Pulse to be issued.	Don't care. HPC are internally used by RM to configure RM status.

RM Memory Load:

The RM Memory Load TC Packet enables Ground to write in the RM SGM. The format of the TC packet shall be as shown in Figure 3.3-5.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
Packet Header (48-bits)	VN = 000			T = 1	DFH = 0	APID											1
	SF = 11		Sequence Count														2
	Packet Length																3
	Address (32-bit)																4
																	5
	Memory ID				Data Field Length												6
	Data Field																7
																	:
																	:
																	:
																	:
																	:
																	N-1
	Packet Error Control																N

Figure 3.3-5: RM Memory Load TC Packet Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be 000
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be 1
Data Filed Header (DFH) flag	Indicates the presence of a data filed header (when set to 1)	Must be 0
APID	Application Process ID	RM-1 SGM APID = 041 H RM-2 SGM APID = 042 H
Sequence Flag (SF)	Only stand-alone packets are supported	Must be set to 11
Sequence Count	Wrap around counter used to count each TC packet from a certain APID. Not verified by RM, only reported in RM Status Report accessible by ASW to indicate last RM TC Packet successfully processed.	0 to $2^{14} – 1$,
Packet Length	Number of bytes contained in the packet data field minus 1	Max RM TC packet size is 226 bytes which is linked to the maximum TC Segment Data Field size.
Address	Address of the memory load operation. Represents the start address for a multiple data load	32-bit address.
Data Field Length	Length of the data to be loaded expressed in byte.	12-bit field. Max Data Field size is 212 bytes.
Memory ID	Identifies the memory	4-bit field. 0000 – Dynamic Data Base memory (no Ground access) 1111 – Static Data Base memory
Data Field	The data to be loaded which is 16-bit word aligned. If byte load is required, then a dummy byte could be required.	
Packet Error Control (PEC)	Provides an error detection code used by the CPDU to verify the integrity of the complete TC packet.	0 to $2^{16} – 1$

3.4 TC PACKET

Sentinel-1 general TC Packet format is shown in Figure 3.4-1. It conforms to the structure defined in [AS.03].

All TC Packets contain the Sentinel-1 standard Packet Data Field Header derived from the PUS, [AS.01], except for the TC Packets addressed to the SMU TC Command Pulse Distribution Unit (CPDU), SMU RM CPDU and SMU RM Safe Guard Memory (SGM).

AVS manages all S/C TC packets uplinked by Ground. The max AVS TC packet size processed by the ASW is 512 bytes which corresponds to ASW TC buffer size.

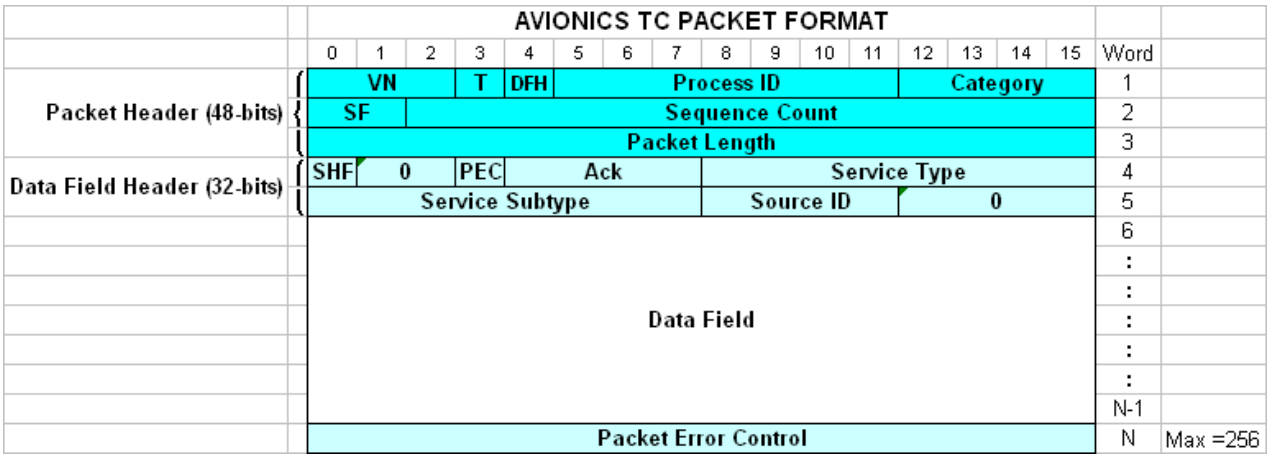


Figure 3.4-1 TC Packet Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be set to 0 for all commands
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be set to 1 for all telecommands
Data Field Header (DFH) flag	Indicates the presence of a data field header (when set to 1)	Must be set to 1 for all telecommands addressed to SMU PM (MAP 2 and 3) and all AU Control commands (MAP 63). Must be set to 0 for TC CPDU, RM CPDU and RM SGM commands.
Process ID (PID)	The application process which is the destination of the TC packet. Used on-board for routing the TC packet.	Refer to Table 8.1.1-1 (section 8.1.1)
Packet Category (PCAT)	The PCAT for TC have a fixed value	Refer to Table 8.1.2-1 (section 8.1.2)
Sequence Flag (SF)	Only stand-alone packets are supported	Must be set to 11_{bin} (stand alone TC packet)
Sequence Count	Wrap around counter used to count each TC packet	0 to $2^{14} – 1$

PARAMETER	DESCRIPTION	RANGE OR VALUE
	from a certain APID. For each APID a separate Sequence Counter is maintained.	
Packet Length	Number of bytes contained in the packet data field minus 1	Max AVS TC packet size is 512 bytes. Max TC packet size is driven by the AVS (Note: Same size used on TASI heritage missions.) C-SAR, PDHT and GPS TC packets maximum size is **492** bytes in order to be compatible with TC (11,4) and TC (132,4). Minimum size of TC packets is **12** bytes with PEC and **10** bytes without PEC (Note: Onboard stored TC (i.e. TCs stored in the ASW OBCD) has no PEC).
CCSDS Secondary Header Flag (SHF)	As required by CCSDS 203.1 -- B -- 1	This field indicates that the PUS data field header is a “non-CCSDS defined secondary header” and shall be set to 0
PEC Flag	Indicates the presence of the PEC field	0 = No PEC field 1 = PEC field.
Telecommand Acknowledgements (ACK)	This field is used to indicate which acknowledgement, in the form of telecommand verification packets, must be sent to Ground to notify acceptance and to verify execution (this relates only to positive acknowledgements, as the negative ones are generated by default	0000: No positive acknowledgement must be sent ***1: TC acceptance packet must be sent **1*: TC execution start packet must be sent *1**: TC execution progress packet must be sent 1***: TC execution completion packet must be sent
Service Type	Indicates the service to which the packet relates	1 to 19 Standard PUS Service Types 128 to 255 S-1 Specific Service Types
Service Subtype	Indicates the service subtype to which the packet relates	1 to 26 Standard PUS Service Subtypes 128 to 255 S-1 Specific Service Subtypes
Source ID	Identification of the command source issuing the TC packet	Refer to Table 8.2-1 (section 8.2)
Spare		Set to 0000
Data Field		Contents and length linked to PUS service type and subtype pair.
Packet Error Control (PEC)	The PEC field provides an error detection code that is used by the receiving application process to	0 to $2^{16} – 1$

PARAMETER	DESCRIPTION	RANGE OR VALUE
	verify the integrity of the complete TC packet. The PEC is a CRC as specified in [AS.01] Annex A1. Note: On-board generated TC has no PEC field (i.e. when PEC Flag = 0 no CRC check is performed)	

The general AU control command TC Packet format is shown Figure 3.4-2 below.

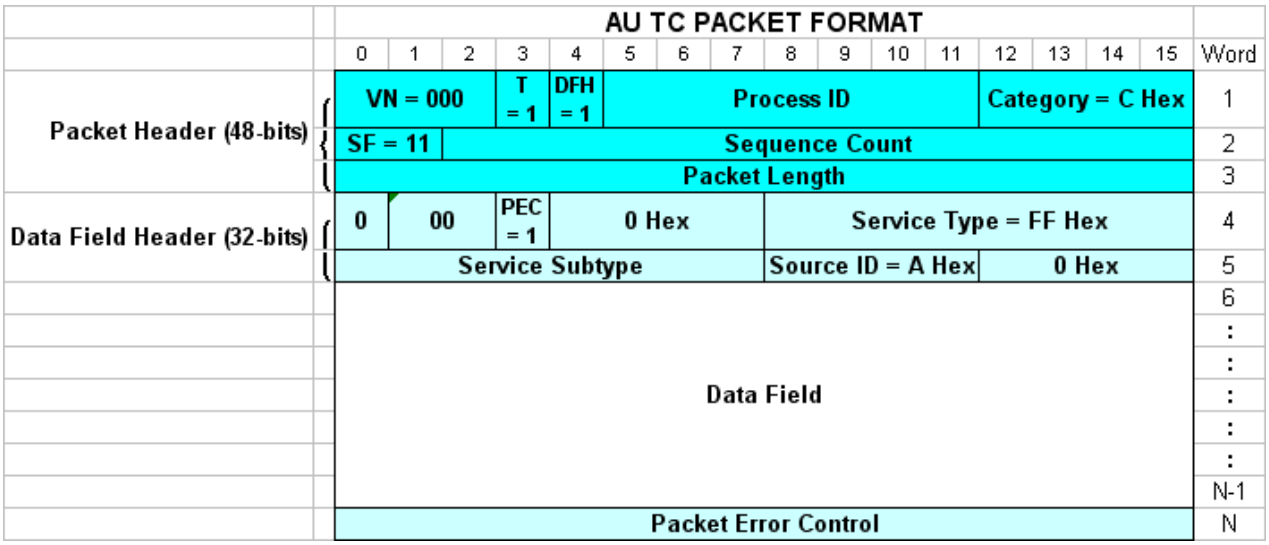


Figure 3.4-2: General AU Control TC Packet Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be set to 0 for all commands
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be set to 1 for all telecommands
Data Field Header (DFH) flag	Indicates the presence of a data filed header (when set to 1)	Must be set to 1 for all telecommands addressed to AU (MAP ID 63)
Process ID (PID)	The PID assigned to the AU function	AU-1 PID set to **0F** Hex AU-2 PID set to **0F** Hex
Packet Category (PCAT)	PCAT for TC have a fixed value	PCAT must be set to 12 (**C** Hex)
Sequence Flag (SF)	Only stand-alone packets are supported	Must be set to 11_{bin}
Sequence Count	Wrap around counter used by Ground to identify the AU control command. It is not checked by the AU but it is part of the HPTM to indicate the executed AU control command. Refer to HPTM format.	0 to $2^{14} - 1$

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Length	Number of bytes contained in the packet data field minus 1	Minimum size of AU TC packets is 12 bytes.
CCSDS Secondary Header Flag (SHF)	As required by CCSDS 203.1 -- B -- 1	This field indicates that the PUS data field header is a “non-CCSDS defined secondary header” and shall be set to 0
PEC Flag	Indicates the presence of the PEC field	Set to 1 (i.e. PEC field present
Telecommand Acknowledgements (ACK)	Not applicable to AU function.	Must be set to 0000
Service Type	Service Type 255 assigned to AU function	Must be set to FF Hex.
Service Subtype	The service subtype identifies the command request.	1 to 255 (i.e. 01 to FF Hex)
Source ID	Source ID of AU control command	Must be set to A Hex.
Spare		Set to 0000
Data Field		Contents and length linked to Service Subtype value.
Packet Error Control (PEC)	CRC-16 checksum as specified in [AS.01] Annex A1	0 to $2^{16} – 1$

3.5 AVS TC (11, 4) PACKET: INSERT TC IN TIME-TAGGED SCHEDULE

AVS TC (11,4) telecommand is used for the upload of all S/C time-tagged telecommands. The format of AVS TC (11,4) is shown in Figure 3.5-1. As shown, TC (11,4) is capable to hold more than one TT-TC. The format of the Time Tag field is shown in Figure 3.5-2.

	AV TC (11,4) PACKET: INSERT TT-TC IN COMMAND SCHEDULE																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word	
Packet Header (48-bits)	VN			T	DFH	APID											1	
	SF	Sequence Count															2	
	Packet Length																3	
Data Field Header (32-bits)	SHF	0		PEC	Ack				Service Type = 11								4	
	Service Subtype									Source ID				0			5	
	Sub-schedule ID											N° of TC Packets (=P)					6	
	Time Tag-1																7	
																	8	
																	9	
	TC Packet-1																10	
																	:	
																	:	
																	:	
	Time Tag-2																:	
																	:	
																	:	
	TC Packet-2																:	
																	:	
																	:	
																	:	
	:																:	
	:																:	
	:																:	
	Time Tag-P																:	
																	:	
																	:	
	TC Packet-P																:	
																	:	
																	:	
																	N-1	
	Packet Error Control																N	Max =256

Figure 3.5-1: AVS TC (11,4) Packet Format

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
0	0	0	0	0	0	0	0	2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	1
2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2
2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	3

Figure 3.5-2: Time Tag Field Format

The constraints applicable to TC (11,4) are:

(a) All TT-TC within a TC (11,4) must have the same sub-schedule ID.
(b) The TT-TC within a TC (11,4) must be time ordered.

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Header	Refer to section 3.4	
Data Field Header	Refer to section 3.4	

PARAMETER	DESCRIPTION	RANGE OR VALUE
Sub-schedule ID	Provides Ground the capability to group a sequence of commands addressing different PID and linked to a specific operation together via the sub-schedule ID field. Commands with the same sub-schedule ID are able to be manipulated by Ground while in the MTL command schedule without impact on the rest of MTL commands in the queue. **NOTE**: If the TT-TC is disabled (e.g. the sub-schedule including the TT-TC in question is disabled) and the TT-TC expires, then only the expired TT-TC shall be deleted.	
N° of TC Packets	Specifies the number of TT-TC embedded in the TC (11,4).	1 to P = 10 max The only other constraint is the maximum size limit of the TC packet (i.e. 256 words)

3.6 AVS TC (132,4) PACKET: INSERT TC IN POSITION TAG SCHEDULE

AVS TC (132,4) telecommand is used for the upload of all S/C position-tagged telecommands. The format of AVS TC (132,4) is shown in Figure 3.6-1. As shown, TC (132,4) is capable to hold more than one position tagged TC. The format of the Position Tag field is shown in Figure 3.6-2.

	AV TC (132,4) PACKET: INSERT PT-TC IN COMMAND SCHEDULE																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word	
Packet Header (48-bits)	VN			T	DFH	Process ID							Category				1	
	SF	Sequence Count															2	
	Packet Length																3	
Data Field Header (32-bits)	SHF	0		PEC	Ack				Service Type = 132								4	
	Service Subtype = 4								Source ID				0				5	
	Sub-schedule ID											N° of TC Packets (=P)					6	
	Position Tag-1																7	
																	8	
																	9	
	TC Packet-1																10	
																	:	
																	:	
																	:	
	Position Tag-2																:	
																	:	
																	:	
	TC Packet-2																:	
																	:	
																	:	
	:																:	
	:																:	
	:																:	
	Position Tag-P																:	
																	:	
																	:	
	TC Packet-P																:	
																	:	
																	:	
																	N-1	
	Packet Error Control																N	Max =256

Figure 3.6-1: AVS TC (132,4) Packet Format

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word	
ORBIT NUMBER																1	
2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2	ORBIT ANGLE
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}	3	

Figure 3.6-2: Position Tag Field Format

The constraints applicable to TC (132,4) are:

(a) All Position Tag TC within a TC (132,4) must have the same sub-schedule ID.

(b) The Position Tag TC within a TC (132,4) must be “position” ordered.

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Header	Refer to section 3.4	
Data Field Header	Refer to section 3.4	
Sub-schedule ID	Provides Ground the capability to group a sequence of commands addressing different PID and linked to a specific operation together via the sub-schedule ID field. Commands with the same sub-schedule ID are able to be manipulated by Ground while in the MTL command schedule without impact on the rest of MTL commands in the queue. **NOTE**: If the PT-TC is disabled (e.g. the sub-schedule including the PT-TC in question is disabled) and the PT-TC expires, then only the expired PT-TC shall be deleted.	
N° of TC Packets	Specifies the number of TT-TC embedded in the TC (132,4).	1 to P = 10 max. The only other constraint is the maximum size limit of the TC packet (i.e. 256 words)
Orbit Number	The on board orbit number “n” which is a continuous unsigned 16-bit counter (more than 11 years wrap-around)	
Orbit Angle	Anomaly w.r.t the [TOD] ascending node **α** having 2^{-23} degrees resolution.	

3.7 AVS TC (134,1) PACKET: EXECUTE TELECOMMAND BATCH

AVS TC (134,1) telecommand is used for the upload of a batch of telecommands for immediate execution. The format of AVS TC (134,1) is shown in Figure 3.7-1. The maximum number of telecommands which can be grouped with a TC (134,1) is only limited to the maximum size of TC (134,1), that is 256 words.

TC (134,1) embedded telecommands (TC Packet-1, TC Packet-2 …) will be checked and dispatched to the addressed PID. If embedded telecommands are to the same PID, then the execution order of telecommands with the same PID is as they appear in the TC (134,1). However if embedded telecommands address different PID, then the execution order is no longer guaranteed as it depends on the addressed PID scheduling and the telecommand required execution time. That is, it is possible that telecommands with different PID could be executed in parallel.

Note: TC (134,1) implements the same function as a TC aggregation (i.e. more than one TC packet in a TC Segment) with the added advantage that TC (134,1) has a maximum size of 512 bytes whereas TC aggregation would have been limited to 226 bytes. Also TC (134,1) is supported by Service 1 TC verification before the grouped TC are dispatched for execution. Sentinel-1 does not support TC aggregation.

	AV TC (134,1) PACKET: EXECUTE TC BATCH																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word	
Packet Header (48-bits)	VN			T	DFH	Process ID							Category				1	
	SF	Sequence Count															2	
	Packet Length																3	
Data Field Header (32-bits)	SHF	0		PEC	Ack				Service Type								4	
	Service Subtype								Source ID				0				5	
	Spare								N° of TC Packets (=P)								6	
	TC Packet-1																7	
																	8	
																	:	
																	:	
	TC Packet-2																:	
																	:	
																	:	
																	:	
	TC Packet-3																:	
																	:	
																	:	
																	:	
	:																:	
	:																:	
	:																:	
	TC Packet-P																:	
																	:	
																	:	
																	N-1	
	Packet Error Control																N	Max =256

Figure 3.7-1: AVS TC (134,1) Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Header	Refer to section 3.4	
Data Field Header	Refer to section 3.4	
N° of TC Packets	Specifies the number of immediate TC embedded in the TC (134,1).	1 to P The only constraint is the maximum size limit of the TC packet (i.e. 256 words)

3.8 TC PACKET NESTING

In section 3.5 the general format of AVS TC (11,4) is defined showing the nesting of multiple time-tagged commands for the MTL within TC (11,4).

Similarly in section 3.6 the general format of AVS TC (132,4) is defined showing the nesting of multiple position-tagged commands for the MTL within TC (132,4).

While in section 3.7 the general format of AVS TC (134,1) is defined showing the nesting of multiple immediate commands to be dispatched and executed immediately.

The embedded “TC Packet” structure is generic and is the same for all services that use embedded TCs.

The are no on-board checks of the embedded TC Source Sequence Count.

If a PEC is present it will be checked. Whether or not there is a PEC is driven by the PEC flag in the embedded TC header.

TC(11,4) and TC(132,4) embedded TC which address remote PID to the ASW and require to be dispatched on the 1553B Bus (i.e. SES, TCU, DSHA, LCT PID) must have a PEC. While the presence of a PEC on other embedded TC is optional. Internally generated or stored TC do not require a PEC.

3.9 SPECIAL AVS SERVICES FOR SAR MEASUREMENT AND IMAGE STORE / PASS-THROUGH

3.9.1 TC (163, 71) Command SAR Measurement

TC (163, 71) instructs the ASW to compute and update the Measurement Start Time parameter in the embedded TC (152, 164) Perform Measurement, then update the PEC field before dispatching the TC (152,164) to the SES. TC(152, 164) parameters are defined in [RD.02].

First the Image Start Time is derived from the specified Image Start Position. The Measurement Start Time is then obtained by subtracting from the Image Start Time the stored ECC Initial Delay Time corresponding to the specified ECC Program Number. The ECC Program Number is the SES parameter defined in [RD.02] supporting the range 0..47. The ECC Initial Delay Time has a fixed value for a given ECC Program Number.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (163, 71)**	2 words
6..8	Image Start Position	3 words
9	Spare = 0	10 bits
9	ECC Program Number	6 bits
10..26	TC (152, 164) Packet	17 words
27	**Packet Error Control**	1 word

Figure 3.9.1-1: TC (163, 71) Command SAR Measurement

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word	
ORBIT NUMBER																1	
2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2	ORBIT ANGLE
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}	3	

Figure 3.9.1-2: Image Start Position Format

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	6
2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	7
2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	8

Figure 3.9.1-3: Measurement Start Time Format

Word N°	Parameter	Size
10..12	**Packet Header**	3 words
13..14	**Telecommand ID (152, 164)**	2 words
15..17	Measurement Start Time	3 words
18	Warmup	1 bit
18	Spare	4 bits
18	Polarisation	3 bits
18	Immediate	1 bit
18	Spare	1 bit
18	ECC Program Number	6 bits
19	Spare	3 bits
19	Start Orbit Swath Data Window	13 bits
20	Spare	3 bits
20	BAQ Mode N° (CN)	5 bits
20	Spare	3 bits
20	BAQ Mode N° (CE)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XN)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XE)	5 bits
22..23	Data Take ID	2 words
24	N° of Program Repetitions	1 word
25	Delta SWL	1 word
26	**Packet Error Control**	1 word

Figure 3.9.1-4: TC (152, 164) Perform Measurement

3.9.2 TC (163, 72) Command SAR Measurement and Data Store

TC (163, 72) instructs the ASW to compute and update the Measurement Start Time parameter in the embedded TC (152, 164) Perform Measurement, then update the PEC field before dispatching the TC (152,164) to the SES. Also compute the dispatching time of the embedded TC (15, 227) Store and dispatch the TC to the DSHA when the dispatching time expires. TC (152, 164) parameters are defined in [RD.02], while TC (15, 227) parameters are defined in [RD.06].

First the Image Start Time is derived from the specified Image Start Position. The Measurement Start Time is then obtained by subtracting from the Image Start Time the stored ECC Initial Delay Time corresponding to the specified ECC Program Number. The ECC Program Number is the SES parameter defined in [RD.02] supporting the range 0..47. The ECC Initial Delay Time has a fixed value for a given ECC Program Number.

The dispatch time of TC (15, 227) to the DSHA is derived from the ASW computed Measurement Start Time by subtraction from it a fixed time offset (baseline 1.575 seconds).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (163, 72)**	2 words
6..8	Image Start Position	3 words
9	Spare = 0	10 bits
9	ECC Program Number	6 bits
10..26	TC (152,164) Packet	17 words
27..37	TC (15, 227) Packet	11 words
38	**Packet Error Control**	1 word

Figure 3.9.2-1: TC (163, 72) Command SAR Measurement and Data Store

Word N°	Parameter	Size
10..12	**Packet Header**	3 words
13..14	**Telecommand ID (152, 164)**	2 words
15..17	Measurement Start Time	3 words
18	Warmup	1 bit
18	Spare	4 bits
18	Polarisation	3 bits
18	Immediate	1 bit
18	Spare	1 bit
18	ECC Program Number	6 bits
19	Spare	3 bits
19	Start Orbit Swath Data Window	13 bits
20	Spare	3 bits
20	BAQ Mode N° (CN)	5 bits
20	Spare	3 bits
20	BAQ Mode N° (CE)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XN)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XE)	5 bits
22..23	Data Take ID	2 words
24	N° of Program Repetitions	1 word
25	Delta SWL	1 word
26	**Packet Error Control**	1 word

Figure 3.9.2-2: TC (152,164) Perform Measurement

Word N°	Parameter	Size
27..29	**Packet Header**	3 words
30..31	**Telecommand ID (15, 227)**	2 words
32	Spare = 0	12 bits
32	SDI Within Time-Out Flag	1 bit
32	SDI Initial Time-Out Flag	1 bit
32	Enable Store – Pol. V	1 bit
32	Enable Store – Pol. H	1 bit
33	Packet Store ID – Pol. H	1 word
34	Packet Store ID – Pol. V	1 word
35	Initial Time-Out Value	1 word
36	Within Time-Out Value	1 word
37	**Packet Error Control**	1 word

Figure 3.9.2-3: TC (15, 227) Store

3.9.3 TC (163, 73) Command SAR Measurement and Data Pass Through

TC (163, 73) instructs the ASW to compute and update the Measurement Start Time parameter in the embedded TC (152, 164) Perform Measurement, then update the PEC field before dispatching the TC (152,164) to the SES. Also compute the dispatching time of the embedded TC (15, 229) Pass Through Mode and dispatch the TC to the DSHA when the dispatching time expires. TC (152, 164) parameters are defined in [RD.02], while TC (15, 229) parameters are defined in [RD.06].

First the Image Start Time is derived from the specified Image Start Position. The Measurement Start Time is then obtained by subtracting from the Image Start Time the stored ECC Initial Delay Time corresponding to the specified ECC Program Number. The ECC Program Number is the SES parameter defined in [RD.02] supporting the range 0..47. The ECC Initial Delay Time has a fixed value for a given ECC Program Number.

The dispatch time of TC (15, 229) to the DSHA is derived from the ASW computed Measurement Start Time by subtraction from it a fixed time offset (i.e. baseline 1.575 seconds).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (163, 73)**	2 words
6..8	Image Start Position	3 words
9	Spare = 0	10 bits
9	ECC Program Number	6 bits
10..26	TC (152, 164) Packet	17 words
27..45	TC (15, 229) Packet	19 words
46	**Packet Error Control**	1 word

Figure 3.9.3-1: TC (163, 73) Command SAR Measurement and Data Pass Through

Word N°	Parameter	Size
10..12	**Packet Header**	3 words
13..14	**Telecommand ID (152,164)**	2 words
15..17	Measurement Start Time	3 words
18	Warmup	1 bit
18	Spare	4 bits
18	Polarisation	3 bits
18	Immediate	1 bit
18	Spare	1 bit
18	ECC Program Number	6 bits
19	Spare	3 bits
19	Start Orbit Swath Data Window	13 bits
20	Spare	3 bits
20	BAQ Mode N° (CN)	5 bits
20	Spare	3 bits
20	BAQ Mode N° (CE)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XN)	5 bits
21	Spare	3 bits
21	BAQ Mode N° (XE)	5 bits
22..23	Data Take ID	2 words
24	N° of Program Repetitions	1 word
25	Delta SWL	1 word
26	**Packet Error Control**	1 word

Figure 3.9.3-2: TC (152,164) Perform Measurement

Word N°	Parameter	Size
27..29	**Packet Header**	3 words
30..31	**Telecommand ID (15,229)**	2 words
32	Spare	10 bits
32	Interleaved DL on Pol. H Flag	1 bit
32	Interleaved DL on Pol. V Flag	1 bit
32	SDI Within Time-Out Flag	1 bit
32	SDI Initial Time-Out Flag	1 bit
32	Enable Store – Pol. V	1 bit
32	Enable Store – Pol. H	1 bit
33	Initial Time-Out Value	1 word
34	Within Time-Out Value	1 word
35	Store ID – Pol. H	1 word
36	Sign Fill Data H	7 bits
36	Carrier Selection – Pol. H	1 bit
36	Data Strategy – Pol. H	1 bit
36	Spare	7 bits
37	Pass Through Delay H	1 word
38	Pass Through Time Duration H	1 word
39	Store ID – Pol. V	1 word
40	Sign Fill Data V	7 bits
40	Carrier Selection – Pol. V	1 bit
40	Data Strategy – Pol. V	1 bit
40	Spare	7 bits
41	Pass Through Delay V	1 word
42	Pass Through Time Duration V	1 word
43	Interleaved DL PS ID - Pol. H	1 word
44	Interleaved DL PS ID - Pol. V	1 word
45	**Packet Error Control**	1 word

Figure 3.9.3-3: TC (15,229) Pass Through Mode

4 TELEMETRY STRUCTURE

4.1 TELEMETRY TRANSFER FRAME

The Telemetry Transfer Frame conforms to the structure defined in [AS.04]. The TM Transfer Frame structure is shown in Figure 4.1-1 below

Attached Sync. Marker	Transfer Frame			Reed-Solomon Code Block
	Transfer Frame Header	Transfer Frame Data Field	Transfer Frame Trailer	
			CLCW	
	6 bytes	1105 bytes	4 bytes	
4 bytes	1115 bytes			160 bytes

Figure 4.1-1 TM Transfer Frame Structure

The Transfer Frame Primary Header conforms to the structure defined in [AS.04]. The structure is shown in Figure 4.1-2 below.

Version Number	Frame Identification			Master Channel Frame Counter	Virtual Channel Frame Counter	Frame Data Field Status				
	Spacecraft ID	Virtual Channel ID	Operational Control Field Flag			Secondary Header Flag	Data Field Synch. Flag	Packet Order Flag	Segment Length ID	First Header Pointer
2	10	3	1	8	8	1	1	1	2	11
2 bytes				1 byte	1 byte	2 bytes				

Figure 4.1-2 Transfer Frame Primary Header Structure

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be set to 0 for all TM Transfer Frames
Spacecraft ID		EQM: 3FF Hex Sentinel-1A PFM: 22B Hex Sentinel-1B FM2: 22D Hex
Virtual Channel ID	ID of the virtual channel	VC-0: TM containing all real time S/C TM packets.

PARAMETER	DESCRIPTION	RANGE OR VALUE
		VC-1: TM containing HW generated High Priority TM packets. VC-6: TM containing playback TM packets which were stored in Packet Store A. VC-5: TM containing playback TM packets which were stored in Packet Store B. VC-3: TM containing playback TM packets which were stored in Packet Store C. VC-2: TM containing playback TM packets which were stored in Packet Store D (System Log). VC-7: Idle Transfer Frames
Operational Control Field Flag	Indicates the presence or absence of the CLCW	Set to 1, CLCW present in each frame
Master Channel Frame Counter	Counter for Transfer Frames. Increments for each transfer frame in the downlink.	0 to 255. Modulo 256 counter.
Virtual Channel Frame Counter	One counter for each Virtual Channel. Increments for each transfer frame from a given virtual channel.	0 to 255. Modulo 256 counter.
Secondary Header Flag	Indicates presence or absence of a secondary header	Must be set to 0, no secondary header
Data Field Synch. Flag	Indicates the mode of packet insertion	Set to 0 to indicate that TM packets are inserted contiguously (synchronous insertion) on byte boundaries. The location of the byte containing the first header being indicated by the FHP in the frame header.
Packet Order Flag	Indicates forward or reverse order	Set to 0 to indicate forward order packets.
Segment Length ID	Identifies the selected maximum data field length of the TM packets being inserted in the frames of a given Virtual Channel.	Set to 11 to indicate no segmentation.
First Header Pointer	Pointer to the first byte of	Number of bytes to the first byte of the first TM

PARAMETER	DESCRIPTION	RANGE OR VALUE
	the first TM Source Packet	Packet Set to $7FF_{hex}$, if no TM Packet header in Frame Set to $7FE_{hex}$ for Idle Frames

4.2 IDLE TM TRANSFER FRAME

The Idle Transfer Frames are generated as per ESA Packet Telemetry Standard (PSS-04-106) page 29.

The First Header Pointer is set to all ones minus one (i.e. 11111111110) for an Idle TM Transfer Frame and the data field is filled with a string of "01" bits (i.e. 5555555.....).

4.3 TELEMETRY PACKET

The standard Sentinel-1 PUS Telemetry Packet format is shown in Figure 4.3-1. The TM Packet Time Stamp field format is shown in Figure 4.3-2 which is the same as the Time Tag field format of TC (11,4) given in Figure 3.5-2.

	TM PACKET FORMAT																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
Packet Header (48-bits)	VN			T	DFH	Process ID							Category				1
	GF		Source Sequence Count														2
	Packet Length																3
Data Field Header (80-bits)	0	00		PEC	OBTS		NS	EF	Service Type								4
	Service Subtype								Destination ID				Spare = 0				5
	Time Stamp CUC Format (MSB ≈ 68 years, LSB ≈ 3.9 msec)																6
																	7
																	8
	Data Field																9
																	:
																	:
																	:
																	:
																	M-1
	Packet Error Control																M

Figure 4.3-1 TM Packet Format

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
0	0	0	0	0	0	0	0	2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	1
2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2
2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	3

Figure 4.3-2: Time Stamp Field Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Must be set to 0 for all TM source packets
Type	Packet type (0 = telemetry, 1 = telecommand)	Must be set to 0 for all TM source packets
Data Field Header (DFH) Flag	Indicates the presence of a secondary (data field) header (when set to 1)	Must be set to 1 for all TM source packets, Exceptions: must be set to 0 for Time Packets, HPTM and Idle Packets
Process ID (PID)	Identifies the application process which generated the TM packet.	Refer to Table 8.1.1-1 (section 8.1.1)
Packet Category (PCAT)	Identifies the TM packet category which Ground uses in conjunction to PID and Source Sequence Count to immediately detect missing TM packet(s).	Refer to Table 8.1.2-2 (section 8.1.2)
Grouping Flag (GF)	Indicates the grouping (segmentation) of TM source packets	11 - stand alone TM packet
Source Sequence Count	Uniquely identify a TM packet generated by an APID. The APID increment s by 1 this field for each new TM packet. The counter wrap-around occurs from 2^{14}-1 to 0.	Must be set to 0 for first packet, increments up to 2^{14}-1, wrap around to 0
Packet Length	Number of bytes contained in the [(Data Field Header + Data + PEC if present) – 1].	Min value is 9 if no PEC or 11 if with PEC. The max value is 249 Max size TM packet applicable to all packet terminals is 256 bytes. Note: The data for all fixed length PUS services e.g. TM(3,25), must always fit within the 256 byte constraint, i.e. a SID must never be delivered over several packets.
PEC Flag	Indicates the presence of the PEC field.	0 = No PEC field. 1 = PEC field NOTE: ASW does not support PEC. All remote packet terminals are required to support PEC.
OBT Status (OBTS)	Indicates S/C OBT synchronization status with respect to GPS. Only used by AVS.	00 = In-synch with GPS (nominal condition) 01 = GPS not available (indicates a drift condition)

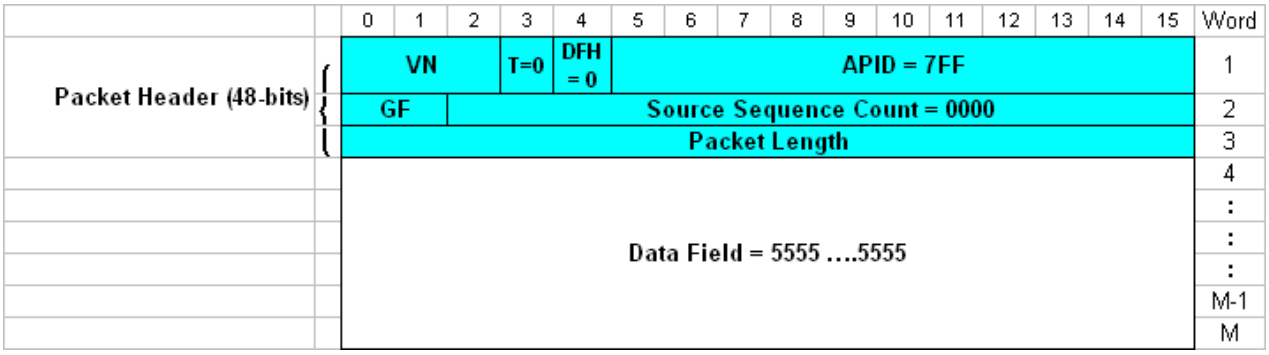
PARAMETER	DESCRIPTION	RANGE OR VALUE
	Note: Not applicable to GPS, C-SAR Instrument and PDHT S/S where '00' is reported.	10 = Synchronisation disabled (indicates a drift condition) 11 = Synchronisation in progress (indicates that the sync status has not been reached)
Not Synchronised (NS)	Not Synchronised to S/C OBT. Used by C-SAR and PDHT S/S. Indicates that their OBT have not yet been synchronised to S/C OBT. Not applicable to AVS.	0 = Synchronised to S/C OBT. 1 = Not Synchronised
Error Flag (EF)	Indicates that at least one parameter in the data field is not valid. Only used by AVS.	0 = Nominal (all parameters are valid). 1 = Error, at least one parameter in the data field is not valid. Note: The EF is set for Ground use only. No onboard use is made by the ASW. It indicates that at least one of the parameter in the Data field is not valid or up-to-date. This could arise when data acquisitions from the 1553B Bus are interrupted due to an on-going recovery or a 1553B Bus acquisition error has occurred. The ASW checks the validity of the data pool when generating the TM packets.
Service Type	Indicates the service to which the packet relates	Any valid S1 PUS service
Service Subtype	Indicates the service subtype to which the packet relates	Any valid S1 PUS sub-service
Destination ID	Enables Ground to discriminate the onboard source of the "solicited" TM packet. Refer to section 8.2 for details.	Refer to Table 8.2-1 and Table 8.2-2 (section 8.2). For "Solicited" TM, the onboard application shall insert a copy of the TC packet's "Source ID" into the TM packet's "Destination ID". For "Unsolicited" TM, it shall set the "Destination ID" to 0 (refer to Table 8.2-2).
Time Stamp	Onboard time (OBT) in CUC format with MSB = 68 years and LSB = 3.9 ms.	Refer to Figure 4.3-2.
Data Field	Contains the data of the TM source packet.	The maximum length of the Data field is equal to 256 bytes minus 16 bytes of the standard headers which is equal to 240 bytes with no PEC present or 238 bytes with PEC. The maximum size TM packet has been fixed for Sentinel-1 to enable an efficient storage and retrieval of TM packet in Packet Stores.
Packet Error Control	The PEC field transports	0 to $2^{16} - 1$

PARAMETER	DESCRIPTION	RANGE OR VALUE
(PEC)	an error detection code that can be used by Ground to verify the integrity of the complete telemetry source packet. The PEC is CRC as specified in [AS.01] Annex A1.	

4.4 IDLE TM PACKET

The “Idle” TM Packet is generated by the ASW when a filler telemetry packet is required.

The "Idle" TM Packet format is as shown in figure 4.4-1 where:



The minimum size "Idle" TM Packet is 8 bytes.

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Set to 0
Type	Packet type (0 = telemetry, 1 = telecommand)	Set to 0
Data Field Header (DFH) Flag	Indicates the presence of a data field header	Set to 0
Application Identifier (APID)	The APID of the Idle packet is set to “all ones”.	Set to 7FF (Hex)
Grouping Flag (GF)	Indicates the grouping (segmentation) of TM source packets	Set to 11 to indicate standalone
Source Sequence Count	The Source Sequence Count is set to a fixed value.	Set to 0000 Hex.

PARAMETER	DESCRIPTION	RANGE OR VALUE
Packet Length	Number of bytes contained in the packet data field minus 1	1..N

4.5 TIME TM PACKET

The Time Packet format is as shown in Figure 4.5-1. The Time Packet has no Data Field Header and hence not a standard PUS TM packet (i.e. The Time Packet covers TM (9,2) Time Report but without a standard PUS Data Field Header). The Time Packet is generated every 16 VC-0 TM Transfer Frames which results with a Time Packet every approx. 24 sec. The Time Packet generation rate is a PROM configuration parameter which cannot be changed in flight.

	TIME PACKET FORMAT																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
Packet Header (48-bits)	VN			T=0	DFH = 0	Process ID = 0							Category = 0				1
	GF		Source Sequence Count														2
	Packet Length																3
	Time Sync S/C OBT																4
																	5
																	6
																	7
	Spare = 0															OBTS	8

Figure 4.5-1 Time Packet Format

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
0	0	0	0	0	0	0	0	2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	1
2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2
2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	3
2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}	2^{-24}	4

Figure 4.5-2 Time Sync S/C OBT Format

PARAMETER	DESCRIPTION	RANGE OR VALUE
Version Number	CCSDS Version Number	Set to 0
Type	Packet type (0 = telemetry, 1 = telecommand)	Set to 0

PARAMETER	DESCRIPTION	RANGE OR VALUE
Data Field Header (DFH) Flag	Indicates the presence of a secondary (data field) header (when set to 1)	Set to 0 for Time Packet
Process ID (PID)	Identifies the application process.	Set to 0 for Time Packet
Packet Category (PCAT)	Identifies the TM packet category.	Set to 0 for Time Packet
Grouping Flag (GF)	Indicates the grouping (segmentation) of TM source packets	Set to '11'.
Source Sequence Count	Uniquely identify a TM packet generated by an APID. The APID increment s by 1 this field for each new TM packet.	Set to 0 for first packet, increments up to 2^{14}-1, wrap around to 0.
Packet Length	Number of bytes contained in the packet data field minus 1	Set to 9.
Time Sync S/C OBT	Time Sync S/C OBT is derived by the ASW by summing the Delta OBT (controlled by Ground) to the Frozen SMU OBT value (i.e. SMU RM OBT value HW sampled at the onboard – Ground time correlation TM sync instant).	Refer to Figure 4.5-2.
OBT Status (OBTS)	Indicates S/C OBT synchronization status with respect to GPS.	00 = In-synch with GPS (nominal condition) 01 = GPS not available (indicates a drift condition) 10 = Synchronisation disabled (indicates a drift condition) 11 = Synchronisation in progress (indicates that the sync status has not been reached)

4.6 HIGH PRIORITY TM PACKET

The High Priority TM (HPTM) packet is periodically generated by the SMU TMTCMM board in use (referred as the TM Active). The format of the HPTM packet is shown in Figure 4.6-1. One HPTM packet at a time is generated by the TMTCMM board and the HPTM packet contains the data from both the main and redundant sections of the SMU. The TMTCMM board in use is identified by the APID.

The HPTM generation rate is programmable. The baseline is to generate one HPTM packet every 8 TM Transfer Frames (TF). Hence VC1 TM TF would be downliked every approximately 59 TM TF.

Source	Word	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	1	VN			TY	DF	AP-ID										
	2	SF		Packet Sequence Counter													
	3	Packet Length															
INT	4	B00	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15
EXT	5	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26	B27	B28	B29	B30	B31
RM-1	6	SMU RM-1 Word 1															
	7	SMU RM-1 Word 2															
RM-2	8	SMU RM-2 Word 1															
	9	SMU RM-2 Word 2															
PM-1	10	SMU PM-1															
PM-2	11	SMU PM-2															
TC-1	12	O/N	Frame Analysis			Illegal Frame Qual			Accepted Code Blocks Count						S:Error CB Count		
	13	Legal Fr.ID		Input Channel ID			Last MP Addressed						0	Authent. Report			0
	14	Flag – HPC1		Packet Name of the last packet accepted for execution – HPC1													
	15	Flag – HPC2 & DRC		Packet Name of the last packet accepted for execution – HPC2 & DRC													
TC-2	16	O/N	Frame Analysis			Illegal Frame Qual			Accepted Code Blocks Count						S.Error CB Count		
	17	Legal Fr.ID		Input Channel ID			Last MP Addressed						0	Authent. Report			0
	18	Flag – HPC1		Packet Name of the last packet accepted for execution – HPC1													
	19	Flag – HPC2 & DRC		Packet Name of the last packet accepted for execution – HPC2 & DRC													
AU-1	20..47	AU-1 Words 1..28															
AU-2	48..75	AU-2 Words 1..28															

Figure 4.6-1: HPTM Packet Format

5 SUPPORTED PUS SERVICES

5.1 SERVICE 1: TELECOMMAND VERIFICATION

The following summary table provides Service 1 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(1,1)	Telecommand Acceptance Report - Success	TM	Y	Y	Y	Y	Y	Y	Y	Y	Y
(1,2)	Telecommand Acceptance Report – Failure	TM	Y	Y	Y	Y	Y	Y	Y	Y	Y
(1,3)	Telecommand Execution Started Report - Success	TM	Y	Y	N	N	N	N	N	N	N
(1,4)	Telecommand Execution Started Report - Failure	TM	Y	Y	N	N	N	N	N	N	N
(1,5)	Telecommand Execution Progress Report - Success	TM	Y	Y	N	N	N	N	N	N	N
(1,6)	Telecommand Execution Progress Report - Failure	TM	Y	Y	N	N	N	N	N	N	N
(1,7)	Telecommand Execution Completed Report - Success	TM	Y	Y	Y	Y	Y	Y	Y	Y	Y
(1,8)	Telecommand Execution Completed Report - Failure	TM	Y	Y	Y	Y	Y	Y	Y	Y	Y
(1,128)	Enable Successful Telecommand Verification Report	TC	Y	Y	N	N	N	N	N	N	N
(1,129)	Disable Successful Telecommand Verification Report	TC	Y	Y	N	N	N	N	N	N	N
(1,160)	Assign Internal TC Acknowledgement Flags	TC	N	N	N	Y	N	N	N	N	N

5.2 SERVICE 2: DEVICE COMMANDING

The following summary table provides Service 2 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(2,1)	Distribute On/Off Commands	TC	N	N	N	N	N	N	N	N	N
(2,2)	Distribute Register Load Commands	TC	N	N	N	N	N	N	N	N	N
(2,3)	Distribute CPDU Commands – (*)	TC	N	N	N	N	N	N	N	N	N
(2,144)	Distribute CPDU TC Packet(s) – (*)	TC	Y	Y	N	N	N	N	N	N	N

(*) – TC(2,144) specifies complete CPDU TC Packet(s), whereas TC (2,3) specifies only the command instruction and the CPDU TC Packet would require to be generated on-board. TC (2,3) is not supported.

5.3 SERVICE 3: PERIODIC REPORTING

The following summary table provides Service 3 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	LCT
(3,1)	Define New HK Parameter Report	TC	Y	Y	N	N	N	N	N	N	N
(3,2)	Define New Diagnostic Parameter Report	TC	Y	Y	N	Y	N	N	N	N	Y
(3,3)	Clear HK Parameter Definitions	TC	Y	Y	N	N	N	N	N	N	N
(3,4)	Clear Diagnostic Parameter Report Definitions	TC	Y	Y	N	Y	N	N	N	N	Y
(3,5)	Enable HK Parameter Report Generation	TC	Y	Y	N	Y	Y	N	Y	N	Y
(3,6)	Disable HK parameter Report Generation	TC	Y	Y	N	Y	Y	N	Y	N	Y
(3,7)	Enable Diagnostic Parameter Report Generation	TC	Y	Y	N	Y	N	N	N	N	Y
(3,8)	Disable Diagnostic Parameter Report Generation	TC	Y	Y	N	Y	N	N	N	N	Y
(3,9)	Report HK Parameter Report Definitions	TC	Y	Y	N	Y	N	N	N	N	Y
(3,10)	HK Parameter Report Definitions Report	TM	Y	Y	N	Y	N	N	N	N	Y
(3,11)	Report Diagnostic Parameter Report Definitions	TC	Y	Y	N	Y	N	N	N	N	Y
(3,12)	Diagnostic Parameter Report Definitions Report	TM	Y	Y	N	Y	N	N	N	N	Y
(3,13)	Report HK Parameter Sampling-Time Offsets	TC	N	N	N	N	N	N	N	N	N
(3,14)	Report Diagnostic Parameter Sampling-Time Offsets	TC	N	N	N	N	N	N	N	N	N
(3,15)	HK Parameter Sampling-Time Offsets Report	TM	N	N	N	N	N	N	N	N	N
(3,16)	Diagnostic Parameter Sampling-Time Offsets Report	TM	N	N	N	N	N	N	N	N	N
(3,17)	Selected Periodic HK Parameter Report Generation Mode	TC	N	N	N	N	N	N	N	N	N
(3,18)	Selected Periodic Diagnostic Parameter Report Generation Mode	TC	N	N	N	N	N	N	N	N	N
(3,19)	Selected Filtered HK Parameter Report Generation Mode	TC	N	N	N	N	N	N	N	N	N
(3,20)	Selected Filtered Diagnostic Parameter Report Generation Mode	TC	N	N	N	N	N	N	N	N	N
(3,21)	Report Unfiltered Housekeeping Parameters	TM	N	N	N	N	N	N	N	N	N
(3,22)	Report Unfiltered Diagnostic Parameters	TM	N	N	N	N	N	N	N	N	N
(3,23)	Unfiltered Housekeeping Parameters Report	TM	N	N	N	N	N	N	N	N	N
(3,24)	Unfiltered Diagnostic Parameters Report	TM	N	N	N	N	N	N	N	N	N
(3,25)	Housekeeping Parameter Report	TM	Y	Y	Y	Y	Y	N	Y	N	Y
(3,26)	Diagnostic Parameter Report	TM	Y	Y	N	Y	N	N	N	N	Y
(3,128)	Modify HK Report Generation Rate	TC	Y	Y	N	Y	Y	N	Y	N	N
(3,129)	Modify Diagnostic Report Generation Rate	TC	N	N	N	Y	N	N	N	N	N
(3,130)	Report HK Telemetry Generation Status	TC	Y	Y	N	Y	Y	N	N	N	Y

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(3,131)	HK Telemetry Generation Status Report	TM	N	N	N	Y	Y	N	N	N	Y
(3,132)	Report Diagnostic Telemetry Generation Status	TC	Y	Y	N	Y	N	N	N	N	Y
(3,133)	Diagnostic Telemetry Generation Status Report	TM	N	N	N	Y	N	N	N	N	Y
(3,144)	AVS HK Telemetry Generation Status Report	TM	Y	Y	N	N	N	N	N	N	N
(3,145)	AVS Diagnostic Telemetry Generation Status Report	TM	Y	Y	N	N	N	N	N	N	N
(3,160)	Save Diagnostic Configuration Data	TC	N	N	N	Y	N	N	N	N	N
(3,161)	Send Single Housekeeping Parameters Report	TC	N	N	N	N	Y	N	N	N	N
(3,240)	Define HK Parameter Report Collection Interval	TC	N	N	N	N	N	N	N	N	Y
(3,241)	Define Diagnostic Parameter Report Collection Interval	TC	N	N	N	N	N	N	N	N	Y

5.4 SERVICE 4: STATISTICS REPORTING

The following summary table provides Service 4 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(4,1)	Report Parameter Statistics	TC	Y	N	N	Y	N	N	Y	N	N
(4,2)	Parameter Statistics Report	TM	Y	N	N	Y	N	N	Y	N	N
(4,3)	Reset Parameter Statistics Reporting	TC	Y	N	N	N	N	N	Y	N	N
(4,4)	Enable Statistics Function	TC	Y	N	N	Y	N	N	Y	N	N
(4,5)	Disable Statistics Function	TC	Y	N	N	Y	N	N	Y	N	N
(4,6)	Add Parameters to Parameter Statistics List	TC	N	N	N	N	N	N	Y	N	N
(4,7)	Delete Parameters from Parameter Statistics List	TC	N	N	N	Y	N	N	Y	N	N
(4,8)	Report Parameter Statistics List	TC	Y	N	N	Y	N	N	Y	N	N
(4,9)	Parameter Statistics List Report	TM	N	N	N	N	N	N	Y	N	N
(4,10)	Clear Parameter Statistics List	TC	Y	N	N	Y	N	N	Y	N	N
(4,144)	AVS Add Parameters to Parameter Statistics List	TC	Y	N	N	N	N	N	N	N	N
(4,145)	AVS Delete Parameters from Parameter Statistics List	TC	Y	N	N	N	N	N	N	N	N
(4,146)	AVS Parameter Statistics List Report	TM	Y	N	N	N	N	N	N	N	N
(4,160)	SES Save Statistics Configuration Data	TC	N	N	N	Y	N	N	N	N	N
(4,161)	SES Add Parameters to Parameter Statistics List	TC	N	N	N	Y	N	N	N	N	N
(4,162)	SES Parameter Statistics List Report	TM	N	N	N	Y	N	N	N	N	N

5.5 SERVICE 5: EVENT REPORTING

The following summary table provides Service 5 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(5,1)	Normal / Progress Report	TM	Y	Y	Y	Y	Y	N	Y	N	Y
(5,2)	Error / Anomaly Report – Low Severity	TM	Y	Y	Y	Y	Y	N	Y	N	Y
(5,3)	Error / Anomaly Report – Medium Severity	TM	Y	Y	Y	Y	Y	N	Y	N	Y
(5,4)	Error / Anomaly Report – High Severity	TM	Y	Y	Y	Y	Y	N	Y	N	Y
(5,5)	Enable Event Packet Generation	TC	N	N	N	Y	N	N	Y	N	Y
(5,6)	Disable Event Packet Generation	TC	N	N	N	Y	N	N	Y	N	Y
(5,129)	Report List of Disabled Events	TC	N	N	N	Y	N	N	Y	N	N
(5,130)	List of Disabled Events Report	TM	N	N	N	Y	N	N	Y	N	N
(5,145)	Crash Report	TM	Y	Y	N	N	N	N	N	N	N
(5,146)	Init Log Report	TM	Y	Y	N	N	N	N	N	N	N
(5,160)	SES Save Event Configuration Data	TC	N	N	N	Y	N	N	N	N	N
(5, 210)	GPS Enable Event Packet Generation	TC	N	N	Y	N	N	N	N	N	N
(5, 211)	GPS Disable Event Packet Generation	TC	N	N	Y	N	N	N	N	N	N
(5, 212)	GPS Report Disabled Event Packets	TC	N	N	Y	N	N	N	N	N	N
(5, 213)	GPS Disabled Event Packets Report	TM	N	N	Y	N	N	N	N	N	N
(5,240)	Report List of Disabled Events	TC	N	N	N	N	N	N	N	N	Y
(5,241)	List of Disabled Events Report	TM	N	N	N	N	N	N	N	N	Y

NOTE :
1. ASW Event status is report with TM(19,153) and requested through TC(19,152). Hence TC(5,129) and TM(5,130) are not applicable to ASW.
2. TC(5,5) and TC(5,6) not applicable to ASW as controlled through private subtype TC(19,146).

5.6 SERVICE 6: MEMORY MANAGEMENT

The following summary table provides Service 6 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	LCT
(6,1)	Load Memory using Base plus Offsets	TC	Y	Y	N	N	N	N	N	N	N
(6,2)	Load Memory using Absolute Addresses	TC	Y	Y	N	Y	Y	Y	Y	Y	Y
(6,3)	Dump Memory using Base plus Offsets	TC	Y	Y	N	N	N	N	N	N	N
(6,4)	Memory Dump using Base plus Offsets Report – (*)	TM	N	N	N	N	N	N	N	N	N
(6,5)	Dump Memory using Absolute Addresses	TC	Y	Y	N	Y	Y	Y	Y	Y	Y
(6,6)	Memory Dump using Absolute Addresses Report	TM	Y	Y	N	Y	Y	Y	Y	Y	Y
(6,7)	Check Memory using Base plus Offset	TC	N	N	N	N	N	N	N	N	N
(6,8)	Memory Check using Base plus Offset Report	TM	N	N	N	N	N	N	N	N	N
(6,9)	Check Memory using Absolute Addresses	TC	Y	Y	N	Y	Y	Y	Y	Y	Y
(6,10)	Memory Check using Absolute Addresses Report	TM	Y	Y	N	Y	Y	Y	Y	Y	Y
(6,144)	Physical Address Resolution Report	TM	Y	Y	N	N	N	N	N	N	N
(6,145)	Memory Dump using Base plus Offset Report – (*)	TM	Y	Y	N	N	N	N	N	N	N
(6,146)	Load Logical Parameters	TC	Y	Y	N	N	N	N	N	N	N
(6,147)	Dump Logical Parameter	TC	Y	Y	N	N	N	N	N	N	N
(6,148)	Logical Parameter Dump	TM	Y	Y	N	N	N	N	N	N	N
(6,149)	Register Load	TC	Y	Y	N	N	N	N	N	N	N
(6,150)	Dump Register	TC	Y	Y	N	N	N	N	N	N	N
(6,151)	Register Dump	TM	Y	Y	N	N	N	N	N	N	N
(6,152)	Add to Logical Parameters	TC	Y	Y	N	N	N	N	N	N	N
(6,153)	Dump CAM Box Image / Status	TC	Y	N	N	N	N	N	N	N	N
(6,154)	CAM Box Image / Status Dump Report	TM	Y	N	N	N	N	N	N	N	N
(6,155)	Abort CAM Box Image / Status Dump	TC	Y	N	N	N	N	N	N	N	N
(6,161)	Copy RAM to EEPROM	TC	N	N	N	Y	Y	N	N	N	N
(6,162)	Copy EEPROM to RAM	TC	N	N	N	N	Y	Y	N	N	N
(6, 210)	GPS Copy Memory	TC	N	N	Y	N	N	N	N	N	N
(6, 212)	GPS Load Memory using Absolute Addresses	TC	N	N	Y	N	N	N	N	N	N
(6, 215)	GPS Dump Memory using Absolute Addresses	TC	N	N	Y	N	N	N	N	N	N
(6, 216)	GPS Memory Dump using Absolute Addresses Report	TM	N	N	Y	N	N	N	N	N	N

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(6, 219)	GPS Check Memory using Absolute Addresses	TC	N	N	Y	N	N	N	N	N	N
(6, 218)	GPS Memory Check using Absolute Addresses Report	TM	N	N	Y	N	N	N	N	N	N
(6,224)	DSHA Copy EEPROM to RAM	TC	N	N	N	N	N	N	N	Y	N
(6,225)	DSHA Copy RAM to EEPROM	TC	N	N	N	N	N	N	Y	Y	N
(6,240)	Copy Memory	TC	N	N	N	N	N	N	N	N	Y
(6,241)	Inflate OAS Image	TC	N	N	N	N	N	N	N	N	Y
(6,242)	Switch Application Memory	TC	N	N	N	N	N	N	N	N	Y
(6,243)	Dump Error Log Memory – (**)	TC	N	N	N	N	N	N	N	N	Y
(6,244)	Abort Memory Dump using Absolute Addresses	TC	N	N	N	N	N	N	N	N	Y

(*) - TM (6,145) is the response to TC (6,3). Before the generation of TM (6,145), TM (6,144) is generated which reports the physical address correspondence of the Base ID. TM (6,145) includes the physical address and not the “Base ID” and “Offset” as PUS TM (6,4). TM (6,145) substitutes PUS TM (6,4).

(**) – The response to TC(6,243) is TM(6,6).

The Dump TM packets are generated periodically up to completion of the dump. Constraints are imposed on maximum dump rates linked to the allocated TM bandwidth.

5.7 SERVICE 8: FUNCTIONS MANAGEMENT

The following summary table provides Service 8 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(8,1)	LCT Perform Function	TC	N	N	N	N	N	N	N	N	Y
(8,217)	TCU Change Mode To Operation	TC	N	N	N	N	Y	N	N	N	N
(8,218)	TCU Change Mode To Init	TC	N	N	N	N	Y	N	N	N	N
(8,219)	TCU Issue TA-A On Pulse Command to TPSU	TC	N	N	N	N	Y	N	N	N	N
(8,220)	TCU Issue TA-B On Pulse Command to TPSU	TC	N	N	N	N	Y	N	N	N	N
(8,221)	TCU Update Power Sync Phase Control Register	TC	N	N	N	N	Y	N	N	N	N
(8,222)	TCU Update RABCF Parameters	TC	N	N	N	N	Y	N	N	N	N
(8,240)	LCT Enable Function Execution	TC	N	N	N	N	N	N	N	N	Y
(8,241)	LCT Disable Function Execution	TC	N	N	N	N	N	N	N	N	Y
(8,242)	LCT Enable Function Arming	TC	N	N	N	N	N	N	N	N	Y
(8,243)	LCT Disable Function Arming	TC	N	N	N	N	N	N	N	N	Y
(8,244)	LCT Report Function Status	TC	N	N	N	N	N	N	N	N	Y
(8,245)	LCT Function Status Report	TM	N	N	N	N	N	N	N	N	Y

NOTE: Service 8 subtypes are mainly S/S specific and only a limited commonality of subtypes exist between S/S.

Both OIRD FM-1 and FM-2 requirements are applicable to AVS, C-SAR and PDHT through the respective applicable Command & Control Specification documents.

The referenced OIRD requirements state:

FM-1: It shall be possible for the ground to exercise control over onboard software Application Function in the following manner:

- activate a Function;
- de-activate a Function;
- suspend/resume a Function (when meaningful for the function);
- communicate parameters to a Function.

OIRD FM-3: It shall be possible for the ground to inspect the loaded Function parameters at any time prior to Function activation as well as whilst they are use.

5.8 SERVICE 9: ON-BOARD TIME MANAGEMENT

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(9,1)	Change Time Report Generation Rate	TC	N	N	N	N	N	N	N	N	N
(9,2)	Time Report (*)	TM	Y	Y	N	N	N	N	N	N	N
(9,144)	Set Delta OBT	TC	Y	Y	N	N	N	N	N	N	N
(9,145)	Modify Delta OBT	TC	Y	Y	N	N	N	N	N	N	N
(9,146)	Align Standby OBT	TC	Y	Y	N	N	N	N	N	N	N
(9,147)	Synchronise Instrument	TC	Y	N	N	N	N	N	N	N	N
(9,148)	Synchronise PDHT	TC	Y	N	N	N	N	N	N	N	N
(9,149)	Synchronise LCT	TC	Y	N	N	N	N	N	N	N	N
(9,129)	Instrument / PDHT / LCT Set Time	TC	N	N	N	Y	N	N	Y	N	Y
(9,130)	Instrument / PDHT / LCT Report Time	TC	N	N	N	Y	N	N	Y	N	Y
(9,160)	Instrument Time Report	TM	N	N	N	Y	N	N	N	N	N
(9, 224)	PDHT Time Report	TM	N	N	N	N	N	N	Y	N	N
(9, 241)	LCT Time Report	TM	N	N	N	N	N	N	N	N	Y

(*) – AVS Time Report has no Data Field Header, as per PUS. Time TM Packet format is specified in section 4.5.

5.9 SERVICE 11: TIME-TAG MISSION SCHEDULE SERVICE

A centralised On-Board Mission Schedule is supported by the AVS. The On-Board Mission Schedule is implemented by the AVS with two distinct command schedules, the Time-Tagged TC Schedule (Service 11) and the Position-Tagged TC Schedule (Service 132). A complete set of PUS On-Board Command Schedule services are supported by AVS for each of the command schedules, as reflected in the summary table below, for Ground management of the on-board Mission Time Line (MTL) commands.

Hence Ground updates of the S/C MTL only involves the AVS command schedules as per OIRD OBMT-4 requirement.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(11,1)	Enable Release of Time-Tagged TC	TC	Y	Y	N	N	N	N	N	N	N
(11,2)	Disable Release of Time-Tagged TC	TC	Y	Y	N	N	N	N	N	N	N
(11,3)	Reset Time-Tagged Schedule	TC	Y	Y	N	N	N	N	N	N	N
(11,4)	Insert TC in Time-Tagged Schedule	TC	Y	Y	N	N	N	N	N	N	N
(11,5)	Delete TC from Time-Tagged Schedule	TC	Y	Y	N	N	N	N	N	N	N
(11,6)	Delete TT-TC over Time Period and Sub-Schedule	TC	Y	N	N	N	N	N	N	N	N
(11,144)	Delete TT-TC over Time Period and APID	TC	Y	N	N	N	N	N	N	N	N
(11,7)	Time-Shift Selected Time-Tagged Telecommands	TC	Y	N	N	N	N	N	N	N	N
(11,8)	Time-Shift TT-TC over Time Period and Sub-Schedule	TC	Y	N	N	N	N	N	N	N	N
(11,145)	Time-Shift TT-TC over Time Period and Sub-APID	TC	Y	N	N	N	N	N	N	N	N
(11,10)	Detailed Time-Tagged Command Schedule Report	TM	Y	Y	N	N	N	N	N	N	N
(11,13)	Summary Time-Tagged Command Schedule Report	TM	Y	Y	N	N	N	N	N	N	N
(11,15)	Time-Shift all Time-Tagged Telecommands	TC	Y	N	N	N	N	N	N	N	N
(11,16)	Report Time-Tagged Command Schedule in Detailed Form	TC	Y	Y	N	N	N	N	N	N	N
(11,17)	Report Time-Tagged Command Schedule in Summary Form	TC	Y	Y	N	N	N	N	N	N	N
(11,18)	Report Status of Time-Tagged Command Schedule	TC	Y	Y	N	N	N	N	N	N	N
(11,19)	Time-Tagged Command Schedule Status Report	TM	Y	Y	N	N	N	N	N	N	N

5.10 SERVICE 12: ON-BOARD MONITORING

The following summary table provides Service 12 applicability.

Parameter monitoring allows a single parameter contained in a data pool to be monitored against a limit set or an expected status value and react with a specified event report if the parameter gets out-of-limit. When an error is repeated for a configurable number of consecutive times the monitor reports, via a specified event packet.

Parameter monitoring information is maintained which drives the parameter monitoring activity and the generation of Out-of-Limit Reports.

The ground segment can modify or report the contents of the parameter monitoring list or Monitoring Data Set (MDS) tables for the case of AVS using service requests to:

- Enable or disable the monitoring checks of parameters in the Monitoring List or MDS;
- Add, delete or modify the Monitoring List or MDS;
- Report the monitoring check information for all parameters in the Monitoring List or MDS;
- Report the set of checks which are currently out-of-limits.

The On-Board Monitoring Service maintains static monitoring check information for each parameter to be monitored. A check definition provides the information required to check a sample of the parameter against either one pair of limits, one expected value. More than one check definition may be associated with a given parameter. A check definition indicates:

- The nature of the check to be performed which can be a Limit-check or an Expected-value check. For a Limit-check, a low-limit value and a high-limit value are specified. For an Expected-value-check, an expected value is specified.
- A “repetition count“. For a limit-check or an expected-value-check, this indicates the number of successive samples of the parameter which must fail (or succeed) the check in order to establish a new checking status for the parameter.

TM (5,2) report is generated to report OOL condition classified as low severity. TM (5,3) report is generated to report OOL condition classified as medium severity. While TM (5,4) report is generated to report OOL condition classified as high severity.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(12,1)	Enable Monitoring of Parameters	TC	N	N	N	Y	Y	N	Y	N	N
(12,2)	Disable Monitoring of Parameters	TC	N	N	N	Y	Y	N	Y	N	N
(12,3)	Change Maximum Reporting Delay	TC	N	N	N	N	N	N	N	N	N
(12,4)	Clear Monitoring List	TC	N	N	N	N	N	N	N	N	N
(12,225)	Add Parameters to Monitoring List	TC	N	N	N	N	N	N	Y	N	N
(12,6)	Delete Parameters from Monitoring List	TC	N	N	N	Y	N	N	Y	N	N
(12,7)	Modify Parameter Checking Information	TC	N	N	N	N	Y	N	N	N	N

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(12,8)	Report Current Monitoring List	TC	N	N	N	Y	Y	N	Y	N	N
(12,9)	Current Monitoring List Report	TM	N	N	N	N	Y	N	N	N	N
(12,10)	Report Current Parameters Out-of-limit List	TC	Y	Y	N	Y	N	N	Y	N	N
(12,11)	Current Parameters Out-of-limit List Report	TM	N	N	N	Y	N	N	Y	N	N
(12,12)	Check Transition Report	TM	N	N	N	N	N	N	N	N	N
(12,144)	Configure MDS Configuration Table	TC	Y	Y	N	N	N	N	N	N	N
(12,145)	Configure MDS Status Table	TC	Y	Y	N	N	N	N	N	N	N
(12,146)	Disable Monitoring Service	TC	Y	Y	N	N	N	N	N	N	N
(12,147)	Enable Monitoring Service	TC	Y	Y	N	N	N	N	N	N	N
(12,148)	Disable MDS	TC	Y	Y	N	N	N	N	N	N	N
(12,149)	Enable MDS	TC	Y	Y	N	N	N	N	N	N	N
(12,150)	Reset All HK Filter Counters	TC	Y	Y	N	N	N	N	N	N	N
(12,151)	Reset All MDS Filter Counters	TC	Y	Y	N	N	N	N	N	N	N
(12,152)	Reset Single HK Filter Counter	TC	Y	Y	N	N	N	N	N	N	N
(12,153)	AVS Current Parameters Out-of-Limit List Report	TM	Y	Y	N	N	N	N	N	N	N
(12,154)	Report MDS	TC	Y	Y	N	N	N	N	N	N	N
(12,155)	MDS Report	TM	Y	Y	N	N	N	N	N	N	N
(12,160)	Save Monitoring Configuration Data	TC	N	N	N	Y	Y	N	N	N	N
(12,161)	Add Parameters to Monitoring List	TC	N	N	N	Y	N	N	N	N	N
(12,162)	Current Monitoring List Report	TM	N	N	N	Y	N	N	N	N	N
(12,163)	Modify Parameter Checking Information	TC	N	N	N	Y	N	N	N	N	N
(12,227)	Modify Parameter Checking Information	TC	N	N	N	N	N	N	Y	N	N
(12,229)	Current Monitoring List Report	TM	N	N	N	N	N	N	Y	N	N

NOTE:

1. The enable/disable of the On-Board Monitoring Function is performed using TC (12,1) and TC (12,2) with N=0 as per PUS.

5.11 SERVICE 13: LARGE DATA TRANSFER

Not supported.

5.12 SERVICE 14: PACKET TRANSMISSION CONTROL

The following summary table provides Service 14 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(14,1)	Enable Forwarding of Telemetry Source Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,2)	Disable Forwarding of Telemetry Source Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,3)	Report Disabled Telemetry Source Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,4)	Disabled Telemetry Source Packets Report	TM	Y	Y	N	N	N	N	N	N	N
(14,144)	Enable Forwarding of Housekeeping Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,145)	Disable Forwarding of Housekeeping Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,7)	Report Disabled Housekeeping Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,146)	Disabled Housekeeping Packets Report	TM	Y	Y	N	N	N	N	N	N	N
(14,147)	Enable Forwarding of Diagnostic Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,148)	Disable Forwarding of Diagnostic Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,11)	Report Disabled Diagnostic Packets	TC	Y	Y	N	N	N	N	N	N	N
(14,149)	Disabled Diagnostic Packets Report	TM	Y	Y	N	N	N	N	N	N	N
(14,13)	Enable Forwarding of Event Report Packets	TC	N	N	N	N	N	N	N	N	N
(14,14)	Disable Forwarding of Event Report Packets	TC	N	N	N	N	N	N	N	N	N
(14,15)	Report Disabled Event Report Packets	TC	N	N	N	N	N	N	N	N	N
(14,16)	Disabled Event Report Packets Report	TM	N	N	N	N	N	N	N	N	N

NOTE:
1. TC (14,1) and TC (14,2) allow to filter the packets per type / subtype.
2. In Ultimate Safe Mode (USM) (i.e. SM ASW running) the number of telemetry source packets are considerably reduced with respect to all the other S/C modes supported by NM ASW. The Housekeeping packets are predefined, enabled and down-linked.
3. The telemetry throughput is 885 kbps at TM packet level with 1024 Kbps downlink rate at CADU level. This volume of date is due to the playback telemetry stored in the packet stores and not due to the real time telemetry. The real time telemetry peak rate could reach about 50 Kbps when performing a dump considering also the HPTM

5.13 SERVICE 15: ON-BOARD STORAGE AND RETRIEVAL

The following summary table provides Service 15 applicability.

AVS SMU supports four Packet Stores and a possible telemetry mapping is as follows:
- Packet Store A contains all S/C TM packets except Service 6 TM packets.
- Packet Store B contains all Service 6 TM packets.
- Packet Store C is Spare.

- Packet Store D functions as the System Log and contains Service 1 Error TM packets and Service 5 TM packets.

The mapping between TM PID, Service Type and Service Subtype to specific Packet Store is managed by the ASW and is configurable in flight through Service 15.

Service types (15,9), (15,11), (15,128), (15,146) and (15,147) are not applicable to the System Log. While (15,148) is only applicable to the System Log.

The PDHT DSHA stores and retrieves SAR H Polarisation Data, SAR V Polarisation Data, S/C TM and Auxiliary Data in Packet Stores.

The content of the 4 DSHA Packet Stores allocated for S/C TM would contain the same TM packets as the equivalent SMU Packet Stores A, B, C and System Log. It is possible through the ASW service TC(15,1) and TC(15,2) to enable and disable a specific Packet Store filling (SMU and/or DSHA). Hence for each corresponding pair of Packet Stores in the SMU and DSHA, it is possible to store in both Packet Stores (SMU and DSHA) or in only one Packet Store, either the SMU Packet Store or the DSHA Packet Store.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(15,1)	Enable Storage in Packet Stores	TC	Y	Y	N	N	N	N	Y	N	N
(15,2)	Disable Storage in Packet Stores	TC	Y	Y	N	N	N	N	Y	N	N
(15,3)	Add Packets to Storage Selection Definition	TC	Y	N	N	N	N	N	N	N	N
(15,4)	Remove Packets from Storage Selection Definition	TC	Y	N	N	N	N	N	N	N	N
(15,5)	Report Storage Selection Definition	TC	Y	N	N	N	N	N	N	N	N
(15,6)	Storage Selection Definition Report	TM	Y	N	N	N	N	N	N	N	N
(15,7)	Downlink Packet Store Contents for Packet Range	TC	N	N	N	N	N	N	N	N	N
(15,8)	Packet Store Contents Report	TM	N	N	N	N	N	N	N	N	N
(15,9)	Downlink Packet Store Contents for Time Period	TC	Y	Y	N	N	N	N	N	N	N
(15,10)	Delete Packet Stores Contents up to Specified Packets	TC	N	N	N	N	N	N	N	N	N
(15,11)	Delete Packet Stores Contents up to Specified Storage Time	TC	Y	Y	N	N	N	N	N	N	N
(15,12)	Report Catalogues for Selected Packet Stores	TC	N	N	N	N	N	N	Y	N	N
(15,13)	Packet Store Catalogue Report	TM	N	N	N	N	N	N	N	N	N
(15,128)	Set the Nominal Read Pointer in a Packet Store	TC	Y	Y	N	N	N	N	N	N	N
(15,129)	Delete Packet Store Contents up to Read Pointer	TC	Y	Y	N	N	N	N	N	N	N
(15,144)	Set Packet Store Configuration	TC	Y	Y	N	N	N	N	N	N	N
(15,146)	Suspend Packet Store Downlink	TC	Y	Y	N	N	N	N	N	N	N
(15,147)	Resume Packet Store Downlink	TC	Y	Y	N	N	N	N	N	N	N
(15,148)	Clear System Log Packet Store	TC	Y	Y	N	N	N	N	N	N	N
(15,149)	Downlink Packet Store Contents for Packet Range	TC	Y	Y	N	N	N	N	N	N	N
(15,150)	Select TMM Module	TC	Y	Y	N	N	N	N	N	N	N

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(15,151)	Initialise Mass Memory Driver	TC	Y	Y	N	N	N	N	N	N	N
(15,152)	Start Mass Memory Scrubbing	TC	Y	Y	N	N	N	N	N	N	N
(15,153)	Stop Mass Memory Scrubbing	TC	Y	Y	N	N	N	N	N	N	N
(15,154)	Report Mass Memory Scrubbing Status	TC	Y	Y	N	N	N	N	N	N	N
(15,155)	Configure Mass Memory Bank Mapping	TC	Y	Y	N	N	N	N	N	N	N
(15,156)	Start Mass Memory Filling	TC	Y	Y	N	N	N	N	N	N	N
(15,157)	Report Mass Memory Filling Status	TC	Y	Y	N	N	N	N	N	N	N
(15,158)	Start Mass Memory Checking	TC	Y	Y	N	N	N	N	N	N	N
(15,159)	Report Mass Memory Checking Status	TC	Y	Y	N	N	N	N	N	N	N
(15,160)	Mass Memory Scrubbing Status Report	TM	Y	Y	N	N	N	N	N	N	N
(15,161)	Mass Memory Filling Status Report	TM	Y	Y	N	N	N	N	N	N	N
(15,162)	Mass Memory Checking Status Report	TM	Y	Y	N	N	N	N	N	N	N
(15,224)	Packet Store Catalogue Report	TM	N	N	N	N	N	N	Y	N	N
(15,226)	Configure Packet Store	TC	N	N	N	N	N	N	Y	N	N
(15,227)	Store	TC	N	N	N	N	N	N	Y	N	N
(15,228)	Downlink	TC	N	N	N	N	N	N	Y	N	N
(15,229)	Pass Through Mode	TC	N	N	N	N	N	N	Y	N	N
(15,230)	Perform E2E BITE	TC	N	N	N	N	N	N	Y	N	N
(15,231)	Perform Memory TEST	TC	N	N	N	N	N	N	Y	N	N
(15,232)	Abort	TC	N	N	N	N	N	N	Y	N	N
(15,233)	Set Nominal Read Pointer of Packet Store	TC	N	N	N	N	N	N	Y	N	N
(15,234)	Delete Packet Store Contents up to Read Pointer	TC	N	N	N	N	N	N	Y	N	N

NOTE:
1. TC (15,3) allows to add packets by type / subtype.
2. TC (15,8) is not applicable as the TM packets both for the SMU Packet Stores and DSHA Packet Stores are directly down-linked from memory to the downlink channel.

5.14 SERVICE 17: CONNECTION TEST

The following summary table provides Service 17 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(17,1)	Perform Connection Test	TC	Y	Y	Y	Y	Y	Y	Y	Y	Y
(17,2)	Connection Test Report	TM	Y	Y	Y	Y	Y	Y	Y	Y	Y

5.15 SERVICE 18: ON-BOARD OPERATIONS PROCEDURES SERVICE

The following summary table provides Service 18 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(18,1)	Load Procedure	TC	N	N	N	N	N	N	N	N	N
(18,144)	Add / Modify OBOP	TC	Y	Y	N	N	N	N	N	N	N
(18,160)	Add Telecommand to OBOP	TC	N	N	N	Y	N	N	N	N	N
(18,2)	Delete Procedure	TC	Y	Y	N	Y	N	N	N	N	N
(18,3)	Start Procedure	TC	Y	Y	N	Y	N	N	N	N	N
(18,4)	Stop Procedure	TC	Y	Y	N	Y	N	N	N	N	N
(18,5)	Suspend Procedure	TC	N	N	N	N	N	N	N	N	N
(18,6)	Resume Procedure	TC	N	N	N	N	N	N	N	N	N
(18,7)	Communicate Parameters to a Procedure	TC	N	N	N	N	N	N	N	N	N
(18,8)	Report List of Onboard Operation Procedure	TC	N	N	N	N	N	N	N	N	N
(18,162)	Report List of Onboard Operation Procedure	TC	N	N	N	Y	N	N	N	N	N
(18,145)	Report List of OBOP with Status	TC	Y	Y	N	N	N	N	N	N	N
(18,9)	Onboard Operation Procedures List Report	TM	N	N	N	N	N	N	N	N	N
(18,146)	OBOP List with Status Report	TM	Y	Y	N	N	N	N	N	N	N
(18,163)	List Of Onboard Operations Procedures Report	TM	N	N	N	Y	N	N	N	N	N
(18,130)	Report OBOP Detailed Definition	TC	Y	Y	N	Y	N	N	N	N	N
(18,149)	OBOP Flow Control	TC	Y	Y	N	N	N	N	N	N	N
(18,150)	AVS OBOP Definition Report	TM	Y	Y	N	N	N	N	N	N	N
(18,151)	OBOP Termination	TC	Y	Y	N	N	N	N	N	N	N

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(18,147)	Enable OBOP	TC	Y	Y	N	N	N	N	N	N	N
(18,148)	Disable OBOP	TC	Y	Y	N	N	N	N	N	N	N
(18,164)	SES OBOP Detailed Definition Report	TM	N	N	N	Y	N	N	N	N	N
(18,10)	Report List of Active Onboard Operation Procedures	TC	Y	Y	N	N	N	N	N	N	N
(18,11)	Onboard Active Operations Procedures List Report	TM	Y	Y	N	N	N	N	N	N	N
(18,12)	Abort Procedure	TC	N	N	N	N	N	N	N	N	N
(18,161)	Save OBOP Configuration Data	TC	N	N	N	Y	N	N	N	N	N

Note:

1. For ASW, TC(18,144) is used to load new OBOP, i.e. list of TCs with associated time information, to a spare on-board location. Same service is used to modify all or part of an existing OBOP.

2. C-SAR has a fixed number of OBOP, some of which are empty. Then service TC(18,160) can be used to add TCs to these OBOP. TC(18,2) can be used to delete an OBOP.

3. TC(18,149) and TC(18,151) can only be part of an OBOP and not directly sent for execution by Ground.

5.16 SERVICE 19: EVENT DETECTION AND ACTION EXECUTION

The following summary table provides Service 19 applicability.

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(19,1)	Add Events to the Detection List	TC	N	N	N	N	N	N	N	N	N
(19,2)	Delete Events from the Detection List	TC	N	N	N	Y	N	N	N	N	N
(19,3)	Clear the Event Detection List	TC	N	N	N	N	N	N	N	N	N
(19,4)	Enable Actions	TC	N	N	N	Y	N	N	N	N	N
(19,5)	Disable Actions	TC	N	N	N	Y	N	N	N	N	N
(19,6)	Report the Event Detection List	TC	N	N	N	Y	N	N	N	N	N
(19,7)	Event Detection List Report	TM	N	N	N	Y	N	N	N	N	N
(19,128)	Report Event Action	TC	N	N	N	Y	N	N	N	N	N
(19,129)	Event Action Report	TM	N	N	N	Y	N	N	N	N	N
(19,144)	Configure RID-Event Table Event Fields	TC	Y	Y	N	N	N	N	N	N	N
(19,145)	Configure RID-Event Table Enable/Disable Fields	TC	Y	Y	N	N	N	N	N	N	N

ID	Name	Type	AVS			C-SAR			PDHT		LCT
			NM ASW	SM ASW	GPS	ICM	TCU	ICM BOOT	DSHA	DSHA BOOT	
(19,146)	Configure Event-Action Table Parameter Fields	TC	Y	Y	N	N	N	N	N	N	N
(19,147)	Configure Event-Action Table Enable/Disable Fields	TC	Y	Y	N	N	N	N	N	N	N
(19,148)	Report RID-Event Table Configuration	TC	Y	Y	N	N	N	N	N	N	N
(19,149)	RID-Event Table Configuration Report	TM	Y	Y	N	N	N	N	N	N	N
(19,150)	Report RID-Event Table Status	TC	Y	Y	N	N	N	N	N	N	N
(19,151)	RID-Event Table Status Report	TM	Y	Y	N	N	N	N	N	N	N
(19,152)	Report Event-Action Table Configuration	TC	Y	Y	N	N	N	N	N	N	N
(19,153)	Event-Action Table Configuration Report	TM	Y	Y	N	N	N	N	N	N	N
(19,154)	Report Event-Action Table Status	TC	Y	Y	N	N	N	N	N	N	N
(19,155)	Event-Action Table Status Report	TM	Y	Y	N	N	N	N	N	N	N
(19,156)	Enable Event-Action Service	TC	Y	Y	N	N	N	N	N	N	N
(19,157)	Disable Event-Action Service	TC	Y	Y	N	N	N	N	N	N	N
(19,158)	Raise RID	TC	Y	Y	N	N	N	N	N	N	N
(19.160)	Add Events to the Detection List	TC	N	N	N	Y	N	N	N	N	N
(19.161)	Save Event Detection List Configuration Data	TC	N	N	N	Y	N	N	N	N	N

5.17 ASW MISSION SPECIFIC SERVICES

5.17.1 Service 130: Command Database Management Service

The Command Database Management Service allows the management of the On-board Command Data Base.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(130,1)	Insert Telecommand	TC	Y	Y
(130,2)	Reset Spare OBCD Section	TC	Y	Y
(130,3)	Report Free Available Space	TC	Y	Y
(130,4)	Free Available Space Report	TM	Y	Y
(130,5)	Dump OBCD Telecommand	TC	Y	Y
(130,6)	Dump OBCD Telecommand Report	TM	Y	Y
(130,7)	Execute Telecommand	TC	Y	Y

ID	Name	Type	AVS	
			NM ASW	SM ASW
(130,8)	Enable OBCD Telecommand	TC	Y	Y
(130,9)	Disable OBCD Telecommand	TC	Y	Y
(130,10)	Modify OBCD Telecommand	TC	Y	Y
(130,11)	Report OBCD Telecommands Status	TC	Y	Y
(130,12)	OBCD Telecommands Status Report	TM	Y	Y

5.17.2 Service 131: Reserved

5.17.3 Service 132: Position-Tag Mission Schedule Services

The Position-Tag Mission Schedule Service allows the management of the position-tagged telecommands.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(132,1)	Enable Release of Position-Tagged Telecommands	TC	Y	N
(132,2)	Disable Release of Position-Tagged Telecommands	TC	Y	N
(132,3)	Reset Position-Tagged Command Schedule	TC	Y	N
(132,4)	Insert Position-Tagged Telecommands in Command Schedule	TC	Y	N
(132,5)	Delete Position-Tagged Telecommands	TC	Y	N
(132,6)	Delete Position-Tagged TC over Position Interval and Sub-Schedule	TC	Y	N
(132,144)	Delete Position-Tagged TC over Position Interval and APID	TC	Y	N
(132,10)	Detailed Position-Tagged Command Schedule Report	TM	Y	N
(132,13)	Summary Position-Tagged Command Schedule Report	TM	Y	N
(132,16)	Report Position-Tagged Command Schedule in Detailed Form	TC	Y	N
(132,17)	Report Position-Tagged Command Schedule in Summary Form	TC	Y	N
(132,18)	Report Status of Position-Tagged Command Schedule	TC	Y	N
(132,19)	Position-Tagged Command Schedule Status Report	TM	Y	N

5.17.4 Service 133: Two-Step Telecommand Management Service

The Two-Step Telecommands Management Service allows to execute commands as two step commands for secure operations.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(133,1)	Arm Telecommand	TC	Y	Y
(133,2)	Download Armed Telecommand	TC	Y	Y
(133,3)	Armed Telecommand Report	TM	Y	Y
(133,4)	Delete Armed Telecommand	TC	Y	Y
(133,5)	Fire Telecommand	TC	Y	Y

5.17.5 Service 134: Telecommand Batch Management Service

The Telecommands Batch Management Service allows to manage groups of TC packets sent by Ground in a single TC for immediate execution.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(134,1)	Execute Telecommand Batch	TC	Y	Y

5.17.6 Service 135: Spacecraft Management Service

Refer to [RD.10] for details on Service 135.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(135,1)	Change Mode Transition Plausibility Table (TC_SC_CMTP)	TC	Y	N
(135,2)	Report Mode Transition Plausibility Table (TC_SC_RMTP)	TC	Y	N
(135,3)	Mode Transition Plausibility Table Report (MTPR TM)	TM	Y	N
(135,4)	Change Configuration Action Sequence Table (TC_SC_CCAS)	TC	Y	N
(135,5)	Report Configuration Actions Sequence Table (TC_SC_RCAS)	TC	Y	N
(135,6)	Configuration Actions Sequence Table Report (CASR TM)	TM	Y	N
(135,128)	S/C Operational Mode Transition Nominal (TC_SC_MOTR)	TC	Y	N
(135,129)	S/C Operational Mode Transition Spare (TC_SC_MOSP)	TC	Y	N
(135,130)	S/C Operational Mode FDIR (TC_SC_MOFD)	TC	Y	N

5.17.7 Service 136: SM AOCS Management Service

Refer to [RD.10] for details on Service 136.

.

ID	Name	Type	AVS	
			NM ASW	SM ASW
AOCN CGYRO Management				
(136,1)	Switch CGYRO Off	TC	N	Y
(136,2)	Switch CGYRO On	TC	N	Y
(136,3)	Enable CGYRO Acquisition	TC	N	Y
(136,4)	Disable CGYRO Acquisition	TC	N	Y
(136,5)	Transmit CGYRO Low Level Command	TC	N	Y
(136,6)	Receive CGYRO Low Level Data	TC	N	Y
(136,7)	Configure CGYRO On-Control	TC	N	Y
(136,8)	Set CGYRO Subsystem Mode	TC	N	Y
(136,9)	Reset CGYRO	TC	N	Y
(136,10)	Reset & Confirm On-Control CGYRO	TC	N	Y
(136,11)	Switch CGYRO Subsystem Off	TC	N	Y
(136,12)	CGYRO Low-Level Data Report	TM	N	Y
AOCN SMM Assembly Management				
(136,26)	Set SMM Assembly Mode	TC	N	Y
(136,27)	Switch SMM Assembly Off	TC	N	Y
(136,28)	Switch SMM Off	TC	N	Y
(136,29)	Switch SMM On	TC	N	Y
(136,30)	Reset SMM	TC	N	Y
(136,31)	Enable SMM Acquisition	TC	N	Y
(136,32)	Disable SMM Acquisition	TC	N	Y
(136,33)	Configure SMM On-Control	TC	N	Y
(136,34)	Swap SMM	TC	N	Y
(136,35)	Reset & Confirm On-Control SMM	TC	N	Y
(136,36)	Transmit SMM Low-Level Command	TC	N	Y
(136,37)	Receive SMM Low-Level Data	TC	N	Y
(136,38)	SMM Low-Level Data Report	TM	N	Y
AOCN SMRCT Management				
(136,76)	Set SMRCT Assembly Mode	TC	N	Y
(136,77)	Inhibit SMRCT Assembly	TC	N	Y
(136,80)	Configure SMRCT Branch On-Control	TC	N	Y
(136,81)	Swap SMRCT Branch	TC	N	Y
(136,82)	Configure On-Control SMRCT Heaters	TC	N	Y
(136,83)	Actuate SMRCT Firing Profile	TC	N	Y
(136,84)	Stop SMRCT Firing Profile	TC	N	Y
AOCN Diagnostic Management				

ID	Name	Type	AVS	
			NM ASW	SM ASW
(136,101)	Enable ACE Acquisition	TC	N	Y
(136,102)	Disable ACE Acquisition	TC	N	Y
(136,103)	Transmit ACE Low-Level Command	TC	N	Y
(136,104)	Receive ACE Low-Level Data	TC	N	Y
(136,106)	Actuate MGT Torque	TC	N	Y
(136,107)	Actuate RW Torque	TC	N	Y
(136,109)	Switch NM Equipment Off	TC	N	Y
(136,111)	Stop MGT Actuation	TC	N	Y
(136,112)	Stop RW Actuation	TC	N	Y
(136,121)	ACE Low-Level Data Report	TM	N	Y
AOCN Kernel Management				
(136,126)	Configure Kernel Parameters	TC	N	Y
(136,127)	Apply Kernel Configuration Parameters Change	TC	N	Y
(136,128)	Clear Kernel Configuration Parameters Change	TC	N	Y
(136,129)	Report Kernel Configuration Parameters	TC	N	Y
(136,130)	Reset RCT Accumulated Actuation Time Error	TC	N	Y
(136,250)	Kernel Configuration Parameters Report	TM	N	Y
AOCN Dynamic DB Management				
(136,201)	Enable ADR Updating	TC	N	Y
(136,202)	Disable ADR Updating	TC	N	Y

5.17.8 Service 137: NM AOCS Management Service

Refer to [RD.10] for details on Service 137.

.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(137,1)	Enable AOCS Data Acquisition	TC	Y	N
(137,2)	Disable AOCS Data Acquisition	TC	Y	N
(137,3)	Enable AOCS ADR Updating	TC	Y	N
(137,4)	Disable AOCS ADR Updating	TC	Y	N
(137,5)	Enable AOCS Parameters Surveillance	TC	Y	N
(137,6)	Disable AOCS Parameters Surveillance	TC	Y	N
(137,7)	Enable Fine GYRO Synchronisation Protocol	TC	Y	N
(137,8)	Disable Fine GYRO Synchronisation Protocol	TC	Y	N
(137,9)	STT Time Synchronisation	TC	Y	N

ID	Name	Type	AVS	
			NM ASW	SM ASW
(137,21)	Load New CKPM Local Value	TC	Y	N
(137,22)	Report CKPM Local Value	TC	Y	N
(137,23)	CKPM Report	TM	Y	N
(137,24)	Load New CKSG Local Values	TC	Y	N
(137,25)	Report CKSG Local Values	TC	Y	N
(137,26)	CKSG Local Values Report	TM	Y	N
(137,27)	Update CKPM/CSKG Interfaces	TC	Y	N
(137,28)	Change AOCS CAS Table	TC	Y	N
(137,29)	Report AOCS CAS Table	TC	Y	N
(137,30)	AOCS CAS Table Report	TM	Y	N
(137,31)	Change AOCS DHHS Table	TC	Y	N
(137,32)	Report AOCS DHHS Table	TC	Y	N
(137,33)	AOCS DHHS Table Report	TM	Y	N
(137,34)	Change AOCS MRH Table	TC	Y	N
(137,35)	Report AOCS MRH Table	TC	Y	N
(137,36)	AOCS MRH Table Report	TM	Y	N
(137,37)	Change AOCS HCs Table	TC	Y	N
(137,38)	Report AOCS HCs Table	TC	Y	N
(137,39)	AOCS HCs Table Report	TM	Y	N
(137,40)	Change AOCS MTP Table	TC	Y	N
(137,41)	Report AOCS MTP Table	TC	Y	N
(137,42)	AOCS MTP Table Report	TM	Y	N
(137,43)	Change AOCS MDS Look-Up Table	TC	Y	N
(137,44)	Report AOCS MDS Look-Up Table	TC	Y	N
(137,45)	AOCS MDS Look-Up Table Report	TM	Y	N
(137,70)	Change HW Configuration	TC	Y	N
(137,71)	Stop Mil-Bus-1553 Hardware Actuation	TC	Y	N
(137,100)	Transmit ACE Low Level Command	TC	Y	N
(137,101)	Receive ACE Low Level Command	TC	Y	N
(137,102)	ACE Low-Level Data Report	TM	Y	N
(137,103)	Transmit SMM Low Level Command	TC	Y	N
(137,104)	Receive SMM Low Level Command	TC	Y	N
(137,105)	SMM Low-Level Data Report	TM	Y	N
(137,106)	Transmit GYRO Low Level Command	TC	Y	N
(137,107)	Receive GYRO Low Level Command	TC	Y	N
(137,108)	GYRO Low-Level Data Report	TM	Y	N
(137,109)	Transmit GPS Low Level Command	TC	Y	N
(137,110)	Receive GPS Low Level Command	TC	Y	N
(137,111)	GPS Low-Level Data Report	TM	Y	N

ID	Name	Type	AVS	
			NM ASW	SM ASW
(137,112)	Transmit STT Low Level Command	TC	Y	N
(137,113)	Receive STT Low Level Command	TC	Y	N
(137,114)	STT Low-Level Data Report	TM	Y	N
(137,115)	Transmit CGYRO Low Level Command	TC	Y	N
(137,116)	Receive CGYRO Low Level Command	TC	Y	N
(137,117)	CGYRO Low-Level Data Report	TM	Y	N
(137,128)	AOCS Operational Mode Transition Start-Up	TC	Y	N
(137,129)	AOCS Operational Mode Transition Nominal	TC	Y	N
(137,130)	AOCS Operational Mode Transition Spare	TC	Y	N
(137,131)	Change HW Configuration through OBCP	TC	Y	N
(137,132)	AOCS Operational Mode FDIR	TC	Y	N

5.17.9 Service 160: RM Oscillator Management Service

Refer to [RD.10] for details on Service 160.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(160,1)	Enable RM Oscillator Frequency Drift Estimation	TC	Y	Y
(160,2)	Disable RM Oscillator Frequency Drift Estimation	TC	Y	Y
(160,3)	Enable RM Oscillator Frequency Drift Correction	TC	Y	Y
(160,4)	Disable RM Oscillator Frequency Drift Correction	TC	Y	Y
(160,5)	Select RM Oscillator Drift Estimation Source	TC	Y	Y
(160,6)	Set RM Oscillator Drift Estimation Period	TC	Y	Y
(160,7)	Configure Input Mux	TC	Y	Y
(160,8)	Configure PM Mux	TC	Y	Y
(160,9)	Configure Output Mux	TC	Y	Y
(160,10)	Set RM Drift Correction Register	TC	Y	Y
(160,11)	Set Drift Correction Mode	TC	Y	Y

5.17.10 Service 161: Common Resources Service

Refer to [RD.10] for details on Service 161.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(161,1)	Set SLHK Assembly Mode	TC	Y	Y
(161,2)	Switch SLHK Assembly Off	TC	Y	Y
(161,3)	Switch SLHK Off	TC	Y	Y
(161,4)	Switch SLHK On	TC	Y	Y
(161,5)	Reset SLHK	TC	Y	Y
(161,6)	Enable SLHK Acquisitions	TC	Y	Y
(161,7)	Disable SLHK Acquisitions	TC	Y	Y
(161,8)	Configure SLHK On-Control	TC	Y	Y
(161,9)	Swap SLHK	TC	Y	Y
(161,10)	Reset & Confirm On-Control SLHK	TC	Y	Y
(161,11)	Transmit SLHK Low-Level Command	TC	Y	Y
(161,12)	Receive SLHK Low-Level Data	TC	Y	Y
(161,13)	SLHK Low-Level Data Report	TM	Y	Y
(161,14)	Enable SLHK DCU Acquisitions	TC	Y	N
(161,15)	Disable SLHK DCU Acquisitions	TC	Y	N
(161,31)	Set SBT Assembly Mode	TC	Y	Y
(161,37)	Configure SBT On-Control	TC	Y	Y
(161,38)	Swap SBT	TC	Y	Y
(161,61)	Configure MilBus	TC	Y	Y

5.17.11 Service 162: EPS-TCS Management Service

Refer to [RD.10] for details on Service 162.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(162,1)	Set PCDU Assembly Mode	TC	Y	Y
(162,2)	Switch PCDU Assembly Off	TC	Y	Y
(162,3)	Switch PCDU Off	TC	Y	Y
(162,4)	Switch PCDU On	TC	Y	Y
(162,5)	Reset PCDU	TC	Y	Y
(162,6)	Enable PCDU Acquisitions	TC	Y	Y
(162,7)	Disable PCDU Acquisitions	TC	Y	Y
(162,8)	Configure PCDU On-Control	TC	Y	Y

ID	Name	Type	AVS	
			NM ASW	SM ASW
(162,9)	Swap PCDU	TC	Y	Y
(162,10)	Reset & Confirm On-Control PCDU	TC	Y	Y
(162,11)	Transmit PCDU Low-Level Command	TC	Y	Y
(162,12)	Receive PCDU Low-Level Data	TC	Y	Y
(162,13)	PCDU Low-Level Data Report	TM	Y	Y
(162,31)	Set CAPS Assembly Mode	TC	Y	Y
(162,32)	Switch CAPS Assembly Off	TC	Y	Y
(162,33)	Switch CAPS Off	TC	Y	Y
(162,34)	Switch CAPS On	TC	Y	Y
(162,35)	Reset CAPS	TC	Y	Y
(162,36)	Enable CAPS Acquisitions	TC	Y	Y
(162,37)	Disable CAPS Acquisitions	TC	Y	Y
(162,38)	Configure CAPS On-Control	TC	Y	Y
(162,39)	Swap CAPS	TC	Y	Y
(162,40)	Reset & Confirm On-Control CAPS	TC	Y	Y
(162,41)	Transmit CAPS Low-Level Command	TC	Y	Y
(162,42)	Receive CAPS Low-Level Data	TC	Y	Y
(162,43)	CAPS Low-Level Data Report	TM	Y	Y
(162,44)	Report CAPS Sporadic Telemetry	TC	Y	Y
(162,45)	CAPS Sporadic Telemetry Report	TM	Y	Y
(162,61)	Set SRM Assembly Mode	TC	Y	Y
(162,62)	Switch SRM Assembly Off	TC	Y	Y
(162,63)	Switch SRM Off	TC	Y	Y
(162,64)	Switch SRM On	TC	Y	Y
(162,65)	Reset SRM	TC	Y	Y
(162,66)	Enable SRM Acquisitions	TC	Y	Y
(162,67)	Disable SRM Acquisitions	TC	Y	Y
(162,68)	Configure SRM On-Control	TC	Y	Y
(162,69)	Swap SRM	TC	Y	Y
(162,70)	Reset & Confirm On-Control SRM	TC	Y	Y
(162,71)	Transmit SRM Low-Level Command	TC	Y	Y
(162,72)	Receive SRM Low-Level Data	TC	Y	Y
(162,73)	SRM Low-Level Data Report	TM	Y	Y
(162,74)	Enable SAW Rotation Feasibility Check	TC	Y	Y
(162,75)	Disable SAW Rotation Feasibility Check	TC	Y	Y
(162,76)	Actuate SAW Relative Rotation	TC	Y	Y
(162,77)	Actuate SAW Absolute Rotation	TC	Y	Y
(162,78)	SM Set SAW Position Discrepancy Parameter	TC	N	Y
(162,91)	SM Select Thermal Control Table	TC	N	Y

ID	Name	Type	AVS	
			NM ASW	SM ASW
(162, 92)	SM Enable Thermal Control	TC	N	Y
(162, 93)	SM Disable Thermal Control	TC	N	Y
(162, 94)	SM Enable Nominal Thermal Control Loop	TC	N	Y
(162, 95)	SM Disable Nominal Thermal Control Loop	TC	N	Y
(162, 96)	SM Enable FDIR Thermal Control Loop	TC	N	Y
(162, 97)	SM Disable FDIR Thermal Control Loop	TC	N	Y
(162,98)	SM Configure PCDU Nominal Thermal Control Loop	TC	N	Y
(162, 99)	SM Report PCDU Nominal Thermal Control Loop	TC	N	Y
(162, 100)	SM PCDU Nominal Thermal Control Loop Report	TM	N	Y
(162, 101)	SM Configure PCDU FDIR Thermal Control Loop	TC	N	Y
(162, 102)	SM Report PCDU FDIR Thermal Control Loop	TC	N	Y
(162, 103)	SM PCDU FDIR Thermal Control Loop Report	TM	N	Y
(162, 104)	SM Configure CAPS FDIR Thermal Control Loop	TC	N	Y
(162, 105)	SM Report CAPS FDIR Thermal Control Loop	TC	N	Y
(162, 106)	SM CAPS FDIR Thermal Control Loop Report	TM	N	Y
(162, 107)	SM Define Virtual Thermistor	TC	N	Y
(162, 108)	SM Delete Virtual Thermistor	TC	N	Y
(162, 109)	SM Enable Virtual Thermistor	TC	N	Y
(162, 110)	SM Disable Virtual Thermistor	TC	N	Y
(162, 111)	SM Report Virtual Thermistors	TC	N	Y
(162, 112)	SM Virtual Thermistors Report	TM	N	Y
(162, 121)	Select Thermal Control Table	TC	Y	N
(162, 122)	Enable Thermal Control	TC	Y	N
(162, 123)	Disable Thermal Control	TC	Y	N
(162, 124)	Enable Nominal Thermal Control Loop	TC	Y	N
(162, 125)	Disable Nominal Thermal Control Loop	TC	Y	N
(162, 126)	Enable FDIR Thermal Control Loop	TC	Y	N
(162, 127)	Disable FDIR Thermal Control Loop	TC	Y	N
(162,128)	Configure PCDU Nominal Thermal Control Loop	TC	Y	N
(162, 129)	Report PCDU Nominal Thermal Control Loop	TC	Y	N
(162, 130)	PCDU Nominal Thermal Control Loop Report	TM	Y	N
(162, 131)	Configure PCDU FDIR Thermal Control Loop	TC	Y	N
(162, 132)	Report PCDU FDIR Thermal Control Loop	TC	Y	N
(162, 133)	PCDU FDIR Thermal Control Loop Report	TM	Y	N
(162, 134)	Configure CAPS FDIR Thermal Control Loop	TC	Y	N
(162, 135)	Report CAPS FDIR Thermal Control Loop	TC	Y	N
(162, 136)	CAPS FDIR Thermal Control Loop Report	TM	Y	N
(162, 137)	Define Virtual Thermistor	TC	Y	N
(162, 138)	Delete Virtual Thermistor	TC	Y	N

ID	Name	Type	AVS	
			NM ASW	SM ASW
(162, 139)	Enable Virtual Thermistor	TC	Y	N
(162, 140)	Disable Virtual Thermistor	TC	Y	N
(162, 141)	Report Virtual Thermistors	TC	Y	N
(162, 142)	Virtual Thermistors Report	TM	Y	N

5.17.12 Service 163: Payload Management Service

Refer to [RD.10] for details on Service 163.

ID	Name	Type	AVS	
			NM ASW	SM ASW
(163,1)	Set DSHA Supervisor Assembly Mode	TC	Y	N
(163,2)	Switch DSHA Supervisor Assembly Off	TC	Y	N
(163,3)	Switch DSHA Supervisor Off	TC	Y	N
(163,4)	Switch DSHA Supervisor On	TC	Y	N
(163,5)	Reset DSHA Supervisor	TC	Y	N
(163,6)	Enable DSHA Acquisitions	TC	Y	N
(163,7)	Disable DSHA Acquisitions	TC	Y	N
(163,8)	Configure DSHA Supervisor On-Control	TC	Y	N
(163,9)	Swap DSHA Supervisor	TC	Y	N
(163,10)	Reset & Confirm On-Control DSHA Supervisor	TC	Y	N
(163,11)	NM Transmit DSHA Low-Level Command	TC	Y	N
(163,12)	NM Receive DSHA Low-Level Data	TC	Y	N
(163,13)	NM DSHA Low-Level Data Report	TM	Y	N
(163,14)	Execute PDHT EQSOL	TC	Y	N
(163,15)	Enable S/C Telemetry Transmission to PDHT	TC	Y	N
(163,16)	Disable S/C Telemetry Transmission to PDHT	TC	Y	N
(163,21)	Set SES ICE Assembly Mode	TC	Y	N
(163,22)	Switch SES ICE Assembly Off	TC	Y	N
(163,23)	Switch SES ICE Off	TC	Y	N
(163,24)	Switch SES ICE On	TC	Y	N
(163,25)	Reset SES ICE	TC	Y	N
(163,26)	Enable CSAR Acquisitions	TC	Y	N
(163,27)	Disable CSAR Acquisitions	TC	Y	N
(163,28)	Configure SES ICE On-Control	TC	Y	N

ID	Name	Type	AVS	
			NM ASW	SM ASW
(163,29)	Swap SES ICE	TC	Y	N
(163,30)	Reset & Confirm On-Control SES ICE	TC	Y	N
(163,31)	NM Transmit CSAR Low-Level Command	TC	Y	N
(163,32)	NM Receive CSAR Low-Level Data	TC	Y	N
(163,33)	NM CSAR Low-Level Data Report	TM	Y	N
(163,34)	Enable Ancillary Data Transmission	TC	Y	N
(163,35)	Disable Ancillary Data Transmission	TC	Y	N
(163,36)	Execute CSAR EQSOL	TC	Y	N
(163,41)	Set LCT Assembly Mode	TC	Y	N
(163,42)	Switch LCT Assembly Off	TC	Y	N
(163,43)	Switch LCT Off	TC	Y	N
(163,44)	Switch LCT On	TC	Y	N
(163,45)	Reset LCT	TC	Y	N
(163,46)	Enable LCT Acquisitions	TC	Y	N
(163,47)	Disable LCT Acquisitions	TC	Y	N
(163,48)	Configure LCT On-Control	TC	Y	N
(163,50)	Reset & Confirm On-Control LCT	TC	Y	N
(163,51)	Transmit LCT Low Level Command	TC	Y	N
(163,52)	Receive LCT Low Level Data	TC	Y	N
(163,53)	LCT Low Level Data Report	TM	Y	N
(163,54)	Enable Ancillary Data Transmission	TC	Y	N
(163,55)	Disable Ancillary Data Transmission	TC	Y	N
(163,56)	Execute LCT EQSOL	TC	Y	N
(163,71)	Command SAR Measurement	TC	Y	N
(163,72)	Command SAR Measurement and Data Store	TC	Y	N
(163,73)	Command SAR Measurement and Data Pass Through	TC	Y	N
(163,100)	SM Switch Loads OFF	TC	N	Y
(163,101)	SM Transmit Payload Low-Level Command	TC	N	Y
(163,102)	SM Receive Payload Low-Level Command	TC	N	Y
(163,103)	SM Payload Low-Level Command Report	TM	N	Y

5.18 C-SAR MISSION SPECIFIC SERVICES

5.18.1 Service 152: SES Function Management

ID	Name	Type	C-SAR		
			ICM	ICM BOOT	TCU
(152,160)	Change Mode to Standby	TC	Y	N	N
(152,161)	Change Mode to Pause	TC	Y	N	N
(152,162)	Change Mode to Ready	TC	Y	N	N
(152,163)	Change Mode to Standby Refuse	TC	Y	N	N
(152,164)	Perform Measurement	TC	Y	N	N
(152,165)	Release Refuse	TC	Y	N	N
(152,166)	Set ECC Program Parameters	TC	Y	N	N
(152,167)	Set Beam Steering Table Parameters	TC	Y	N	N
(152,168)	Set SWST Parameters	TC	Y	N	N
(152,169)	Set Swath Elevation Address	TC	Y	N	N
(152,170)	Set Rank and PRI Duration Parameters	TC	Y	N	N
(152,171)	Set TX Pulse Parameters	TC	Y	N	N
(152,172)	Set Mission Specific Parameters	TC	Y	N	N
(152,173)	Set PRI Parameters	TC	Y	N	N
(152,174)	Send Direct Power Switching Command	TC	Y	N	N
(152,175)	Send CAN Message	TC	Y	N	N
(152,176)	CAN Message Response Report	TM	Y	N	N
(152,177)	Send SpaceWire Message	TC	Y	N	N
(152,178)	SpaceWire Message Response Report	TM	Y	N	N
(152,179)	Clear Radar Parameter Data	TC	Y	N	N
(152,182)	Perform Test	TC	Y	N	N
(152,183)	Report Radar Parameters	TC	Y	N	N
(152,184)	ECC Parameters Report	TM	Y	N	N
(152,185)	BST Parameters Report	TM	Y	N	N
(152,186)	Rank and PRI Duration Parameters Report	TM	Y	N	N
(152,187)	SWST Parameters Report	TM	Y	N	N
(152,188)	Tx Pulse Parameters Report	TM	Y	N	N
(152,189)	PRI Parameters Report	TM	Y	N	N
(152,190)	Mission Specific Parameters Report	TM	Y	N	N
(152,191)	Set Instrument Redundancy Configuration	TC	Y	N	N
(152,192)	Enable Memory Scrubber	TC	Y	N	N
(152,193)	Disable Memory Scrubber	TC	Y	N	N
(152,194)	Set SWL Parameters	TC	Y	N	N
(152,195)	Set Rx Gain Parameters	TC	Y	N	N

ID	Name	Type	C-SAR		
			ICM	ICM BOOT	TCU
(152,196)	Set Tx Pulse and Rx Bandwidth Parameters	TC	Y	N	N
(152,197)	SWL Parameters Report	TM	Y	N	N
(152,198)	Rx Gain Parameters Report	TM	Y	N	N
(152,199)	Tx Pulse and Rx Bandwidth Parameters Report	TM	Y	N	N
(152,200)	Enable Swath Parameters Updates	TC	Y	N	N
(152,201)	Disable Swath Parameters Updates	TC	Y	N	N
(152,202)	Save Radar Database Data	TC	Y	N	N
(152,203)	Save Instrument Redundancy Configuration Data	TC	Y	N	N
(152,204)	Request EQSOL	TC	Y	N	N
(152,205)	Send Serial Message	TC	Y	N	N
(152,206)	Serial Message Response Report	TM	Y	N	N
(152,207)	Change Mode To Pause Refuse	TC	Y	N	N
(152,208)	Enable Watchdog	TC	Y	N	N
(152,209)	Disable Watchdog	TC	Y	N	N
(152,210)	Set Instrument Configuration Identifier	TC	Y	N	N
(152,211)	Report Instrument Redundancy Configuration	TC	Y	N	N
(152,212)	Instrument Redundancy Configuration Report	TM	Y	N	N
(152,213)	Report Software Information Report Table	TC	Y	N	N
(152,214)	Software Information Report Table Report	TM	Y	N	N
(152,215)	Reset ICM	TC	Y	Y	N
(152,216)	Execute Application	TC	N	Y	N
(152,217)	Set Tx Pulse Predistortion Parameters	TC	Y	N	N
(152,218)	Tx Pulse Predistortion Parameters Report	TM	Y	N	N
(152,219)	Set User Defined RxM Test Pattern Data	TC	Y	N	N
(152,220)	User Defined RxM Test Pattern Data Report	TM	Y	N	N
(152,221)	Set User Defined RxM Filter Parameters	TC	Y	N	N
(152,222)	User Defined RxM Filter Parameters Report	TM	Y	N	N
(152,223)	Set User Defined RxM Compression Parameters	TC	Y	N	N
(152,224)	User Defined RxM Compression Parameters Report	TM	Y	N	N
(152,225)	Report User Defined RxM Configuration Data	TC	Y	N	N
(152,226)	Save User Defined RxM Configuration Data	TC	Y	N	N
(152,227)	Set User Defined RxM Bit Rate Selection Parameters	TC	Y	N	N
(152,228)	User Defined RxM Bit Rate Selection Parameters Report	TM	Y	N	N
(152,229)	Set User Defined RxM EC Parameters	TC	Y	N	N
(152,230)	User Defined RxM EC Parameters Report	TM	Y	N	N
(152,231)	Set User Defined RxM Index Values	TC	Y	N	N
(152,232)	User Defined RxM Index Values Report	TM	Y	N	N

ID	Name	Type	C-SAR		
			ICM	ICM BOOT	TCU
(152,233)	Set User Defined RxM Range Zone Width Parameters	TC	Y	N	N
(152,234)	User Defined RxM Range Zone Width Parameters Report	TM	Y	N	N
(152,235)	Set User Defined RxM Filter Program Parameters	TC	Y	N	N
(152,236)	User Defined RxM Filter Program Parameters Report	TM	Y	N	N
(152,237)	Set User Defined RxM Filter Program Pointers	TC	Y	N	N
(152,238)	User Defined RxM Filter Program Pointers Report	TM	Y	N	N
(152,239)	Set User Defined RxM Filter Control Registers	TC	Y	N	N
(152,240)	User Defined RxM Filter Control Registers Report	TM	Y	N	N
(152,241)	Set TxM Power LUT Values	TC	Y	N	N
(152,242)	Change Mode To Init	TC	Y	N	N
(152,243)	TxM Power LUT Values Report	TM	Y	N	N

5.19 PDHT MISSION SPECIFIC SERVICES

5.19.1 Service 176: PDHT Mode Transitions

ID	Name	Type	PDHT	
			DSHA	DSHA BOOT
(176,1)	INIT	TC	N	Y
(176,2)	IDLE	TC	Y	N
(176,3)	STANDBY	TC	Y	N
(176,4)	MEM_ON	TC	Y	N
(176,5)	TX_ON	TC	Y	N

5.19.2 Service 177: PDHT Configuration

ID	Name	Type	PDHT	
			DSHA	DSHA BOOT
(177,1)	Set TXA Configuration	TC	Y	N
(177,2)	Set TXA Redundancy	TC	Y	N
(177,3)	Set DSHA Redundancy	TC	Y	N
(177,4)	Configure Memory Module	TC	Y	N
(177,5)	Set Override Carrier	TC	Y	N

5.19.3 Service 178: PDHT Function Management

ID	Name	Type	PDHT	
			DSHA	DSHA BOOT
(178,225)	Enable Switch-down	TC	Y	N
(178,226)	Inhibit Switch-down	TC	Y	N
(178,229)	Enable/Disable Timeouts	TC	Y	N
(178,230)	Reboot	TC	Y	N
(178,231)	Direct Command	TC	Y	N
(178,232)	Enable/Disable Column Switch	TC	Y	N

5.20 GPSR MISSION SPECIFIC SERVICES

5.20.1 Service 210: Mode Service

ID	Name	Type	GPSR
(210,1)	Change GPSR Mode	TC	Y

5.20.2 Service 211: Parameter Service

ID	Name	Type	GPSR
(211,1)	Load GPSR Parameter	TC	Y
(211,2)	Report GPSR Parameter	TC	Y
(211,3)	GPSR Parameter Report	TM	Y

5.20.3 Service 212: Science Data Service

ID	Name	Type	GPSR
(212,1)	GPSR Science Data	TM	Y

5.20.4 Service 213: Periodical Memory Service

ID	Name	Type	GPSR
(213,1)	Periodical Memory Diagnosis	TC	Y
(213,2)	Periodical Memory Diagnosis Report	TM	Y
(213,3)	Abort Memory Service	TC	Y

5.21 LCT MISSION SPECIFIC SERVICES

5.21.1 Service 240: Parameter Management

ID	Name	Type	LCT
(240,1)	Set N Parameters	TC	Y
(240,2)	Get N Parameters	TC	Y
(240,3)	Parameter Report	TM	Y
(240,4)	Reload Default Parameters (copy EEPROM to RAM)	TC	Y
(240,5)	Update Default Parameters (copy RAM to EEPROM)	TC	Y
(240,24)	Reload N Parameters (copy N Parameters from EEPROM to RAM)	TC	Y
(240,25)	Update N Parameters (copy N Parameters from RAM to EEPROM)	TC	Y

5.21.2 Service 241: LCT Mode Transitions

ID	Name	Type	LCT
(241,136)	LCT Goto Application S/W Boot Mode	TC	Y
(241,139)	LCT Goto Self Test Mode	TC	Y
(241,140)	LCT Goto Commanded Functional Test Mode	TC	Y
(241,142)	LCT Perform Warm Restart	TC	Y
(241,143)	Get LCT Self Test Report	TC	Y
(241,144)	LCT Self Test Report	TM	Y
(241,145)	LCT Goto Terminal Warmup Mode	TC	Y
(241,146)	LCT Goto SW Standby Mode	TC	Y
(241,147)	LCT Goto Terminal Ready Mode	TC	Y
(241,148)	LCT Goto Terminal Standby Mode	TC	Y
(241,149)	LCT Goto Calibration Mode	TC	Y
(241,150)	LCT Goto Operation Mode	TC	Y
(241,152)	LCT Goto Safe Mode	TC	Y
(241,153)	Report TAPCO Software Status	TC	Y
(241,154)	TAPCO Software Status Report	TM	Y
(241,155)	LCT Goto Launch Lock Release Mode	TC	Y
(241,156)	LCT Goto Emergency Safe	TC	Y
(241,157)	Get LCT Self Calibration Report	TC	Y
(241,158)	LCT Self Calibration Report	TM	Y
(241,159)	LCT Goto Application SW Boot Mode from Address	TC	Y

5.21.3 Service 242: LCT Configuration Service

ID	Name	Type	LCT
(242,2)	Get Terminal Configuration	TC	Y
(242,3)	Terminal Configuration Report	TM	Y
(242,4)	Perform Measurement (No Parameter Change)	TC	Y
(242,5)	Select 1PPS Synchronization Signal A	TC	Y
(242,6)	Select 1PPS Synchronization Signal B	TC	Y
(242,7)	Set Pump Module Head TX Laser Bench Configuration	TC	Y
(242,8)	Set Pump Module Head LO Laser Bench Configuration	TC	Y
(242,9)	Set Optical Power Amplifier 1 Laser Diode Configuration	TC	Y
(242,10)	Set Optical Power Amplifier 2 Laser Diode Configuration	TC	Y
(242,11)	Set Optical Power Amplifier 3 Laser Diode Configuration	TC	Y
(242,12)	Set Data Transmission Configuration	TC	Y
(242,128)	Copy Terminal Configuration from RAM to EEPROM	TC	Y
(242,129)	Copy Terminal Configuration from EEPROM to RAM	TC	Y

5.21.4 Service 244: LCT Table Management Service

ID	Name	Type	LCT
(244,1)	Set Table Row	TC	Y
(244,2)	Get Table Row	TC	Y
(244,3)	Table Row Report	TM	Y
(244,4)	Reload Default Table from EEPROM	TC	Y
(244,5)	Update Default Table to EEPROM	TC	Y

5.21.5 Service 245: LCT Commanded Functional Test Mode Service

ID	Name	Type	LCT
(245,2)	Switch LCT Internal Unit Power On/Off	TC	Y
(245,3)	Switch RXDE/TXDE Functions On/Off	TC	Y
(245,4)	Set RXDE Channel Rotator (Manual)	TC	Y
(245,5)	Reset TXDE/RXDE Functions	TC	Y
(245,7)	Set Optical Power Amplifier (OPA) Parameter Set	TC	Y
(245,8)	Set Fine Pointing Assembly (FPA) Parameter Set	TC	Y
(245,9)	Set Point Ahead Assembly (PAA) Parameter Set	TC	Y
(245,10)	Set Coarse Pointing Assembly (CPA) Parameter Set	TC	Y
(245,11)	Activate/Deactivate Loops	TC	Y
(245,12)	Start Self Calibration	TC	Y
(245,13)	Start Operation	TC	Y
(245,14)	Continue Acquisition	TC	Y
(245,15)	Start Tracking with PAA	TC	Y
(245,16)	Perform Measurement (Sweep, Scan)	TC	Y
(245,17)	Enable/Disable PAT Mechanisms	TC	Y
(245,18)	Stop All Running PAT Algorithms	TC	Y
(245,19)	Reset LCT Measurement Results Memory	TC	Y
(245,21)	Switch LCT Internal Heater Power On/Off	TC	Y
(245,25)	Start RXA Diagnostic Data Measurement	TC	Y
(245,26)	Get RXA Diagnostic Data Report	TC	Y
(245,27)	RXA Diagnostic Data Report	TM	Y
(245,32)	Start Automatic Heater Powering	TC	Y
(245,33)	Stop Automatic Heater Powering	TC	Y
(245,34)	Set ASK EOM Parameter	TC	Y
(245,35)	Switch OPLL Integrator On/Off	TC	Y

ID	Name	Type	LCT
(245,36)	Set PMH-TX Heater Control Temperature Parameter	TC	Y
(245,37)	Set PMH-LO Heater Control Temperature Parameter	TC	Y
(245,42)	Set LO Laser Parameter Set	TC	Y
(245,43)	Set TX Laser Parameter Set	TC	Y
(245,44)	Perform CPA Commutation	TC	Y
(245,45)	Perform CPA Encoder Configuration	TC	Y

5.21.6 Service 246: LCT Target Trajectory Management Service

ID	Name	Type	LCT
(246,10)	Report LCT Target Trajectory Parameter	TC	Y
(246,11)	LCT Target Trajectory Parameter Report	TM	Y
(246,12)	Set LCT Target Trajectory Parameter	TC	Y

5.21.7 Service 247: LCT Launch Lock Release Mode Service

ID	Name	Type	LCT
(247,1)	Switch On Nominal CPA Launch Lock Heater Power	TC	Y
(247,4)	Start Automatic Launch Lock Release Operating Sequence	TC	Y

5.22 SERVICE 255: AU CONTROL COMMANDS

Refer to [RD.07] for details on AU control commands.

ID	Name	Type	AU
(255,1)	Disable Normal Command Authentication	TC	Y
(255,2)	Enable Normal Command Authentication	TC	Y
(255,3)	Upload New Session Key Set	TC	Y
(255,4)	Activate New Session Key Set	TC	Y
(255,5)	Activate New Authentication Key	TC	Y
(255,6)	Activate New Key Decryption Key	TC	Y
(255,7)	Set LAC Acceptance Window	TC	Y

ID	Name	Type	AU
(255,8)	Prepare AU Configuration Update	TC	Y
(255,9)	Reset Error Identifiers	TC	Y
(255,10)	Dummy Command	TC	Y
(255,11)	Disable Session Key Memory Scrubber	TC	Y
(255,12)	Enable Session Key Memory Scrubber	TC	Y

6 PUS SERVICES DETAILS

In general, the specified Service Type/Subtype Data fields having the same name as used in PUS [AS.01] are to be considered to have the same definition as [AS.01].

The general layout used throughout Section 6 for the definitions of individual telecommand and telemetry packets are shown in Figure 6-1 and Figure 6-2 respectively. The details of the Packet Header is omitted while the Data Field Header is simplified showing only the values of the Service Type and Service Subtype numbers. The main focus is on the relevant Application Data field structure of the telecommand packet and the Source Data field structure of the telemetry packet.

For readability reasons the message parameters are shown in a list format to provide equal space to each parameter regardless of its actual size. The parameter position in the message is given by the word number on the left, while the parameter size is given on the right. The parameter is left-justified, that is, stacked on the most significant side of the word.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (Type, Subtype)**	2 words
	Application Data	variable
M	**Packet Error Control**	1 word

Figure 6-1: Telecommand Packet General Layout

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (Type, Subtype)**	5 words
	Source Data	variable
M	**Packet Error Control**	1 word

Figure 6-2: Telemetry Packet General Layout

6.1 SERVICE 1: TELECOMMAND VERIFICATION

6.1.1 TM (1, 1) Telecommand Acceptance Report – Success

TM (1,1) 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 (APID).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,1)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	**Packet Error Control**	1 word

Figure 6.1.1-1: TM (1, 1) Telecommand Acceptance Report – Success

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (1,1)**	6 words
10	Telecommand Packet ID	1 word
11	Packet Sequence Control	1 word
12	**Packet Error Control**	1 word

Figure 6.1.1-2: TM (1, 1) GPSR Telecommand Acceptance Report – Success

TM (1,1) Applicability	TM (1,1) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header as shown in Figure 6.1.1-2.
ICM	None
ICM Boot	None
TCU	None
DSHA	None
DSHA Boot	None
LCT	None

6.1.2 TM (1, 2) Telecommand Acceptance Report – Failure

TM (1,2) report is generated if the acceptance check of a TC failed. Each application process provides a TC acceptance failure report independent from the ACK flag settings. It indicates the reason for the failure in the Code field and provides the indication of the Parameter found in error. An additional field, the Complimentary Information, can provide further information related to the failure report.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,2)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	Code	1 word
12..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.1.2-1: TM (1, 2) Telecommand Acceptance Report – Failure

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (1,2)**	6 words
10	Telecommand Packet ID	1 word
11	Packet Sequence Control	1 word
12	Code	1 word
13..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.1.2-2: TM (1, 2) GPSR Telecommand Acceptance Report – Failure

For each APID + Type + Subtype + Code combination the "complimentary information" shall be fixed and defined in the relevant database tables.

TM (1,2) Applicability	TM (1,2) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header as shown in Figure 6.1.2-2.
ICM	None
ICM Boot	None
TCU	None
DSHA	None
DSHA Boot	None
LCT	None

6.1.3 TM (1, 3) Telecommand Execution Started Report – Success

TM (1,3) reports, if the corresponding ACK flag was set in the TC' the successful start of execution of a telecommand packet.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,3)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word

Figure 6.1.3-1: TM (1, 3) Telecommand Execution Started Report – Success

TM (1,3) Applicability	TM (1,3) Format Deviations
NM ASW	None
SM ASW	None

6.1.4 TM (1, 4) Telecommand Execution Started Report – Failure

TM (1,4) reports a failure in the start of execution of a telecommand packet.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,4)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	Code	1 word
12..N	Complementary Information	variable

Figure 6.1.4-1: TM (1, 4) Telecommand Execution Started Report – Failure

For each APID + Type + Subtype + Code combination the "complimentary information" shall be fixed and defined in the relevant database tables.

TM (1,4) Applicability	TM (1,4) Format Deviations
NM ASW	None
SM ASW	None

6.1.5 TM (1, 5) Telecommand Execution Progress Report – Success

TM (1,5) reports is generated if the corresponding ACK flag was set in the TC. The report informs the TC source the successful execution of an intermediate step of a telecommand packet execution profile.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,5)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	Step Number	1 word

Figure 6.1.5-1: TM (1, 5) Telecommand Execution Progress Report – Success

TM (1,5) Applicability	TM (1,5) Format Deviations
NM ASW	None
SM ASW	None

6.1.6 TM (1, 6) Telecommand Execution Progress Report – Failure

TM (1,6) reports if the execution of an intermediate step of a telecommand packet fails.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,6)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	Step Number	1 word
12	Code	1 word
13..N	Complementary Information	variable

Figure 6.1.6-1: TM (1, 6) Telecommand Execution Progress Report – Failure

For each APID + Type + Subtype + Code combination the "complimentary information" shall be fixed and defined in the relevant database tables.

TM (1,6) Applicability	TM (1,6) Format Deviations
NM ASW	None
SM ASW	None

6.1.7 TM (1, 7) Telecommand Execution Completed Report – Success

TM (1,7) 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 TC by the receiving onboard application (PID).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,7)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	**Packet Error Control**	1 word

Figure 6.1.7-1: TM (1, 7) Telecommand Execution Completed Report – Success

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (1,7)**	6 words
10	Telecommand Packet ID	1 word
11	Packet Sequence Control	1 word
12	**Packet Error Control**	1 word

Figure 6.1.7-2: TM (1, 7) GPSR Telecommand Execution Completed Report – Success

TM (1,7) Applicability	TM (1,7) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header as shown in Figure 6.1.7-2.
ICM	None
ICM Boot	None
TCU	None
DSHA	None
DSHA Boot	None
LCT	None

6.1.8 TM (1, 8) Telecommand Execution Completed Report – Failure

TM (1,8) report is generated if the execution of a TC failed. Each application process provides a TC execution failure report independent from the ACK flag settings It indicates the reason for the failure in the Code field and provides the indication of the Parameter found in error. An additional field, the Complimentary Information, can provide further information related to the failure report.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (1,8)**	5 words
9	Telecommand Packet ID	1 word
10	Packet Sequence Control	1 word
11	Code	1 word
12..N	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.1.8-1: TM (1, 8) Telecommand Execution Completed Report – Failure

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (1,8)**	6 words
10	Telecommand Packet ID	1 word
11	Packet Sequence Control	1 word
12	Code	1 word
13..N	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.1.8-2: TM (1, 8) GPSR Telecommand Execution Completed Report – Failure

For each APID + Type + Subtype + Code combination the "complimentary information" shall be fixed and defined in the relevant database tables.

TM (1,8) Applicability	TM (1,8) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header as shown in Figure 6.1.8-2.
ICM	None
ICM Boot	None
TCU	None
DSHA	None
DSHA Boot	None
LCT	None

6.1.9 TC (1, 128) Enable Successful Telecommand Verification Report

TC(1,128) and TC(129) allows to modify the acknowledgement flags for hard-coded TC stored on-board (i.e. OBCD TC). A global Boolean variables is defined which can be updated by Ground. Its value determine whether the acceptance acknowledgement is to be generated or not.

The global boolean status will be ANDed with the ACK flag status.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (1,128)**	2 words
6	**Packet Error Control**	1 word

Figure 6.1.9-1: TC (1,128) Enable Successful Telecommand Verification Report

TC (1,128) Applicability	TC (1,128) Format Deviations
NM ASW	None
SM ASW	None

6.1.10 TC (1, 129) Disable Successful Telecommand Verification Report

TC(1,128) and TC(129) allows to modify the acknowledgement flags for hard-coded TC stored on-board (i.e. OBCD TC).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (1,129)**	2 words
6	**Packet Error Control**	1 word

Figure 6.1.10-1: TC (1,129) Disable Successful Telecommand Verification Report

TC (1,129) Applicability	TC (1,129) Format Deviations
NM ASW	None
SM ASW	None

6.1.11 TC (1, 160) Assign Internal TC Acknowledgement Flags

TC(1,160) instructs the SES to assign the Acceptance and Execution Complete Acknowledgement Flags in the packet headers for internally generated telecommands as specified in this telecommand. These flags control whether a telecommand will generate the (1,1) and (1,7) telemetry packets to acknowledge successful Acceptance or Execution Complete. They do not affect the generation of failure reports.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (1,160)**	2 words
6	Spare	14 bits
6	Internal TC Acceptance Report Flag	1 bit
6	Internal TC Execution Complete Report Flag	1 bit
7	**Packet Error Control**	1 word

Figure 6.1.11-1: TC (1,160) Assign Internal TC Acknowledgement Flags

TC (1,160) Applicability	TC (1,160) Format Deviations
ICM	None

6.2 SERVICE 2: DEVICE COMMANDING

Direct HPC1 commands (i.e. no SW involvement) are defined in section 3.3. While in this section, all the services involve software.

6.2.1 TC (2, 144) Distribute CPDU TC Packet(s)

TC (2,144) requests the ASW to activate the HPC2 command(s) by dispatching CPDU TC Packet command(s) contained in TC(2,144).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (2,144)**	2 words
6	Length of CPDU TC Packet-1	1 byte
6	Length of CPDU TC Packet-2	1 byte
7..M-1	CPDU TC Packet-1 (*)	variable
M..N-1	CPDU TC Packet-2 (*)	variable
N	**Packet Error Control**	1 word

Figure 6.2.1-1: TC (2,144) Distribute CPDU Commands

(*) – CPDU TC Packet format shown in Figure 3.3-1.

Note: The two CPDU commands have to be addressed to the two CPDU. Even if not nominally used, the two CPDU could contain a different set of HPC instructions. TC(2,144) also supports one CPDU command this is achieved by having the "Length of CPDU TC Packet-2 = 0. The ASW dispatches the CPDU command based on the APID. Note that TC(2,144) cannot contain RM CPDU commands which can only be sent by Ground.

TC (2,144) Applicability	TC (2,144) Format Deviations
NM ASW	None
SM ASW	None

6.3 SERVICE 3: PERIODIC REPORTING

6.3.1 TC (3, 1) Define New Housekeeping Parameter Report

Upon reception of TC (3,1) a new HK Report Definition is created in the onboard system.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (3,1)**	2 words	
6	SID	1 word	
7	Collection Interval	1 word	
8	Collection Offset	1 word	
9	NPAR1	1 word	
10..11	Parameter #	2 words	P
	P repeated NPAR1-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.3.1-1: TC (3, 1) Define New Housekeeping Parameter Report

TC (3,1) Applicability	TC (3,1) Format Deviations
NM ASW	None
SM ASW	None

6.3.2 TC (3, 2) Define New Diagnostic Parameter Report

Upon reception of TC (3,2) a new Diagnostic Report Definition is created in the onboard system. It is possible with TC (3,2) to support super-commutation.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (3,2)**	2 words		
6	SID	1 word		
7	Collection Interval	1 word		
8	Collection Offset	1 word		
9	NPAR1	1 word		
10..11	Parameter #	2 words	P	
12..M	P repeated NPAR1-1 times	variable		
M+1	NFA	1 word		
M+2	NREP	1 byte		S
M+2	NPAR2	1 byte		
M+3..M+4	Parameter #	2 words	R	
	R repeated NPAR2-1 times	variable		
	Block S repeated NFA-1 times	variable		
N	**Packet Error Control**	1 word		

Figure 6.3.2-1: TC (3, 2) Define New Diagnostic Parameter Report

Note:

1. The ASW requires the Collection Interval to be specified in Time Slice (i.e. TS = 125 ms) and must be multiple of 2 up to 16 seconds (i.e. 128 TS). The Collection Interval divided by the NREP must be an integer (e.g. if Collection Interval is 8 then NREP can be either 1, 2, 4 or 8).
2. The ICM NREP defines the number of times the Parameter # in a fixed length array have to be sampled within the associated collection interval. NREP can be 2, 4, 8, 16 or 32. NPAR2 defines the number of Parameters # contained in a fixed length array. NPAR2 can be 1..16. The Collection Interval specifies the time interval between successive report packets and can be 0.25, 0.5, 1, 2, 4, 8, 16 or 32 sec which are coded as 0, 1, 2, 3, 4, 5, 6 and 7 respectively.

TC (3,2) Applicability	TC (3,2) Format Deviations
NM ASW	None
SM ASW	None
ICM	“Collection Offset” is referred as “Collection Slice”
LCT	Same format except that Collection Offset field is not supported and it is replaced by a Spare word. Also LCT supports only one fixed length array i.e. NFA is always set to “1”.

6.3.3 TC (3, 3) Clear Housekeeping Parameter Report Definitions

Upon reception of TC (3,3) the HK Report Definition specified by the SID number is removed from the onboard system.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,3)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.3-1: TC (3, 3) Clear Housekeeping Parameter Report Definitions

TC (3,3) Applicability	TC (3,3) Format Deviations
NM ASW	None
SM ASW	None

6.3.4 TC (3, 4) Clear Diagnostic Parameter Report Definitions

Upon reception of TC (3,4) the Diagnostic Report Definition specified by the SID number is removed from the onboard system.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,4)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.4-1: TC (3, 4) Clear Diagnostic Parameter Report Definitions

TC (3,4) Applicability	TC (3,4) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.5 TC (3, 5) Enable HK Parameter Report Generation

Upon reception of TC (3,5) the HK Report Definition specified by the SID number is enabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,5)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.5-1: TC (3, 5) Enable HK Parameter Report Generation

TC (3,5) Applicability	TC (3,5) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
TCU	None
DSHA	None
LCT	None

6.3.6 TC (3, 6) Disable HK parameter Report Generation

Upon reception of TC (3,6) the HK Report Definition specified by the SID number is disabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,6)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.6-1: TC (3, 6) Disable HK parameter Report Generation

TC (3,6) Applicability	TC (3,6) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
TCU	None
DSHA	None
LCT	None

6.3.7 TC (3, 7) Enable Diagnostic Parameter Report Generation

Upon reception of TC (3,7) the Diagnostics Report Definition specified by the SID number is enabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,7)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.7-1: TC (3, 7) Enable Diagnostic Parameter Report Generation

TC (3,7) Applicability	TC (3,7) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.8 TC (3, 8) Disable Diagnostic Parameter Report Generation

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

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,8)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.8-1: TC (3, 8) Disable Diagnostic Parameter Report Generation

TC (3,8) Applicability	TC (3,8) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.9 TC (3, 9) Report HK Parameter Report Definitions

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

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,9)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.9-1: TC (3, 9) Report HK Parameter Report Definitions

TC (3,9) Applicability	TC (3,9) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.10 TM (3, 10) HK Parameter Report Definitions Report

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

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,10)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	SID	1 word	
11	Collection Interval	1 word	
12	Collection Offset	1 word	
13	NPAR1	1 word	
14..15	Parameter #	2 words	P
16..M	P repeated NPAR1-1 times	variable	
M+1	NFA	1 word	
M+2	NREP	1 byte	S
M+2	NPAR2	1 byte	S
M+3..M+4	Parameter #	2 words	R S
	R repeated NPAR2-1 times	variable	S
	Block S repeated NFA-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.3.10-1: TM (3, 10) HK Parameter Report Definitions Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained. This means that losing individual packets will not result in adjacent packets being invalidated, as each TM packet contains a complete subset of data. However all of the TM packets must be received to determine the correct complete TM report. Missing packets may be determined by checking the Report Integrity Counter. The counts should be consecutive. If the last packet is “lost”, then the Last Packet flag will not be received.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,10)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	SID	1 word	
11	Collection Interval	1 word	
12	Spare	1 word	
13	NPAR1	1 word	
14..15	Parameter #	2 words	P
	P repeated NPAR1-1 times	variable	
	NFA = 0	1 word	
	NREP = 0	1 byte	
	NPAR2 = 0	1 byte	
N	**Packet Error Control**	1 word	

Figure 6.3.10-2: TM (3, 10) LCT HK Parameter Report Definitions Report

TM (3,10) Applicability	TM (3,10) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
ICM	“Collection Offset” is referred as “Collection Slice”
LCT	Same format except that Collection Offset field is not supported and it is replaced by a Spare word. Also LCT does not supports any fixed length arrays i.e. NFA, NREP and NPAR2 are always set to “0” as shown in Figure 6.3.10-2.

6.3.11 TC (3, 11) Report Diagnostic Parameter Report Definitions

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

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,11)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.11-1: TC (3, 11) Report Diagnostic Parameter Report Definitions

TC (3,11) Applicability	TC (3,11) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.12 TM (3, 12) Diagnostic Parameter Report Definitions Report

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

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,12)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	SID	1 word	
11	Collection Interval	1 word	
12	Collection Offset	1 word	
13	NPAR1	1 word	
14..15	Parameter #	2 words	P
16..M	P repeated NPAR1-1 times	variable	
M+1	NFA	1 word	
M+2	NREP	1 byte	S
M+2	NPAR2	1 byte	S
M+3..M+4	Parameter #	2 words	R S
	R repeated NPAR2-1 times	variable	S
	Block S repeated NFA-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.3.12-1: TM (3, 12) Diagnostic Parameter Report Definitions Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,12)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	SID	1 word	
11	Collection Interval	1 word	
12	Spare	1 word	
13	NPAR1	1 word	
14..15	Parameter #	2 words	P
	P repeated NPAR1-1 times	variable	
	NFA = 1	1 word	
	NREP	1 byte	
	NPAR2	1 byte	
	Parameter #	2 words	R
	R repeated NPAR2-1 times	variable	
M = 128 max	**Packet Error Control**	1 word	

Figure 6.3.12-2: TM (3, 12) LCT Diagnostic Parameter Report Definitions Report

TM (3,12) Applicability	TM (3,12) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
ICM	“Collection Offset” is referred as “Collection Slice”
LCT	Same format except that Collection Offset field is not supported and it is replaced by a Spare word. Also LCT only supports one fixed length array i.e. NFA is always set to “1” as shown in Figure 6.3.12-2.

6.3.13 TM (3, 25) Housekeeping Parameter Report

Housekeeping telemetry packet uniquely identified by Ground processing system through Process ID (PID) and the Structure ID (SID). A TM (3, 25) must not exceed 128 words which implies that a SID must not be delivered over several packets.

TC (3,25) format applicable to all Sentinel-1 packet terminals except GPS is shown in Figure 6.3.13-1. While GPS TC (3,25) format is shown in Figure 6.3.13-2.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (3,25)**	5 words
9	SID	1 word
	Parameters	variable
N = 128 words max	**Packet Error Control**	1 word

Figure 6.3.13-1: TM (3, 25) Housekeeping Parameter Report

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (3,25)**	6 words
10	SID	1 word
11	Filler = 0000	1 word
	Parameters	variable
N	**Packet Error Control**	1 word

Figure 6.3.13-2: TM (3, 25) GPSR Housekeeping Parameter Report

TM (3,25) Applicability	TM (3,25) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header and “Filler” word as shown in Figure 6.3.13-2.
ICM	None
TCU	None
DSHA	None
LCT	None

6.3.14 TM (3, 26) Diagnostic Parameter Report

Diagnostic telemetry packet uniquely identified by Ground processing system through Process ID (PID) and the Structure ID (SID). A TM (3, 26) must not exceed 128 words which implies that a SID must not be delivered over several packets..

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (3,26)**	5 words
9	SID	1 word
	Parameters	variable
N = 128 words max	**Packet Error Control**	1 word

Figure 6.3.14-1: TM (3, 26) Diagnostic Parameter Report

TM (3,26) Applicability	TM (3,26) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
ICM	None
LCT	None

6.3.15 TC (3, 128) Modify HK Report Generation Rate

Upon reception of TC (3,128), the generation rate for the specified HK Parameter Report is changed.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,128)**	2 words
6	SID	1 word
7	Collection Interval	1 word
8	Collection Offset	1 word
9	**Packet Error Control**	1 word

Figure 6.3.15-1: TC (3, 128) Modify HK Report Generation Rate

TC (3,128) Applicability	TC (3,128) Format Deviations
NM ASW	None
SM ASW	None
ICM	
TCU	None
DSHA	None

6.3.16 TC (3, 129) Modify Diagnostic Report Generation Rate

Upon reception of TC (3,129), the generation rate for the specified Diagnostic Parameter Report is changed.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,129)**	2 words
6	SID	1 word
7	Collection Interval	1 word
8	Collection Offset	1 word
9	**Packet Error Control**	1 word

Figure 6.3.16-1: TC (3, 129) Modify Diagnostic Report Generation Rate

TC (3,129) Applicability	TC (3,129) Format Deviations
ICM	"Collection Offset" is referred as "Collection Slice"

6.3.17 TC (3, 130) Report HK Telemetry Generation Status

TC (3,130) requests the generation status of each of the Housekeeping Telemetry.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,130)**	2 words
6	**Packet Error Control**	1 word

Figure 6.3.17-1: TC (3,130) Report HK Telemetry Generation Status

TC (3,130) Applicability	TC (3,130) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
TCU	None
LCT	None

6.3.18 TM (3, 131) HK Telemetry Generation Status Report

TM (3,131) reports the status (enabled or disabled) and collection interval and offset for each of the Housekeeping reports.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,131)**	5 words	
9	NSID	1 word	
10	SID	1 word	R1
11	Status	1 word	R1
12	Collection Interval	1 word	R1
13	Collection Offset	1 word	R1
⋮	Block R1 repeated NSID-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.3.18-1: TM (3,131) HK Telemetry Generation Status Report

TM (3,131) Applicability	TM (3,131) Format Deviations
ICM	“Collection Offset” is referred as “Collection Slice”
TCU	None
LCT	“Collection Offset” is replaced by “Spare” and set to zero.

6.3.19 TC (3, 132) Report Diagnostic Telemetry Generation Status

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,132)**	2 words
6	**Packet Error Control**	1 word

Figure 6.3.19-1: TC (3,132) Report Diagnostic Telemetry Generation Status

TC (3,132) Applicability	TC (3,132) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
LCT	None

6.3.20 TM (3, 133) Diagnostic Telemetry Generation Status Report

TM (3,133) reports the status (enabled or disabled) and collection interval and offset for each of the Diagnostic reports.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,133)**	5 words	
9	NSID	1 word	
10	SID	1 word	R1
11	Status	1 word	R1
12	Collection Interval	1 word	R1
13	Collection Offset	1 word	R1
	Block R1 repeated NSID-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.3.20-1: TM (3,133) Diagnostic Telemetry Generation Status Report

TM (3,133) Applicability	TM (3,133) Format Deviations
ICM	“Collection Offset” is referred as “Collection Slice”
LCT	“Collection Offset” is replaced by “Spare” and set to zero.

6.3.21 TM (3, 144) AVS HK Telemetry Generation Status Report

TM (3,144) reports the status (enabled or disabled) and collection interval and offset for each of the Housekeeping reports.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,144)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NSID	1 word	
11	SID	1 word	R1
12	Status	1 word	R1
13	Collection Interval	1 word	R1
14	Collection Offset	1 word	R1
	Block R1 repeated NSID-1 times	variable	

Figure 6.3.21-1: TM (3,144) AVS HK Telemetry Generation Status Report

TM (3,144) Applicability	TM (3,144) Format Deviations
NM ASW	None
SM ASW	None

6.3.22 TM (3, 145) AVS Diagnostic Telemetry Generation Status Report

TM (3,145) reports the status (enabled or disabled) and collection interval and offset for each of the Diagnostic reports.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (3,145)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NSID	1 word	
11	SID	1 word	R1
12	Status	1 word	R1
13	Collection Interval	1 word	R1
14	Collection Offset	1 word	R1
	Block R1 repeated NSID-1 times	variable	

Figure 6.3.22-1: TM (3,145) AVS Diagnostic Telemetry Generation Status Report

TM (3,145) Applicability	TM (3,145) Format Deviations
NM ASW	None
SM ASW	None

6.3.23 TC (3, 160) Save Diagnostic Configuration Data

TC (3,160) instructs SES to save the configuration data for the Service to EEPROM. This comprises the Diagnostic Report Definitions and Enable/Disable status of the reports.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,160)**	2 words
6	**Packet Error Control**	1 word

Figure 6.3.23-1: TC (3, 160) Save Diagnostic Configuration Data

TC (3,160) Applicability	TC (3,160) Format Deviations
ICM	None

6.3.24 TC (3, 161) Send Single Housekeeping Parameters Report

TC (3,161) instructs to send once the selected Housekeeping Parameter Report Definition Report regardless of the enable status of the periodic reporting.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,161)**	2 words
6	SID	1 word
7	**Packet Error Control**	1 word

Figure 6.3.24-1: TC (3, 161) Send Single Housekeeping Parameters Report

TC (3,161) Applicability	TC (3,161) Format Deviations
TCU	None

6.3.25 TC (3, 240) LCT Define HK Parameter Report Collection Interval

Upon reception of TC(3,240), the collection interval for the specified HK Parameter Report is changed. The HK Parameter Report generation for the specified SID must be disabled in order to fulfil the request.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,240)**	2 words
6	SID	1 word
7	Collection Interval	1 word
8	**Packet Error Control**	1 word

Figure 6.3.25-1: TC (3, 240) LCT Define HK Parameter Report Collection Interval

TC (3,240) Applicability	TC (3,240) Format Deviations
LCT	None

6.3.26 TC (3, 241) LCT Define Diagnostic Parameter Report Collection Interval

Upon reception of TC(3,241), the collection interval for the specified Diagnostic Parameter Report is changed. The Diagnostic Parameter Report generation for the specified SID must be disabled in order to fulfil the request.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (3,241)**	2 words
6	SID	1 word
7	Collection Interval	1 word
8	**Packet Error Control**	1 word

Figure 6.3.26-1: TC (3, 241) LCT Define Diagnostic Parameter Report Collection Interval

TC (3,241) Applicability	TC (3,241) Format Deviations
LCT	None

6.4 SERVICE 4: STATISTICS REPORTING

6.4.1 TC (4, 1) Report Parameter Statistics

TC (4,1) requests a parameter statistics report which contains the current parameter statistics values. The evaluation of the parameters are to be reset immediately after the report is generated if the Reset Flag is "Yes".

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,1)**	2 words
6	Reset Flag	1 word
7	**Packet Error Control**	1 word

Figure 6.4.1-1: TC (4,1) Report Parameter Statistics

TC (4,1) Applicability	TC (4,1) Format Deviations
NM ASW	None
ICM	None
DSHA	None

6.4.2 TM (4, 2) Parameter Statistics Report

TM (4,2) reports the statistics report in response to TC (4,1).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (4,2)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10..12	Tstart	3 words	
13	NPAR	1 word	
14..15	Parameter #	2 words	R1
16..17	Maxval	2 words	R1
18..20	Tmax	3 words	R1
21..22	Minval	2 words	R1
23..25	Tmin	3 words	R1
26..27	Meanval	2 words	R1
	Block R1 repeated NPAR-1 times	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.2-1: TM (4,2) Parameter Statistics Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (4,2) Applicability	TM (4,2) Format Deviations
NM ASW	No PEC
ICM	None
DSHA	None

6.4.3 TC (4, 3) Reset Parameter Statistics Reporting

When TC (4,3) request is received, the evaluation of the parameter statistics must be reset immediately, that is to say the current set of values is discarded and the evaluation must start again from scratch.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,3)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.3-1: TC (4,3) Reset Parameter Statistics Reporting

TC (4,3) Applicability	TC (4,3) Format Deviations
NM ASW	None
DSHA	None

6.4.4 TC (4, 4) Enable Statistics Function

TC (4,4) requests to enable the statistics function.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,4)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.4-1: TC (4,4) Enable Statistics Function

TC (4,4) Applicability	TC (4,4) Format Deviations
NM ASW	None
ICM	None
DSHA	None

6.4.5 TC (4, 5) Disable Statistics Function

TC (4,5) requests to disable the statistics function.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,5)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.5-1: TC (4,5) Disable Statistics Function

TC (4,5) Applicability	TC (4,5) Format Deviations
NM ASW	None
ICM	None
DSHA	None

6.4.6 TC (4, 6) Add Parameters to Parameter Statistics List

When TC (4,6) request is received, the indicated parameters must be added to the statistics list and the evaluation of their statistics must be started immediately.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (4,6)**	2 words	
6	NPAR	1 word	
7..8	Parameter #	2 words	R1
9	Sampling Interval	1 word	R1
10..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.6-1: TC (4,6) Add Parameters to Parameter Statistics List

TC (4,6) Applicability	TC (4,6) Format Deviations
DSHA	None

6.4.7 TC (4, 7) Delete Parameters from Parameter Statistics List

When TC (4,7) request is received, the indicated parameters must be removed from the list and the evaluation of their statistics must be stopped immediately.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (4,7)**	2 words	
6	NPAR	1 word	
7..8	Parameter #	2 words	R1
9..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.7-1: TC (4,7) Delete Parameters from Parameter Statistics List

TC (4,7) Applicability	TC (4,7) Format Deviations
ICM	None
DSHA	None

6.4.8 TC (4, 8) Report Parameter Statistics List

TC (4,8) requests a report of the parameter statistics list.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,8)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.8-1: TC (4,8) Report Parameter Statistics List

TC (4,8) Applicability	TC (4,8) Format Deviations
NM ASW	None
ICM	None
DSHA	None

6.4.9 TM (4, 9) Parameter Statistics List Report

TM (4,9) reports the parameter statistics list report in response to TC (4,8).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (4,9)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NPAR	1 word	
11..12	Parameter #	2 words	R1
13	Sampling Interval	1 word	R1
14..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.9-1: TM (4,9) Parameter Statistics List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (4,9) Applicability	TM (4,9) Format Deviations
DSHA	None

6.4.10 TC (4, 10) Clear Parameter Statistics List

When TC (4,10) request is received, the statistics list must be cleared immediately.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,10)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.10-1: TC (4,10) Clear Parameter Statistics List

TC (4,10) Applicability	TC (4,10) Format Deviations
NM ASW	None
ICM	None
DSHA	None

6.4.11 TC (4, 144) AVS Add Parameters to Parameter Statistics List

When TC (4,144) request is received, the indicated parameters must be added to the statistics list and the evaluation of their statistics must be started immediately.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (4,144)**	2 words	
6	NPAR	1 word	
7	Statistics Table Offset	1 word	R1
8	Data Format	1 word	R1
9..10	Parameter #	2 words	R1
11	Sampling Interval	1 word	R1
12..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.11-1: TC (4,144) AVS Add Parameters to Parameter Statistics List

TC (4,144) Applicability	TC (4,144) Format Deviations
NM ASW	None

6.4.12 TC (4, 145) AVS Delete Parameters from Parameter Statistics List

When TC (4,145) request is received, the indicated parameters must be removed from the list and the evaluation of their statistics must be stopped immediately.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (4,145)**	2 words	
6	NPAR	1 word	
7	Statistics Table Offset	1 words	R1
8..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.12-1: TC (4,145) AVS Delete Parameters from Parameter Statistics List

TC (4,145) Applicability	TC (4,145) Format Deviations
NM ASW	None

6.4.13 TM (4, 146) AVS Parameter Statistics List Report

TM (4,146) reports the parameter statistics list report in response to TC (4,8).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (4,146)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NPAR	1 word	
11	Statistics Table Offset	1 word	R1
12	Data Format	1 word	R1
13..14	Parameter #	2 words	R1
15..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.13-1: TM (4,146) AVS Parameter Statistics List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (4,146) Applicability	TM (4,146) Format Deviations
NM ASW	No PEC

6.4.14 TC (4, 160) SES Save Statistics Configuration Data

TC (4,160) instructs SES to save the configuration data for the Service to EEPROM. This comprises the definition of the Parameter Statistics List.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (4,160)**	2 words
6	**Packet Error Control**	1 word

Figure 6.4.14-1: TC (4,160) SES Save Statistics Configuration Data

TC (4,160) Applicability	TC (4,160) Format Deviations
ICM	None

6.4.15 TC (4, 161) SES Add Parameters to Parameter Statistics List

TC (4,161) instructs the SES to add one or more Parameters to the Parameter Statistics List. Evaluation of the statistics for these Parameters start immediately and be reported in the next, and subsequent, statistics report.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (4,161)**	2 words	
6	NPAR	1 word	
7..8	Parameter #	2 words	R1
9	ICM Sampling Interval	1 byte	R1
9	Acquisition Slice	1 byte	R1
10..N-1	Block R1 repeated NPAR-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.4.15-1: TC (4,161) SES Add Parameters to Parameter Statistics List

TC (4,161) Applicability	TC (4,161) Format Deviations
ICM	None

6.4.16 TM (4, 162) SES Parameter Statistics List Report

TM (4,162) reports the parameter statistics list report in response to TC (4,8).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (4,162)**	5 words	
9	NPAR	1 word	
10..11	Parameter #	2 words	R1
12	ICM Sampling Interval	1 byte	R1
12	Acquisition Slice	1 byte	R1
13..57	Block R1 repeated NPAR-1	variable	
13..58	**Packet Error Control**	1 word	

When NPAR = 0, the remaining packet will be structured as:

9	NPAR	1 word
10	**Packet Error Control**	1 word

Figure 6.4.16-1: TM (4,162) SES Parameter Statistics List Report

TM (4,162) Applicability	TM (4,162) Format Deviations
ICM	None

6.5 SERVICE 5: EVENT REPORTING

6.5.1 TM (5, 1) Normal / Progress Report

TM (5,1) is generated to report the normal progress of an on board action that does not relate to a fault condition.

TM (5,1) format applicable to all Sentinel-1 packet terminals except GPS is shown in Figure 6.5.1-1. While GPS TM (5,1) format is shown in Figure 6.5.1-2.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,1)**	5 words
9	RID	1 word
10..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.1-1: TM (5, 1) Normal / Progress Report

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (5,1)**	6 words
10	RID	1 word
11	Filler = 0000	1 word
12..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.1-2: TM (5, 1) GPSR Normal / Progress Report

TM (5,1) Applicability	TM (5,1) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header and "Filler" word as shown in Figure 6.5.1-2.
ICM	None
TCU	None
DSHA	None
LCT	None

6.5.2 TM (5, 2) Error / Anomaly Report – Low Severity

This report is generated to report the errors or anomalies of low severity.

TM (5,2) format applicable to all Sentinel-1 packet terminals except GPS is shown in Figure 6.5.2-1. While GPS TM (5,2) format is shown in Figure 6.5.2-2.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,2)**	5 words
9	RID	1 word
10..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.2-1: TM (5, 2) Error / Anomaly Report – Low Severity

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (5,2)**	6 words
10	RID	1 word
11	Filler = 0000	1 word
12..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.2-2: TM (5, 2) GPSR Error / Anomaly Report – Low Severity

TM (5,2) Applicability	TM (5,2) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header and "Filler" word as shown in Figure 6.5.2-2.
ICM	None
TCU	None
DSHA	None
LCT	None

6.5.3 TM (5, 3) Error / Anomaly Report – Medium Severity

TM (5,3) report is generated to report the errors or anomalies of medium severity.

TM (5,3) format applicable to all Sentinel-1 packet terminals except GPS is shown in Figure 6.5.3-1. While GPS TM (5,3) format is shown in Figure 6.5.3-2.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,3)**	5 words
9	RID	1 word
10..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.3-1: TM (5, 3) Error / Anomaly Report – Medium Severity

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (5,3)**	6 words
10	RID	1 word
11	Filler = 0000	1 word
12..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.3-2: TM (5, 3) GPSR Error / Anomaly Report – Medium Severity

TM (5,3) Applicability	TM (5,3) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header and "Filler" word as shown in Figure 6.5.3-2.
ICM	None
TCU	None
DSHA	None
LCT	None

6.5.4 TM (5, 4) Error / Anomaly Report – High Severity

TM (5,4) report is generated to report the errors or anomalies of high severity.

TM (5,4) format applicable to all Sentinel-1 packet terminals except GPS is shown in Figure 6.5.4-1. While GPS TM (5,4) format is shown in Figure 6.5.4-2.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,4)**	5 words
9	RID	1 word
10..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.4-1: TM (5, 4) Error / Anomaly Report – High Severity

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (5,4)**	6 words
10	RID	1 word
11	Filler = 0000	1 word
12..N-1	Complementary Information	variable
N	**Packet Error Control**	1 word

Figure 6.5.4-2: TM (5, 4) GPSR Error / Anomaly Report – High Severity

TM (5,4) Applicability	TM (5,4) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPSR	Additional word in TM Data Field Header and "Filler" word as shown in Figure 6.5.4-2.
ICM	None
TCU	None
DSHA	None
LCT	None

6.5.5 TC (5, 5) Enable Event Packet Generation

Upon reception of TC (5,5) the Event Packet generation specified by the Event Packet Structure Identifier is enabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (5,5)**	2 words	
6	NRID	1 word	
7	RID	1 words	R1
8..N-1	Block R1 repeated NRID-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.5.5-1: TC (5,5) Enable Event Packet Generation

TC (5,5) Applicability	TC (5,5) Format Deviations
ICM	None
DSHA	None
LCT	None

6.5.6 TC (5, 6) Disable Event Packet Generation

Upon reception of TC (5,6) the Event Packet generation specified by the Event Packet Structure Identifier is disabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (5,6)**	2 words	
6	NRID	1 word	
7	RID	1 words	R1
8..N-1	Block R1 repeated NRID-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.5.6-1: TC (5,6) Disable Event Packet Generation

TC (5,6) Applicability	TC (5,6) Format Deviations
ICM	None
DSHA	None
LCT	None

6.5.7 TC (5, 129) Report List of Disabled Events

Upon reception of TC (5,129) the report TM (5,130) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,129)**	2 words
6	**Packet Error Control**	1 word

Figure 6.5.7-1: TC (5,129) Report List of Disabled Events

TC (5,129) Applicability	TC (5,129) Format Deviations
ICM	None
DSHA	None

6.5.8 TM (5, 130) List of Disabled Events Report

TM (5,130) is the response to TC (5,129).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (5,130)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NRID	1 word	
11	RID	1 words	R1
12..N-1	Block R1 repeated NRID-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.5.8-1: TM (5,130) List of Disabled Events Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (5,130) Applicability	TM (5,130) Format Deviations
ICM	None
DSHA	None

6.5.9 TC (5, 160) SES Save Event Configuration Data

TC (5,160) instructs SES to save the configuration data for the Service to EEPROM.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,160)**	2 words
6	**Packet Error Control**	1 word

Figure 6.5.9-1: TC (5,160) SES Save Event Configuration Data

TC (5,160) Applicability	TC (5,160) Format Deviations
ICM	None

6.5.10 TC (5, 210) GPSR Enable Event Packet Generation

TC (5,210) instructs the GPSR to enable the sending of an event.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,210)**	2 words
6	Number of Event ID = 1	1 byte
6	Filler = 0	1 byte
7	RID	1 words
8	**Packet Error Control**	1 word

Figure 6.5.10-1: TC (5,210) GPSR Enable Event Packet Generation

TC (5,210) Applicability	TC (5,210) Format Deviations
GPSR	None

6.5.11 TC (5, 211) GPSR Disable Event Packet Generation

TC (5,211) instructs the GPSR to disable the sending of an event.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,211)**	2 words
6	Number of Event ID = 1	1 byte
6	Filler = 0	1 byte
7	RID	1 words
8	**Packet Error Control**	1 word

Figure 6.5.11-1: TC (5,211) GPSR Disable Event Packet Generation

TC (5,211) Applicability	TC (5,211) Format Deviations
GPSR	None

6.5.12 TC (5, 212) GPSR Report Disabled Event Packets

TC (5,212) instructs the GPSR to generate a report providing the disabled events.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,212)**	2 words
6	**Packet Error Control**	1 word

Figure 6.5.12-1: TC (5,212) GPSR Report Disabled Event Packets

TC (5,212) Applicability	TC (5,212) Format Deviations
GPSR	None

6.5.13 TM (5, 213) GPSR Disabled Event Packets Report

In response to TC (5,212), TM(5,213 reports the list of disabled events.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..9	**Telemetry ID (5,213)**	6 words	
10	NRID	1 word	
11	RID	1 words	R1
12..N-1	Block R1 repeated NRID-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.5.13-1: TM (5,213) GPSR Disabled Event Packets Report

TM (5,213) Applicability	TM (5,213) Format Deviations
GPSR	None

Note: GPSR has an additional word in the TM Data Field Header.

6.5.14 TM (5, 145) ASW Crash Report

TM (5,145) reports the ASW crash report generated by an ASW controlled PM recovery.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,145)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bit
	Crash Report Data	variable
N	**Packet Error Control**	1 word

Figure 6.5.14-1: TM (5,145) ASW Crash Report

TM (5,145) Applicability	TM (5,145) Format Deviations
NM ASW	None
SM ASW	None

6.5.15 TM (5, 146) ASW Init Log Record Report

TM (5,146) reports the ASW Init Log Record generated by the ASW at the end of software startup.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (5,146)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bit
	Init Log Record Data	variable
N	**Packet Error Control**	1 word

Figure 6.5.15-1: TM (5,146) ASW Init Log Record Report

TM (5,146) Applicability	TM (5,146) Format Deviations
NM ASW	None
SM ASW	None

6.5.16 TC (5, 240) Report List of Disabled Events

Upon reception of TC (5,240) the report TM (5,241) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (5,240)**	2 words
6	**Packet Error Control**	1 word

Figure 6.5.16-1: TC (5,240) Report List of Disabled Events

TC (5,240) Applicability	TC (5,240) Format Deviations
LCT	None

6.5.17 TM (5, 241) List of Disabled Events Report

TM (5,241) is the response to TC (5,240).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (5,241)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	NRID	1 word	
11	RID	1 words	R1
12..N-1	Block R1 repeated NRID-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.5.17-1: TM (5,241) List of Disabled Events Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (5,241) Applicability	TM (5,241) Format Deviations
LCT	None

6.6 SERVICE 6: MEMORY MANAGEMENT

6.6.1 TC (6, 1) Load Memory using Base plus Offsets

TC (6,1) loads any data or code to the memory identified by the relevant parameters of the TC.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,1)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Base ID	2 word	
10	Offset	1 word	
11	Length	1 word	R1
12..N-1	Data	variable	
N..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.1-1: TC (6,1) Load Memory using Base plus Offsets

TC (6,1) Applicability	TC (6,1) Format Deviations
NM ASW	None
SM ASW	None

6.6.2 TC (6, 2) Load Memory using Absolute Addresses

TC (6,2) loads any data or code to the memory identified by the relevant parameters of the TC.

TC (6,2) format applicable to all Sentinel-1 packet terminals except ASW is shown in Figure 6.6.2-1. While ASW TC (6,2) format is shown in Figure 6.6.2-2.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,2)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Start Address	2 word	R1
10	Length	1 word	R1
11..N-1	Data	variable	R1
N..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.2-1: TC (6,2) Load Memory using Absolute Addresses

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,2)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Start Address	2 word	R1
10	Spare	1 word	R1
11	Length	1 word	R1
12..N-1	Data	variable	R1
N..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.2-2: ASW TC (6,2) Load Memory using Absolute Addresses

TC (6,2) Applicability	TC (6,2) Format Deviations
NM ASW	Additional “Spare” word between “Start Address” and “Length” as shown in Figure 6.6.2-2 (Note: Same format as TC(6,1)).
SM ASW	Same as NM ASW
ICM	None
ICM BOOT	Only supports the load of one contiguous are of memory, i.e. N = 1.
TCU	None
DSHA	None
DSHA BOOT	None
LCT	Only supports the load of one contiguous are of memory, i.e. N = 1.

6.6.3 TC (6, 3) Dump Memory using Base plus Offsets

TC (6,3) requests a dump of any data or code from the memory identified by the relevant parameters of the TC.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,3)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Base ID	2 word	R1
10	Offset	1 word	R1
11..12	Length_6_3	2 words	R1
13..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.3-1: TC (6,3) Dump Memory using Base plus Offsets

TC (6,3) Applicability	TC (6,3) Format Deviations
NM ASW	None
SM ASW	None

6.6.4 TC (6, 5) Dump Memory using Absolute Addresses

TC (6,5) requests a dump of any data or code from the memory identified by the relevant parameters of the TC.

TC (6,5) format applicable to all Sentinel-1 packet terminals except ASW is shown in Figure 6.6.4-1. While ASW TC (6,5) format is shown in Figure 6.6.4-2.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,5)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Start Address	2 word	R1
10..11	Length_6_5	2 words	R1
12..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.4-1: TC (6,5) Dump Memory using Absolute Addresses

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,5)**	2 words	
6	Memory ID	1 word	
7	N	1 word	
8..9	Start Address	2 word	R1
10	Spare	1 word	R1
11..12	Length_6_5	2 words	R1
130..M-1	Block R1 repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.4-2: ASW TC (6,5) Dump Memory using Absolute Addresses

TC (6,5) Applicability	TC (6,5) Format Deviations
NM ASW	Additional “Spare” word between “Start Address” and “Length” fields as shown in Figure 6.6.4-2. (Note: Same format as TC(6,3)).
SM ASW	Same as NM ASW.
ICM	None
ICM BOOT	Supports only the dump of a single contiguous area of memory, i.e. N = 1.
TCU	None
DSHA	None
DSHA BOOT	None
LCT	Supports only the dump of a single contiguous area of memory, i.e. N = 1.

6.6.5 TM (6, 6) Memory Dump using Absolute Addresses Report

TM (6,6) is the response to TC (6,5).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,6)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	Memory ID	1 word
11..12	Start Address	2 word
13	Length	1 word
14..N-1	Data	variable
N	**Packet Error Control**	1 word

Figure 6.6.5-1: TM (6,6) Memory Dump using Absolute Addresses Report

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (6,6)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	Memory ID	1 word	
11	N	1 word	
12..13	Start Address	2 word	R
14	Length	1 word	R
	Data	variable	R
	Block R repeated N-1	variable	
N	**Packet Error Control**	1 word	

Figure 6.6.5-2: TCU TM (6,6) Memory Dump using Absolute Addresses Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (6,6) Applicability	TM (6,6) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
ICM	None
ICM BOOT	None
TCU	TCU reports non-contiguous memory areas in different packets. However TCU TM(6,6) includes the parameter “N” which has always the value “1”.
DSHA	
DSHA BOOT	
LCT	Supports only the dump of a single continuous area of memory, i.e. N = 1.

6.6.6 TC (6, 9) Check Memory using Absolute Addresses

TC (6,9) requests a checksum report.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,9)**	2 words
6	Memory ID	1 word
7..8	Start Address	2 word
9..10	Length_6_9	2 word
11	**Packet Error Control**	1 word

Figure 6.6.6-1: TC (6,9) Check Memory using Absolute Addresses

TC (6,9) Applicability	TC (6,9) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
ICM BOOT	None
TCU	None
DSHA	None
DSHA BOOT	None
LCT	None

6.6.7 TM (6, 10) Memory Check using Absolute Addresses Report

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

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,10)**	5 words
9	Memory ID	1 word
10..11	Start Address	2 word
12..13	Length_6_9	2 words
14	Checksum	1 word
15	**Packet Error Control**	1 word

Figure 6.6.7-1: TM (6,10) Memory Check using Absolute Addresses Report

TM (6,10) Applicability	TM (6,10) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
ICM	None
ICM BOOT	None
TCU	None except that for the Checksum parameter where the TCU uses the CRC algorithm according to ECSS PUS Annex A1 and not the ISO algorithm according to ECSS PUS Annex A2.
DSHA	None
DSHA BOOT	None
LCT	None

6.6.8 TM (6, 144) Physical Address Resolution Report

TM (6,144) is generated in response to TC (6,3) for each base plus offset scattered dump before the TM (6,145). TM (6,144) is also generated in response to TC (6,1) for each base plus offset scattered load.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,144)**	5 words
9..10	Base ID	2 words
11	Offset	1 word
12..13	Start Address	2 word

Figure 6.6.8-1: TM (6,144) Physical Address Resolution Report

TM (6,144) Applicability	TM (6,144) Format Deviations
NM ASW	None
SM ASW	None

6.6.9 TM (6, 145) Memory Dump using Base plus Offset Report

TM (6,145) is the response to TC (6,3). Before the generation of TM (6,145), TM (6,144) is generated which reports the physical address correspondence of the Base ID.
TM (6,145) includes the physical address and not the “Base ID” and “Offset” as PUS TM (6,4). TM (6,145) substitutes PUS TM (6,4).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,145)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	Memory ID	1 word
11..12	Start Address	2 word
13	Length	1 word
14..N	Data	variable

Figure 6.6.9-1: TM (6,145) Memory Dump using Base plus Offsets Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (6,145) Applicability	TM (6,145) Format Deviations
NM ASW	None
SM ASW	None

6.6.10 TC (6, 146) Load Logical Parameters

TC(6,146) specifies to patch the logical parameters identified by TAG ID with the specified parameter data.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,146)**	2 words	
6	Spare = 00	1 byte	
6	N1	1 byte	
7..8	TAG ID	2 word	R
9	Length of Parameter	1 word	R
	Parameter Data	variable	R
10..M-1	Block R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.10-1: TC (6,146) Load Logical Parameters

TC (6,146) Applicability	TC (6,146) Format Deviations
NM ASW	None
SM ASW	None

6.6.11 TC (6, 147) Dump Logical Parameter

TC(6,147) requests to dump the parameter identified by the specified TAG ID.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,147)**	2 words
6..7	TAG ID	2 word
8	**Packet Error Control**	1 word

Figure 6.6.11-1: TC (6,147) Dump Logical Parameter

TM (6,147) Applicability	TM (6,147) Format Deviations
NM ASW	None
SM ASW	None

6.6.12 TM (6, 148) Logical Parameter Dump

TM(6,148) is generated in response to TC(6,147).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,148)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10..11	TAG ID	2 words
12..13	Parameter Data Length	2 words
14..N-1	Parameter Data	variable

Figure 6.6.12-1: TM (6,148) Logical Parameter Dump

TC (6,148) Applicability	TC (6,148) Format Deviations
NM ASW	None
SM ASW	None

6.6.13 TC (6, 149) Register Load

TC(6,149) request to load the identified register with the value specified.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,149)**	2 words
6	Local / Partner	1 byte
6	Register ID	1 byte
7..N-1	Parameters (Parameters linked to Register ID value)	variable
N	**Packet Error Control**	1 word

Figure 6.6.13-1: TC (6,149) Register Load

TM (6,149) Applicability	TM (6,149) Format Deviations
NM ASW	None
SM ASW	None

6.6.14 TC (6, 150) Dump Register

TC(6,150) requests to dump the specified register.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,150)**	2 words
6	Local / Partner	1 byte
6	Register ID	1 byte
7..8	Register Address	2 words
9	**Packet Error Control**	1 word

Figure 6.6.14-1: TC (6,150) Dump Register

TC (6,150) Applicability	TC (6,150) Format Deviations
NM ASW	None
SM ASW	none

6.6.15 TM (6, 151) Register Dump

TM(6,151) is generated in response to TC(6,150).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,151)**	5 words
9	Local / Partner	1 byte
9	Register ID	1 byte
10..N	Register Data (Register Data linked to Register ID value)	variable

Figure 6.6.15-1: TM (6,151) Register Dump

TM (6,151) Applicability	TM (6,151) Format Deviations
NM ASW	None
SM ASW	None

6.6.16 TC (6, 152) Add to Logical Parameters

TC(6,152) requests to add to the parameter specified by the TAG ID of the TM Data Pool the value specified.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (6,152)**	2 words	
6	Spare = 00	1 byte	
6	N1	1 byte	
7..8	TAG ID	2 word	R
9	Length of Parameter	1 word	R
	Parameter Data to Add	variable	R
10..M-1	Block R repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.6.16-1: TC (6,152) Add to Logical Parameters

TC (6,152) Applicability	TC (6,152) Format Deviations
NM ASW	None
SM ASW	None

6.6.17 TC (6, 153) Dump CAM Box Image / Status

TC(6,153) requests the dump of the M-CAM image stored in the CAM Box image or CAM Box status specifying the total number of words to dump.

NOTE: The "Image / Status Identifier" parameter is not interpreted onboard, but only reported in the resulting TM(6,154) dump reports for Ground use. The "Image / Status Identifier" parameter is structured as shown in Figure 6.6.17-2 to provide the image ID and data format requested through the CAM Box "Download Picture" command issued to the CAM Box through ASW TC(161,11) "Transmit SLHK Low-Level Command" prior to TC(6, 153) dump request. The "Data Format" field indicates if the dumped data corresponds to an image format of a status format. If Data Format = 1 indicates a status format, then all other fields have zero value and are considered don't care.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,153)**	2 words
6	Image / Status Identifier	1 word
7..8	N° of 16-bit Words	2 word
9	**Packet Error Control**	1 word

Figure 6.6.17-1: TC (6,153) Dump CAM Box Image / Status

	Bit N°	Image / Status Identifier Field	Size
MSB	15	Data Format	1 bit
	14	Spare = 0	1 bit
	13..12	Camera ID	2 bits
	11	Undersampling	1 bit
	10..7	Windowing Configuration	4 bits
LSB	6..0	Image ID	7 bits

Figure 6.6.17-2: Image / Status ID Parameter Format

TC (6,153) Applicability	TC (6,153) Format Deviations
NM ASW	None

6.6.18 TM (6, 154) CAM Box Image / Status Dump Report

TM (6,154) is the report resulting from TC(6,152) request containing the image or status data.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (6,154)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bit
10	Image / Status Identifier	1 word
11	N° of Data Words	1 word
12..127	Image / Status Data	Variable (1..116 words)

Figure 6.6.18-1: TM (6,154) CAM Box Image/Status Dump Report

TM (6,154) Applicability	TM (6,154) Format Deviations
NM ASW	None

6.6.19 TC (6, 155) Abort CAM Box Image / Status Dump

TC (6,155) requests to abort the on-going image dump.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,155)**	2 words
6	**Packet Error Control**	1 word

Figure 6.6.19-1: TC (6,155) Abort CAM Box Image/Status Dump

TC (6,155) Applicability	TC (6,155) Format Deviations
NM ASW	None

6.6.20 TC (6, 161) Copy RAM to EEPROM

TC (6,161) requests to copy the specified number of words from a source RAM to a destination EEPROM.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,161)**	2 words
6..7	Start Address	2 words
8..9	Length_6_161	2 words
10..11	Destination Address	2 word
12	**Packet Error Control**	1 word

Figure 6.6.20-1: TC (6,161) Copy RAM to EEPROM

TC (6,161) Applicability	TC (6,161) Format Deviations
ICM	None
TCU	None

6.6.21 TC (6, 162) Copy EEPROM to RAM

TC (6,162) copies the specified number of words from a start address in EEPROM to a destination address located in RAM. This telecommand is only supported by the SES Boot Software and used to load the SES Application SW in RAM as part of the SW boot.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,162)**	2 words
6..7	Start Address	2 words
8..9	Length_6_161	2 words
10..11	Destination Address	2 word
12	**Packet Error Control**	1 word

Figure 6.6.21-1: TC (6,162) Copy EEPROM to RAM

TC (6,162) Applicability	TC (6,162) Format Deviations
ICM Boot	None
TCU	None

6.6.22 TC (6, 210) GPSR Copy Memory

TC(6,210) requests the GPSR to perform a memory to memory copy from the specified memory source to the specified destination memory.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,210)**	2 words
6	Memory ID Source	1 word
7..8	Start Address Source	2 word
9..10	Data Length	2 words
11	Memory ID Destination	1 word
12..13	Start Address Destination	2 words
14	**Packet Error Control**	1 word

Figure 6.6.22-1: TC (6,210) Copy Memory

TC (6,210) Applicability	TC (6,210) Format Deviations
GPSR	None

6.6.23 TC (6, 212) GPSR Load Memory

TC(6,212) requests the GPSR to patch data in RAM or EEPROM specified by the Memory ID.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,212)**	2 words
6	Memory ID	1 word
7..8	Start Address	2 word
9..10	Data Length	2 words
	Data	variable
M	**Packet Error Control**	1 word

Figure 6.6.23-1: TC (6,212) Load Memory

TC (6,212) Applicability	TC (6,212) Format Deviations
GPSR	None

6.6.24 TC (6, 215) GPSR Dump Memory

TC(6,215) requests the GPSR to perform a memory dump.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,215)**	2 words
6	Memory ID	1 word
7..8	Start Address	2 word
9..10	Data Length	2 words
11	**Packet Error Control**	1 word

Figure 6.6.24-1: TC (6,215) Dump Memory

TC (6,215) Applicability	TC (6,215) Format Deviations
GPSR	None

6.6.25 TM (6, 216) GPS Memory Dump Report

In response to TC(6,215), TM(6,216) reports the requested memory dump.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (6,216)**	6 words
10	Memory ID	1 word
11..12	Start Address	2 word
13..14	Data Length	2 words
	Data	variable
M	**Packet Error Control**	1 word

Figure 6.6.25-1: TM (6,216) Memory Dump Report

TM (6,216) Applicability	TM (6,216) Format Deviations
GPSR	None

6.6.26 TC (6, 219) GPSR Check Memory

TC(6,219) requests the GPSR to calculate the CRC16 checksum for the specified memory data.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,219)**	2 words
6	Memory ID	1 word
7..8	Start Address	2 word
9..10	Data Length	2 words
11	**Packet Error Control**	1 word

Figure 6.6.26-1: TC (6,219) Check Memory

TC (6,215) Applicability	TC (6,215) Format Deviations
GPSR	None

6.6.27 TM (6, 218) GPSR Memory Check Report

In response to TC(6,219), TM(6,218) reports the CRC16 checksum of the requested memory data.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..9	**Telemetry ID (6,218)**	6 words
10	Memory ID	1 word
11..12	Start Address	2 word
13..14	Data Length	2 words
15	CRC16	1 word
16	**Packet Error Control**	1 word

Figure 6.6.27-1: TM (6,218) Memory Check Report

TM (6,218) Applicability	TM (6,218) Format Deviations
GPSR	None

6.6.28 TC (6, 224) DSHA Copy EEPROM to RAM

TC (6,224) copies the specified number of words from a start address in EEPROM to a destination address located in RAM. This telecommand is only supported by the DSHA Boot Software and used to load the DSHA Application SW in RAM as part of the SW boot.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,224)**	2 words
6..7	Start Address	2 words
8..9	Length	2 words
10..11	Destination Address	2 word
12	**Packet Error Control**	1 word

Figure 6.6.28-1: TC (6,224) DSHA Copy EEPROM to RAM

TC (6,224) Applicability	TC (6,224) Format Deviations
DSHA Boot	None

6.6.29 TC (6, 225) DSHA Copy RAM to EEPROM

TC (6,225) copies the specified number of words from a source RAM to a destination EEPROM.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,225)**	2 words
6..7	Start Address	2 words
8..9	Length	2 words
10..11	Destination Address	2 word
12	**Packet Error Control**	1 word

Figure 6.6.29-1: TC (6,225) DSHA Copy RAM to EEPROM

TC (6,225) Applicability	TC (6,225) Format Deviations
DSHA Boot	None
DSHA	None

6.6.30 TC (6, 240) LCT Copy Memory

TC (6,240) requests to copy the specified number of words from a source memory to a destination memory.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,240)**	2 words
6	Source Memory ID	1 words
7..8	Source Start Address	2 words
9	Destination Memory ID	1 word
10..11	Destination Start Address	2 words
13	Length of Data Block	2 words
14	**Packet Error Control**	1 word

Figure 6.6.30-1: TC (6,240) LCT Copy Memory

TC (6,240) Applicability	TC (6,240) Format Deviations
LCT	none

6.6.31 TC (6, 241) LCT Inflate OAS Image

TC (6,241) requests the LCT TAPCO to decompress (inflate) the OAS Image to the RAM address specified in the OAS RAM Header.
Note: The received parameter value must be the OAS ROM Address of a valid OAS ROM Image.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,241)**	2 words
6..7	OAS ROM Address	2 words
8	**Packet Error Control**	1 word

Figure 6.6.31-1: TC (6,241) LCT Inflate OAS Image

TC (6,241) Applicability	TC (6,241) Format Deviations
LCT	None

6.6.32 TC (6, 242) LCT Switch Application Memory

TC (6,242) specifies the parameter value to be used to identify the Application Memory to be switched to:

- Application Memory A
- Application Memory B

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,242)**	2 words
6	Memory Page ID	1 byte
6	Spare = 0	1 byte
7	**Packet Error Control**	1 word

Figure 6.6.32-1: TC (6,242) LCT Switch Application Memory

TC (6,242) Applicability	TC (6,242) Format Deviations
LCT	None

6.6.33 TC (6, 243) LCT Dump Error Log Memory

TC (6,243) requests the LCT TAPCO Software to dump the data contents of the Error Log memory which is stored in NVRAM. The response to TC(6,243) is TM(6,6).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,243)**	2 words
6	**Packet Error Control**	1 word

Figure 6.6.33-1: TC (6,243) LCT Dump Error Log Memory

TC (6,243) Applicability	TC (6,243) Format Deviations
LCT	None

6.6.34 TC (6, 244) LCT Abort Memory Dump using Absolute Addresses

TC (6,244) requests the LCT TAPCO Software to abort immediately the execution of the active memory dump and remove all Memory Dump command requests from the command FIFO queue, if any.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (6,244)**	2 words
6	**Packet Error Control**	1 word

Figure 6.6.34-1: TC (6,244) LCT Abort Memory Dump using Absolute Addresses

TC (6,244) Applicability	TC (6,244) Format Deviations
LCT	None

6.7 SERVICE 8: FUNCTIONS MANAGEMENT

6.7.1 TC (8, 1) LCT Perform Function

TC(8,1) requests to perform the function identified by the Function ID if the execution is allowed (i.e. the current status is “enabled”).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,1)**	2 words
6	Function ID	1 byte
6..8	Parameter 1	2 words
8..10	Parameter 2	2 word
10	Spare = 0	1 byte
11	**Packet Error Control**	1 word

Figure 6.7.1-1: TC (8,1) LCT Perform Function

TC (8,1) Applicability	TC (8,1) Format Deviations
LCT	None

6.7.2 TC (8, 217) TCU Change Mode To Operation

TC(8,217) instructs the TCU to start a transition to Operation Mode (i.e. start Real-time Antenna Beam Control Function).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,217)**	2 words
6	**Packet Error Control**	1 word

Figure 6.7.2-1: TC (8,217) TCU Change Mode To Operation

TC (8,217) Applicability	TC (8,217) Format Deviations
TCU	None

6.7.3 TC (8, 218) TCU Change Mode To Init

TC(8,218) instructs the TCU to start a transition to Init Mode (i.e. stop Real-time Antenna Beam Control Function).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,218)**	2 words
6	**Packet Error Control**	1 word

Figure 6.7.3-1: TC (8,218) TCU Change Mode To Init

TC (8,218) Applicability	TC (8,218) Format Deviations
TCU	None

6.7.4 TC (8, 219) TCU Issue TA-A On Pulse Command to TPSU

TC(8,219) instructs the TCU to issue a pulse to the TPSU to switch on secondary power to TA-A.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,219)**	2 words
6	**Packet Error Control**	1 word

Figure 6.7.4-1: TC (8,219) TCU Issue TA-A On Pulse Command to TPSU

TC (8,219) Applicability	TC (8,219) Format Deviations
TCU	None

6.7.5 TC (8, 220) TCU Issue TA-B On Pulse Command to TPSU

TC(8,220) instructs the TCU to issue a pulse to the TPSU to switch on secondary power to TA-B.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,220)**	2 words
6	**Packet Error Control**	1 word

Figure 6.7.5-1: TC (8,220) TCU Issue TA-B On Pulse Command to TPSU

TC (8,220) Applicability	TC (8,220) Format Deviations
TCU	None

6.7.6 TC (8, 221) TCU Update Power Sync Phase Control Register

TC(8,221) instructs the TCU to write a new value into the phase control register for the TPSU power synchronisation signals.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,221)**	2 words
6	Sync Phase	1 word
7	**Packet Error Control**	1 word

Figure 6.7.6-1: TC (8,221) TCU Update Power Sync Phase Control Register

TC (8,221) Applicability	TC (8,221) Format Deviations
TCU	None

6.7.7 TC (8, 222) TCU Update RABCF Parameters

TC(8,222) instructs the TCU to write new values into the RABCF control registers.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,222)**	2 words
6	EFE HK Acquisition Cycle	1 word
7	EFE Temp Comp Delta T	1 word
8	EFE Temp Comp Timeout	1 word
9	**Packet Error Control**	1 word

Figure 6.7.7-1: TC (8,221) TCU Update RABCF Parameters

TC (8,222) Applicability	TC (8,222) Format Deviations
TCU	None

6.7.8 TC (8, 240) LCT Enable Function Execution

TC(8,240) sets the Execution Status of the function identified by the Function ID to enabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,240)**	2 words
6	N = 1	1 byte
6	Function ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.7.8-1: TC (8,240) LCT Enable Function Execution

TC (8,240) Applicability	TC (8,240) Format Deviations
LCT	None

6.7.9 TC (8, 241) LCT Disable Function Execution

TC(8,241) sets the Execution Status of the function identified by the Function ID to disabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,241)**	2 words
6	N = 1	1 byte
6	Function ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.7.9-1: TC (8,241) LCT Disable Function Execution

TC (8,241) Applicability	TC (8,241) Format Deviations
LCT	None

6.7.10 TC (8, 242) LCT Enable Function Arming

TC(8,242) sets Arming Status of the function identified by the Function ID to enabled and the Execution Status to disabled. This implies that the function must be explicitly enabled before it can execute only once. After execution it is automatically set back to disabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,242)**	2 words
6	N = 1	1 byte
6	Function ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.7.10-1: TC (8,242) LCT Enable Function Arming

TC (8,242) Applicability	TC (8,242) Format Deviations
LCT	None

6.7.11 TC (8, 243) LCT Disable Function Arming

TC(8,243) sets the Arming Status of the function identified by the Function ID to disabled. The Execution Status to unaffected. With Arming disabled, the Execution status remains at the value set by TC(8,240) and TC(8,241), regardless whether the function has been executed or not.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,243)**	2 words
6	N = 1	1 byte
6	Function ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.7.11-1: TC (8,243) LCT Disable Function Arming

TC (8,243) Applicability	TC (8,243) Format Deviations
LCT	None

6.7.12 TC (8, 244) LCT Report Function Status

TC(8,244) requests the Function Status Report TM(8,245).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (8,244)**	2 words
6	N = 1	1 byte
6	Function ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.7.12-1: TC (8,244) LCT Report Function Status

TC (8,244) Applicability	TC (8,244) Format Deviations
LCT	None

6.7.13 TM (8, 245) LCT Function Status Report

In response to TC(8,244), TM(8,245) reports the LCT function status.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (8,245)**	5 words
9	N = 1	1 byte
9	Function ID	1 byte
10	Spare = 0	7 bits
10	Execution Status	1 bit
10	Spare = 0	7 bits
10	Arming Status	1 bit
11	**Packet Error Control**	1 word

Figure 6.7.13-1: TM (6,245) LCT Function Status Report

TM (8,245) Applicability	TM (8,245) Format Deviations
LCT	None

6.8 SERVICE 9: ON-BOARD TIME MANAGEMENT

6.8.1 TC (9, 1) Change Time Report Generation Rate – Not Supported

The Time report is generated every N^{th} VC0 frame, where the default rate is hardware configurable through a PROM configuration parameter. The PROM value is set for the generation of a Time report every 16 VC0 TM transfer frames.

It is not envisaged to change the Time report rate in flight, and as a consequence there is no need of TC(9,1) service.

6.8.2 TM (9, 2) Time Report

The Time Packet format is reported in section 4.5.

The Time Packet has no PUS standard Data Field Header. The Time Packet reported in section 4.5 covers TM (9,2) Time Report service.

6.8.3 TC (9, 144) Set Delta OBT

TC (9, 144) used to set the SW variable to be added to the hardware counter. It can only set seconds and not sub-seconds.

NOTE: The hardware OBT counter can be set using TC(6, 149) Register Load.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,144)**	2 words
6..8	Delta OBT	3 words
9	**Packet Error Control**	1 word

Figure 6.8.3-1: TC (9,144) Set Delta OBT

TC (9,144) Applicability	TC (9,144) Format Deviations
NM ASW	None
SM ASW	None

6.8.4 TC (9, 145) Modify Delta OBT

TC (9,145) allows adjustment (add or subtract) of software variable to be added to the hardware counter.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,145)**	2 words
6	Spare = 0	15 bits
6	Sign	1 bit
7..9	Time Offset	3 words
10	**Packet Error Control**	1 word

Figure 6.8.4-1: TC (9,145) Modify Delta OBT

TC (9,145) Applicability	TC (9,145) Format Deviations
NM ASW	None
SM ASW	None

6.8.5 TC (9, 146) Align Standby OBT

TC (9, 146) is used to align the Standby OBT to the Master OBT. The seconds are aligned by the service while the sub-seconds are automatically aligned by hardware.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,146)**	2 words
6	**Packet Error Control**	1 word

Figure 6.8.5-1: TC (9,146) Align Standby OBT

TC (9,146) Applicability	TC (9,146) Format Deviations
NM ASW	None
SM ASW	None

6.8.6 TC (9, 147) Synchronise Instrument

TC (9,147) is used to instruct the AVS to synchronise the SES OBT to the S/C OBT down to seconds level at the Instrument. Synchronisation at sub-seconds level is achieved automatically via the PPS.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,147)**	2 words
6	**Packet Error Control**	1 word

Figure 6.8.6-1: TC (9,147) Synchronise Instrument

TC (9,147) Applicability	TC (9,147) Format Deviations
NM ASW	None

6.8.7 TC (9, 148) Synchronise PDHT

TC (9,148) is used to instruct the AVS to synchronise the DSHA OBT to the S/C OBT down to seconds level at the PDHT. Synchronisation at sub-seconds level is achieved automatically via the PPS.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,148)**	2 words
6	**Packet Error Control**	1 word

Figure 6.8.7-1: TC (9,148) Synchronise PDHT

TC (9,148) Applicability	TC (9,148) Format Deviations
NM ASW	None

6.8.8 TC (9, 149) Synchronise LCT

TC (9,149) is used to instruct the AVS to synchronise the LCT OBT to the S/C OBT down to seconds level at the LCT. Synchronisation at sub-seconds level is achieved automatically via the PPS.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,149)**	2 words
6	**Packet Error Control**	1 word

Figure 6.8.8-1: TC (9,149) Synchronise LCT

TC (9,149) Applicability	TC (9,149) Format Deviations
LCT	None

6.8.9 TC (9, 129) Instrument / PDHT / LCT Set Time

TC(9,129) instructs to set the Instrument / PDHT / LCT OBT to the value specified in the telecommand at the next PPS. Nominally used by the AVS to distribute time on-board, though could be sent from Ground via time-tag.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,129)**	2 words
6..7	New Onboard Time	2 words
8	**Packet Error Control**	1 word

Figure 6.8.8-1: TC (9,129) Instrument / PDHT / LCT Set Time

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	6
2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	7

Figure 6.8.8-2: New Onboard Time Format

TC (9,129) Applicability	TC (9,129) Format Deviations
ICM	None
DSHA	None
LCT	None

6.8.10 TC (9, 130) Instrument / PDHT / LCT Report Time

TC (9,130) instructs to report the current Instrument / PDHT / LCT OBT.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (9,130)**	2 words
6	**Packet Error Control**	1 word

Figure 6.8.9-1: TC (9,130) Instrument/PDHT/LCT Report Time

TC (9,130) Applicability	TC (9,130) Format Deviations
ICM	None
DSHA	None
LCT	None

6.8.11 TM (9, 160) Instrument Time Report

TM (9,160) is generated by the Instrument in response to TC (9,130)

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (9,160)**	5 words
9..11	ICM PPS Sync Time	3 words
12..14	TCM Current Time	3 words
15..17	RxM H Current Time	3 words
18..20	RxM V Current Time	3 words
21	**Packet Error Control**	1 word

Figure 6.8.10-1: TM (9,160) Instrument Time Report

ICM PPS Sync Time, TCM Current Time, RxM H Current Time and RxM V Current Time formats are shown in Figure 6.8.10-2.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	1
2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2
2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	3

Figure 6.8.10-2: Time Formats in TM (9,160)

TM (9,160) Applicability	TM (9,160) Format Deviations
ICM	None

6.8.12 TM (9, 224) PDHT Time Report

TM (9,224) is generated by the DSHA in response to TC (9,130)

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (9,224)**	5 words
9..11	DSHA PPS Sync Time	3 words
12	**Packet Error Control**	1 word

Figure 6.8.11-1: TM (9,224) PDHT Time Report

TM (9,224) Applicability	TM (9,224) Format Deviations
DSHA	None

6.8.13 TM (9, 241) LCT Time Report

TM (9,241) is generated by the LCT in response to TC (9,130)

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (9,241)**	5 words
9..11	LCT PPS Sync Time	3 words
12	**Packet Error Control**	1 word

Figure 6.8.12-1: TM (9,241) LCT Time Report

TM (9,241) Applicability	TM (9,241) Format Deviations
LCT	None

6.9 SERVICE 11: ON-BOARD TIME-TAG COMMAND SCHEDULING

6.9.1 TC (11, 1) Enable Release of Time-Tagged TC

TC (11,1) is used to enable the release of Time-Tagged TC. It allows to enable all Sub-Schedure ID and PID (N1 = 0) or all PID of a Subschedule (N2 = 0).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,1)**	2 words	
6	N1 > 0	1 words	
7	Spare = 0	5 bits	
7	Sub-Schedule ID	11 bits	
8	N2 > 0	1 word	
9	Spare = 0	5 bits	
9	PID	7 bits	R S
9	Reserved = 0	4 bits	
	R repeated N2-1	variable	
	Block S repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,1)**	2 words
6	N1 = 0	1 words
7	**Packet Error Control**	1 word

Case N1 > 0 and N2 = 0:

1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,1)**	2 words	
6	N1 > 0	1 words	
7	Spare = 0	5 bits	S
7	Sub-Schedule ID	11 bits	S
8	N2 = 0	1 word	S
	Block S repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.9.1-1: TC (11,1) Enable Release of Time-Tagged TC

TC (11,1) Applicability	TC (11,1) Format Deviations
NM ASW	None
SM ASW	None

6.9.2 TC (11, 2) Disable Release of Time-Tagged TC

TC (11,2) is used to disable the release of Time-Tagged TC. It allows to disable all Sub-Schedure ID and PID (N1 = 0) or all PID of a Subschedule (N2 = 0).

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (11,2)**	2 words		
6	N1 > 0	1 word		
7	Spare = 0	5 bits		S
7	Sub-Schedule ID	11 bits		S
8	N2 > 0	1 word		S
9	Spare = 0	5 bits	R	S
9	PID	7 bits	R	S
9	Reserved = 0	4 bits	R	S
	R repeated N2-1	variable		S
	Block S repeated N1-1	variable		
M	**Packet Error Control**	1 word		

Case N1 = 0:			
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,2)**	2 words	
6	N1 = 0	1 words	
7	**Packet Error Control**	1 word	
Case N1 > 0 and N2 = 0:			
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,2)**	2 words	
6	N1 > 0	1 words	
7	Spare = 0	5 bits	S
7	Sub-Schedule ID	11 bits	S
8	N2 = 0	1 word	S
⋮	Block S repeated N1-1	variable	⋮
M	**Packet Error Control**	1 word	

Figure 6.9.2-1: TC (11,2) Disable Release of Time-Tagged TC

TC (11,2) Applicability	TC (11,2) Format Deviations
NM ASW	None
SM ASW	None

6.9.3 TC (11, 3) Reset Time-Tagged Schedule

Upon reception of TC (11,3) the Time-Tagged Schedule is reset by clearing all entries in the command schedule.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,3)**	2 words
6	**Packet Error Control**	1 word

Figure 6.9.3-1: TC (11,3) Reset Time-Tagged Schedule

TC (11,3) Applicability	TC (11,3) Format Deviations
NM ASW	None
SM ASW	None

6.9.4 TC (11, 4) Insert TC in Time-Tagged Schedule

Upon reception of TC (11,4) the TT-TC contained in the TC Packet Data Field are inserted in the Time-Tagged Schedule. TT-TC in the command schedule are ordered with increasing time tag. TT-TC with identical time tag are sorted in the sequence they are received. The resolution of the Time-Tags is given by the format of the spacecraft time. However, the execution accuracy of the TT-TC is less than the Time Tag resolution itself.

The format of TC (11,4) is specified in section 3.5 Figure 3.5-1.

TC (11,4) Applicability	TC (11,4) Format Deviations
NM ASW	None
SM ASW	None

6.9.5 TC (11, 5) Delete TC from Time-Tagged Schedule

Upon reception of TC (11,5) all TT-TC which satisfy the selection criteria defined by the PID, Sequence Count and the Number of TC are deleted.

TC (11,5) allows to delete a number of successive telecommands with the same PID starting from the specified Sequence Count and following the PID Sequence Count ordered list.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,5)**	2 words	
6	N	1 words	
7	Spare = 0	5 bits	R
7	PID	7 bits	R
7	Reserved = 0	4 bits	R
8	Spare = 0	2 bits	R
8	Sequence Count	14 bits	R
9	Number of Telecommands	1 word	R
	Block R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.9.5-1: TC (11,5) Delete TC from Time-Tagged Schedule

TC (11,5) Applicability	TC (11,5) Format Deviations
NM ASW	None
SM ASW	None

6.9.6 TC (11, 6) Delete TT-TC over Time Period and Sub-Schedule

Upon reception of TC (11,6) the TT-TC specified will be removed from the command schedule.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,6)**	2 words	
6	Range	1 word	
7..9	Time Tag 1	3 words	
10..12	Time Tag 2	3 words	
13	N1 > 0	1 word	
14	Spare = 0	5 bits	R
14	Sub-Schedule ID	11 bits	R
⋮	R repeated N1-1	variable	⋮
M	**Packet Error Control**	1 word	

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,6)**	2 words
6	Range	1 word
7..9	Time Tag 1	3 words
10..12	Time Tag 2	3 words
13	N1 = 0	1 word
14	**Packet Error Control**	1 word

Figure 6.9.6-1: TC (11,6) Delete TC over Time Period and Sub-Schedule

TC (11,6) Applicability	TC (11,6) Format Deviations
NM ASW	None

6.9.7 TC (11, 144) Delete TC over Time Period and PID

Upon reception of TC (11,144) the TT-TC specified will be removed from the command schedule.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,144)**	2 words	
6	Range	1 word	
7..9	Time Tag 1	3 words	
10..12	Time Tag 2	3 word	
13	N1 > 0	1 word	
14	Spare = 0	5 bits	R
14	PID	7 bits	R
14	Reserved = 0	4 bits	R
⋮	R repeated N1-1	variable	⋮
M	**Packet Error Control**	1 word	

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,144)**	2 words
6	Range	1 word
7..9	Time Tag 1	3 words
10..12	Time Tag 2	3 words
13	N1 = 0	1 word
14	**Packet Error Control**	1 word

Figure 6.9.7-1: TC (11,144) Delete TC over Time Period and PID

TC (11,144) Applicability	TC (11,144) Format Deviations
NM ASW	None

6.9.8 TC (11, 7) Time-Shift Selected Time-Tagged TC

TC (11,7) instructs to time-shift (by adding or subtracting the time offset) the telecommands in the time schedule which meet the selection criteria defined by the specified PID, Sequence Count and Number of Telecommands.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,7)**	2 words
6..8	Time Offset	3 words
9	Sign of Time Offset	1 word
10	Spare = 0	5 bits
10	PID	7 bits
10	Reserved = 0	4 bits
11	Spare = 0	2 bits
11	Sequence Count	14 bits
12	Number of Telecommands	1 word
13	**Packet Error Control**	1 word

Figure 6.9.8-1: TC (11,7) Time-Shift Selected Telecommands

TC (11,7) Applicability	TC (11,7) Format Deviations
NM ASW	None

6.9.9 TC (11, 8) Time-Shift Selected TC over Time Period and Sub-Schedule

TC (11, 8) instructs to time-shift (by adding or subtracting the time offset) the telecommands in the time schedule if they have release times falling in the specified absolute time period and belong to the specified Sub-Schedule(s).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,8)**	2 words
6	Range	1 word
7..9	Time Tag 1	3 words
10..12	Time Tag 2	3 words
13..15	Time Offset	3 words
16	Sign of Time Offset	1 word
17	N1	1 word
18	Spare = 0	5 bits
18	Sub-Schedule ID	11 bits
	R repeated N1-1	variable
M	**Packet Error Control**	1 word

R

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,8)**	2 words
6	Range	1 word
7..9	Time Tag 1	3 words
10..12	Time Tag 2	3 words
13..15	Time Offset	3 words
16	Sign of Time Offset	1 word
17	N1 = 0	1 word
18	**Packet Error Control**	1 word

Figure 6.9.9-1: TC (11,8) Time-Shift Selected TC over Time Period and Sub-Schedule

TC (11,8) Applicability	TC (11,8) Format Deviations
NM ASW	None

6.9.10 TC (11, 145) Time-Shift Selected TC over Time Period and PID

TC (11, 145) instructs to time-shift (by adding or subtracting the time offset) the telecommands in the time schedule if they have release times falling in the specified absolute time period and belong to the specified PID.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (11,145)**	2 words	
6	Range	1 word	
7..9	Time Tag 1	3 words	
10..12	Time Tag 2	3 words	
13..15	Time Offset	3 words	
16	Sign of Time Offset	1 word	
17	N1	1 word	
18	Spare = 0	5 bits	R
18	PID	7 bits	R
18	Reserved = 0	4 bits	R
⋮	R repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,145)**	2 words
6	Range	1 word
7..9	Time Tag 1	3 words
10..12	Time Tag 2	3 words
13..15	Time Offset	3 words
16	Sign of Time Offset	1 word
17	N1 = 0	1 word
18	**Packet Error Control**	1 word

Figure 6.9.10-1: TC (11,145) Time-Shift Selected TC over Time Period and PID

TC (11,145) Applicability	TC (11,145) Format Deviations
NM ASW	None

6.9.11 TM (11, 10) Detailed Time-Tagged Schedule Report

TM (11,10) reports in detailed form the time-tagged telecommand specified with TC (11, 16).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (11,10)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	Spare = 0	5 bits
10	Sub-Schedule ID	11 bits
11..13	Time Tag	3 words
14	N° of TC Packet Words	1 word
15..M	TC Packet Words	variable

Figure 6.9.11-1: TM (11,10) Detailed Time-Tagged Schedule Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (11,10) Applicability	TM (11,10) Format Deviations
NM ASW	None
SM ASW	None

6.9.12 TM (11, 13) Summary Time-Tagged Schedule Report

TM (11,13) is the response to TC(11,17).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (11,13)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N	1 word	
11	Spare = 0	5 bits	R
11	Sub-Schedule ID	11 bits	R
12..14	Time Tag	3 words	R
15..17	TC Packet Header	3 words	R
18..19	TC Packer Data Field Header	2 words	R
20,,M	Block R repeated N-1 times		

Figure 6.9.12-1: TM (11,13) Summary Time-Tagged Schedule Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (11,13) Applicability	TM (11,13) Format Deviations
NM ASW	None
SM ASW	None

6.9.13 TC (11, 15) Time-Shift All Time-Tagged Telecommands

TC (11,15) instructs to time-shift (by adding or subtracting the time offset) all telecommands in the time schedule.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,15)**	2 words
6..8	Time Offset	3 word
9	Sign of Time Offset	1 word
10	**Packet Error Control**	1 word

Figure 6.9.13-1: TC (11,15) Time-Shift All Telecommands

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Word
0	0	0	0	0	0	0	0	2^{31}	2^{30}	2^{29}	2^{28}	2^{27}	2^{26}	2^{25}	2^{24}	1
2^{23}	2^{22}	2^{21}	2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2
2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	3

Figure 6.9.13-2: Time Offset Format

TC (11,15) Applicability	TC (11,15) Format Deviations
NM ASW	None

6.9.14 TC (11, 16) Report Time-Tagged TC Schedule in Detailed Form

Upon reception of TC (11,16) the report TM (11,10) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,16)**	2 words
6	Spare = 0	5 bits
6	PID	7 bits
6	Reserved = 0	4 bits
7	Spare = 0	2 bits
7	Sequence Counter	14 bits
8	**Packet Error Control**	1 word

Figure 6.9.14-1: TC (11,16) Report Time-Tagged TC Schedule in Detailed Form

TC (11,16) Applicability	TC (11,16) Format Deviations
NM ASW	None
SM ASW	None

Note: Only one detailed TT-TC packet can be dumped with a single TC request. All TT-TC in the schedule can be dumped in summary form with a single TC (11,17) request

6.9.15 TC (11, 17) Report Time-Tagged Command Schedule in Summary Form

Upon reception of TC (11,17) the report TM (11,13) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,17)**	2 words
6	**Packet Error Control**	1 word

Figure 6.9.15-1: TC (11,17) Report Time-Tagged TC Schedule in Summary Form

TC (11,17) Applicability	TC (11,17) Format Deviations
NM ASW	None
SM ASW	None

6.9.16 TC (11, 18) Report Status of Time-Tagged Command Schedule

Upon reception of TC (11,18) the report TM (11,19) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (11,18)**	2 words
6	**Packet Error Control**	1 word

Figure 6.9.16-1: TC (11,18) Report Status of Time-Tagged TC Schedule

TC (11,18) Applicability	TC (11,18) Format Deviations
NM ASW	None
SM ASW	None

6.9.17 TM (11, 19) Time-Tagged TC Schedule Status Report

TM (11,19) is the response to TC (11,18).

Note: The Time-Tag TC Schedule global enable/disable status is reported in AVS HK telemetry.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (11,19)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N1	1 word	
11	Status	1 bit	S
11	Spare = 0	4 bits	S
11	Sub-Schedule ID	11 bits	S
12	N2	1 word	S
13	Status	1 bit	R, S
13	Spare = 0	4 bits	R, S
13	PID	7 bits	R, S
13	Reserved = 0	4 bits	R, S
	Block R repeated N2-1 times		S
	Block S repeated N1-1 times		

Figure 6.9.17-1: TM (11,19) Time-Tagged TC Schedule Status Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (11,19) Applicability	TM (11,19) Format Deviations
NM ASW	None
SM ASW	None

6.10 SERVICE 12: ON-BOARD MONITORING

6.10.1 TC (12, 1) Enable Monitoring of Parameters

Upon reception of TC (12,1) the monitoring of the specified parameters are enabled. Allows to enable all parameters in the onboard Parameter Monitoring List (i.e. N_12_1 = 0) or to enable the monitoring of one or more parameters as defined in the telecommand (i.e. N_12_1 > 0).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (12,1)**	2 words	
6	N_12_1	1 word	
When N_12_1 = 0			
7	**Packet Error Control**	1 word	
When N_12_1 > 0			
7..8	Parameter #	2 words	R
9..M-1	R repeated N_12_1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.10.1-1: TC (12,1) Enable Monitoring of Parameters

TC (12,1) Applicability	TC (12,1) Format Deviations
ICM	None
TCU	None
DSHA	None

6.10.2 TC (12, 2) Disable Monitoring of Parameters

Upon reception of TC (12,2) the monitoring of the specified parameters are disabled. Allows to disable all parameters in the onboard Parameter Monitoring List (i.e. N_12_1 = 0) or to disable the monitoring of one or more parameters as defined in the telecommand (i.e. N_12_1 > 0).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (12,2)**	2 words	
6	N_12_1	1 word	
When N_12_1 = 0			
7	**Packet Error Control**	1 word	
When N_12_1 > 0			
7..8	Parameter #	2 words	R
9..M-1	R repeated N_12_1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.10.2-1: TC (12,2) Disable Monitoring of Parameters

TC (12,2) Applicability	TC (12,2) Format Deviations
ICM	None
TCU	None
DSHA	None

6.10.3 TC (12, 225) Add Parameters to Monitoring List

TC(12,225) allows to add one or more Parameters to the onboard Parameter Monitoring List. A Parameter ID may have either a Limit Check or an Expected Value Check defined, not a combination of both. The maximum number of Check Definitions, that is the maximum value of either NOL or NOE, assigned to a Parameter ID is 1 for the DSHA.
For a single parameter, the following information is included in a parameter monitoring definition:

- How many consecutive failed checks are necessary to start a recovery (OOL Number)
- If the recovery action is enabled or not (Recovery Action)
- For each limit (LL, HL or EV) the associated Report ID in case of OOL detection (optional).

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (12,225)**	2 words		
6	NPAR	1 word		
7..8	Parameter #	2 words	R1	
9	Recovery Action	1 bit	R1	
9	OOL Number	4 bits	R1	
9	Spare = 0	11 bits	R1	
10	NOL	1 word	R1	Limit Check
	Optional Parameters: If NOL = 0, these parameters are omitted.		R1	Limit Check
	NOE	1 word	R1	Expected Check
	Optional Parameters: If NOE = 0, these parameters are omitted.		R1	Expected Check
	Block R1 repeated NPAR-1 times	variable		
M	**Packet Error Control**	1 word		

When NOL = 1, the Limit Check will be structured as:

	Low Limit #	2 words
	LL RID #	1 word
	High Limit #	2 words
	HL RID #	1 word

When NOE = 1 , the Expected Check will be structured as:

	Expected Value #	2 words
	EV RID #	1 word

Figure 6.10.3-1: TC (12,225) Add Parameters to Monitoring List

TC (12,225) Applicability	TC (12,225) Format Deviations
DSHA	None

6.10.4 TC (12, 6) Delete Parameters from Monitoring List

Upon reception of TC (12,6) the specified parameter is deleted from the monitoring list, provided that the parameters monitoring status is not "active".

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (12,6)**	2 words	
6	N_12_6	1 word	
7..8	Parameter #	2 words	R
9..M-1	R repeated N_12_6-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.10.4-1: TC (12,6) Delete Parameters from Monitoring List

TC (12,6) Applicability	TC (12,6) Format Deviations
ICM	None
DSHA	None

6.10.5 TC (12, 7) Modify Parameter Checking Information

When TC (12,7) request is received, the service must process the checking information for each parameter in turn and (if no error is detected) must replace, add or delete the specified check definitions.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (12,7)**	2 words		
6	N	1 word		
7..8	Parameter #	2 words		R
9	NOL	1 word		R
10	Check Position	1 byte	L	R
10	Check Selection	1 byte	L	R
11..12	Low Limit	2 word	L	R
13	RID	1 word	L	R
14..15	High Limit	2 words	L	R
16	RID	1 word	L	R
17	NOE	1 word		R
18	Check Position	1 byte	E	R
18	Check Selection	1 byte	E	R
19..20	Expected Value	2 words	E	R
21	RID	1 word	E	R
22..M-1	R repeated N-1	variable		
M	**Packet Error Control**	1 word		

Figure 6.10.5-1: TC (12,7) Modify Parameter Checking Information

NOTE:
(a) If NOL = 0, parameters “L” are omitted.
(b) If NOE = 0, parameters “E” are omitted.

TC (12,7) Applicability	TC (12,7) Format Deviations
TCU	The TCU supports only one check per parameter, either limit check or expected value check. That is, if NOE = 1 for the same parameter NOL must be '0' and vice versa.

6.10.6 TC (12, 8) Report Current Monitoring List

TC (12,8) requests to report with the current parameter monitoring list.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,8)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.6-1: TC (12,8) Report Current Monitoring List

TC (12,8) Applicability	TC (12,8) Format Deviations
ICM	None
TCU	None
DSHA	None

6.10.7 TM (12, 9) Current Monitoring List Report

TM(12,9) is generated in response to a valid TC(12,8) request to report the current Parameter Monitoring List.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..8	**Telemetry ID (12,9)**	5 words		
9	Last Packet	1 bit		
9	Report Integrity Counter	15 bits		
10	Monitoring Status	8 bits		
10	Maximum Reporting Delay	8 bits		
11	N	1 word		
12..13	Parameter #	2 words	R1	Limit Check
14	Parameter Monitoring Interval	8 bits	R1	Limit Check
14	Parameter Monitoring Status	8 bits	R1	Limit Check
15	NOL	1 word	R1	Limit Check
	Optional Parameters: If NOL = 0, these parameters are omitted.		R1	Limit Check
	NOE	1 word	R1	Expected Check
	Optional Parameters: If NOE = 0, these parameters are omitted.		R1	Expected Check
	Block R1 repeated N-1 times	variable		
M	**Packet Error Control**	1 word		

When NOL = 1, the Limit Check will be structured as:

	Check Position	8 bits
	Check Selection	8 bits
	Low Limit	2 words
	RID	1 word
	High Limit	2 words
	RID	1 word

When NOE = 1, the Expected Check will be structured as:

	Check Position	8 bits
	Check Selection	8 bits
	Expected Value	2 words
	RID	1 word

Figure 6.10.7-1: TM (12,9) Current Monitoring List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (12,9) Applicability	TM (12,9) Format Deviations
TCU	None

6.10.8 TC (12, 10) Report Current Parameters Out-of-Limit List

TC (12,10) requests a report of all parameter checks whose Current Checking Status is Below Low Limit, Above High Limit or Unexpected Value.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,10)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.8-1: TC (12, 10) Report Current Parameters Out-of-Limit List

TC (12,10) Applicability	TC (12,10) Format Deviations
NM ASW	None
SM ASW	None
ICM	None
DSHA	None

6.10.9 TM (12, 11) Current Parameters Out-of-Limit List Report

TM (12,11) is generated in response to TC (12,10).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (12,11)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	N_12_11	1 word	
11..12	Parameter #	2 words	R
13..14	Parameter Value	2 words	R
15..16	Limit Crossed	2 words	R
17	Previous Checking Status	1 byte	R
17	Current Checking Status	1 byte	R
18..20	Transition Time	3 words	R
21..M-1	R repeated N_12_11-1	variable	
M	**Packet Error Control**	1 word	

When N_12_11 = 0:

10	N_12_11 = 0	1 word	
11	**Packet Error Control**	1 word	

Figure 6.10.9-1: TM (12,11) Current Parameters Out-of-Limit List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (12,11) Applicability	TM (12,11) Format Deviations
ICM	None
DSHA	None

6.10.10 TC (12, 144) Configure MDS Configuration Table

TC(12,144) has the purpose to configure a specified number of contiguous Monitor Items inside the same MDS.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (12,144)**	2 words	
6	MDS ID	1 byte	
6	Reserved = 0	1 byte	
7	N	1 word	
8	Monitoring ID	1 byte	R
8	EN-DIS Status	4 bits	R
8	Repeat Flag	4 bits	R
9..10	Parameter #	2 words	R
11..12	Validity Parameter 1	2 words	R
13..14	Validity Parameter 2	2 words	R
15	Data Type	1 byte	R
15..16	HK Filter	3 bytes	R
17..18	Low Threshold	2 words	R
19..20	High Threshold	2 words	R
21	Event Handler 1	1 word	R
22	Event Handler 2	1 word	R
23	Event Handler 3	1 word	R
24..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.10.10-1: TC (12,144) Configure MDS Configuration Table

TC (12,144) Applicability	TC (12,144) Format Deviations
NM ASW	None
SM ASW	None

6.10.11 TC (12, 145) Configure MDS Status Table

TC(12,145) has the purpose to configure the Enable/Disable status for a specified number of contiguous Monitor Items inside the same MDS.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (12,145)**	2 words	
6	MDS ID	1 byte	
6	Reserved = 0	1 byte	
7	N	1 word	
8	Monitoring ID	1 byte	R
8	Spare = 0	4 bits	R
8	EN-DIS Status	4 bits	R
9..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.10.11-1: TC (12,145) Configure MDS Status Table

TC (12,145) Applicability	TC (12,145) Format Deviations
NM ASW	None
SM ASW	None

6.10.12 TC (12, 146) Disable Monitoring Service

TC(12,146) disables the monitoring service.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,146)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.12-1: TC (12,146) Disable Monitoring Service

TC (12,146) Applicability	TC (12,146) Format Deviations
NM ASW	None
SM ASW	None

6.10.13 TC (12, 147) Enable Monitoring Service

TC(12,147) enables the monitoring service.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,147)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.13-1: TC (12,147) Enable Monitoring Service

TC (12,147) Applicability	TC (12,147) Format Deviations
NM ASW	None
SM ASW	None

6.10.14 TC (12, 148) Disable MDS

TC(12,148) disables/suspends at MDS level.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,148)**	2 words
6	MDS ID	1 byte
6	Spare = 0	7 bits
6	MDS TC Option	1 bit
7	**Packet Error Control**	1 word

Figure 6.10.14-1: TC (12,148) Disable MDS

TC (12,148) Applicability	TC (12,148) Format Deviations
NM ASW	None
SM ASW	None

6.10.15 TC (12, 149) Enable MDS

TC(12,149) enables/remove suspension at MDS level.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,149)**	2 words
6	MDS ID	1 byte
6	Spare = 0	7 bits
6	MDS TC Option	1 bit
7	**Packet Error Control**	1 word

Figure 6.10.15-1: TC (12,149) Enable MDS

TC (12,149) Applicability	TC (12,149) Format Deviations
NM ASW	None
SM ASW	None

6.10.16 TC (12, 150) Reset All HK Filter Counters

TC(12,150) resets all the monitoring function HK filters. No parameter is present.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,150)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.16-1: TC (12,150) Reset All HK Filter Counters

TC (12,150) Applicability	TC (12,150) Format Deviations
NM ASW	None
SM ASW	None

6.10.17 TC (12, 151) Reset All MDS Filter Counters

TC(12,151) resets all the HK filters for a specified MDS.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,151)**	2 words
6	MDS ID	1 byte
6	Reserved = 0	1 byte
7	**Packet Error Control**	1 word

Figure 6.10.17-1: TC (12,151) Reset All MDS Filter Counters

TC (12,151) Applicability	TC (12,151) Format Deviations
NM ASW	None
SM ASW	None

6.10.18 TC (12, 152) Reset Single HK Filter Counter

TC(12,152) resets the HK filter for a specified Monitoring Item.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,152)**	2 words
6	MDS ID	1 byte
6	Monitoring ID	1 byte
7	**Packet Error Control**	1 word

Figure 6.10.18-1: TC (12,152) Reset Single HK Filter Counter

TC (12,152) Applicability	TC (12,152) Format Deviations
NM ASW	None
SM ASW	None

6.10.19 TM (12, 153) AVS Current Parameters Out-of-Limit List Report

In response to TC(12,10), TM(12,153) reports the list of parameters that are out-of-limit and that are not disabled or suspended.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (12,153)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bit
10	N1	1 word
11	MDS ID	1 byte
11	Reserved = 0	1 byte
12	N2	1 word
13	Monitoring ID	1 byte
13	Out-of-Limit Status	1 byte
	R repeated N2-1	variable
	S repeated N1-1	

Figure 6.10.19-1: TM (12,153) AVS Current Parameters Out-of-Limit List Report

Note:

1. When generating multiple TM packet reports, each of the generated packets shall always be self contained.
2. The OOL parameter value is reported in the monitoring event TM(5,x).

TM (12,153) Applicability	TM (12,153) Format Deviations
NM ASW	None
SM ASW	None

6.10.20 TC (12, 154) Report MDS

TC(12,154) requests a report of the specified MDS.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,154)**	2 words
6	MDS ID	1 byte
6	Reserved = 0	1 byte
7	**Packet Error Control**	1 word

Figure 6.10.20-1: TC (12,154) Report MDS

TC (12,154) Applicability	TC (12,154) Format Deviations
NM ASW	None
SM ASW	None

6.10.21 TM (12, 155) MDS Report

In response to TC(12,154), TM(12,155) reports the configuration of the requested MDS.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (12,155)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bit	
10	MDS ID	1 byte	
10	Reserved = 0	1 byte	
11	N	1 word	
12	Monitoring ID	1 byte	R
12	EN-DIS Status	4 bits	R
12	Repeat Flag	4 bits	R
13..14	Parameter #	2 words	R
15..16	Validity Parameter 1	2 words	R
17..18	Validity Parameter 2	2 words	R
19	Data Type	1 byte	R
19..20	HK Filter	3 bytes	R
21..22	Low Threshold	2 words	R
23..24	High Threshold	2 words	R
25	Event Handler 1	1 word	R
26	Event Handler 2	1 word	R
27	Event Handler 3	1 word	R
Max 128	R repeated N-1	variable	

Figure 6.10.21-1: TM (12,155) MDS Report

Note:

1. When generating multiple TM packet reports, each of the generated packets shall always be self contained.
2. All the MDS status are reported in the ASW HK periodic TM. This reduces the need to request a report of all MDS.

TM (12,155) Applicability	TM (12,155) Format Deviations
NM ASW	None
SM ASW	None

6.10.22 TC (12, 160) Save Monitoring Configuration Data

TC (12,160) instructs SES/TCU to save the configuration data for the Service to EEPROM which comprises the definition of the Monitoring List and the Enable/Disable status on service level and for each individual check.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,160)**	2 words
6	**Packet Error Control**	1 word

Figure 6.10.22-1: TC (12, 160) Save Monitoring Configuration Data

TC (12,160) Applicability	TC (12,160) Format Deviations
ICM	None
TCU	None

6.10.23 TC (12, 161) Add Parameters to Monitoring List

TC(12,161) instruct the SES to add one or more Parameter # to the onboard Parameter Monitoring List. A Parameter # may have either a Limit Check or an Expected Value Check defined, not a combination of both.
A Parameter # may only have one ICM Check Definition per Mode. The ICM Check Selection parameter is used to specify the Modes for which the associated ICM Check Definition applies. It can be used to specify a single Mode or a combination of Modes. By default Parameters added to the monitoring list have their ICM Check Definitions set to Disabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,161)**	2 words
6	N	1 word
7	Parameter Monitoring Interval	8 bits
7	Acquisition Slice	8 bits
8..9	Parameter #	2 words
10	NOL	1 word
	Optional Parameters: If NOL = 0, these parameters are omitted.	
	NOE	1 word
	Optional Parameters: If NOE = 0, these parameters are omitted.	
	Block R1 repeated N-1 times	variable
M	**Packet Error Control**	1 word

R1: Limit Check / Expected Check

When NOL = 1 to 7, the Limit Check will be structured as:

	ICM Check Selection	1 word
	Low Limit	2 words
	RID	1 word
	High Limit	2 words
	RID	1 word

When NOE = 1 to 7, the Expected Check will be structured as:

	ICM Check Selection	1 word
	Expected Value	2 words
	RID	1 word

Figure 6.10.23-1: TC (12,161) Add Parameters to Monitoring List

TC (12,161) Applicability	TC (12,161) Format Deviations
ICM	None

6.10.24 TM (12, 162) Current Monitoring List Report

The SES generates TM(12,162) in response to a valid TC(12,8) request to report the current onboard Parameter Monitoring List.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (12,162)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bit
10	Monitoring Status	8 bits
10	Maximum Reporting Delay	8 bits
11	N_12_9	1 word
12..13	Parameter #	2 words
14	Parameter Monitoring Interval	8 bits
14	Acquisition Slice	8 bits
15	Parameter Monitoring Status	1 word
16	NOL	1 word
	Optional Parameters: If NOL = 0, these parameters are omitted.	
	NOE	1 word
	Optional Parameters: If NOE = 0, these parameters are omitted.	
	Block R1 repeated N_12_9-1 times	variable
M	**Packet Error Control**	1 word

R1: Limit Check / Expected Check

When NOL = 1 to 7, the Limit Check will be structured as:

	ICM Check Selection	1 word
	Low Limit	2 words
	RID	1 word
	High Limit	2 words
	RID	1 word

When NOE = 1 to 7, the Expected Check will be structured as:

	ICM Check Selection	1 word
	Expected Value	2 words
	RID	1 word

Figure 6.10.24-1: TM (12,162) Current Monitoring List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (12,162) Applicability	TM (12,162) Format Deviations
ICM	None

6.10.25 TC (12, 163) Modify Parameter Checking Information

TC (12,163) instructs SES to delete or modify one or more check definitions associated to a Parameter. If the ICM Check Position value is -1, the ICM Check Definitions for the Modes given by the associated ICM Check Selection parameter will be deleted; if the ICM Check Position is +1, the specified ICM Check Definitions will be applied for the Modes in accordance with the associated ICM Check Selection parameter.

Note that the last ICM Check Definition for a Parameter can not be deleted using TC(12,163), the TC(12,6) must be used instead.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (12,163)**	2 words		
6	N_12_7	1 word		
7..8	Parameter #	2 words	R1	
9	NOL	1 word	R1	
10..65	Optional Parameters: If NOL = 0, these parameters are omitted.		R1	Limit Check
10..66	NOE	1 word	R1	
11..63	Optional Parameters: If NOE = 0, these parameters are omitted.		R1	Expected Check
13..240	Block R1 repeated N_12_7-1 times	variable		
13..241	**Packet Error Control**	1 word		

When NOL = 1 to 7, the Limit Check will be structured as:

10..58	ICM Check Position	1 word	R2
11..59	ICM Check Selection	1 word	R2
12..65	Optional Limit Check Parameters: If ICM Check Position = -1, these parameters are omitted.		R2
12..65	Block R2 repeated NOL-1 times.		

If ICM Check Position = +1; the Limit Check Parameters will be structured as:

	Low Limit	2 words
	RID	1 word
	High Limit	2 words
	RID	1 word

When NOE = 1 to 7, the Expected Check will be structured as:

11..59	ICM Check Position	1 word	R3
12..60	ICM Check Selection	1 word	
13..63	Optional Expected Check Parameters: If ICM Check Position = -1, these parameters are omitted.		
13..63	Block R3 repeated NOE-1 times.		

If ICM Check Position = +1; the Expected Check parameters will be structured as:

	Expected Value	2 words
	RID	1 word

Figure 6.10.25-1: TC (12,163) Modify Parameter Checking Information

TC (12,163) Applicability	TC (12,163) Format Deviations
ICM	None

6.10.26 TC (12, 227) Modify Parameter Checking Information

TC(12,227) allows to modify the Check Definition associated to a selected Parameter. The number of parameters whose entry in the monitoring list can be modified will be limited to a maximum of MONLIST_MAX_PARAMS supported by the DSHA. The maximum number of Check Definitions, that is effectively the maximum value of either NOL or NOE, assigned to a Parameter ID is defined by the mission constant MONLIST_MAX_CHECKS: for the DSHA the max number of check Definitions is 1.

For a single parameter, the following information is included in a parameter monitoring definition:

- How many consecutive failed checks are necessary to start a recovery (OOL Number)
- If the recovery action is enabled or not (Recovery Action)
- The specified limits (LL and HL) or expected value (EV) applicable.
- For each limit (LL, HL or EV) the associated Report ID in case of OOL detection (optional).

Note: The last Check Definition for a Parameter cannot be deleted using TC(12,227), the TC(12,6) Delete Parameters from Monitoring List must be used instead.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (12,227)**	2 words
67	NPAR	1 word
78..89	Parameter #	2 words
9	Recovery Action	1 bit
9	OOL Number	4 bits
9	Spare = 0	11 bits
10	NOL	1 word
	Optional Parameters: If NOL = 0, these parameters are omitted.	
	NOE	1 word
	Optional Parameters: If NOE = 0, these parameters are omitted.	
	Block R1 repeated NPAR-1 times	variable
M	**Packet Error Control**	1 word

R1: Limit Check; Expected Check

When NOL = 1, the Limit Check will be structured as:

	Low Limit #	2 words
	LL RID #	1 word
	High Limit #	2 words
	HL RID #	1 word

When NOE = 1, the Expected Check will be structured as:

	Expected Value #	2 words
	EV RID #	1 word

Figure 6.10.26-1: TC (12,227) Modify Parameter Checking Information

TC (12,227) Applicability	TC (12,227) Format Deviations
DSHA	None

6.10.27 TM (12, 229) Current Monitoring List Report

TM(12,229) is generated in response to a valid TC(12,8) request to report the current On Board Parameter Monitoring List.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..8	**Telemetry ID (12,229)**	5 words		
9	Last Packet	1 bit		
9	Report Integrity Counter	15 bit		
10	Monitoring Status	1 byte		
10	Spare = 0	1 byte		
11	NPAR	1 word		
12..13	Parameter #	2 words	R1	Limit Check
14	Recovery Action	1 bit	R1	Limit Check
14	OOL Number	4 bits	R1	Limit Check
14	Spare = 0	3 bits	R1	Limit Check
14	Parameter Monitoring Status	8 bits	R1	Limit Check
15	NOL	1 word	R1	Limit Check
	Optional Parameters: If NOL = 0, these parameters are omitted.		R1	Limit Check
	NOE	1 word	R1	Expected Check
	Optional Parameters: If NOE = 0, these parameters are omitted.		R1	Expected Check
	Block R1 repeated NPAR-1 times	variable		
M	**Packet Error Control**	1 word		

When NOL = 1, the Limit Check will be structured as:

	Low Limit #	2 words
	LL RID #	1 word
	High Limit #	2 words
	HL RID #	1 word

When NOE = 1, the Expected Check will be structured as:

	Expected Value #	2 words
	EV RID #	1 word

Figure 6.10.27-1: TM (12,229) Current Monitoring List Report

TM (12,229) Applicability	TM (12,229) Format Deviations
DSHA	None

6.11 SERVICE 13: LARGE DATA TRANSFER – NOT SUPPORTED

This service is not required.

6.12 SERVICE 14: PACKET TRANSMISSION CONTROL

6.12.1 TC (14, 1) Enable Forwarding of TM Source Packets

Upon reception of TC (14,1) forwarding of the specified TM Source Packets is enabled.

Word N°	Parameter	Size		
1..3	**Packet Header**	3 words		
4..5	**Telecommand ID (14,1)**	2 words		
6	Spare	5 bits		
6	PID	7 bits		
6	Reserved = 0	4 bits		
7	N2	1 word		
8	Spare = 0	1 byte		S
8	Type	1 byte		
9	N3	1 word		
10	Spare = 0	1 byte	R	
10	Subtype	1 byte		
	R repeated N3-1	variable		
	S repeated N2-1	variable		
M	**Packet Error Control**	1 word		

Figure 6.12.1-1: TC (14,1) Enable Forwarding of TM Source Packets

TC (14,1) Applicability	TC (14,1) Format Deviations
NM ASW	None
SM ASW	None

6.12.2 TC (14, 2) Disable Forwarding of TM Source Packets

Upon reception of TC (14,2) forwarding of the specified TM Source Packets is disabled.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (14,2)**	2 words
6	Spare	5 bits
6	PID	7 bits
6	Reserved = 0	4 bits
7	N2	1 word
8	Spare = 0	1 byte
8	Type	1 byte
9	N3	1 word
10	Spare = 0	1 byte
10	Subtype	1 byte
	R repeated N3-1	variable
	S repeated N2-1	variable
M	**Packet Error Control**	1 word

Figure 6.12.2-1: TC (14,2) Disable Forwarding of TM Source Packets

When N2 = 0, all the Service Types managed by the PID and all the associated Sub-Types are disabled.
When N3 = 0, the relevant Service Type and all the associated Sub-Types are disabled.

TC (14,2) Applicability	TC (14,2) Format Deviations
NM ASW	None
SM ASW	None

6.12.3 TC (14, 3) Report Disabled TM Source Packets

Upon reception of TC (14,3) the report TM (14,4) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (14,3)**	2 words
6	**Packet Error Control**	1 word

Figure 6.12.3-1: TC (14,3) Report Disabled TM Source Packets

TC (14,3) Applicability	TC (14,3) Format Deviations
NM ASW	None
SM ASW	None

6.12.4 TM (14, 4) Disabled TM Source Packets Report

TM (14,4) is the response to TC (14,3).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (14,4)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	Spare	5 bits	
10	PID	7 bits	
10	Reserved = 0	4 bits	
11	N2	1 word	
12	Spare = 0	1 byte	S
12	Type	1 byte	S
13	N3	1 word	S
14	Spare = 0	1 byte	R
14	Subtype	1 byte	R
	R repeated N3-1	variable	S
	S repeated N2-1		

Figure 6.12.4-1: TM (14,4) Disabled TM Source Packets Report

When N2 = 0, all the Service Types managed by the PID and all the associated Sub-Types are enabled.
When N3 = 0, the relevant Service Type and all associated Sub-Types are disabled.

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (14,4) Applicability	TM (14,4) Format Deviations
NM ASW	None
SM ASW	None

6.12.5 TC (14, 144) Enable Forwarding of HK Packets

Upon reception of TC (14,144) forwarding of the specified HK Packets is enabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (14,144)**	2 words	
7	N	1 word	
8	SID	1 word	R
	R repeated N-1	variable	R
M	**Packet Error Control**	1 word	

Figure 6.12.5-1: TC (14,144) Enable Forwarding of HK Packets

TC (14,144) Applicability	TC (14,144) Format Deviations
NM ASW	None
SM ASW	None

6.12.6 TC (14, 145) Disable Forwarding of HK Packets

Upon reception of TC (14,145) forwarding of the specified HK Packets is disabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (14,145)**	2 words	
7	N	1 word	
8	SID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.12.6-1: TC (14,145) Disable Forwarding of HK Packets

TC (14,145) Applicability	TC (14,145) Format Deviations
NM ASW	None
SM ASW	None

6.12.7 TC (14, 7) Report Disabled HK Packets

Upon reception of TC (14,7) the report TM (14,146) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (14,7)**	2 words
6	**Packet Error Control**	1 word

Figure 6.12.7-1: TC (14,7) Report Disabled HK Packets

TC (14,7) Applicability	TC (14,7) Format Deviations
NM ASW	None
SM ASW	None

6.12.8 TM (14, 146) Disabled HK Packets Report

TM (14,146) is the response to TC (14,7).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (14,146)**	5 words	
9	N	1 word	
10	SID	1 word	R
	R repeated N-1	variable	

Figure 6.12.8-1: TM (14,146) Disabled HK Packets Report

TM (14,146) Applicability	TM (14,146) Format Deviations
NM ASW	None
SM ASW	None

6.12.9 TC (14, 147) Enable Forwarding of Diagnostic Packets

Upon reception of TC (14,147) forwarding of the specified Diagnostic Packets is enabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (14,147)**	2 words	
6	N	1 word	
7	SID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.12.9-1: TC (14,147) Enable Forwarding of Diagnostic Packets

TC (14,147) Applicability	TC (14,147) Format Deviations
NM ASW	None
SM ASW	None

6.12.10 TC (14, 148) Disable Forwarding of Diagnostic Packets

Upon reception of TC (14,148) forwarding of the specified Diagnostic Packets is disabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (14,148)**	2 words	
6	N	1 word	
7	SID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.12.10-1: TC (14,148) Disable Forwarding of Diagnostic Packets

TC (14,148) Applicability	TC (14,148) Format Deviations
NM ASW	None
SM ASW	None

6.12.11 TC (14, 11) Report Disabled Diagnostic Packets

Upon reception of TC (14,11) the report TM (14,149) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (14,11)**	2 words
6	**Packet Error Control**	1 word

Figure 6.12.11-1: TC (14,11) Report Disabled Diagnostic Packets

TC (14,11) Applicability	TC (14,11) Format Deviations
NM ASW	None
SM ASW	None

6.12.12 TM (14, 149) Disabled Diagnostic Packets Report

TM (14,149) is the response to TC (14,11).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (14,149)**	5 words	
9	N	1 word	
10	SID	1 word	R
	R repeated N-1	variable	

Figure 6.12.12-1: TM (14,149) Disabled Diagnostic Packets Report

TM (14,149) Applicability	TM (14,149) Format Deviations
NM ASW	None
SM ASW	None

6.13 SERVICE 15: ON-BOARD STORAGE AND RETRIEVAL

6.13.1 TC (15, 1) Enable Storage in Packet Stores

Upon reception of TC (15,1) the specified Packet Store is enabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,1)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.1-1: TC (15,1) Enable Storage in Packet Stores

TC (15,1) Applicability	TC (15,1) Format Deviations
NM ASW	None
SM ASW	None
DSHA	None

For the DSHA, TC(15,1) only applies to the Packet Stores linked to the S/C TM and Auxiliary Data, that is the Packet Stores used to store TM packets from the Avionics received through the SpareWire interface.

6.13.2 TC (15, 2) Disable Storage in Packet Stores

Upon reception of TC (15,2) the specified Packet Store is disabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,2)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
⋮	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.2-1: TC (15,2) Disable Storage in Packet Stores

TC (15,2) Applicability	TC (15,2) Format Deviations
NM ASW	None
SM ASW	None
DSHA	None

For the DSHA, TC(15,2) only applies to the Packet Stores linked to the S/C TM and Auxiliary Data.

6.13.3 TC (15, 3) Add Packets to Storage Selection Definition

Upon reception of TC (15,3) the specified packets are added to the storage selection definition.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,3)**	2 words	
6	Store ID	1 word	
7	Spare = 0	5 bits	
7	PID	7 bits	
7	Reserved = 0	4 bits	
8	N2	1 word	
9	Spare = 0	1 byte	R2
9	Type	1 byte	R2
10	N3	1 word	R2
11	Spare = 0	1 byte	R1 / R2
11	Subtype	1 byte	R1 / R2
	Block R1 repeated N3-1	variable	R2
	Block R2 repeated N2-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.3-1: TC (15,3) Add Packets to Storage Selection Definition

TC (15,3) Applicability	TC (15,3) Format Deviations
NM ASW	None

6.13.4 TC (15, 4) Remove Packets from Storage Selection Definition

Upon reception of TC (15,4) the specified packets are removed from the storage selection definition.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,4)**	2 words	
6	Store ID	1 word	
7	Spare = 0	5 bits	
7	PID	7 bits	
7	Reserved = 0	4 bits	
8	N2	1 word	
9	Spare = 0	1 byte	R2
9	Type	1 byte	R2
10	N3	1 word	R2
11	Spare = 0	1 byte	R1 / R2
11	Subtype	1 byte	R1 / R2
	Block R1 repeated N3-1	variable	R2
	Block R2 repeated N2-1		
M	**Packet Error Control**	1 word	

Figure 6.13.4-1: TC (15,4) Remove Packets from Storage Selection Definition

TC (15,4) Applicability	TC (15,4) Format Deviations
NM ASW	None

6.13.5 TC (15, 5) Report Storage Selection Definition

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,5)**	2 words
6	Store ID	1 word
7	**Packet Error Control**	1 word

Figure 6.13.5-1: TC (15,5) Report Storage Selection Definition

TC (15,5) Applicability	TC (15,5) Format Deviations
NM ASW	None

6.13.6 TM (15, 6) Storage Selection Definition Report

TM (15,6) is the response to TC (15,5).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (15,6)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	Store ID	1 word	
11	Spare = 0	5 bits	
11	PID	7 bits	
11	Reserved = 0	4 bits	
12	N2	1 word	
13	Spare = 0	1 byte	R2
13	Type	1 byte	R2
14	N3	1 word	R2
15	Spare = 0	1 byte	R1, R2
15	Subtype	1 byte	R1, R2
	Block R1 repeated N3-1	variable	R2
	Block R2 repeated N2-1	variable	

Figure 6.13.6-1: TM (15,4) Storage Selection Definition Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (15,6) Applicability	TM (15,6) Format Deviations
NM ASW	None

6.13.7 TC (15, 9) Downlink Packet Store Contents for Time Period

TC (15,9) requests the downlink of the contents of the specified packet store falling within the specified storage time ranges. The Time Span specifies the type of packet range where:

- 0 ⇒ Full contents of the Packet Store
- 1 ⇒ Between Storage Time 1 and Storage Time 2
- 2 ⇒ Before Storage Time 1 (i.e. less than or equal to Storage Time 1)
- 3 ⇒ After Storage Time 1 (i.e. greater than or equal to Storage Time 1).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,9)**	2 words
6	Store ID	1 word
7	Time Span	1 word
8..10	Storage Time 1	3 words
11..13	Storage Time 2	3 words
14	**Packet Error Control**	1 word

Figure 6.13.7-1: TC (15,9) Downlink Packet Store Contents for Time Period

TC (15,9) Applicability	TC (15,9) Format Deviations
NM ASW	None
SM ASW	None

6.13.8 TC (15, 11) Delete Packet Stores Contents up to Specified Storage Time

When TC (15,11) request is received by the Process ID which provides the storage and retrieval sub-service, the packets in the specified packet stores which have a storage time earlier than or equal to the specified time must be deleted.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,11)**	2 words	
6..8	End Time	3 words	
9	N	1 word	
10	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.8-1: TC (15,11) Delete Packet Stores Contents up to Specified Storage Time

TC (15,11) Applicability	TC (15,11) Format Deviations
NM ASW	None
SM ASW	None

6.13.9 TC (15, 12) Report Catalogues for Selected Packet Stores

TC(15,12) requests a status report of all the specified packet stores.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,12)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.9-1: TC (15,12) Report Catalogues for Selected Packet Stores

N = 0 means “all packet stores”.

TC (15,12) Applicability	TC (15,12) Format Deviations
DSHA	None

6.13.10 TC (15, 128) Set the Nominal Read Pointer in a Packet Store

TC(15,128) requests to set the Read Pointer of the specified Packet Store to point to the TM packet which has a storage time equal to or just after the stated time.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,128)**	2 words
6	Store ID	1 word
7..9	Time	3 words
10	**Packet Error Control**	1 word

Figure 6.13.10-1: TC (15,128) Set the Nominal Read Pointer in a Packet Store

TC (15,128) Applicability	TC (15,128) Format Deviations
NM ASW	None
SM ASW	None

6.13.11 TC (15, 129) Delete Packet Store Contents up to Read Pointer

TC(15,129) requests to delete the specified Packet Stores up to the Read Pointer. (i.e. the oldest TM packet in the Packer Store after the delete operation coincides with that pointed by the Read Pointer).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,129)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.11-1: TC (15,129) Delete Packet Store Contents up to Read Pointer

TC (15,129) Applicability	TC (15,129) Format Deviations
NM ASW	None
SM ASW	None

6.13.12 TC (15, 144) Set Packet Store Configuration

TC(15, 144) requests to configure the specified Packet Stores.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,144)**	2 words	
6	MM Identifier	1 word	
7	N	1 word	
8	Store ID	1 word	
9..10	Mode	2 words	R
11..12	Address	2 words	
13..14	Size	2 words	
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.12-1: TC (15,144) Set Packet Store Configuration

TC (15,144) Applicability	TC (15,144) Format Deviations
NM ASW	None
SM ASW	None

6.13.13 TC (15, 146) Suspend Packet Store Downlink

TC(15,146) requests to suspend the downlink of the specified Packet Stores.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,146)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.13-1: TC (15,146) Suspend Packet Store Downlink

TC (15,146) Applicability	TC (15,146) Format Deviations
NM ASW	None
SM ASW	None

6.13.14 TC (15, 147) Resume Packet Store Downlink

TC(15,147) requests to resume the downlink of the specified Packet Stores.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,147)**	2 words	
6	N	1 word	
7	Store ID	1 word	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.14-1: TC (15,147) Resume Packet Store Downlink

TC (15,147) Applicability	TC (15,147) Format Deviations
NM ASW	None
SM ASW	None

6.13.15 TC (15, 148) Clear System Log Packet Store

TC(15,148) requests to clear all TM packets from the System Log Packet Store.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,148)**	2 words
6	**Packet Error Control**	1 word

Figure 6.13.15-1: TC (15,148) Clear System Log Packet Store

TC (15,148) Applicability	TC (15,148) Format Deviations
NM ASW	None
SM ASW	None

6.13.16 TC (15, 149) Downlink Packet Store Contents for Packet Range

TC (15,149) requests the downlink of the contents of the specified packet store between TM Packet 1 and TM Packet 2 inclusive falling between storage times Storage Time 1 and Storage Time 2. TM Packet 1 and TM Packet 2 are identified by the respective APID and Source Sequence Count,

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,149)**	2 words
6	Store ID	1 word
7..9	Storage Time 1	3 words
10	Spare = 0	5 bits
10	APID 1	11 bits
11	Spare = 0	2 bits
11	Source Sequence Count 1	14 bits
12..14	Storage Time 2	3 words
15	Spare = 0	5 bits
15	APID 2	11 bits
16	Spare = 0	2 bits
16	Source Sequence Count 2	14 bits
17	**Packet Error Control**	1 word

Figure 6.13.16-1: TC (15,149) Downlink Packet Store Contents for Packet Range

TC (15,149) Applicability	TC (15,149) Format Deviations
NM ASW	None
SM ASW	None

6.13.17 TC (15, 150) Select TMM Module

TC(15,150) instructs the ASW to configure the specified TMM module (i.e. TMM-1 or TMM-2) as the active TMM module.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,150)**	2 words
6	TMM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.17-1: TC (15,150) Select TMM Module

TC (15,150) Applicability	TC (15,150) Format Deviations
NM ASW	None
SM ASW	None

6.13.18 TC (15, 151) Initialise Mass Memory Driver

TC(15,151) instructs the ASW to initialise the specified Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,151)**	2 words
6	MM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.18-1: TC (15,151) Initialise Mass Memory Driver

TC (15,151) Applicability	TC (15,151) Format Deviations
NM ASW	None
SM ASW	None

6.13.19 TC (15, 152) Start Mass Memory Scrubbing

TC(15,152) instructs the ASW to configure and activate on the specified Mass Memory (MM) the scrubbing function.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,152)**	2 words
6	MM Identifier	1 word
7..8	End Address	2 words
9..10	Scrubbing Rate	2 words
11	**Packet Error Control**	1 word

Figure 6.13.19-1: TC (15,152) Start Mass Memory Scrubbing

TC (15,152) Applicability	TC (15,152) Format Deviations
NM ASW	None
SM ASW	None

6.13.20 TC (15, 153) Stop Mass Memory Scrubbing

TC(15,153) instructs the ASW to stop the mass memory scrubbing function on the specified Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,153)**	2 words
6	MM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.20-1: TC (15,153) Stop Mass Memory Scrubbing

TC (15,153) Applicability	TC (15,153) Format Deviations
NM ASW	None
SM ASW	None

6.13.21 TC (15, 154) Report Mass Memory Scrubbing Status

TC(15,154) requests the ASW to report the status of the mass memory scrubbing on the specified Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,154)**	2 words
6	MM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.21-1: TC (15,154) Report Mass Memory Scrubbing Status

TC (15,154) Applicability	TC (15,154) Format Deviations
NM ASW	None
SM ASW	None

6.13.22 TC (15, 155) Configure Mass Memory Bank Mapping

TC(15,155) instructs the ASW to configure the mass memory bank mapping as specified on the indicated Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,155)**	2 words
6	MM Identifier	1 word
7..8	Position 0 Bank ID	2 words
9..10	Position 1 Bank ID	2 words
11..12	Position 2 Bank ID	2 words
13..14	Position 3 Bank ID	2 words
15	**Packet Error Control**	1 word

Figure 6.13.22-1: TC (15,155) Configure Mass Memory Bank Mapping

TC (15,155) Applicability	TC (15,155) Format Deviations
NM ASW	None
SM ASW	None

6.13.23 TC (15, 156) Start Mass Memory Filling

TC(15,156) instructs the ASW to activate the mass memory filling with the specified filling pattern on the indicated memory range and Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,156)**	2 words
6	MM Identifier	1 word
7..8	Start Address	2 words
9..10	End Address	2 words
11..12	Pattern Type	2 words
13..14	Pattern Value	2 words
15	**Packet Error Control**	1 word

Figure 6.13.23-1: TC (15,156) Start Mass Memory Filling

TC (15,156) Applicability	TC (15,156) Format Deviations
NM ASW	None
SM ASW	None

6.13.24 TC (15, 157) Report Mass Memory Filling Status

TC(15,157) requests the ASW to report the status of the mass memory filling on the specified Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,157)**	2 words
6	MM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.24-1: TC (15,157) Report Mass Memory Filling Status

TC (15,157) Applicability	TC (15,157) Format Deviations
NM ASW	None
SM ASW	None

6.13.25 TC (15, 158) Start Mass Memory Checking

TC(15,158) instructs the ASW to activate the mass memory checking with the specified filling pattern on the indicated memory range and Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,158)**	2 words
6	MM Identifier	1 word
7..8	Start Address	2 words
9..10	End Address	2 words
11..12	Pattern Type	2 words
13..14	Pattern Value	2 words
15	**Packet Error Control**	1 word

Figure 6.13.25-1: TC (15,158) Start Mass Memory Checking

TC (15,158) Applicability	TC (15,158) Format Deviations
NM ASW	None
SM ASW	None

6.13.26 TC (15, 159) Report Mass Memory Checking Status

TC(15,159) requests the ASW to report the status of the mass memory checking on the specified Mass Memory (MM).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,159)**	2 words
6	MM Identifier	1 word
7	**Packet Error Control**	1 word

Figure 6.13.26-1: TC (15,159) Report Mass Memory Checking Status

TC (15,159) Applicability	TC (15,159) Format Deviations
NM ASW	None
SM ASW	None

6.13.27 TM (15, 160) Mass Memory Scrubbing Status Report

TM(15,160) is generated in response to TC(15,154) and reports the status of the mass memory scrubbing.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (15,160)**	5 words
9..10	EDAC Function Status	2 words
11..12	Memory Scrubbing Status	2 words
13..14	First Address after Scrub Area	2 words
15..16	Current Scrubber Address	2 words
17..18	Scrubbing Rate	2 words
19	N° of Words Corrected Bank 0	1 byte
19	N° of Words Corrected Bank 1	1 byte
20	N° of Words Corrected Bank 2	1 byte
20	N° of Words Corrected Bank 3	1 byte
21..22	First Failing Address	2 words
23..24	Validity of First Failing Address	2 words

Figure 6.13.27-1: TM (15,160) Mass Memory Scrubbing Status Report

TM (15,160) Applicability	TM (15,160) Format Deviations
NM ASW	None
SM ASW	None

6.13.28 TM (15, 161) Mass Memory Filling Status Report

TM(15,161) is generated in response to TC(15,157) and reports the status of the mass memory filling.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (15,161)**	5 words
9..10	MM Process Status	2 words
11..12	MM Current Address	2 words
13..14	MM Check Status	2 words

Figure 6.13.28-1: TM (15,161) Mass Memory Filling Status Report

TM (15,161) Applicability	TM (15,161) Format Deviations
NM ASW	None
SM ASW	None

6.13.29 TM (15, 162) Mass Memory Checking Status Report

TM(15,162) is generated in response to TC(15,159) and reports the status of the mass memory checking.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (15,162)**	5 words
9..10	MM Process Status	2 words
11..12	MM Current Address	2 words
13..14	MM Check Status	2 words

Figure 6.13.29-1: TM (15,162) Mass Memory Checking Status Report

TM (15,162) Applicability	TM (15,162) Format Deviations
NM ASW	None
SM ASW	None

6.13.30 TM (15, 224) Packet Store Catalogue Report

In response to TC(15,12), TC(15,224) reports the requested Packet Store status information.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (15,224)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	Free Sector Count	1 word	
11	N	1 word	
12	Store ID	1 word	
13	Spare = 0	1 bit	
13	PS Type	1 bit	
13	Virtual Channel ID	6 bits	
13	Spare = 0	5 bits	
13	Overwrite Status	1 bit	
13	EN-DIS Status	1 bit	R
13	PS Status	1 bit	
14	Start Pointer	1 word	
15	Read Pointer	1 word	
16	Write Pointer	1 word	
17	PS Size	1 word	
18	PS Max Size	1 word	
	Block R repeated N-1	variable	
Max 128	**Packet Error Control**		

Figure 6.13.30-1: TM (15,224) Packet Store Catalogue Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (15,224) Applicability	TM (15,224) Format Deviations
DSHA	None

6.13.31 TC (15, 226) Configure Packet Store

TC(15,226) requests the configuration of the specified Packet Store(s) providing the maximum Packet Store size limit, whether Circular Type (data can be overwritten) or Bounded (data cannot be overwritten), and Virtual Channel to Packet Store mapping.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,226)**	2 words
6	Store ID	1 word
7	Spare = 0	1 bit
7	Packet Store Type	1 bit
7	Virtual Channel ID	6 bits
7	Spare = 0	8 bits
8	Max Size	1 word
9	**Packet Error Control**	1 word

Figure 6.13.31-1: TC (15,226) Configure Packet Store

TC (15,226) Applicability	TC (15,226) Format Deviations
DSHA	None

6.13.32 TC (15, 227) Store

TC (15,227) requests to start storing data received from SAR payload related to a single image.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,227)**	2 words
6	Spare = 0	12 bits
6	SDI Within Time-Out Flag	1 bit
6	SDI Initial Time-Out Flag	1 bit
6	Enable Store - Pol.V	1 bit
6	Enable Store - Pol.H	1 bit
7	Store ID – Pol.H	1 word
8	Store ID – Pol.V	1 word
9	Initial Time Out Value	1 word
10	Within Time Out Value	1 word
11	**Packet Error Control**	1 word

Figure 6.13.32-1: TC (15,227) Store

TC (15,227) Applicability	TC (15,227) Format Deviations
DSHA	None

6.13.33 TC (15, 228) Downlink

TC (15,228) requests to start down-linking a specified sequence of packet stores maintaining the same carrier. The selected Number of Sectors starting from the first Packet Store specified in the TC. When the total content of the Packet Store has been downloaded, the DSH passes to downlink the next Packet Store present in the TC. The execution will continue up to one of the following events will be verified:

- No other Packet Store to downlink
- Number of Sectors to downlink specified in the TC has been reached.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (15,228)**	2 words	
6	Number of Sectors	1 word	
7	SIGN Fill Data	7 bits	
7	Carrier Selection	1 bit	
7	Spare = 0	8 bits	
8	N	1 word	
9	Store ID	1 word	R
10	Spare = 0	14 bits	R
10	Data Strategy	1 bit	R
10	Read Pointer Setting	1 bit	R
	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.13.33-1: TC (15,228) Downlink

TC (15,228) Applicability	TC (15,228) Format Deviations
DSHA	None

6.13.34 TC (15, 229) Pass Through Mode

TC (15,229) requests to start down-linking SAR data currently being acquired from the SAR and buffered in the DSHA. The delay between starting the image acquisition and starting the image down-linking is programmed according to the parameters specified in the TC.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,229)**	2 words
6	Spare	10 bits
6	Interleaved DL on Pol. H Flag	1 bit
6	Interleaved DL on Pol. V Flag	1 bit
6	SDI Within Time Out Flag	1 bit
6	SDI Initial Time Out Flag	1 bit
6	Enable Pass Through – Pol.V	1 bit
6	Enable Pass Through – Pol.H	1 bit
7	Initial Time Out Value	1 word
8	Within Time Out Value	1 word
9	Store ID - Pol.H	1 word
10	SIGN Fill Data H	7 bits
10	Carrier Selection – Pol.H	1 bit
10	Data Strategy - Pol.H	1 bit
10	Spare = 0	7 bits
11	Pass Through Delay – Pol.H	1 word
12	Pass Through Time Duration – Pol.H	1 word
13	Store ID - Pol.V	1 word
14	SIGN Fill Data - Pol.V	7 bits
14	Carrier Selection - Pol.V	1 bit
14	Data Strategy - Pol.V	1 bit
14	Spare = 0	7 bits
15	Pass Through Delay - Pol.V	1 word
16	Pass Through Time Duration - Pol.V	1 word
17	Interleaved DL PS ID - Pol. H	1 word
18	Interleaved DL PS ID - Pol. V	1 word
19	**Packet Error Control**	1 word

Figure 6.13.34-1: TC (15,229) Pass Through Mode

TC (15,229) Applicability	TC (15,229) Format Deviations
DSHA	None

6.13.35 TC (15, 230) Perform E2E BITE

TC (15,230) requests to perform a BITE of the DSHA, filling completely a memory module, with a pattern, provided as parameter in the TC, and then down-linking the memory module data contents.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,230)**	2 words
6	SIGN Fill Data	7 bits
6	Carrier Selection	1 bit
6	Spare = 0	3 bits
6	Overwriting BITE	1 bit
6	Memory Module On/Off Switch	1 bit
6	Memory Module Selection	3 bit
7	BITE Filler Word	1 word
8	**Packet Error Control**	1 word

Figure 6.13.35-1: TC (15,230) Perform E2E BITE

TC (15,230) Applicability	TC (15,230) Format Deviations
DSHA	None

6.13.36 TC (15, 231) Perform Memory TEST

TC (15,231) requests to perform a test of all memory module. The test is a destructive test and previously stored data are lost.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,231)**	2 words
6	**Packet Error Control**	1 word

Figure 6.13.36-1: TC (15,231) Perform Memory TEST

TC (15,231) Applicability	TC (15,231) Format Deviations
DSHA	None

6.13.37 TC (15, 232) Abort

TC (15, 232) requests to abort a currently running mission operation (i.e. Store, Downlink, Pass-Through, Memory Test or BITE). Each instance of TC(15,232) can abort only one running operation, consequently it has to be re-sent for each operation to abort.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,232)**	2 words
6	Spare = 0	8 bits
6	Test Abort	1 bit
6	BITE Abort	1 bit
6	SAR Data Store Abort – Pol. V	1 bit
6	SAR Data Store Abort – Pol. H	1 bit
6	L2 Downlink Abort	1 bit
6	L1 Downlink Abort	1 bit
6	Pass Through Abort – Pol. V	1 bit
6	Pass Through Abort – Pol. H	1 bit
7	**Packet Error Control**	1 word

Figure 6.13.37-1: TC (15,232) Abort

TC (15,232) Applicability	TC (15,232) Format Deviations
DSHA	None

6.13.38 TC (15, 233) Set Nominal Read Pointer of Packet Store

TC (15,233) requests to set the Nominal Read Pointer in a Packet Store supporting three different strategies:

- To first sector (all zeroes)
- To end of the last stored sector (all ones)
- Go back of a specified number of sectors already read.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,233)**	2 words
6	Store ID	1 word
7	Sectors Shift	1 word
8	**Packet Error Control**	1 word

Figure 6.13.38-1: TC (15,233) Set Nominal Read Pointer of Packet Store

TC (15,233) Applicability	TC (15,233) Format Deviations
DSHA	None

6.13.39 TC (15, 234) Delete Packet Store Contents up to Read Pointer

TC (15,234) requests to delete Packet Store contents up to the Read Pointer

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (15,234)**	2 words
6	Store ID	1 word
7	**Packet Error Control**	1 word

Figure 6.13.39-1: TC (15,234) Delete Packet Store Contents up to Read Pointer

TC (15,234) Applicability	TC (15,234) Format Deviations
DSHA	None

6.14 SERVICE 17: CONNECTION TEST

6.14.1 TC (17, 1) Perform Connection Test

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).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (17,1)**	2 words
6	**Packet Error Control**	1 word

Figure 6.14.1-1: TC (17,1) Perform Connection Test

TC (17,1) Applicability	TC (17,1) Format Deviations
NM ASW	None
SM ASW	None
GPS	None
ICM	None
ICM BOOT	None
TCU	None
DSHA	None
DSHA BOOT	None
LCT	None

6.14.2 TM (17, 2) Connection Test Report

TM (17,2) report is generated in response to TC (17,1).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (17,2)**	5 words
9	**Packet Error Control**	1 word

Figure 6.14.2-1: TM (17,2) Connection Test Report

TM (17,2) Applicability	TM (17,2) Format Deviations
NM ASW	No PEC
SM ASW	No PEC
GPS	None
ICM	None
ICM BOOT	None
TCU	None
DSHA	None
DSHA BOOT	None
LCT	None

6.15 SERVICE 18: ON-BOARD OPERATIONS PROCEDURE SERVICE

6.15.1 TC (18, 144) Add / Modify OBOP

TC (18, 144) instructs AVS to add or modify the specified OBOP starting at the position given by the Command Offset.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (18,144)**	2 words	
6..7	OBOP ID	2 words	
8	Commands in OBOP	1 word	
9	Command Offset	1 word	
10	N	1 word	
11..12	OBCD Command ID	2 words	R
13..14	Time Delay	2 words	R
	Block R Repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.15.1-1: TC (18,144) Add / Modify OBOP

TC (18,144) Applicability	TC (18,144) Format Deviations
NM ASW	None
SM ASW	None

6.15.2 TC (18, 160) Add Telecommand to OBOP

TC (18, 160) instructs SES to add the telecommand contained within TC (18,160) to the specified OBOP at the position given by the Procure Step number. The incorporated telecommand is specified as a complete packet.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,160)**	2 words
6..7	OBOP ID	2 words
8	Step ID	1 byte
8	Execution Delay	1 byte
9	No. Of TC Packet Words	1 word
	TC Packet	variable
M	**Packet Error Control**	1 word

Figure 6.15.2-1: TC (18,160) Add Telecommand to OBOP

TC (18,160) Applicability	TC (18,160) Format Deviations
ICM	None

6.15.3 TC (18, 2) Delete Procedure

Upon reception of TC (18,2), the specified onboard procedure is deleted from the list of loaded onboard procedures.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,2)**	2 words
6..7	OBOP ID	2 words
8	**Packet Error Control**	1 word

Figure 6.15.3-1: TC (18,2) Delete Procedure

TC (18,2) Applicability	TC (18,2) Format Deviations
NM ASW	None
SM ASW	None
ICM	None

6.15.4 TC (18, 3) Start Procedure

TC (18,3) instructs to immediately begin execution of the specified Onboard Operation Procedure (OBOP).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,3)**	2 words
6..7	OBOP ID	2 words
8	**Packet Error Control**	1 word

Figure 6.15.4-1: TC (18,3) Start Procedure

TC (18,3) Applicability	TC (18,3) Format Deviations
NM ASW	None
SM ASW	None
ICM	None

6.15.5 TC (18, 4) Stop Procedure

TC (18,4) instructs to halt execution of the specified Onboard Operation Procedure (OBOP) after the completion of the current execution step.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,4)**	2 words
6..7	OBOP ID	2 words
8	**Packet Error Control**	1 word

Figure 6.15.5-1: TC (18,4) Stop Procedure

TC (18,4) Applicability	TC (18,4) Format Deviations
NM ASW	None
SM ASW	None
ICM	None

6.15.6 TC (18, 162) Report List of Onboard Operation Procedure

TC (18,162) instructs the SES to generate a telemetry packet reporting the list of all the Onboard Operation Procedures (OBOP).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,162)**	2 words
6	**Packet Error Control**	1 word

Figure 6.15.6-1: TC (18,162) Report List of Onboard Operation Procedure

TC (18,162) Applicability	TC (18,162) Format Deviations
ICM	None

6.15.7 TC (18, 145) Report List of OBOP with Status

TC(18,145) requests to report the list of OBOP with the enable/disable status.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,145)**	2 words
6	**Packet Error Control**	1 word

Figure 6.15.7-1: TC (18,145) Report List of OBOP with Status

TC (18,145) Applicability	TC (18,145) Format Deviations
NM ASW	None
SM ASW	None

6.15.8 TM (18, 146) OBOP List and Status Report

In response to TC(18,145), TM(18,146) report the list of OBOP with the enable/disable status.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (18,146)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	NPROC	1 word	
11..12	OBOP ID	2 words	R
13	Status	1 word	
⋮	R repeated NPROC-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.15.8-1: TM (18,146) OBOP List and Status Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (18,146) Applicability	TM (18,146) Format Deviations
NM ASW	No PEC
SM ASW	No PEC

6.15.9 TM (18, 163) List Of Onboard Operations Procedures Report

TM(18,163) is generated in response to a valid TC(18,162) request to list all of the Onboard Operation Procedures (OBOP).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (18,163)**	5 words	
9..10	OBOP(i) ID	2 words	R1
11	Current Step ID	8 bits	R1
11	OBOP(i) Status	8 bits	R1
12..104	Block R1 repeated 31 times (where i ε [0..31])		
105	**Packet Error Control**	1 word	

Figure 6.15.9-1: TM (18,163) List Of Onboard Operations Procedures Report

TM (18,163) Applicability	TM (18,163) Format Deviations
ICM	None

6.15.10 TC (18, 130) Report OBOP Detailed Definition

TC (18,130) instructs to generate a report providing the detailed definition of the specified OBOP.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,130)**	2 words
6..7	OBOP ID	2 words
8	**Packet Error Control**	1 word

Figure 6.15.10-1: TC (18,130) Report OBOP Detailed Definition

TC (18,130) Applicability	TC (18,130) Format Deviations
NM ASW	None
SM ASW	None
ICM	None

6.15.11 TC (18, 149) OBOP Flow Control

TC (18,149) is used only within an OBOP to change the execution flow of steps. Note that Ground can generate OBOP containing TC (18, 149).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,149)**	2 words
6..7	Parameter #	2 words
8..9	High Limit	2 words
10..11	Low Limit	2 words
12	Data Type	1 word
13	Step Offset	1 word
14	**Packet Error Control**	1 word

Figure 6.15.11-1: TC (18,149) OBOP Flow Control

TC (18,149) Applicability	TC (18,149) Format Deviations
NM ASW	None
SM ASW	None

6.15.12 TM (18, 150) AVS OBOP Definition Report

TM (18,150) is generated by the ASW in response to TC(18,130).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (18,150)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10..11	OBOP ID	2 words	
12	Command in OBOP	1 word	
13	Command Offset	1 word	
14	N	1 word	
15	Section ID	1 word	R1
16	Command ID	1 word	R1
17..18	Time Offset	2 words	R1
	Block R1 repeated N-1		

Figure 6.15.12-1: TM (18,150) AVS OBOP Definition Report

TM (18,150) Applicability	TM (18,150) Format Deviations
NM ASW	None
SM ASW	None

6.15.13 TC (18, 151) OBOP Termination

TC(18,151) is used only within an OBOP to force the OBOP step execution termination.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,151)**	2 words
6	**Packet Error Control**	1 word

Figure 6.15.13-1: TC (18,151) OBOP Termination

TC (18,151) Applicability	TC (18,151) Format Deviations
NM ASW	None
SM ASW	None

6.15.14 TC (18, 147) Enable OBOP

TC (18,147) requests to enable the specified OBOP.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (18,147)**	2 words	
6	NPROC	1 word	
7..8	OBOP ID	2 words	R
	R repeated NPROC-1		
N	**Packet Error Control**	1 word	

Figure 6.15.14-1: TC (18,147) Enable OBOP

TC (18,147) Applicability	TC (18,147) Format Deviations
NM ASW	None
SM ASW	None

6.15.15 TC (18, 148) Disable OBOP

TC (18,148) requests to disable the specified OBOP.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (18,148)**	2 words	
6	NPROC	1 word	
7..8	OBOP ID	2 words	R
	R repeated NPROC-1		
N	**Packet Error Control**	1 word	

Figure 6.15.15-1: TC (18,148) Disable OBOP

TC (18,148) Applicability	TC (18,148) Format Deviations
NM ASW	None
SM ASW	None

6.15.16 TM (18, 164) SES OBOP Definition Report

SES generates TM (18,164) in response to TC(18,130) request to list the detailed definition of an Onboard Operation Procedure (OBOP). A Telecommand for a Procedure Step that exceeds the maximum size of a telemetry report packet is split across two consecutive packets. In this case the second packet simply re-states the Procedure Step number and Execution Delay, and then follow with the remaining Telecommand packet words.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (18,164)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10..11	OBOP ID	2 words	
12	NSTEPS > 0	1 word	
13	Step ID	1 byte	R1
13	Execution Delay	1 byte	R1
14	No. Of TC Packet Words	1 word	R1
	TC Packet Telecommand packet associated with Procedure Step	variable	R1
	Block R1 Repeated (NSTEPS-1) times		
M	**Packet Error Control**	1 word	

NSTEPS = 0 is not valid.

Figure 6.15.16-1: TM (18,164) SES OBOP Definition Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (18,164) Applicability	TM (18,164) Format Deviations
ICM	None

6.15.17 TC (18, 10) Report List of Active Onboard Operations Procedures

TC(18,10) requests to report the list of active on-board operations procedures.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,10)**	2 words
6	**Packet Error Control**	1 word

Figure 6.15.17-1: TC (18,10) Report List of Active Onboard Operations Procedures

TC (18,10) Applicability	TC (18,10) Format Deviations
NM ASW	None
SM ASW	None

6.15.18 TM (18, 11) Onboard Active Operations Procedures List Report

In response to TC(18,10), TM(18,11) reports the list of active on-board operations procedures.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (18,11)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	NPROC	1 word	
11..12	OBOP ID	2 words	R
13	Step	1 word	
⋮	R repeated NPROC-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.15.18-1: TM (18,11) Onboard Active Operations Procedures List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (18,11) Applicability	TM (18,11) Format Deviations
NM ASW	No PEC
SM ASW	No PEC

6.15.19 TC (18, 161) Save OBOP Configuration Data

TC (18, 161) instructs SES to save the configuration data for the Service to EEPROM. This comprises the definition of the Onboard Operation Procedures.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (18,161)**	2 words
6	**Packet Error Control**	1 word

Figure 6.15.19-1: TC (18,161) Save OBOP Configuration Data

TC (18,161) Applicability	TC (18,161) Format Deviations
ICM	None

6.16 SERVICE 19: EVENT DETECTION AND ACTION EXECUTION

6.16.1 TC (19, 2) Delete Events from the Detection List

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

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,2)**	2 words	
6	N	1 word	
7	RID	1 word	R
8..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.1-1: TC (19,2) Delete Events from the Detection List

TC (19,2) Applicability	TC (19,2) Format Deviations
ICM	None

6.16.2 TC (19, 4) Enable Actions

Upon reception of TC (19,4) the specified event is enabled.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,4)**	2 words	
6	N	1 word	
7	RID	1 word	R
8..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.2-1: TC (19,4) Enable Actions

TC (19,4) Applicability	TC (19,4) Format Deviations
ICM	None

6.16.3 TC (19, 5) Disable Actions

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

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,5)**	2 words	
6	N	1 word	
7	RID	1 word	R
8..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.3-1: TC (19,5) Disable Actions

TC (19,5) Applicability	TC (19,5) Format Deviations
ICM	None

6.16.4 TC (19, 6) Report the Event Detection List

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

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,6)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.4-1: TC (19,6) Report the Event Detection List

TC (19,6) Applicability	TC (19,6) Format Deviations
ICM	None

6.16.5 TM (19, 7) Event Detection List Report

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

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (19,7)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N	1 word	
11	RID	1 word	R
12	Action Status	1 word	
13..M-1	R repeated N-1	variable	
M	**Packet Error Control**	1 word	

When N = 0; the remaining packet will be structured as:

10	N	1 word
11	**Packet Error Control**	1 word

Figure 6.16.5-1: TM (19,7) Event Detection List Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,7) Applicability	TM (19,7) Format Deviations
ICM	None

6.16.6 TC (19, 128) Report Event Action

TC(19,128) requests to report the onboard stored TC associated to the specified RID specified as the event action. The resultant report is TM(19,129).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,128)**	2 words
6	RID	1 word
7	**Packet Error Control**	1 word

Figure 6.16.6-1: TC (19,128) Report Event Action

TC (19,128) Applicability	TC (19,128) Format Deviations
ICM	None

6.16.7 TM (19, 129) Event Action Report

TM(19,129) is generated as response to TC(19,128).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (19,129)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	RID	1 word
11	N° of TC Packet Words	1 word
	TC Packet Words	variable
M	**Packet Error Control**	1 word

Figure 6.16.7-1: TM (19,129) Event Action Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,129) Applicability	TM (19,129) Format Deviations
ICM	None

6.16.8 TC (19, 144) Configure RID-Event Table Event Fields

TC(19,144) configures (a section of) the Rid-Event table.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,144)**	2 words	
6	First RID	1 word	
7	N Record	1 word	
8	OK Event ID	1 word	R
9	NOK Event ID	1 word	
	R repeated N Record - 1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.8-1: TC (19,144) Configure RID-Event Table Event Fields

TC (19,144) Applicability	TC (19,144) Format Deviations
NM ASW	None
SM ASW	None

6.16.9 TC (19, 145) Configure RID-Event Table Enable/Disable Fields

TC(19,145) configures the Enabled/Disabled status of the Rid-Event table entries, as well as their internal status used for issuing the Event with OK/NOK specification. The following parameters are present:

- First RID: Identifier of the first RID to be modified
- N Record: Number of RID to be configured

For each RID the following parameters (explained in section RID-Event table) are specified:

- Enable/Disable;
- Last occurrence OK/NOK condition

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,145)**	2 words	
6	First RID	1 word	
7	N Record	1 word	
8	RID Status	1 byte	R
8	Last OK/NOK Condition	1 byte	
	R repeated N Record - 1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.9-1: TC (19,145) Configure RID-Event Table Enable/Disable Status

TC (19,145) Applicability	TC (19,145) Format Deviations
NM ASW	None
SM ASW	None

6.16.10 TC (19, 146) Configure Event-Action Table Parameter Fields

TC(19,146) configures the Event-action table.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,146)**	2 words	
6	First Event	1 word	
7	N Record	1 word	
8	RECO 1 Filter	1 byte	
8	RECO 2 Filter	1 byte	
9	RECO 3 Filter	1 byte	
9	Spare = 0	1 byte	
10	Event Handler Enable/Disable	1 bit	
10	Recovery Action Enable/Disable	1 bit	
10	Telemetry Enable/Disable	1 bit	
10	Suspend MDS RECO 1	1 bit	
10	Disable Monitoring RECO 1	1 bit	
10	Suspend MDS RECO 2	1 bit	R
10	Disable Monitoring RECO 2	1 bit	
10	Suspend MDS RECO 3	1 bit	
10	Disable Monitoring RECO 3	1 bit	
10	Nominal / Recovery Flag	1 bit	
10	RECO 1 Type	2 bits	
10	RECO 2 Type	2 bits	
10	RECO 3 Type	2 bits	
11..12	RECO 1 ID	2 words	
13..14	RECO 2 ID	2 words	
15..16	RECO 3 ID	2 words	
17..18	Fail Mark Data	2 words	
19	Fail Mark Level	1 word	
	R repeated N Record - 1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.10-1: TC (19,146) Configure Event-Action Table Parameter Fields

TC (19,146) Applicability	TC (19,146) Format Deviations
NM ASW	None
SM ASW	None

6.16.11 TC (19, 147) Configure Event-Action Table Enable/Disable Fields

TC(19,147) configures the Enabled/Disabled status for the different entries in the Event-Action Table.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,147)**	2 words	
6	First Event	1 word	
7	N Record	1 word	
8	Status of Event-Action Entry	1 word	R
	R repeated N Record - 1	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.11-1: TC (19,147) Configure Event-Action Table Enable/Disable Fields

TC (19,147) Applicability	TC (19,147) Format Deviations
NM ASW	None
SM ASW	None

6.16.12 TC (19, 148) Report RID-Event Table Configuration

TC(19,148) requests a report containing the RID-Event Table configuration.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,148)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.12-1: TC (19,148) Report RID-Event Table Configuration

TC (19,148) Applicability	TC (19,148) Format Deviations
NM ASW	None
SM ASW	None

6.16.13 TM (19, 149) RID-Event Table Configuration Report

TM(19,149) report match exactly the RID-Event table structure.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (19,149)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	First RID	1 word	
11	N Record	1 word	
12	OK Event ID	1 word	R
13	NOK Event ID	1 word	
14..M	R repeated N Record - 1	variable	

Figure 6.16.13-1: TM (19,149) RID-Event Table Configuration Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,149) Applicability	TM (19,149) Format Deviations
NM ASW	None
SM ASW	None

6.16.14 TC (19, 150) Report RID-Event Table Status

TC(19,150) sub-service requests a report containing the RID-Event Table status. No parameter is present.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,150)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.14-1: TC (19,150) Report RID-Event Table Status

TC (19,150) Applicability	TC (19,150) Format Deviations
NM ASW	None
SM ASW	None

6.16.15 TM (19, 151) RID-Event Table Status Report

TM(19,151) parameters in the report match exactly the RID-Event table structure, limited to status parameters.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (19,151)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	First RID	1 word	
11	N Record	1 word	
12	RID Status	1 byte	R
12	Last OK/NOK Condition	1 byte	
13..M-1	R repeated N Record - 1	variable	

Figure 6.16.15-1: TM (19,151) RID-Event Table Status Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,151) Applicability	TM (19,151) Format Deviations
NM ASW	None
SM ASW	None

6.16.16 TC (19, 152) Report Event-Action Table Configuration

TC(19,152) sub-service requests a report containing the Event-action Table configuration. No parameter is present.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,152)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.16-1: TC (19,152) Report Event-Action Table Configuration

TC (19,152) Applicability	TC (19,152) Format Deviations
NM ASW	None
SM ASW	None

6.16.17 TM (19, 153) Event-Action Table Configuration Report

TM(19,153) parameters in the report match exactly the Event-action table structure.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (19,153)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	First RID	1 word	
11	N Record	1 word	
12	RECO 1 Filter	1 byte	
12	RECO 2 Filter	1 byte	
13	RECO 3 Filter	1 byte	
13	Spare = 0	1 byte	
14	Event Handler Enable/Disable	1 bit	
14	Recovery Action Enable/Disable	1 bit	
14	Telemetry Enable/Disable	1 bit	
14	Suspend MDS RECO 1	1 bit	
14	Disable Monitoring RECO 1	1 bit	
14	Suspend MDS RECO 2	1 bit	R
14	Disable Monitoring RECO 2	1 bit	
14	Suspend MDS RECO 3	1 bit	
14	Disable Monitoring RECO 3	1 bit	
14	Nominal / Recovery Flag	1 bit	
14	RECO 1 Type	2 bits	
14	RECO 2 Type	2 bits	
14	RECO 3 Type	2 bits	
15..16	RECO 1 ID	2 words	
17..18	RECO 2 ID	2 words	
19..20	RECO 3 ID	2 words	
21..22	Fail Mark Data	2 words	
23	Fail Mark Level	1 word	
	R repeated N Record - 1	variable	

Figure 6.16.17-1: TM (19,153) Event-Action Table Configuration Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,153) Applicability	TM (19,153) Format Deviations
NM ASW	None
SM ASW	None

6.16.18 TC (19, 154) Report Event-Action Table Status

TC(19,154) sub-service requests a report containing the Event-action Table status.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,154)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.18-1: TC (19,154) Report Event-Action Table Status

TC (19,154) Applicability	TC (19,154) Format Deviations
NM ASW	None
SM ASW	None

6.16.19 TM (19, 155) Event-Action Table Status Report

TM(19,155) parameters in the report match exactly the Event-action table structure, limited to status parameters.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (19,155)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	First RID	1 word	
11	N Record	1 word	
12	Event E/D Status	1 byte	R
12	Action E/D Status	1 byte	
13..M	R repeated N Record - 1	variable	

Figure 6.16.19-1: TM (19,155) Event-Action Table Status Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (19,155) Applicability	TM (19,155) Format Deviations
NM ASW	None
SM ASW	None

6.16.20 TC (19, 156) Enable Event-Action Service

TC(19,156) enables the Overall Event Handling, which is the processing of incoming events. It has no effect on the generation of the events themselves, which is controlled at Monitoring and RID-Event table level.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,156)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.20-1: TC (19,156) Enable Event-Action Service

TC (19,156) Applicability	TC (19,156) Format Deviations
NM ASW	None
SM ASW	None

6.16.21 TC (19, 157) Disable Event-Action Service

TC(19,157) disables the Overall Event Handling.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,157)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.21-1: TC (19,157) Disable Event-Action Service

TC (19,157) Applicability	TC (19,157) Format Deviations
NM ASW	None
SM ASW	None

6.16.22 TC (19, 158) Raise RID

TC(19,158) requests to raise a RID to trigger the associated event action.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,158)**	2 words
6	RID	1 word
7	Error Code	1 word
8	MDS ID	1 byte
8	Monitoring ID	1 byte
9..10	Auxiliary Data	2 word
11	**Packet Error Control**	1 word

Figure 6.16.22-1: TC (19,158) Raise RID

TC (19,158) Applicability	TC (19,158) Format Deviations
NM ASW	None
SM ASW	None

6.16.23 TC (19, 160) Add Events to the Detection List

TC(19,160) instructs the SES to add one or more Events to the onboard Event Detection List. Each Event is uniquely identified by a RID number and is associated with the telecommand specified within the telecommand. The telecommand is specified as a complete packet (i.e. including packet headers, Packet Error Control word).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (19,160)**	2 words	
6	N	1 word	
7	RID	1 word	R1
	R1 repeated N-1	variable	
	N° of TC Packet Words	1 word	
	TC Packet	variable	
M	**Packet Error Control**	1 word	

Figure 6.16.22-1: TC (19,160) Add Events to the Detection List

TC (19,160) Applicability	TC (19,160) Format Deviations
ICM	None

6.16.24 TC (19, 161) Save Event Detection List Configuration Data

TC (19,161) instructs the SES to save the configuration data for the Service to EEPROM. This comprises the definition of the Event Detection List.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (19,161)**	2 words
6	**Packet Error Control**	1 word

Figure 6.16.23-1: TC (19,161) Save Event Detection List Configuration Data

TC (19,161) Applicability	TC (19,161) Format Deviations
ICM	None

6.17 ASW MISSION SPECIFIC SERVICES

6.17.1 Service 130: Command Database Management Service

6.17.1.1 TC (130,1) Insert Telecommand

TC(130,1) appends a new TC in the On-Board Command Database (OBCD).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,1)**	2 words
6	Section ID	1 word
7	Command ID	1 word
	TC Packet	variable
M	**Packet Error Control**	1 word

Figure 6.17.1.1-1: TC (130,1) Insert Telecommand

TC (130,1) Applicability	TC (130,1) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.2 TC (130,2) Reset Spare OBCD Section

TC(130,2) reset the spare section in OBCD.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,2)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.1.2-1: TC (130,2) Reset Spare OBCD Section

TC (130,2) Applicability	TC (130,2) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.3 TC (130,3) Report Free Available Space

TC(130,3) requests to report the free available space in the spare section of the OBCD.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,3)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.1.3-1: TC (130,3) Report Free Available Space

TC (130,3) Applicability	TC (130,3) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.4 TM (130,4) Free Available Space Report

In response to TC(130,3), TM(130,4) reports the available free memory space in the spare section of the OBCD.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (130,4)**	5 words
9	Free Memory	1 word

Figure 6.17.1.4-1: TM (130,4) Free Available Space Report

TM (130,4) Applicability	TM (130,4) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.5 TC (130,5) Dump OBCD Telecommand

TC(130,5) requests to dump the specified OBCD Telecommand.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,5)**	2 words
6	Section ID	1 word
7	Command ID	1 word
8	**Packet Error Control**	1 word

Figure 6.17.1.5-1: TC (130,5) Dump OBCD Telecommand

TC (130,5) Applicability	TC (130,5) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.6 TM (130,6) Dump OBCD Telecommand Report

In response to TC(130,5), TM(130,6) reports the OBCD Telecommand.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (130,6)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	Section ID	1 word
11	Command ID	1 word
12	N° of TC Packet Words	1 word
Max 128	TC Packet Words	variable

Figure 6.17.1.6-1: TM (130,6) Dump OBCD Telecommand Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (130,6) Applicability	TM (130,6) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.7 TC (130,7) Execute Telecommand

TC(130,7) requests to execute the specified OBCD Telecommand.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,7)**	2 words
6	Section ID	1 word
7	Command ID	1 word
8	**Packet Error Control**	1 word

Figure 6.17.1.7-1: TC (130,7) Execute Telecommand

TC (130,7) Applicability	TC (130,7) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.8 TC (130,8) Enable OBCD Telecommand

TC(130,8) enables execution of the specified OBCD Telecommand.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,8)**	2 words
6	Section ID	1 word
7	Command ID	1 word
8	**Packet Error Control**	1 word

Figure 6.17.1.8-1: TC (130,8) Enable OBCD Telecommand

TC (130,8) Applicability	TC (130,8) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.9 TC (130,9) Disable OBCD Telecommand

TC(130,9) disables execution of the specified OBCD Telecommand.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,9)**	2 words
6	Section ID	1 word
7	Command ID	1 word
8	**Packet Error Control**	1 word

Figure 6.17.1.8-1: TC (130,9) Disable OBCD Telecommand

TC (130,9) Applicability	TC (130,9) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.10 TC (130,10) Modify OBCD Telecommand

TC(130,10) over-writes the specified TC in the OBCD.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,10)**	2 words
6	Section ID	1 word
7	Command ID	1 word
	TC Packet	variable
M	**Packet Error Control**	1 word

Figure 6.17.1.10-1: TC (130,10) Modify OBCD Telecommand

TC (130,10) Applicability	TC (130,10) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.11 TC (130,11) Report OBCD Telecommands Status

TC(130,11) requests the enable/disable status report of the OBCD Telecommands.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (130,11)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.1.11-1: TC (130,11) Report OBCD Telecommands Status

TC (130,11) Applicability	TC (130,11) Format Deviations
NM ASW	None
SM ASW	None

6.17.1.12 TM (130,12) OBCD Telecommands Status Report

In response to TC(130,11), TM(130,12) reports the enable/disable status of the OBCD Telecommands.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (130,12)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N	1 word	
11	Section ID	1 word	R1
12	Command ID	1 word	R1
13	TC Enable/Disable Status	1 word	R1
Max 128	Block R1 repeated N – 1 times	variable	

Figure 6.17.1.12-1: TM (130,12) OBCD Telecommands Status Report

TM (130,12) Applicability	TM (130,12) Format Deviations
NM ASW	None
SM ASW	None

6.17.2 Orbit Number Management

The Orbit Number can be set through NM ASW TC(137,24) Load New CKSG Local Values, then the loaded value can be verified through TC(137,25) Report CKSG Local Values and made effective through TC(137,27) Update CKPM/CSKG Interfaces.

The Orbit Number is reported in ASW periodic telemetry.

6.17.3 Service 132: Onboard Position-Tag Command Schedule

6.17.3.1 TC (132,1) Enable Release of Position-Tagged Telecommands

TC (132,1) is used to enable the release of Position-Tagged TC. It allows to enable all Sub-Schedule ID and PID (N1 = 0) or all PID of a Sub-Schedule (N2 = 0).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,1)**	2 words	
6	N1	1 words	
7	Spare = 0	5 bits	
7	Sub-Schedule ID	11 bits	
8	N2	1 word	
9	Spare = 0	5 bits	
9	PID	7 bits	R S
9	Reserved = 0	4 bits	
	R repeated N2-1	variable	
	Block S repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Case N1 = 0:

1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,1)**	2 words	
6	N1 = 0	1 words	
7	**Packet Error Control**	1 word	

Case N1 > 0 and N2 = 0:

1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,1)**	2 words	
6	N1 > 0	1 words	
7	Spare = 0	5 bits	
7	Sub-Schedule ID	11 bits	S
8	N2 = 0	1 word	
	Block S repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.17.3.1-1: TC (132,1) Enable Release of Position-Tagged Telecommands

TC (132,1) Applicability	TC (132,1) Format Deviations
NM ASW	None

Note: Setting Sub-Schedule ID to 0 means all Sub-Schedule ID.

6.17.3.2 TC (132,2) Disable Release of Position-Tagged Telecommands

TC (132,2) is used to disable the release of Position-Tagged TC. It allows to disable all Sub-Schedule ID and PID (N1 = 0) or all PID of a Sub-Schedule (N2 = 0).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,2)**	2 words
6	N1	1 word
7	Spare = 0	5 bits
7	Sub-Schedule ID	11 bits
8	N2	1 word
9	Spare = 0	5 bits
9	PID	7 bits
9	Reserved = 0	4 bits
	R repeated N2-1	variable
	Block S repeated N1-1	variable
M	**Packet Error Control**	1 word

R

S

Case N1 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,2)**	2 words
6	N1 = 0	1 words
7	**Packet Error Control**	1 word

Case N1 > 0 and N2 = 0:

1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,2)**	2 words
6	N1 > 0	1 words
7	Spare = 0	5 bits
7	Sub-Schedule ID	11 bits
8	N2 = 0	1 word
	Block S repeated N1-1	variable
M	**Packet Error Control**	1 word

S

Figure 6.17.3.2-1: TC (132,2) Disable Release of Position-Tagged Telecommands

TC (132,2) Applicability	TC (132,2) Format Deviations
NM ASW	None

Note: Setting Sub-Schedule ID to 0 means all Sub-Schedule ID.

6.17.3.3 TC (132,3) Reset Position-Tagged Command Schedule

Upon reception of TC (132,3) the Position-Tagged Schedule is reset by clearing all entries in the command schedule.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,3)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.3.3-1: TC (11,3) Reset Position-Tagged Command Schedule

TC (132,3) Applicability	TC (132,3) Format Deviations
NM ASW	None

6.17.3.4 TC (132,4) Insert Position-Tagged Telecommands in Command Schedule

Upon reception of TC (132,4) the PT-TC contained in the TC Packet Data Field are inserted in the Position-Tagged Schedule. PT-TC in the command schedule are ordered with increasing position tag. PT-TC with identical position tag are sorted in the sequence they are received.

The format of TC (132,4) is specified in section 3.6 Figure 3.6-1.

6.17.3.5 TC (132,5) Delete Position-Tagged Telecommands

Upon reception of TC (132,5) all PT-TC which satisfy the selection criteria defined by the PID, Sequence Count and the Number of TC are deleted.

TC (132,5) allows to delete a number of successive telecommands with the same PID starting from the specified Sequence Count and following the PID Sequence Count ordered list.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,5)**	2 words	
6	N	1 words	
7	Spare = 0	5 bits	R
7	PID	7 bits	R
7	Reserved = 0	4 bits	R
8	Spare = 0	2 bits	R
8	Packet Sequence Count	14 bits	R
9	Number of Telecommands	1 word	R
	Block R repeated N-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.17.3.5-1: TC (132,5) Delete Position-Tagged Telecommands

TC (132,5) Applicability	TC (132,5) Format Deviations
NM ASW	None

6.17.3.6 TC (132,6) Delete Position-Tagged TC over Position Interval and Sub-Schedule

Upon reception of TC (132,6) the PT-TC specified will be removed from the command schedule. TC in the command schedule are maintained ordered with increasing position tag.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,6)**	2 words	
6	Range	1 word	
7..9	Position Tag 1	3 words	
10..12	Position Tag 2	3 words	
13	N1	1 word	
14	Spare = 0	5 bits	R
14	Sub-Schedule ID	11 bits	R
	R repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.17.3.6-1: TC (132,6) Delete Position-Tagged TC over Position Interval and Sub-Schedule

TC (132,6) Applicability	TC (132,6) Format Deviations
NM ASW	None

Note: Setting Sub-Schedule ID to 0 means all Sub-Schedule ID.

6.17.3.7 TC (132, 144) Delete PT-TC over Position Interval and PID

Upon reception of TC (132,144) the PT-TC specified will be removed from the command schedule.

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..5	**Telecommand ID (132,144)**	2 words	
6	Range	1 word	
7..9	Position Tag 1	3 words	
10..12	Position Tag 2	3 word	
13	N1	1 word	
14	Spare = 0	5 bits	R
14	PID	7 bits	R
14	Reserved = 0	4 bits	R
	R repeated N1-1	variable	
M	**Packet Error Control**	1 word	

Figure 6.17.3.7-1: TC (132,144) Delete PT-TC over Position Interval and PID

TC (132,144) Applicability	TC (132,144) Format Deviations
NM ASW	None

6.17.3.8 TM (132,10) Detailed Position-Tagged Command Schedule Report

TC (132,10) reports in detailed form the position-tagged telecommand specified with TC (132,16).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (132,10)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	Spare = 0	5 bits
10	Sub-Schedule ID	11 bits
11..13	Position Tag	3 words
14	N° of TC Packet Words	1 word
15..N-1	TC Packet Words	variable

Figure 6.17.3.8-1: TM (132,10) Detailed Position-Tagged Command Schedule Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (132,10) Applicability	TM (132,10) Format Deviations
NM ASW	None

6.17.3.9 TM (132,13) Summary Position-Tagged Schedule Report

TM (132,13) is the response to TC(132,17).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (132,13)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N	1 word	
11	Spare = 0	5 bits	R
11	Sub-Schedule ID	11 bits	R
12..14	Position Tag	3 words	R
15..17	TC Packet Header	3 words	R
18..19	TC Packer Data Field Header	2 words	R
	Block R repeated N-1 times		

Figure 6.17.3.9-1: TM (132,13) Summary Position-Tagged Schedule Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (132,13) Applicability	TM (132,13) Format Deviations
NM ASW	None

6.17.3.10 TC (132,16) Report Position-Tagged Command Schedule in Detailed Form

Upon reception of TC (132,16) the report TM (132,10) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,16)**	2 words
6	Spare = 0	5 bits
6	PID	7 bits
6	Reserved = 0	4 bits
7	Spare = 0	2 bits
7	Packet Sequence Counter	14 bits
8	**Packet Error Control**	1 word

Figure 6.17.3.10-1: TC (132,16) Report Position-Tagged Command Schedule in Detailed Form

TC (132,16) Applicability	TC (132,16) Format Deviations
NM ASW	None

Note: Only one detailed PT-TC packet can be dumped with a single TC request. All PT-TC in the schedule can be dumped in summary form with a single TC (132,17) request.

6.17.3.11 TC (132,17) Report Position-Tagged Command Schedule in Summary Form

Upon reception of TC (132,17) the report TM (132,13) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,17)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.3.11-1: TC (132,17) Report Position-Tagged Command Schedule in Summary Form

TC (132,17) Applicability	TC (132,17) Format Deviations
NM ASW	None

6.17.3.12 TC (132,18) Report Status of Position-Tagged Command Schedule

Upon reception of TC (132,18) the report TM (132,19) is generated.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (132,18)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.3.12-1: TC (132,18) Report Status of Position-Tagged Command Schedule

TC (132,18) Applicability	TC (132,18) Format Deviations
NM ASW	None

6.17.3.13 TM (132,19) Position-Tagged Command Schedule Status Report

TM (132,19) is the response to TC (132,18).

Word N°	Parameter	Size	
1..3	**Packet Header**	3 words	
4..8	**Telemetry ID (132,19)**	5 words	
9	Last Packet	1 bit	
9	Report Integrity Counter	15 bits	
10	N1	1 word	
11	Status	1 bit	S
11	Spare = 0	4 bits	S
11	Sub-Schedule ID	11 bits	S
12	N2	1 word	S
13	Status	1 bit	R, S
13	Spare = 0	4 bit	R, S
13	PID	7 bits	R, S
13	Reserved = 0	4 bits	R, S
	Block R repeated N2-1 times		S
	Block S repeated N1-1 times		

Figure 6.17.3.13-1: TM (132,19) Position-Tagged Command Schedule Status Report

Note: When generating multiple TM packet reports, each of the generated packets shall always be self contained.

TM (132,19) Applicability	TM (132,19) Format Deviations
NM ASW	None

6.17.4 Service 133: Two-Step Telecommand Service

The Two Step Telecommand service implements the Arm and Fire protocol. When the Arm TC is received by the ASW the TC is not executed but only arms the TC waiting for the associated Fire TC. When the associated Fire TC is received, the ASW dispatches the TC for execution.

Only one Two-Step TC is managed at any one time. An Arm TC is discarded if received when another Arm TC is already stored. Similarly, a Fire TC is discarded when received without an Arm TC present. The Arm TC is also deleted after a time-out without the reception of a Fire TC.

6.17.4.1 TC (133,1) Arm Telecommand

TC(133,1) requests to store onboard the embedded TC to be armed.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (133,1)**	2 words
	Arm TC Packet	variable
M	**Packet Error Control**	1 word

Figure 6.17.4.1-1: TC (133,1) Arm Telecommand

TC (133,1) Applicability	TC (133,1) Format Deviations
NM ASW	None
SM ASW	None

6.17.4.2 TC (133,2) Download Armed Telecommand

TC(133,2) requests to download the on-board armed TC.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (133,2)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.4.2-1: TC (133,2) Download Armed Telecommand

TC (133,2) Applicability	TC (133,2) Format Deviations
NM ASW	None
SM ASW	None

6.17.4.3 TM (133,3) Armed Telecommand Report

TM(133,3) is generated in response to TC(133,2).

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..8	**Telemetry ID (133,3)**	5 words
9	Last Packet	1 bit
9	Report Integrity Counter	15 bits
10	N° of TC Packet Words	1 word
	Arm TC Packet Words	variable
N	**Packet Error Control**	1 word

Figure 6.17.4.3-1: TM (133,3) Armed Telecommand Report

TM (133,3) Applicability	TM (133,3) Format Deviations
NM ASW	None
SM ASW	None

6.17.4.4 TC (133,4) Delete Armed Telecommand

TC(133,4) requests to delete the on-board armed TC.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (133,4)**	2 words
6	**Packet Error Control**	1 word

Figure 6.17.4.4-1: TC (133,4) Delete Armed Telecommand

TC (133,4) Applicability	TC (133,4) Format Deviations
NM ASW	None
SM ASW	None

6.17.4.5 TC (133,5) Fire Telecommand

TC(133,5) commands to “fire” the on-board stored armed TC to complete the secure two-step command sequence.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (133,5)**	2 words
6..8	Arm TC Packet Header	3 words
9..10	Arm TC Packet Data Field Header	2 words
11	**Packet Error Control**	1 word

Figure 6.17.4.5-1: TC (133,5) Fire Telecommand

TC (133,5) Applicability	TC (133,5) Format Deviations
NM ASW	None
SM ASW	None

6.17.5 Service 134: Telecommand Batch Management Service

AVS Telecommand Batch Management service is used for the upload of a batch of telecommands for immediate execution. The format of AVS TC (134,1) is shown in section 3.7 figure 3.7-1. The maximum number of telecommands which can be grouped with a TC (134,1) is only limited to the maximum size of TC (134,1), that is 256 words.

TC (134,1) embedded telecommands (TC Packet-1, TC Packet-2 …) will be executed in the same order as they appear in the TC (134,1) except if a telecommands address different PID where the execution order is no longer guaranteed.

6.17.5.1 TC (134,1) Execute Telecommand Batch

TC(134,1) commands to execute all the embedded TC after successful TC(134,1) checks. The embedded TC are all dispatched to the destination PID(s) in the order provided.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (134,1)**	2 words
6	Number of TC Packets = P	1 word
	TC Packet-1	variable
	TC Packet-2	variable
	:	
	TC Packet-P	variable
M = 256 max	**Packet Error Control**	1 word

Figure 6.17.5.1-1: TC (134,1) Execute Telecommand Batch

TC (134,1) Applicability	TC (134,1) Format Deviations
NM ASW	None
SM ASW	None

6.18 GPSR MISSION SPECIFIC SERVICES

6.18.1 Service 210: Mode Service

6.18.1.1 TC (210,1) Change GPSR Mode

TC(210) request a GPSR mode change. The mode changes are:

- Mode change into Startup mode
- Mode change into Standby mode.
- Mode change into Navigation mode
- Mode change hold Startup

Refer to [RD.04], Sentinel GPSR command and Housekeeping Data Interface, for the detailed format and definition of TC(210,1).

6.18.2 Service 211: Parameter Service

6.18.2.1 TC (211,1) Load GPSR Parameter

TC(211,1) pre-loads new parameters in the Standby and Navigate mode of the GPSR. The parameters loaded in Standby mode become effective in the frame of the mode transition from Standby to Navigate. Refer to [RD.04] for details of the parameter handling in the different GPSR modes.

Refer to [RD.04] for the detailed format and definition of TC(211,1).

6.18.2.2 TC (211,2) Report GPSR Parameter

TC(211,2) requests a report of parameters, either pre-loaded or already effective. The Function ID determines the type of data records to be reported.

Refer to [RD.04] for the detailed format and definition of TC(211,2).

6.18.2.3 TM (211,3) GPSR Parameter Report

In response to TC(211,2), TM(211,3) reports the requested parameters identified through the specified Function ID. The Function ID determines the type of data records being reported, and implicitly also the format of those data records.

Refer to [RD.04] for the detailed formats and definitions of TC(211,3).

6.18.3 Service 212: Science Data Service

6.18.3.1 TM (212,1) GPSR Science Data

The Science Data sets reported in TM(212,1) packets with specific SID values and that are part of either the nominal or diagnostic set include (TBC):

- TM(212,1) SID E200 H Carrier Amplitude Packet – [RD.05] SID 226 (i.e. E2 H)
- TM(212,1) SID E100 H Carrier Phase Packet - [RD.05] SID 225 (i.e. E1 H)
- TM(212,1) SID E300 H Code Phase Packet - [RD.05] SID 227 (i.e. E3 H)
- TM(212,1) SID D800 H Minimum Navigation Solution Packet - [RD.05] SID 216 (i.e. D8 H)
- TM(212,1) SID D900 H IMT/GPST Correlation Packet - [RD.05] SID 217 (i.e. D9 H)
- TM(212,1) SID DA00 H Auxiliary Data Packet - [RD.05] SID 218 (i.e. DA H)
- TM(212,1) SID DF00 H Satellites in View Status Packet - [RD.05] SID 223 (i.e. DF H)
- TM(212,1) SID E000 H Channel Status Packet - [RD.05] SID 224 (i.e. E0 H)
- TM(212,1) SID E400 H Noise Histogram Data Packet - [RD.05] SID 228 (i.e. E4 H)

Refer to [RD.05], Sentinel GPSR Measurement Data Interface, for the full list of TM(212,1) packets and for the detailed formats and definitions of the TM(212,1) packets.

Note: [RD.05] defines an 8-bit SID field and the next least significant 8-bits as a Filler field = 0. Sentinel-1 GPSR SID is seen by the ASW a 16-bit SID where the two [RD.05] stated fields compose the SID. That is, [RD.05] SID = E2 H becomes Sentinel-1 GPSR SID = E200 H.

6.18.4 Service 213: Periodical Memory Service

6.18.4.1 TC (213,1) Periodical Memory Diagnosis

For diagnostic purposes TC(213,1) service allows to report the contents of a set of scattered memory locations in RAM at a fixed rate of 1 Hz and at a well defined point in time (the PPS leading edge). Upon successful receipt of this TC, the GPSR replies with a TM(1,1) and consequently one Periodical Memory Diagnosis Report is generated every second. The service can be aborted with TC(213,3).

Refer to [RD.04], Sentinel GPSR command and Housekeeping Data Interface, for the detailed format and definition of TC(213,1).

6.18.4.2 TM (213,2) Periodical Memory Diagnosis Report

In response to TC(213,1), TM(213,2) reports the periodic memory dumps of the requested memory locations.

Refer to [RD.04] for the detailed format and definition of TM(213,2).

6.18.4.3 TC (213,3) Abort Memory Service

TC(213,3) allows to stop the memory service without changing the GPS receiver mode.

Refer to [RD.04] for the detailed format and definition of TC(213,3).

6.19 C-SAR MISSION SPECIFIC SERVICES

6.19.1 Service 152: SES Function Management

6.19.1.1 TC (152,160) Change Mode To Standby

TC(152,160) instruct the SES to perform a transition to Standby Mode.

Refer to [RD.02] for details on TC(152,160).

6.19.1.2 TC (152,161) Change Mode To Pause

TC(152,161) instruct the SES to perform a transition to Pause Mode.

Refer to [RD.02] for details on TC(152,161).

6.19.1.3 TC (152,162) Change Mode To Ready

TC(152,162) instruct the SES to perform a transition to Ready Mode.

Refer to [RD.02] for details on TC(152,162).

6.19.1.4 TC (152,163) Change Mode To Standby Refuse

TC(152,163) instruct the SES to perform a transition to Standby Refuse Mode.

Refer to [RD.02] for details on TC(152,163).

6.19.1.5 TC (152,164) Perform Measurement

TC(152,164) instruct the SES to perform a transition to Measurement Mode.

Refer to [RD.02] for details on TC(152,164).

SES TC(152,164) includes in the data field the parameter 'Measurement Start Time', which is the precise acquisition start time (in instrument OBT coordinates).

Ground is allowed to uplink TC(152,164) as either an immediate TC or as a time-tag TC or as a position tag TC as for all other S/C TC. TC(152,164) sent as an immediate TC could be used for test purposes on ground.

For the case Ground loads TC(152,164) as a time-tagged command by means of AVS TC(11,4) 'Insert TC in time tag schedule', then AVS will dispatch the TC to the SES at the expiration of the time-tag.

Hence for the cases of immediate and time-tag dispatching, the TC(152,164) format with the parameter 'Measurement Start Time' is that sent by Ground and processed by SES, shown in Figure 6.19.1.5-1 and Figure 6.19.1.5-4.

For nominal operations, TC(152,164) is nested in either AVS TC(163,71) Command SAR Measurement, TC(163,72) Command SAR Measurement and Data Store or TC(163,73) Command SAR Measurement and Data Pass Through where Ground specifies the "Image Start Position" and AVS computes the "Measurement Start Time" for the update of the nested TC(152,164) togther with the PEC before dispatching to SES as described in section 3.9.

Word N°	Parameter	Size
1..3	**Packet Header**	3 words
4..5	**Telecommand ID (152,164)**	2 words
6..8	Measurement Start Time	3 word
9 10 11 12 13 14 15	Format specified in [RD.02]	
16	**Packet Error Control**	1 word

Figure 6.19.1.5-1: SES TC (152,164) format

6.19.1.6 TC (152,165) Release Refuse

TC(152,165) instruct the SES to exit from whatever Refuse mode it is currently in, back to a normal mode.

Refer to [RD.02] for details on TC(152,165).

6.19.1.7 TC (152,166) Set ECC Program Parameters

TC(152,166) instruct the SES to update the specified ECC Program with the ECC Entries and ECC Instructions defined in the telecommand. .

Refer to [RD.02] for details on TC(152,166).

6.19.1.8 TC (152,167) Set Beam Steering Table Parameters

TC(152,167) instruct the SES to write a block of BST Entries to a specified Beam Steering Table beginning at the BST Entry Number given in the telecommand..

Refer to [RD.02] for details on TC(152,167).

6.19.1.9 TC (152,168) Set SWST Parameters

TC(152,168) instruct the SES to update the specified Swath in the Radar Parameter Database with the SWST values defined in the telecommand. Each SWST value defines a change to be applied during an orbit at the associated *Orbit Swath Data Window*. Each orbit location can only be associated with one SWST value.

Refer to [RD.02] for details on TC(152,168).

6.19.1.10 TC (152,169) Set Swath Elevation Address

TC(152,169) instruct the SES to update the specified Swath in the Radar Parameter Database with the defined Elevation Address.
..

Refer to [RD.02] for details on TC(152,169).

6.19.1.11 TC (152,170) Set Rank and PRI Duration Parameters

TC(152,170) instruct the SES to update the specified Swath in the Radar Parameter Database with the defined in the telecommand. This defines a change of values to occur during an orbit at the time specified by the associated Orbit Swath Data Window.

Refer to [RD.02] for details on TC(152,170).

6.19.1.12 TC (152,171) Set Tx Pulse Parameters

TC(152,171) instruct the SES to update the specified Pulse Number in the Tx Pulse Database with the parameters defined in the telecommand.

Refer to [RD.02] for details on TC(152,171).

6.19.1.13 TC (152,172) Set Mission Specific Parameters

TC(152,172) instruct the SES to update the Mission Timing Parameters with the specified timing coefficient values.

Refer to [RD.02] for details on TC(152,172).

6.19.1.14 TC (152,173) Set PRI Parameters

TC(152,173) instruct the SES to update the 32 PRI's with the values specified in the telecommand.

Refer to [RD.02] for details on TC(152,173).

6.19.1.15 TC (152,174) Send Direct Power Switching Command

TC(152,174) instruct the SES to execute a power switching command internal to the SES.

Refer to [RD.02] for details on TC(152,176).

6.19.1.16 TC (152,175) Send CAN Message

TC(152,175) instruct the SES to send the specified Message via both Antenna Control Busses (ACB)..

Refer to [RD.02] for details on TC(152,175).

6.19.1.17 TM (152,176) CAN Message Response Report

SES will generate TM(152,176) in response to a valid TC(152,175) request to send a CAN message that generates a response message.

Refer to [RD.02] for details on TM(152,176).

6.19.1.18 TC (152,177) Send SpaceWire Message

TC(152,177) instruct the SES to send the specified Message via the SpaceWire bus..

Refer to [RD.02] for details on TC(152,177).

6.19.1.19 TM (152,178) SpaceWire Message Response Report

SES will generate TM(152,178) in response to a valid TC(152,177) that sends a SpaceWire message resulting in the response message.

Refer to [RD.02] for details on TM(152,178).

6.19.1.20 TC (152,179) Clear Radar Parameter Data

TC(152,179) instruct the SES to clear all parameter data for an element of the Radar Parameter Database. The action of clearing will set all data entries to zero or the equivalent default value and the status within the Database will be set to Undefined.

Refer to [RD.02] for details on TC(152,179).

6.19.1.21 TC (152,182) Perform Test

TC(152,182) instruct the SES to generate a transition to Test Mode.

Refer to [RD.02] for details on TC(152,182).

6.19.1.22 TC (152,183) Report Radar Parameters

TC(152,183) instruct the SES to generate a Telemetry packet, or packets, to report the values of the requested element from the Radar Parameter Database..

Refer to [RD.02] for details on TC(152,183).

6.19.1.23 TM (152,184) ECC Parameters Report

SES generates TM(152,184) in response to a valid TC(152,183) request to report the values for a particular ECC Program defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,184).

6.19.1.24 TM (152,185) BST Parameters Report

SES generates TM(152,185) in response to a valid TC(152,183) request to report the values for a particular Beam Steering Table defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,185).

6.19.1.25 TM (152,186) Rank and PRI Duration Parameters Report

SES generates TM(152,186) in response to a valid TC(152,183) request to report the Rank and PRI Duration values for a particular Swath defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,186).

6.19.1.26 TM (152,187) SWST Parameters Report

SES generates TM(152,187) in response to a valid TC(152,183) request to report the values for a particular Swath defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,187).

6.19.1.27 TM (152,188) Tx Pulse Parameters Report

SES generates TM(152,188) in response to a valid TC(152,183) request to report the values for a particular Tx Pulse defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,188).

6.19.1.28 TM (152,189) PRI Parameters Report

SES generates TM(152,189) in response to a valid TC(152,183) request to report the PRI values defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,189).

6.19.1.29 TM (152,190) Mission Specific Parameters Report

SES generates TM(152,190) in response to a valid TC(152,183) request to report the Mission Specific Parameter values defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,190).

6.19.1.30 TC (152,191) Set Instrument Redundancy Configuration

TC(152,191) instruct the SES to use the specified redundancy configuration for the SAS Antenna during Measurement Mode.

Refer to [RD.02] for details on TC(152,191).

6.19.1.31 TC (152,192) Enable Memory Scrubber

TC(152,192) instruct the SES to enable the Memory Scrubber.

Refer to [RD.02] for details on TC(152,192).

6.19.1.32 TC (152,193) Disable Memory Scrubber

TC(152,193) instruct the SES to disable the Memory Scrubber.

Refer to [RD.02] for details on TC(152,193).

6.19.1.33 TC (152,194) Set SWL Parameters

TC(152,194) instruct the SES to update the specified Swath in the Radar Parameter Database with the parameters defined in the telecommand. This defines a change of values to occur during an orbit at the time specified by the associated Orbit Swath Data Window.

Refer to [RD.02] for details on TC(152,194).

6.19.1.34 TC (152,195) Set Rx Gain Parameters

TC(152,195) instruct the SES to update the specified Swath in the Radar Parameter Database with the parameters defined in the telecommand. This defines a change of values to occur during an orbit at the time specified by the associated Orbit Swath Data Window.

Refer to [RD.02] for details on TC(152,195).

6.19.1.35 TC (152,196) Set Tx Pulse and Rx Bandwidth Parameters

TC(152,196) instruct the SES to update the specified Swath in the Radar Parameter Database with the parameters defined in the telecommand. This defines a change of values to occur during an orbit at the time specified by the associated Orbit Swath Data Window.

Refer to [RD.02] for details on TC(152,196).

6.19.1.36 TM (152,197) SWL Parameters Report

SES generates TM(152,197) in response to a valid TC(152,183) request to report the SWL values for a particular Swath defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,197).

6.19.1.37 TM (152,198) Rx Gain Parameters Report

SES generates TM(152,198) in response to a valid TC(152,183) request to report the Rx Gain (co- and Cross-Polarisation) values for a particular Swath defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,198).

6.19.1.38 TM (152,199) Tx Pulse and Rx Bandwidth Parameters Report

SES generates TM(152,199) in response to a valid TC(152,183) request to report the Tx Pulse and Rx Bandwidth values for a particular Swath defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,199).

6.19.1.39 TC (152,200) Enable Swath Parameter Updates

TC(152,200) instruct the SES to perform Swath Parameter updates during Measurement Modes.

Refer to [RD.02] for details on TC(152,200).

6.19.1.40 TC (152,201) Disable Swath Parameter Updates

TC(152,201) instruct the SES to disable updates to Swath Parameters during Measurement Modes.

Refer to [RD.02] for details on TC(152,201).

6.19.1.41 TC (152,202) Save Radar Database Data

TC(152,202) instruct the SES to copy an element of the Radar Parameter Database from RAM into EEPROM.

Refer to [RD.02] for details on TC(152,202).

6.19.1.42 TC (152,203) Save Instrument Redundancy Configuration Data

TC(152,203) instruct the SES to save the Instrument Redundancy Configuration Data to EEPROM.

Refer to [RD.02] for details on TC(152,203).

6.19.1.43 TC (152,204) Request EQSOL

TC(152,204) only sets the corresponding EQSOL request flag in the CCA. As a consequence the AVS on detection of the EQSOL request will sends the EQSOL discrete command to the SES as a pre-warning of the switch-down. Only then the C-SAR will perform the necessary action prior to the AVS executing the EQSOL switch-down.

Refer to [RD.02] for details on TC(152,204).

6.19.1.44 TC (152,205) Send Serial Message

TC(152,205) instruct the SES to send the specified Message via the CAPS Control bus.

Refer to [RD.02] for details on TC(152,205).

6.19.1.45 TM (152,206) Serial Message Response Report

SES will generate TM(152,206) in response to a valid TC(152,205) request to send a serial message that generates a response message.

Refer to [RD.02] for details on TM(152,206).

6.19.1.46 TC (152,207) Change Mode To Pause Refuse

TC(152,207) instruct the SES to perform a transition to Pause Refuse Mode.

Refer to [RD.02] for details on TC(152,207).

6.19.1.47 TC (152,208) Enable Watchdog

TC(152,208) instruct the SES to enable the hardware Watchdog functionality of the Interface Control Module (ICM).

Refer to [RD.02] for details on TC(152,208).

6.19.1.48 TC (152,209) Disable Watchdog

TC(152,209) instruct the SES to disable the hardware Watchdog functionality of the Interface Control Module (ICM).

Refer to [RD.02] for details on TC(152,209).

6.19.1.49 TC (152,210) Set Instrument Configuration Identifier

TC(152,210) instruct the SES to use the specified value as the Instrument Configuration Identifier.

Refer to [RD.02] for details on TC(152,210).

6.19.1.50 TC (152,211) Report Instrument Redundancy Configuration

TC(152,211) instruct the SES to generate a Telemetry packet to report the Instrument Redundancy settings.

Refer to [RD.02] for details on TC(152,211).

6.19.1.51 TM (152,212) Instrument Redundancy Configuration Report

SES will generate TM(152,212) in response to a valid TC(152,211) request to report the Instrument Redundancy settings.

Refer to [RD.02] for details on TM(152,212).

6.19.1.52 TC (152,213) Report Software Information Report Table

TC(152,213) instruct the SES to generate a Telemetry packet to report the Software Information Report Table. The Reset Flag allows the various counters and performance indicators to be reset immediately after the report has been generated.

Refer to [RD.02] for details on TC(152,213).

6.19.1.53 TM (152,214) Software Information Report Table Report

SES will generate TM(152,214) in response to a valid TC(152,213) request to report the Software Information Report Table. The Table typically contains status flags, error counters, performance indicators and other parameters.

Refer to [RD.02] for details on TM(152,214).

6.19.1.54 TC (152,215) Reset ICM

TC(152,215) instruct the SES to perform a warm reset of the ICM processor board.

Refer to [RD.02] for details on TC(152,215).

6.19.1.55 TC (152,216) Execute Application

TC(152,216) instruct the SES to immediately start code execution from the Start Address specified. Execution of this telecommand effectively passes control of the SES to the Application Software. TC (152,216) is only implemented by the SES Boot Software.

Refer to [RD.02] for details on TC(152,216).

6.19.1.56 TC (152,217) Set Tx Pulse Pre-distortion Parameters

TC(152,217) instruct the SES to set the Pre-distortion values that are common to all Tx Pulses.

Refer to [RD.02] for details on TC(152,217).

6.19.1.57 TM (152,218) Tx Pulse Predistortion Parameters Report

SES will generate TM(152,218) in response to a valid TC(152,183) request to report the Tx Pulse Predistortion Values.

Refer to [RD.02] for details on TM(152,218).

6.19.1.58 TC (152,219) Set User Defined RxM Test Pattern Data

TC(152,219) instruct the SES to set the user-defined Test Pattern Data used by the RxM's..

Refer to [RD.02] for details on TC(152,219).

6.19.1.59 TM (152,220) User Defined RxM Test Pattern Data Report

SES will generate TM(152,220) in response to a valid TC(152,225) request to report the user-defined RxM Test Pattern Data.

Refer to [RD.02] for details on TM(152,220).

6.19.1.60 TC (152,221) Set User Defined RxM Filter Parameters

TC(152,221) instruct the SES to set the user-defined Filter Parameters used by the RxM's..

Refer to [RD.02] for details on TC(152,221).

6.19.1.61 TM (152,222) User Defined RxM Filter Parameters Report

SES will generate TM(152,222) in response to a valid TC(152,225) request to report the user-defined RxM Filter Parameters data.

Refer to [RD.02] for details on TM(152,222).

6.19.1.62 TC (152,223) Set User Defined RxM Compression Parameters

TC(152,223) instruct the SES to set the user-defined Compression Parameters used by the RxM's..

Refer to [RD.02] for details on TC(152,223).

6.19.1.63 TM (152,224) User Defined RxM Compression Parameters Report

SES will generate TM(152,224) in response to a valid TC(152,225) request to report the user-defined RxM Filter Compression Parameters data.

Refer to [RD.02] for details on TM(152,224).

6.19.1.64 TC (152,225) Report User Defined RxM Configuration Data

TC(152,225) instruct the SES to generate a Telemetry packet, or packets, to report the values of the requested element of the user-defined RxM Configuration Data (i.e. the Test Pattern Data, Filter Parameters or Compression Parameters).

Refer to [RD.02] for details on TC(152,225).

6.19.1.65 TC (152,226) Save User Defined RxM Configuration Data

TC(152,226) instruct the SES to save the user-defined RxM Configuration Data (i.e. the Test Pattern Data, Filter Parameters and Compression Parameters) into EEPROM.

Refer to [RD.02] for details on TC(152,226).

6.19.1.66 TC (152,227) Set User Defined RxM Bit Rate Selection Parameters

TC(152,227) instruct the SES to set the user-defined Bit Rate Selection Parameters used by the RxM's. The values defined in the packet are written as a block to the appropriate memory area, starting at the position defined by the RxM Bit Rate Selection Index parameter.

Refer to [RD.02] for details on TC(152,227).

6.19.1.67 TM (152,228) User Defined RxM Bit Rate Selection Parameters Report

In response to TC(152,227), TM(152,228) reports the user-defined RxM Bit Rate Selection Parameter values. The values are read as a block from the memory area starting at the position given by the RxM Bit Rate Selection Index parameter.

Refer to [RD.02] for details on TM(152,228).

6.19.1.68 TC (152,229) Set User Defined RxM EC Parameters

TC(152,229) instruct the SES to set the user-defined EC Parameters used by the RxM's.

Refer to [RD.02] for details on TC(152,229).

6.19.1.69 TM (152,230) User Defined RxM EC Parameters Report

In response to TC(152,229), SES generates TM(152,230) to report the user defined RxM EC Parameters data.

Refer to [RD.02] for details on TM(152,230).

6.19.1.70 TC (152,231) Set User Defined RxM Index Values

TC(152,231) instruct the SES to set the user-defined RxM Index Values used by the RxM's.

Refer to [RD.02] for details on TC(152,231).

6.19.1.71 TM (152,232) User Defined RxM Index Values Report

In response to TC(152,231), SES generates TM(152,232) to report the user defined RxM Index Values.

Refer to [RD.02] for details on TM(152,232).

6.19.1.72 TC (152,233) Set User Defined RxM Range Zone Width Parameters

TC(152,233) instruct the SES to set the user-defined Range Zone Width Parameters used by the RxM's. The values defined in the packet are written to the appropriate memory area starting at the position defined by RxM Range Zone Width Index

Refer to [RD.02] for details on TC(152,233).

6.19.1.73 TM (152,234) User Defined RxM Range Zone Width Parameters Report

In response to TC(152,233), SES generates TM(152,234) to report the user defined RxM Range Zone Width Parameter data. The data in the packet is read as a block starting from the memory position given by RxM Range Zone Width Index.

Refer to [RD.02] for details on TM(152,234).

6.19.1.74 TC (152,235) Set User Defined RxM Filter Program Parameters

TC(152,235) instruct the SES to set the user-defined RxM Filter Program Parameters used by both RxMs. The Filter Program Entries defined in the packet are written as a block to the appropriate memory space starting at the position defined by RxM Filter Program Entry Index.

Refer to [RD.02] for details on TC(152,235).

6.19.1.75 TM (152,236) User Defined RxM Filter Program Parameters Report

In response to TC(152,235), SES generates TM(152,236) to report the user defined RxM Filter Program Parameters. The packet contains the block of Filter Program Entries starting from the position given by RxM Filter Program Entry Index.

Refer to [RD.02] for details on TM(152,236).

6.19.1.76 TC (152,237) Set User Defined RxM Filter Program Pointers

TC(152,237) instruct the SES to set the user-defined values for the RxM Filter Program Pointers for each of the RxM Filters.

Refer to [RD.02] for details on TC(152,237).

6.19.1.77 TM (152,238) User Defined RxM Filter Program Pointers Report

In response to TC(152,237), SES generates TM(152,238) to report the user defined values for the RxM Filter Program Pointers.

Refer to [RD.02] for details on TM(152,238).

6.19.1.78 TC (152,239) Set User Defined RxM Filter Control Registers

TC(152,239) instruct the SES to set the user-defined values for the RxM Filter Control Registers.

Refer to [RD.02] for details on TC(152,239).

6.19.1.79 TM (152,240) User Defined RxM Filter Control Registers Report

In response to TC(152,239), SES generates TM(152,240) to report the user defined values for the RxM Filter Control Registers.

Refer to [RD.02] for details on TM(152,240).

6.19.1.80 TC (152,241) Set TxM Power LUT Values

TC(152,241) instructs the SES to update the Transmit Module (TxM) with the Power Look-Up Table (LUT) values specified in the command.

Refer to [RD.02] for details on TC(152,241).

6.19.1.81 TC (152,242) Change Mode To Init

TC(152,242) instructs the SES to perform a transition to Init Mode, i.e. to change mode to Standby and then perform a Warm Reset of the ICM.

Refer to [RD.02] for details on TC(152,242).

6.19.1.82 TM (152,243) TxM Power LUT Values Report

In response to TC(152,183), SES generates TM(152,243) to report the Power Look-Up Values defined in the Radar Parameters Database.

Refer to [RD.02] for details on TM(152,243).

6.20 PDHT MISSION SPECIFIC SERVICES

6.20.1 Service 176: PDHT Mode Transitions

6.20.1.1 TC (176,1) INIT

TC(176,1) instructs to initialise the Application SW from the PATCH&DUMP mode.

Refer to [RD.06] for details on TC(176,1).

6.20.1.2 TC (176,2) IDLE

TC(176,2)commands a transition to IDLE mode.

Refer to [RD.06] for details on TC(176,2).

6.20.1.3 TC (176,3) STANDBY

TC(176,3) commands a transition to STANDBY Mode

Refer to [RD.06] for details on TC(176,3).

6.20.1.4 TC (176,4) MEM_ON

TC(176,4) commands a transition to MEM_ON Mode

Refer to [RD.06] for details on TC(176,4).

6.20.1.5 TC (176,5) TX_ON

TC(176,5) commands a transition to TX_ON Mode

Refer to [RD.06] for details on TC(176,5).

6.20.2 Service 177: PDHT Configuration

The PDHT Configuration Service is used to select PDHT redundancy configuration or to configure the active equipment during sub-system operations.

6.20.2.1 TC (177,1) Set TXA Configuration

TC(177,1) commands to configure the TXA.

Refer to [RD.06] for details on TC(177,1).

6.20.2.2 TC (177,2) Set TXA Redundancy

TC(177,2) defines the TXA redundancy configuration. The TXA units selected will be powered only during transition in TX-ON mode.

Refer to [RD.06] for details on TC(177,2).

6.20.2.3 TC (177,3) Set DSHA Redundancy

TC(177,3) defines the DSHA redundancy configuration. The DSHA units selected will be powered during opportune mode transitions.

Refer to [RD.06] for details on TC(177,3).

6.20.2.4 TC (177,4) Configure Memory Module

TC(177,4) instructs to substitute a failed Memory Module with the spare module.

Refer to [RD.06] for details on TC(177,4).

6.20.2.5 TC (177,5) Set Override Carrier

TC(177,5) allows to enable/disable the override Carrier OFF circuit in order to avoid the generation of an un-modulated carrier when there is no valid data to be transmitted..

Refer to [RD.06] for details on TC(177,5).

6.20.3 Service 178: PDHT Function Management

6.20.3.1 TC (178,225) Enable Switch Down

TC(178,225) is used to re-start recovery action activation.
Refer to [RD.06] for details on TC(178,225).

6.20.3.2 TC (178,226) Inhibit Switch Down

TC(178,226) is used to support ground testing and useful for in orbit diagnostic. TC(178,226) allows to disable all the recovery actions (e.g. transition to SAFE if any check performed during the MEM-ON to TX-ON transition fails or any monitoring check fails) which the on-board software starts after an anomaly detection. In this way monitoring is fully operating and any anomaly is logged with an Event Report but no recovery action is activated.

Refer to [RD.06] for details on TC(178,226).

6.20.3.3 TC (178,229) Enable/Disable Timeouts

TC(178,229) allows to enable/disable the SAR data interface timeout (at the start and during data acquisition).

Refer to [RD.06] for details on TC(178,229).

6.20.3.4 TC (178,230) Reboot

TC(178,230) allows to reproduce a PDHT switch on transition to IDLE without using the discrete ON and OFF command interface when in IDLE mode.

Note: A DSHA executed recovery action as a result of detectable errors can automatically drive the PDHT in IDLE mode.

Refer to [RD.06] for details on TC(178,230).

6.20.3.5 TC (178,231) Direct Command

TC(178,231) allows to generate a Direct Command which directly acts on the DHSA TM/TC board forcing the generation of a discrete command.

TC(178,231) will only be used during on-ground PDHT integration activities.

Refer to [RD.06] for details on TC(178,231).

6.20.3.6 TC (178,232) Enable/Disable Column Switch

TC(178,232) allows directly to enable or disable column switch on a single memory module.

Refer to [RD.06] for details on TC(178,232).

6.21 LCT MISSION SPECIFIC SERVICES

6.21.1 Service 240: Parameter Management Service

6.21.1.1 TC (240,1) Set N Parameters

TC(240,1) instructs to set the values of the N parameters to the specified value.

Refer to [RD.09] for details on TC(240,1).

6.21.1.2 TC (240,2) Get N Parameters

TC(240,2) requests to report the value of the specified parameters.

Refer to [RD.09] for details on TC(240,2).

6.21.1.3 TM (240,3) Parameter Report

TM(240,3) is in response to TC(240,2)

Refer to [RD.09] for details on TM(240,3).

6.21.1.4 TC (240,4) Reload Default Parameter

TC(240,4) instructs to overwrite all the RAM parameters to the default values stored in EEPROM (i.e. copy the parameters from EEPROM to RAM overwriting any modifications performed before).

Refer to [RD.09] for details on TC(240,4).

6.21.1.5 TC (240,5) Update Default Parameter

TC(240,5) instructs to store the RAM parameters in EEPROM to become the new default values (i.e. the EEPROM values are over written with the RAM values).

Refer to [RD.09] for details on TC(240,5).

6.21.1.6 TC (240,24) Reload N Default Parameters

TC(240,24) instructs to overwrite N RAM parameters with the default values stored in EEPROM (i.e. copy N parameters from EEPROM to RAM overwriting any modifications performed before).

Refer to [RD.09] for details on TC(240,24).

6.21.1.7 TC (240,25) Update N Default Parameters

TC(240,25) instructs to store the addressed N RAM parameters in EEPROM to become the new default values (i.e. the N EEPROM values are overwritten with the RAM values).

Refer to [RD.09] for details on TC(240,25).

6.21.2 Service 241: LCT Mode Transitions

6.21.2.1 TC (241,136) LCT Goto Application SW Boot Mode

TC(241,136) commands a mode transition to Application SW Boot Mode.

Refer to [RD.09] for details on TC(241,136).

6.21.2.2 TC (241,139) LCT Goto Selftest Mode

TC(241,139) commands a mode transition to Selftest Mode.

Refer to [RD.09] for details on TC(241,139).

6.21.2.3 TC (241,140) LCT Goto Commanded Functional Test Mode

TC(241,140) commands a mode transition to Commanded Functional Test Mode.

Refer to [RD.09] for details on TC(241,140).

6.21.2.4 TC (241,142) LCT Perform Warm Restart

TC(241,142) commands the LCT to perform a Warm Restart.

Refer to [RD.09] for details on TC(241,142).

6.21.2.5 TC (241,143) Get LCT Self Test Report

TC(241,143) requests to generate the LCT Self Test report (i.e. TM(241,144)).

Refer to [RD.09] for details on TC(241,143).

6.21.2.6 TM (241,144) LCT Self Test Report

TM(241,144) is generated in response to TC(241,143).

Refer to [RD.09] for details on TM(241,144).

6.21.2.7 TC (241,145) LCT Goto Terminal Warmup Mode

TC(241,145) commands a mode transition to Terminal Warmup Mode.

Refer to [RD.09] for details on TC(241,145).

6.21.2.8 TC (241,146) LCT Goto SW Standby Mode

TC(241,146) commands a mode transition to SW Standby Mode.

Refer to [RD.09] for details on TC(241,146).

6.21.2.9 TC (241,147) LCT Goto Terminal Ready Mode

TC(241,147) commands a mode transition to Terminal Ready Mode.

Refer to [RD.09] for details on TC(241,147).

6.21.2.10 TC (241,148) LCT Goto Terminal Standby Mode

TC(241,148) commands a mode transition to Terminal Standby Mode.

Refer to [RD.09] for details on TC(241,148).

6.21.2.11 TC (241,149) LCT Goto Calibration Mode

TC(241,149) commands a mode transition to Calibration Mode.

Refer to [RD.09] for details on TC(241,149).

6.21.2.12 TC (241,150) LCT Goto Operation Mode

TC(241,150) commands a mode transition to Operation Mode.

Refer to [RD.09] for details on TC(241,150).

6.21.2.13 TC (241,152) LCT Goto Safe Mode

TC(241,152) commands a mode transition to Safe Mode.

Refer to [RD.09] for details on TC(241,152).

6.21.2.14 TC (241,153) Report LCT TAPCO SW Status

TC(241,153) requests to generate an LCT TAPCO SW status report (i.e. TM(241,154).

Refer to [RD.09] for details on TC(241,153).

6.21.2.15 TM (241,154) LCT TAPCO SW Status Report

TM(241,154) is in response to TC(241,153).

Refer to [RD.09] for details on TM(241,154).

6.21.2.16 TC (241,155) LCT Goto Launch Lock Release Mode

TC(241,155) commands a mode transition to Launch Lock Release Mode.

Refer to [RD.09] for details on TC(241,155).

6.21.2.17 TC (241,156) LCT Goto Emergency Safe

TC(241,156) instructs to restore the LCT to the Emergency Safe which allows subsequently an emergency shutdown of the LCT when the discrete telecommand signal “LCT OFF” is applied to the DC/DC Converter of the LCT.

When TC (241,156) is received, the TAPCO activates a fast transition to the Safe Mode. The change to the Safe Mode is executed regardless of which Mode the TAPCO is actual running except for the Firmware Boot Mode, the Safe Parking Mode and the Safe Mode itself.

Refer to [RD.09] for details on TC(241,156).

6.21.2.18 TC (241,157) Get LCT Self Calibration Report

TC(241,157) instructs to generate the report TM(241,158).

Refer to [RD.09] for details on TC(241,157).

6.21.2.19 TM (241,158) LCT Self Calibration Report

TM(241,158) is in response to TC(241,157).

Refer to [RD.09] for details on TM(241,158).

6.21.2.20 TC (241,159) LCT Goto Application SW Boot Mode from Address

TC(241,159) instructs the TAPCO to read the start address of the OAS start function from the OAS Header and then execute the function from this address.

Note: The received parameter value must be the OAS RAM Address of a valid OAS RAM Image.
The OAS RAM Image starts with an OAS Header which contains the following parameters:

- OAS Magic Word,
- OAS Release Date,
- OAS Coded Version, and
- OAS Start Address.

Refer to [RD.09] for details on TC(241,159).

6.21.3 Service 242: LCT Configuration Service

6.21.3.1 TC (242,2) Get Terminal Configuration

TC(242,2) requests a report of the status of the Terminal Configuration to which it responds with TM(242,3).

Refer to [RD.09] for details on TC(242,2).

6.21.3.2 TM (242,3) Terminal Configuration Report

TM(242,3) is in response to TC(242,2).

Refer to [RD.09] for details on TM(242,3).

6.21.3.3 TC (242,4) Perform Measurement (No Parameter Change)

TC(242,4) instructs the TAPCO to perform measurements of the specified parameters to be logged in a dedicated area of the TAPCO RAM for monitoring and diagnostic purposes. After completion of the measurement the contents of the TAPCO RAM can be dumped to Ground by TM (6,6).

Refer to [RD.09] for details on TC(242,4).

6.21.3.4 TC (242,5) Select 1PPS Synchronisation Signal A

TC(242,5) instructs to select the input of the 1PPS Synchronization Signal A. When TC (242,5) is received, the TAPCO enable the 1PPS Synchronization Signal A receiver.

Refer to [RD.09] for details on TC(242,5).

6.21.3.5 TC (242,6) Select 1PPS Synchronisation Signal B

TC(242,6) instructs to select the input of the 1PPS Synchronization Signal B. When TC (242,6) is received, the TAPCO enable the 1PPS Synchronization Signal B receiver.

Refer to [RD.09] for details on TC(242,6).

6.21.3.6 TC (242,7) Set Pump Module Head TX Laser Bench Configuration

TC(242,7) specifies the parameter value to be used to set the Pump Module Head TX (PMH-TX) Laser Bench configuration.

Refer to [RD.09] for details on TC(242,7).

6.21.3.7 TC (242,8) Set Pump Module Head LO Laser Bench Configuration

TC(242,8) specifies the parameter value to be used to set the Pump Module Head LO (PMH-LO)Laser Bench configuration.

Refer to [RD.09] for details on TC(242,8).

6.21.3.8 TC (242,9) Set Optical Power 1 Laser Diode Configuration

TC(242,9) specifies the parameter value to be used to set the Optical Power Amplifier 1 (OPA 1) Laser Diode configuration.

Refer to [RD.09] for details on TC(242,9).

6.21.3.9 TC (242,10) Set Optical Power 2 Laser Diode Configuration

TC(242,10) specifies the parameter value to be used to set the Optical Power Amplifier 2 (OPA 2) Laser Diode configuration.

Refer to [RD.09] for details on TC(242,10).

6.21.3.10 TC (242,11) Set Optical Power 3 Laser Diode Configuration

TC(242,11) specifies the parameter value to be used to set the Optical Power Amplifier 3 (OPA 3) Laser Diode configuration.

Refer to [RD.09] for details on TC(242,11).

6.21.3.11 TC (242,12) Set Data Transmission Configuration

TC(242,12) instructs to set the Data Transmission configuration using the specified parameter value,

Refer to [RD.09] for details on TC(242,12).

6.21.3.12 TC (242,128) Copy Terminal Configuration from RAM to EEPROM

C(242,128) instructs to store the Terminal Configuration values located in RAM into the EEPROM to become the new default values.

Refer to [RD.09] for details on TC(242,128).

6.21.3.13 TC (242,129) Copy Terminal Configuration from EEPROM to RAM

TC(242,129) instructs to copy the Terminal Configuration values located in EEPROM into the RAM.

Refer to [RD.09] for details on TC(242,129).

6.21.4 Service 244: LCT Table Management Service

6.21.4.1 TC (244,1) Set Table Row

TC(244,1) is used to write a new content to a specified row of a dedicated table located in the TAPCO RAM.

Refer to [RD.09] for details on TC(244,1).

6.21.4.2 TC (244,2) Get Table Row

TC(244,2) request to report the content of a specified row of a dedicated table located in the TAPCO RAM to which it responds with TM(244,3).

Refer to [RD.09] for details on TC(244,2).

6.21.4.3 TM (244,3) Table Row Report

TM(244,3) is generated in response to TC(244,2).

Refer to [RD.09] for details on TM(244,3).

6.21.4.4 TC (244,4) Reload Default Table from EEPROM

TC(244,4) instructs to copy the default content of a specified table from TAPCO EEPROM to the TAPCO RAM, overwriting any potential changes performed before with TC(244,1).

Refer to [RD.09] for details on TC(244,4).

6.21.4.5 TC (244,5) Update Default Table to EEPROM

TC(244,5) instructs to copy the content of a specified table from TAPCO RAM as new default to the TAPCO EEPROM.

Refer to [RD.09] for details on TC(244,5).

6.21.5 Service 245: LCT Commanded Functional Test Mode Service

6.21.5.1 TC (245,2) Switch LCT Internal Unit Power On/Off

TC(245,2) commands to switch “On” or “Off” the specified internal LCT units (DC/DC Converter) identified by the Units ID value. The LCT units are:

- DC/DC Converter 2
- DC/DC Converter 3

Refer to [RD.09] for details on TC(245,2).

6.21.5.2 TC (245,3) Switch RXDE / TXDE Functions On/Off

TC(245,3) allows to “Select” the functions of the RXDE Channel Rotator or the TXDE Reference Frequencies Selection identified by the Function ID.

Refer to [RD.09] for details on TC(245,3).

6.21.5.3 TC (245,4) Set RXDE Channel Rotator

TC(245,4) allows to control the RXDE Channel Rotator manually.

Refer to [RD.09] for details on TC(245,4).

6.21.5.4 TC (245,5) Reset TXDE / RXDE Functions

TC(245,5) allows to reset the:

- RXDE Service Channel Word Decoding Error
- TXDE FIFO Overflow Flag
- RXDE FIFO Overflow Flag

According to the specified Function ID:

Refer to [RD.09] for details on TC(245,5).

6.21.5.5 TC (245,7) Set Optical Power Amplifier (OPA) Parameter Set

TC(245,7) instructs to set the Optical Power Amplifier (OPA) parameters to the values specified in the telecommand.

Refer to [RD.09] for details on TC(245,7).

6.21.5.6 TC (245,8) Set Fine Pointing Assembly (FPA) Parameter Set

TC(245,8) instructs to set the Fine Pointing Assembly (FPA) parameters to the values specified in the telecommand.

Refer to [RD.09] for details on TC(245,8).

6.21.5.7 TC (245,9) Set Point Ahead Assembly (PAA) Parameter Set

TC(245,9) instructs to set the Point Ahead Assembly (PAA) parameters to the values specified in the telecommand

Refer to [RD.09] for details on TC(245,9).

6.21.5.8 TC (245,10) Set Coarse Pointing Assembly (CPA) Parameter Set

TC(245,10) instructs to set the Coarse Pointing Assembly (CPA) parameters to the values specified in the telecommand

Refer to [RD.09] for details on TC(245,10).

6.21.5.9 TC (245,11) Activate / Deactivate Loops

TC(245,11) allows to control the activation and disactivation of a number of control loops.

Refer to [RD.09] for details on TC(245,11).

6.21.5.10 TC (245,12) Start Self Calibration

TC(245,12) commands to start the “Self Calibration” mode.

Refer to [RD.09] for details on TC(245,12).

6.21.5.11 TC (245,13) Start Operation

TC(245,13) commands to start the “Acquisition” mode

Refer to [RD.09] for details on TC(245,13).

6.21.5.12 TC (245,14) Continue Acquisition

TC(245,14) instructs to continue the acquisition.

Refer to [RD.09] for details on TC(245,14).

6.21.5.13 TC (245,15) Start Tracking with PAA

TC(245,15) commands to start the “Tracking with PAA”.

Refer to [RD.09] for details on TC(245,15).

6.21.5.14 TC (245,16) Perform Measurement (Sweep, Scan)

TC(245,16) commands to execute the specified measurement.

Refer to [RD.09] for details on TC(245,16).

6.21.5.15 TC (245,17) Enable / Disable PAT Mechanisms

TC(245,17) commands the enable or disable the mechanisms according to the specified Mechanism ID of:
- Coarse Pointing Assembly (CPA) Azimuth Motor
- Coarse Pointing Assembly (CPA) Elevation Motor
- All Fine Pointing Assembly (FPA) Motors
- All Point Ahead Assembly (PAA) Motors

Refer to [RD.09] for details on TC(245,17).

6.21.5.16 TC (245,18) Stop All Running PAT Algorithms

TC(245,18) commands to stop all running PAT Algorithms.

Refer to [RD.09] for details on TC(245,18).

6.21.5.17 TC (245,19) Reset LCT Measurement Results Memory

TC(245,19) instructs to clear (reset) the LCT Measurement Results Memory.

Refer to [RD.09] for details on TC(245,19).

6.21.5.18 TC (245,21) Switch LCT Internal Heater Power On / Off

TC(245,21) commands the switch “On” or “Off” of the internal LCT heaters specified by Heater ID value.

Refer to [RD.09] for details on TC(245,21).

6.21.5.19 TC (245,25) Start RXA Diagnostic Data Measurement

TC(245,25) commands to start the RXA Diagnostic Data Measurements.

Refer to [RD.09] for details on TC(245,25).

6.21.5.20 TC (245,26) Get RXA Diagnostic Data Report

TC(245,26) requests to generate the report of the RXA Diagnostic Data Measurement.(i.e. TM(245,27)).

Refer to [RD.09] for details on TC(245,26).

6.21.5.21 TM (245,27) RXA Diagnostic Data Report

TM(245,27) is generated in response to TC(245,26).

Refer to [RD.09] for details on TM(245,27).

6.21.5.22 TC (245,32) Start Automatic Heater Powering

TC(245,32) commands to start the automatic heater powering of the H-FUS3 heater.

Refer to [RD.09] for details on TC(245,32).

6.21.5.23 TC (245,33) Stop Automatic Heater Powering

TC(245,33) commands to stop the automatic heater powering of the H-FUS3 heater (i.e. the heater power status of the H-FUS3 heater is set to “Off”).

Refer to [RD.09] for details on TC(245,33).

6.21.5.24 TC (245,34) Set ASK-EOM Parameter

TC(245,34) instructs to set the ASK EOM parameters to the specified values.

Refer to [RD.09] for details on TC(245,34).

6.21.5.25 TC (245,35) Switch OPLL Integrator On / Off

TC(245,35) commands to switch “On” or “Off” the OPLL Integrator.

Refer to [RD.09] for details on TC(245,35).

6.21.5.26 TC (245,36) Set PMH-TX Heater Control Temperature Parameter

TC(245,36) instructs the setting of the PMH-TX Heater with the specified parameter values.

Refer to [RD.09] for details on TC(245,36).

6.21.5.27 TC (245,37) Set PMH-LO Heater Control Temperature Parameter

TC(245,37) instructs the setting of the PMH-LO Heater with the specified parameter values.

Refer to [RD.09] for details on TC(245,37).

6.21.5.28 TC (245,42) Set LO Laser Parameter Set

TC(245,42) instructs the settings of the Local Oscillator (LO) Laser parameters with the specified parameter values.

Refer to [RD.09] for details on TC(245,42).

6.21.5.29 TC (245,43) Set TX Laser Parameter Set

TC(245,43) instructs the settings of both the Transmitter (TX) Laser parameters with the specified parameter values.

Refer to [RD.09] for details on TC(245,43).

6.21.5.30 TC (245,44) Perform CPA Commutation

TC(245,44) instructs to perform the CPA auto commutation for the selected motor axis.

Refer to [RD.09] for details on TC(245,44).

6.21.5.31 TC (245,45) Perform CPA Encoder Configuration

TC(245,45) instructs to perform the CPA Encoder Configuration for the selected motor axis.

Refer to [RD.09] for details on TC(245,45).

6.21.6 Service 246: LCT Target Trajectory Management Service

6.21.6.1 TC (246,10) Report LCT Target Trajectory Parameter

TC(246,10) instructs the TAPCO to report the set of LCT Target Trajectory Parameters. The TAPCO responds with TM(246,11).

Refer to [RD.09] for details on TC(246,10).

6.21.6.2 TM (246,11) LCT Target Trajectory Parameter Report

TM(246,11) is in response to TC(246,10).

Refer to [RD.09] for details on TM(246,11).

6.21.6.3 TC (246,12) Set LCT Target Trajectory Parameter

Upon reception of TC(246,12) the TAPCO updates the target trajectory parameters with the values contained in the TC.

Refer to [RD.09] for details on TC(246,12).

6.21.7 Service 247: LCT Launch Lock Release Mode Service

The LCT Launch Lock Release Mode Service provides the capability to perform either a manual or automatic control of the Launch Lock Release.

6.21.7.1 TC (247,1) Switch On Nominal CPA Launch Lock Heater Power

TC(247,1) commands the switch On of the nominal CPA Launch Lock Heater power.

Refer to [RD.09] for details on TC(247,1).

6.21.7.2 TC (247,4) Start Automatic Launch Lock Release Operating Sequence

TC(247,4) instructs the TAPCO to perform the simplified operating sequence: for the automatic Launch Lock Release.

Refer to [RD.09] for details on TC(247,4).

7 MISSION CONSTANTS

CONSTANT IDENTIFIER	DEFINITION	RANGE OR VALUE
CPDU_DURATION_UNIT	Specifies the pulse duration unit defined for the CPDU, which can be any value between 10 ms and 15 ms. The actual pulse duration for a given CPDU instruction is expressed as a multiple of this value.	D = 15 ms
CPDU_MAX_INSTR	Represents the maximum number of command pulse instructions that can be contained within a CPDU telecommand packet (at least 12 and at most 109).	TC CPDU max pulse instructions is 109 and total execution time must not exceed 16 s.
HDP_MIN_INTERVAL	Represents the minimum sampling interval for the on-board sampling of parameters in housekeeping, diagnostic, or physical reports.	AVS = 125 ms
MISSION_TIME_CODE	Defines the value of the P-field for the time report packet, where this is not contained explicitly within the “Satellite Time” field of that packet.	
MONLIST_MAX_CHECKS	Represent the maximum number of limit pairs or expected values which can be specified for the on-board monitoring of a parameter.	For DSHA = 4
MONLIST_MAX_PARAMS	Represent the maximum number of parameters which can be monitored at any given time by an On-board Monitoring Service (PUS #12).	

CONSTANT IDENTIFIER	DEFINITION	RANGE OR VALUE
PARAM_ABS_SAMPL_TIME	Represent the accuracy to which the absolute (on-board) sampling time of a telemetry parameter can be determined.	
PARAM_REL_SAMPL_TIME	Represent the accuracy to which the relative sampling time of any two parameters, which can be telemetered in different packets, can be determined.	
PKT_STORAGE_TIME	Represent the time for which telemetry source packets must be stored on-board, for later dumping to ground, over and above the longest time interval without ground coverage.	
PSLIST_MAX_PARAMS	Represents the maximum number of parameters whose statistical values can be evaluated at any given time by the application process Parameter Statistics Reporting Service (PUS #4).	
SMALLEST_ADDRESSABLE _UNIT	Represents the smallest unit that the on-board processor can address. This constant is used by the Memory Management Service (PUS #6) for addressing purposes.	
TCPKT_MAX_LENGTH	Represents the maximum length of a telecommand packet.	256 16-bit words.
TC_CHECKSUM_TYPE	Represent the type of checksum used for checking the integrity of telecommand packets by the Telecommand Verification Service (PUS #1).	Cyclic Redundancy Code compliant to PUS Annex A1.
TMPKT_MAX_LENGTH	Represents the maximum length of a telemetry source packet.	128 16-bit words
TM_CHECKSUM_TYPE	This constant shall represent the type of checksum to be computed for the telemetry source packets.	Cyclic Redundancy Code compliant to PUS Annex A1.

8 COMMON DATA TABLES

8.1 APPLICATION PROCESS ID

The Application Process ID (APID) is divided into Process ID (PID - first 7 bits) and Packet Category (PCAT - last 4 bits).

The PID forms a base address which identifies the process to which the TC packet is addressed or generating the TM packet.

The PCAT identifies different categories of TM packets which Ground typically processes in different ways and for which separate accounting (i.e. source sequence counts) is required to be kept.

The PCAT for TC are not used and set to a fixed value.

Telemetry packets originating from a spacecraft application/instrument/unit are assigned the same PID as used for the telecommands to that application/instrument/unit. This implies that the first 7 bits of the telecommand APID are the same to the ones used for the TM packet.

8.1.1 Process ID

Table 8.1.1 reports the assignment of Process ID codes to onboard AVS, C-SAR instrument, PDHT S/S and Ground EGSE.

PID DEC	PID HEX	NUMBER OF PID	SUBSYSTEM / EQUIPMENT / SW	UNIT / FUNCTION	REMARK
0 - 15	**00 – 0F**	**16**	**AVS SMU HW**		
0	00	1	SMU OBT	Time Packet	Category = 0, APID = 000 H
1	01	1	SMU	SMU TM-1 HPTM	Category = 5, APID = 015 H
6	06	1	SMU	SMU TM-2 HPTM	Category = 5, APID = 065 H
2	02	1	SMU	SMU TC-1 CPDU	Category = 1, APID = 021 H
2	02	1	SMU	SMU TC-2 CPDU	Category = 2, APID = 022 H
3	03	1	SMU	SMU RM-1 CPDU	Category = 1, APID = 031 H
3	03	1	SMU	SMU RM-2 CPDU	Category = 2, APID = 032 H
4	04	1	SMU	SMU RM-1 SGM	Category = 1, APID = 041 H
4	04	1	SMU	SMU RM-2 SGM	Category = 2, APID = 042 H
15	0F	1	SMU	SMU TC-1 AU	Category = 12, APID = 0FC H
15	0F	1	SMU	SMU TC-2 AU	Category = 12, APID = 0FC H
16 - 31	**10 – 1F**	**16**	**SMU ASW NM**		
16	10	1	ASW NM	SSMNG NM	
17	11	1	ASW NM	SSMA PL NM	
18	12	1	ASW NM	SSMA PF NM	
19	13	1	ASW NM	ACTXT SYS MNG NM	
20	14	1	ASW NM	ACTXT AOC NM	
32 - 47	**20 – 2F**	**16**	**SMU ASW SM**		

PID DEC	PID HEX	NUMBER OF PID	SUBSYSTEM / EQUIPMENT / SW	UNIT / FUNCTION	REMARK
32	20	1	ASW SM	SSMNG SM	
33	21	1	ASW SM	SSMA PL SM	
34	22	1	ASW SM	SSMA PF SM	
35	23	1	ASW SM	ACTXT SYS MNG SM	
36	24	1	ASW SM	ACTXT AOC SM	
48 - 63	**30 – 3F**	**16**	**AVS AOC UNIT**		
48	30	1	GPS-A	GPS-A SW	
49	31	1	GPS-B	GPS-B SW	
64 - 95	**40 - 5F**	**32**	**C-SAR**		
64	40	1	C-SAR	SES ICM Boot SW	
65	41	1	C-SAR	SES ICM Application SW	
81	51	1	C-SAR	SAS TCU 1	TCU require adjacent address range as the 4 LSB of the PID are determined by a coding connector.
82	52	1	C-SAR	SAS TCU 2	
83	53	1	C-SAR	SAS TCU 3	
84	54	1	C-SAR	SAS TCU 4	
85	55	1	C-SAR	SAS TCU 5	
86	56	1	C-SAR	SAS TCU 6	
87	57	1	C-SAR	SAS TCU 7	
88	58	1	C-SAR	SAS TCU 8	
89	59	1	C-SAR	SAS TCU 9	
90	5A	1	C-SAR	SAS TCU 10	
91	5B	1	C-SAR	SAS TCU 11	
92	5C	1	C-SAR	SAS TCU 12	
93	5D	1	C-SAR	SAS TCU 13	
94	5E	1	C-SAR	SAS TCU 14	
95	5F	1	C-SAR	SAS TCU Broadcast	
96 - 99	**60 - 63**	**4**	**PDHT**		
96	60	1	PDHT	DSHA PROM SW	
97	61	1	PDHT	DSHA SW	
100-109	**64 – 6D**	**10**	**Reserved**		
110-111	**6E – 6F**	**2**	**LCT**		
110	6E	1	LCT	LCT SW	
112-126	**70 – 7E**	**15**	**Ground & EGSE**		
127	**7F**	**1**	**Reserved**		Reserved for Idle TM Packet

Table 8.1.1-1 : Process ID Assignment

8.1.2 Packet Category

Packet Category (PCAT), a 4-bit field, identifies different categories of TM packets which Ground typically processes in different ways and for which separate accounting (i.e. source sequence counts) is required to be kept.

The on-board design must guarantee reception on-ground of TM packets with a continuous source sequence count which allows Ground to immediately detect missing TM packet(s).

The PCAT for TC have a fixed value.

PACKET CATEGORY	DESCRIPTION
1	Reserved to TC-1 CPDU, RM-1 CPDU & RM-1 SGM
2	Reserved to TC-2 CPDU, RM-2 CPDU & RM-2 SGM
12	TELECOMMAND

Table 8.1.2-1 : TC Packet Category

PACKET CATEGORY	DESCRIPTION	TM PACKET MAPPING
0	TIME	TM (9,2) TM(9,160)
1	TC VERIFICATION	TM(1,x), TM(17,2)
2	DIAGNOSTIC	TM(3,26)
3	TABLE	TM(3,10/12/130/131/133), TM(4,2/9/146/162), TM(5,130/213), TM(6,8/10), TM(11,10/13/19), TM(12,9/11/162), TM(14,4/8/12/16), TM(15,6/13), TM(18,9/11/163/164), TM(19,7/129)
4	HOUSEKEEPING	TM(3,25)
5	HIGH PRIORITY	
6	AUXILIARY	Used for TM packets only sent to the PDHT DSHA Auxiliary Data Packet Store by the AVS.
7	EVENT	TM(5,1/2/3/4)
8	NON REAL-TIME HKTM	TM(3,25) with dedicated SID range
9	DUMP	TM(6,6/144/145/148/151/216/218)
10	-	
11	NAVIGATION	Used for GPSR Navigation and Time TM packets delivered with high priority to AVS and used by AVS POD
12	SCIENCE 1	Used for GPSR periodic science data TM packets not classified as PCAT 6.
13	SCIENCE 2	Used for GPSR event science data TM packets.
14	-	
15	IDLE TM PACKET	

Table 8.1.2-2 : TM Packet Category

8.2 TC SOURCE ID AND TM DESTINATION ID FIELDS

A Packet Terminal executes not only immediate telecommands directly received from Ground, but also telecommands which are generated onboard. The onboard generated telecommands are also PUS telecommands like those sent from Ground. Thus these onboard telecommands are accepted and executed in the same way as telecommands received from Ground.

Consequently for each TC, regardless of its origin, the acceptance and/or execution is reported to Ground by Service 1 TM packets. Hence it is possible that Ground receives a number of Service 1 reports, even though it has only sent a single TC shortly before.

To enable to discriminate Service 1 TM packets a concept which makes use of the “Source ID” and “Destination ID” of the packet data header fields of the TC and TM packets respectively will be used. The concept has already been used in Mars Express and refined by ASD for TerraSAR-X and now adapted by ASD and TASI for Sentinel-1. The concept is described below.

Telecommands generated onboard include time-tagged telecommands released from the **Service 11** Onboard Time-Tag Command Schedule, position-tagged telecommands released from **Service 132** Onboard Position-Tag Command Schedule, action telecommands released from the **Service 19** Detection List, telecommands released from the **Service 18** OBCP, the armed telecommand released from the **Service 133** Two-Step Telecommand, hard-coded commands released from the **Service 8** Function Management or commands released from the AVS On-Board Command Data Base.

All onboard commands are either loaded by nested telecommands or are hard coded in EEPROM before the mission.

Concept Description

TM reports are divided into the classes of “solicited” and “unsolicited”.

“Solicited” are all TM packets, which are generated in response to a TC. This comprises first the Service 1 reports and eventually other TM packets like memory dumps, list & status reports, etc.

“Unsolicited” TM packets are further divided into “periodic TM” (i.e. HK and Diagnostic Reports) and “spontaneous TM” (i.e. Event Reports).

For solicited TM, the onboard application shall insert a copy of the TC packet’s “Source ID” into the TM packet’s “Destination ID”. For unsolicited TM it shall set the “Destination ID” to a fixed value.

The ECSS-PUS standard does not forbid assigning multiple codes for “Ground” to the enumerated “Destination ID”. Hence the applied conventions for “Source ID” and “Destination ID” are reported in Table 8.2-1 and Table 8.2-2 respectively.

With the assigned coding the “Source ID” within the TC indicates whether the TC is directly sent from Ground, comes out of either the Onboard Time-Tag Command Schedule, the Onboard Position-Tag Command Schedule, the AVS OBC Data Base, the Onboard Control Procedure (OBCP), the Service 19 (Event/Action) Detection List, the AVS Service 163 Payload Management Service as an embedded C-SAR or PDHT command or is generated by a specific onboard function.

As all codes of the “Destination ID” in Table 8.2-2 have the meaning “Ground“, there is no need to maintain separate Source Sequence Counters, which is required by the PUS standard in case of different destinations.

SOURCE ID CODE (DEC)	SOURCE
0	RESERVED
1	GROUND
2	SERVICE 8 (Used by C-SAR)
3	ON-BOARD COMMAND DATA BASE (Used by AVS)
4	SERVICE 11 (Time Tag Command Schedule)
5	SERVICE 132 (Position Tag Command Schedule)
6	SERVICE 18 (OBCP)
7	SERVICE 19 (Action)
8	SERVICE 133 (Two-Step Command)
10	GROUND SECURITY (AU Control Command)
11	SERVICE 163 (AVS P/L Management) embebbed C-SAR TC
12	SERVICE 163 (AVS P/L Management) embebbed PDHT TC

Table 8.2-1 : Source ID Assignment

DESTINATION ID CODE	DESTINATION
0	GROUND – Unsolicited TM
1	GROUND – TM in response to a direct TC from Ground
2	GROUND – TM in response to a TC generated onboard by a Service 8 hard coded function (Used by C-SAR)
3	GROUND – TM in response to a TC in the On-Board Command Data Base (Used by AVS)
4	GROUND – TM in response to a TC released from the Service 11 Time Tag Command Schedule.
5	GROUND – TM in response to a TC released from the Service 132 Position Tag Command Schedule.
6	GROUND - TM in response to a TC released from the Service 18 OBCP.
7	GROUND - TM in response to a TC released from the Service 19 action.
8	GROUND - TM in response to a TC released from the Service 133 Two-Step Command.
11	GROUND – TM from C-SAR in response to a TC released from AVS Service 163
12	GROUND – TM from PDHT in response to a TC released from AVS Service 163

Table 8.2-2 : Destination ID Assignment

The Source ID is controlled in the following way:

Except for hard coded commands generated by Service 8 and those from the AVS OBC Data Base the allocation of Source IDs are not hard-coded in the onboard software, but the Source ID is set by Ground

when it creates the embedded TC to be loaded with TC (11,4), TC (132,4), TC (18,1) or specific OBCP service subtype, TC (130,1) for AVS OBC Data Base or to the Detection List. The same applies to the acknowledgement flags. The acknowledgement flags of the embedded TC determine whether positive acknowledgment is performed for the TC when it is eventually released.

It must be possible to modify the acknowledgement flags for hard-coded TC. Two global Boolean variables must be defined for that purpose, which can be updated by Ground. Their value determine whether the acceptance and/or completion acknowledgement are to be generated or not.

8.3 PARAMETER NUMBER

8.3.1 Parameter Number Range Assignment

Table 8.3-1 reports the assignment of Parameter Number code ranges to onboard AVS, C-SAR instrument, and PDHT S/S.

SUBSYSTEM	PARAMETER NUMBER RANGE
AVS	00000000 - 5FFFFFFF
LCT	60000000 – 6FFFFFFF
C-SAR SES	80000000 - A1FFFFFF
C-SAR SAS	A2000000 - BFFFFFFF
PDHT	C0000000 - C6FFFFFF
Reserved	70000000 – 7FFFFFFF C7000000 - FFFFFFFF

Table 8.3-1 : Parameter Number Assignment

8.3.2 AVS Parameter Number Structure

The Avionics Software (ASW) Parameter Number assignments follow the structure shown in Figure 8.3.2-1 where the first 16-bit identify the Data Pool and the following 16-bit identify the parameter in the Data Pool. The Data Pool is a collection of parameter identifiers.

The parameter identifier FFFF conventionally indicates the whole Data Pool. Whereas the parameter 0000 conventionally indicates the NULL TAG.

Word	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Data Pool Identifier															
2	Parameter Identifier															

Figure 8.3.2-1: AVS Parameter Number Structure

The ASW has the following range assignments for the Data Pool identifiers.

NM ASW + NM Specific Hardware :

0000 – 001F	NM ACTXT
0020 – 003F	spare
0040 – 005F	NM SSMNG
0060 – 007F	spare

0080 – 00BF NM SSMA
00C0 – 00DF spare
00E0 – 00FF NM AOC&N

NM/SM ASW + NM/SM Common Hardware:
00100 – 002FF

SM ASW:
003FF – 0043F (Application level)
00440 – 004FF (SM SSMNG)

The Parameter Number has been used to define both groups of parameters and single parameters of any size down to 1 bit for ASW specific needs, such as telemetry reporting, housekeeping, FDIR and SW performance optimisation.

8.3.3 C-SAR SES Parameter Number Structure

The SES Parameter Number assignments follow the structure shown in Figure 8.3.3-1.

The most significant bit of the Parameter number is a fixed value and set to '1' to allow the SES parameter numbers to remain in the assigned range of section 8.3.1. The Group Number is used to describe a logical group of parameters that have some commonality e.g. they are all components of a packet header. The Subgroup Number is a unique number to identify a specific parameter within a Group.

SES defined Group Numbers are:

0 ⇒ TM or TC Packet Parameters
1 ⇒ TM or TC Data Parameters
2 ⇒ SW Parameters
3 ⇒ Mission Constants
4..15 ⇒ Not Used.

Refer to [RD.02] Appendix A for the SES parameter list. The Parameter Number is used to define any parameter length from 3 words down to 1 bit.

	MSB															LSB
Word	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	Spare = 0											Group Number			
2	Sub-Group Number															

Figure 8.3.3-1: SES Parameter Number Structure

8.3.4 C-SAR SAS Parameter Number Structure

The SAS TCU Parameter Number assignments follow the structure shown in Figure 8.3.4-1.

The first most significant 12-bits are fixed and set to A20 Hex to remain in the assigned range of section 8.3.1. The TCU ID identify the TCU and have values 1 to E for TCU-1 to TCU-14 respectively. The Parameter Count identify the parameter and are assigned unique values in the range 0001 to 00xx.

Refer to [RD.03] for the TCU parameter list. The Parameter Number has been used to define fixed size parameters of 8 bits even if the reported values can be of varying sizes written to the least significant part of the field and the unused most significant part set to zero.

	MSB															LSB
Word	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	A20 Hex												TCU ID			
2	Parameter Count															

Figure 8.3.4-1: SAS Parameter Number Structure

8.3.5 LCT Parameter Number Structure

The LCT Parameter Number assignments follow the structure shown in Figure 8.3.5-1.

	MSB															LSB
Word	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0	Process ID							Spare = 0							
2	Local Parameter ID															

Figure 8.3.5-1: LCT Parameter Number Structure

Where:

Process ID = 6E hex (110 dec)

Hence the LCT Parameter Number is within the range 6E000000 – 6E00FFFF.

Refer to [RD.09] for the LCT parameter list. The Parameter Number is used to define any parameter length from 32 bits down to 1 bit.

8.4 MISSION SPECIFIC SERVICE TYPE/SUBTYPE NUMBERING

Table 8.3-1 reports the assignment of mission specific service type/subtype numbers to AVS SW (ASW), C-SAR instrument, PDHT and GPS.

SERVICE TYPES	SPECIFIC SERVICE SUBTYPE NUMBERS						
	COMMON	ASW	C-SAR	PDHT	GPS	LCT	SPARE
Service Type 1	128..143	144..159	160..175	224..239		240..255	176..223
Service Type 2	128..143	144..159	160..175	224..239			176..223 240..255
Service Type 3	128..143	144..159	160..175	224..239		240..255	176..223
Service Type 4	128..143	144..159	160..175	224..239			176..223 240..255
Service Type 5	128..143	144..159	160..175	224..239	210..219	240..255	176..209 220..223
Service Type 6	128..143	144..159	160..191	224..239	210..219	240..255	192..209 220..223
Service Type 8		128..159	160..175	224..239			176..223

SERVICE TYPES	SPECIFIC SERVICE SUBTYPE NUMBERS						
	COMMON	ASW	C-SAR	PDHT	GPS	LCT	SPARE
							240..255
Service Type 9	128..143	144..159	160..175	224..239			176..223 240..255
Service Type 11		128..255					
Service Type 12	128..143	144..159	160..175	224..239			176..223 240..255
Service Type 14		128..255					
Service Type 15	128..143	144..159		224..239			160..223 240..255
Service Type 17							
Service Type 18	128..143	144..159	160..175	224..239			176..223 240..255
Service Type 19	128..143	144..159	160..175	224..239			176..223 240..255
ASW Specific Service Types 128..143 Types 160..175		0..255					
C-SAR Specific Service Types 144..159			0..255				
PDHT Specific Service Types 176..191				0..255			
GPS Specific Service Types 210..219					0..255		
LCT Specific Service Types 240..255						0..255	

Table 8.4-1 : Mission Specific Service Type/Subtype Number Assignment

8.5 REPORT IDENTIFICATION

Figure 8.5-1 defines the structure of the RID format to achieve unique RID definitions.

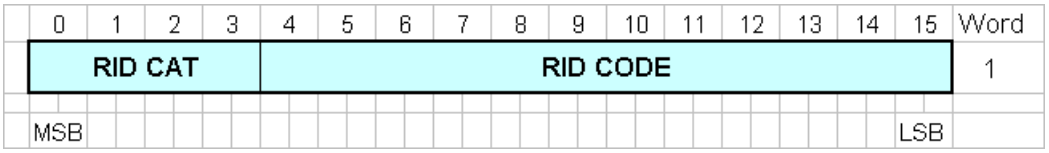


Figure 8.5-1 : Report ID Structure

RID FIELD	DESCRIPTION	RANGE OR VALUE
RID CAT	Report ID category	0 = Common RID 1 = ASW Specific RID & GPSR Specific RID 1000 H to 12FF H: ASW 1300 H to 17FF H: GPSR 1800 H to 1FFF H: ASW 2 = C-SAR SES Specific RID 3 = C-SAR SAS Specific RID 4 = PDHT Specific RID 6 = LCT Specific RID 9 = ESOC 5, 6, 7, 8, 10..15 = Spare
RID CODE	Report ID code	0 to $2^{12} – 1$

8.6 STRUCTURE IDENTIFICATION

Figure 8.6-1 defines the structure of the SID format to achieve unique SID definitions.

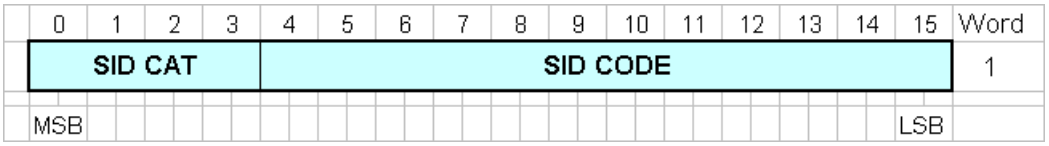


Figure 8.6-1 : SID Structure

SID FIELD	DESCRIPTION	RANGE OR VALUE
SID CAT	SID Category	0 = Reserved 1 = ASW SID 2 = C-SAR SES SID 3 = C-SAR SAS SID 4 = PDHT SID 6 = LCT SID 13 & 14 = GPS SID – (*) 9 = ESOC 5, 7, 8, 10..12, 15 = Spare
SID CODE	SID code	0 to $2^{12} – 1$

Note: (*) – The least significant byte of the S1 GPSR SID is fixed to zero. The SID values reported in Table 5-41 of Sentinel GPSR Command and Housekeeping Data Interface (S1-IF-AAE-SC-0001), [RD.04],

common to the three Sentinels corresponds to the decimal value of the most significant byte of the SID format and ranges between 213 and 235. The range corresponds to D500 Hex and EB00 Hex. Hence the SID CAT field correspond to decimal 13 and 14.

8.7 SID ASSIGNMENT FOR NON-REAL TIME HK TM

The following SID are dedicated for non-real time TM(3,25) with PCAT = 8:

4096 dec (1000 Hex)
4097 dec (1001 Hex)
4098 dec (1002 hex)

9 SERVICE PARAMETER DEFINITIONS

The physical format of the parameter field in a packet is deduced from the value(s) of one or several preceding parameter fields in the packet (including the packet type and subtype). It can additionally depend on the application process and on the service provided by the application process.

Unless where specified, the physical format of a parameter field is unique for the mission. The parameter field can appear in different packet types and subtypes

The encoding of a parameter field is identical in all packet types and subtypes sent to or generated by the application process.

All fields are of type Unsigned Integer (UI), i.e. PTC = 3, unless otherwise specified. The specified type is indicated in column 'Type', where:

B = Boolean (PTC = 1)
E = Enumerated (PTC = 2)
UI = Unsigned Integer (PTC = 3)
SI = Signed Integer (PTC = 4)
FP = Floating Point (PTC = 5)
BS = Bit-String (PTC = 6)
OS = Octet String (PTC = 7)
AT = Absolute Time (PTC = 9)
RT = Relative Time (PTC = 10)
D = Deduced

9.1 SERVICE 1 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Telecommand Packet ID	1 word	UI	This is a copy of the corresponding fields from the packet header of the telecommand to which this verification packet relates (i.e. Word 1 of the TC Packet Header)	TM(1,1) TM(1,2) TM(1,3) TM(1,4) TM(1,5) TM(1,6) TM(1,7) TM(1,8)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Packet Sequence Control	1 word	UI	This is a copy of the corresponding fields from the packet header of the telecommand to which this verification packet relates (i.e. Word 2 of TC Packet Header)	TM(1,1) TM(1,2) TM(1,3) TM(1,4) TM(1,5) TM(1,6) TM(1,7) TM(1,8)	
Code	1 word	E	The code indicates the reason for the failure of the telecommand at this verification stage. At the acceptance stage, the following standard code values are defined: 0 = illegal APID (PAC error); 1 = incomplete or invalid length packet; 2 = incorrect checksum; 3 = illegal packet type; 4 = illegal packet subtype; 5 = illegal or inconsistent application data. Other values of the code are application process specific or command specific (i.e. dependent on combinations of the type, subtype and individual command function). The code is an identifier for the auxiliary information provided with this report, i.e. the parameters field.	TM(1,2) TM(1,4) TM(1,6) TM(1,8)	
Complementary Information	variable	D	Complementary information relating to the particular value of the code field. For full interpretation of failure of a command, knowledge of the nature of the command must be available.	TM(1,2) TM(1,4) TM(1,6) TM(1,8)	
Step Number	1 word	UI	This indicates the intermediate step number of the telecommand execution profile whose execution has been completed. The values it can take are telecommand-specific.	TM(1,5) TM(1,6)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Internal TC Acceptance Report Flag	1 bit	E	This defines the value of a global flag that determines whether telecommands generated internally by the SES Application SW have the Acknowledge Acceptance flag enabled or disabled in the packet header. 0 = Disabled, 1 = Enabled	TC(1,160)	
Internal TC Execution Complete Report Flag	1 bit	E	This defines the value of a global flag that determines whether telecommands generated internally by the SES Application SW have the Acknowledge Execution Completed flag enabled or disabled in the packet header. 0 = Disabled, 1 = Enabled	TC(1,160)	

9.2 SERVICE 2 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Length of CPDU TC Packet-1	1 byte	UI	Specifies the length of the CPDU TC packet-1 embedded in the TC(2,144).	TC(2,144)	
Length of CPDU TC Packet-2	1 byte	UI	Specifies the length of the CPDU TC packet-2 embedded in the TC(2,144). When equal to zero indicates that only one CPDU TC packet is present in TC(2,144)	TC(2,144)	
CPDU TC Packet-1	variable	OS	Complete CPDU TC packet format as shown in Figure 3.3-1.	TC(2,144)	
CPDU TC Packet-2	variable	OS	Complete CPDU TC packet format as shown in Figure 3.3-1.	TC(2,144)	

9.3 SERVICE 3 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
SID	1 word	E	The structure identification which corresponds to this reporting definition.	TC(3,1) TC(3,2) TC(3,3) TC(3,4) TC(3,5) TC(3,6) TC(3,7) TC(3,8) TC(3,9) TM(3,10) TC(3,11) TM(3,12) TM(3,25) TM(3,26) TC(3,128) TC(3,129) TM(3,131) TM(3,133) TM(3,144) TM(3,145) TC(3,240) TC(3,241)	
Collection Interval	1 word	E	The data collection interval for the housekeeping or diagnostic parameter report definition. That is, the time interval between successive report packets as a multiple of time units. ICM possible values are 0 = 0.25 s, 1 = 0.5 s, 2 = 1 s, 3 = 2 s, 4 = 4 s, 5 = 8 s, 6 = 16 s, 7 = 32 s . ASW requires the Collection Interval to be specified in Time Slice (i.e. TS = 125 ms) and must be multiple of 2 up to 16 seconds (i.e. 128 TS). The Collection Interval divided by the NREP must be an integer (e.g. if Collection Interval is 8 then NREP can be either 1, 2, 4 or 8).	TC(3,1) TC(3,2) TM(3,10) TM(3,12) TC(3,128) TC(3,129) TM(3,131) TM(3,133) TM(3,144) TM(3,145)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Collection Offset	1 word	E	Specifies the position in the TM cycle at which a telemetry report will be generated. ASW expresses the Collection Offset in the form [SCO,SLO] where SCO is the offset in seconds of the 16 s major cycle and SLO is the Time Slice of the second. Instead of the term Collection Offset, ICM has Collection Slice expressed in the form [second,slice] and specifies the point in the TM Frame cycle at which a telemetry report will be generated. The cycle is of 32 s and each second is divided into 8 slices.	TC(3,1) TC(3,2) TM(3,10) TM(3,12) TC(3,128) TC(3,129) TM(3,131) TM(3,133) TM(3,144) TM(3,145)	
NPAR1	1 word	UI	The number of parameters in the definition that are sampled once per collection interval.	TC(3,1) TC(3,2) TM(3,10) TM(3,12)	
Parameter #	2 words	UI	The parameter number to be sampled. A “parameter number” is used onboard, for optimisation purposes. It has a unique correspondence with the “Parameter ID” which is used on the ground for identification purposes.	TC(3,1) TC(3,2) TM(3,10) TM(3,12)	
NFA	1 word	UI	The number of fixed-length arrays.	TC(3,2) TM(3,10) TM(3,12)	
NREP	1 byte	UI	The number of values to be sampled for each parameter within this fixed length array.	TC(3,2) TM(3,10) TM(3,12)	
NPAR2	1 byte	UI	The number of different parameters within this fixed-length array, each of which shall be sampled “NREP” times per collection interval.	TC(3,2) TM(3,10) TM(3,12)	
NSID	1 word	UI	Identifies the number of Report Definitions that are contained in the telemetry packet.	TM(3,131) TM(3,133) TM(3,144) TM(3,145)	
Status	1 word	E	Identifies whether the generation of the Housekeeping or Diagnostic Report identified by the SID is enabled or disabled. 0 => Disabled; 1 => Enabled	TM(3,131) TM(3,133) TM(3,144) TM(3,145)	
Last Packet	1 bit	E	Indicates when the last packet has been reached	TM(3,10) TM(3,12) TM(3,144)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(3,145)	
Report Integrity Counter	15 bit	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(3,10) TM(3,12) TM(3,144) TM(3,145)	
Collection Interval	1 word	UI	Generation period for the HK / Diagnostic TM packet expressed in number of cycles.	TC(3,240) TC(3,241)	

9.4 SERVICE 4 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Reset Flag	1 word	E	This indicates whether the evaluation of the parameter statistics must be reset or not. Its values are “No” (value=0) and “Yes” (value=1).	TC(4,1)	
Tstart	3 words	AT	The time at which the evaluation of the parameter statistics started (i.e. the last time the parameter statistics list was reset).	TM(4,2)	
NPAR	1 word	UI	The number of parameters in the parameter statistics list which have been sampled at least once since the list was last reset.	TM(4,2) TC(4,6) TC(4,7) TM(4,9) TC(4,144) TC(4,145) TM(4,146) TC(4,161) TM(4,162)	
Parameter#	2 words	UI	The identification of a parameter.	TM(4,2) TC(4,6) TC(4,7) TM(4,9) TC(4,144) TM(4,146) TC(4,161)	
Maxval	2 words	UI	The maximum value of the corresponding parameter number.	TM(4,2)	
Tmax	3 words	AT	The time at which the maximum value was	TM(4,2)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			attained.		
Minval	2 words	UI	The minimum value of the corresponding parameter number.	TM(4,2)	
Tmin	3 words	AT	The time at which the minimum value was attained.	TM(4,2)	
Meanval	2 words	UI	The mean value of the corresponding parameter number.	TM(4,2)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(4,2) TM(4,9) TM(4,146) TM(4,162)	
Report Integrity Counter	15 bit	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(4,2) TM(4,9) TM(4,146) TM(4,162)	
Sampling Interval	1 word	E	The sampling interval to use for the associated parameter. The sampling interval must always be a divisor of the number of Time Slices (TS) in a System Major Cycle (i.e. 128 TS)	TC(4,6) TC(4,144)	
ICM Sampling Interval	1 byte	E	Specifies the frequency with which the value of the associated parameter will be acquired for the statistical calculation. 0 => 125 ms; 1 => 250 ms; 2 => 500 ms; 3 => 1 s; 4 => 2 s; 5 => 4 s; 6 => 8 s; 7 = 16 s; 8 = 32 s.	TC(4,161) TM(4,162)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Acquisition Slice	1 byte	E	Identifies a position in the TM Frame cycle. The cycle is of 32 seconds duration. Each second is divided into 8 slices. The Acquisition Slice is expressed in the format [second,slice] and specifies the point in the TM Frame cycle at which a telemetry value is specified. The format is “xxxxxyyy”: Where “xxxxx”: 0 => 0 s; 1 => 1 s …. 30 => 30 s; 31 => 31 s Where “yyy”: 0 => TS0; 1 => TS1; 2 => TS2 … 6 => TS6, 7 => TS7.	TC(4,161) TM(4,162)	
Statistics Table Offset	1 word	E	Index of the parameter specifying the position in the Parameter Statistics List table. The index value ranges from 1 to the maximum number of parameters.	TC(4,144) TC(4,145) TM(4,146)	
Data Format	1 word	E	Specifies the parameter type and format 1 => 16-Bit Unsigned Integer Value 2 => 32-Bit Float Value	TC(4,144) TM(4,146)	

9.5 SERVICE 5 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
RID	1 word	E	The Report ID (RID), together with the application process ID, implicitly defines the presence, structure and interpretation of the associated parameters field.	TM(5,1) TM(5,2) TM(5,3) TM(5,4) TC(5,5) TC(5,6) TM(5,130) TM(5,241)	
Complimentary Information	variable	D	Complementary information relating to the particular value of the report ID.	TM(5,1) TM(5,2) TM(5,3) TM(5,4)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
NRID	1 word	UI	The number of RID that follow.	TC(5,5) TC(5,6) TM(5,130) TM(5,241)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(5,130) TM(5,145) TM(5,146) TM(5,241)	
Report Integrity Counter	15 bit	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(5,130) TM(5,145) TM(5,146) TM(5,241)	

9.6 SERVICE 6 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Memory ID	1 word	E	The Memory ID identifies the destination memory block	TC(6,1) TC(6,2) TC(6,3) TC(6,5) TM(6,6) TC(6,9) TM(6,10) TM(6,145)	
N	1 word	UI	The number of data blocks to be loaded.	TC(6,1) TC(6,2) TC(6,3) TC(6,5)	
N1	1 byte	UI	Number of Write TAG operations.	TC(6,146), TC(6,152)	
Base ID	2 words	UI	The Base ID is a base reference which gives the address within the memory block which is used as the zero reference for the offset addresses.	TC(6,1) TC(6,3) TM(6,144)	
Offset	1 word	UI	Specifies the offset from the base reference of the start address for loading / reading the data which follows.	TC(6,1) TC(6,3) TM(6,144)	
Length	1 word	UI	The number of data units expressed in SAU to be loaded or of data that follows.	TC(6,1) TC(6,2) TM(6,6) TM(6,145)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Data	variable	OS	A data block to be loaded or of data that follows.	TC(6,1) TC(6,2) TM(6,6) TM(6,145) TC(6,212) TM(6,216)	
Parameter Data	variable	OS	Logical parameter data identified by TAG ID	TC(6,146) TM(6,148)	
Parameter Data to Add	variable	SI	Signed integer value to be added to the data value identified by TAG ID.	TC(6,152)	
Start Address	2 words	UI	Gives the start address in memory for loading the data or of the data that follows.	TC(6,2) TC(6,5) TM(6,6) TC(6,9) TM(6,10) TM(6,144) TM(6,145) TC(6,161) TC(6,162)	
Length_6_3	2 words	UI	The number of data units to be dumped.	TC(6,3)	
Length_6_5	2 words	UI	The number of data units to be dumped	TC(6,5)	
Length_6_9	2 words	UI	The number of data units to be dumped / that follows.	TC(6,9) TM(6,10)	
Length_6_161	2 words	UI	The number of data units to be dumped. The value must be a multiple of 4.	TC(6,161) TC(6,162)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(6,6) TM(6,145) TM(6,148) TM(6,154)	
Report Integrity Counter	15 bit	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(6,6) TM(6,145) TM(6,148) TM(6,154)	
Checksum	1 word	UI	The value obtained by computing the ISO standard 16-bit checksum over the relevant memory locations.	TM(6,10)	
TAG ID	2 word	UI	TAG identifier of the Parameter in the TM Data Pool	TC(6,146) TC(6,147) TC(6,152)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Length of Parameter	1 word	UI	Size of parameter in bytes. Set to 1 for parameters smaller than 1 byte.	TC(6,146) TC(6,152)	
Parameter Data Length	2 words	UI	The length of the Data dumped corresponding to the logical parameter identified by the TAG ID.	TM(6,148)	
Local / Partner	1 byte	E	Indicates which of the two redundant HW modules to be used. Either on the same HW chain referred to as local, or on the redundant HW chain referred to as partner (e.g. if ASW is running on PM-1 then RM-2 and TMTCMM-2 are partner while PM-1, RM-1 and TMTCMM-1 are local) 0 => local 1 => partner	TC(6,149) TC(6,150) TM(6,151)	
Register ID	1 word	E	SMU HW Register set identifier: 10 H => ACARO registers 20 H => ERC32 registers 30 H => HPC2 register 40 H => RM registers 50 H => SpaceWire registers 60 H => TCM registers 70 - 71 H => TME registers 80 - 89 H => OBRT registers	TC(6,149) TC(6,150) TM(6,151)	
Register Address	2 words	UI	Address of the Register to dump. The address is the physical address except for when addressing the RM and OBRT registers in which case it is a logical address.	TC(6,150)	
Destination Address	2 words	UI	An Address in memory expressed in SAU. The memory address values must be a multiple of 4.	TC(6,161) TC(6,162)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Memory ID Source	1 word	E	Source memory identifier. 1 => NVM1 EEPROM 11 => NVM2 EEPROM 21 => RAM 23 => I/O	TC(6,210)	
Start Address Source	2 words	UI	Source start address	TC(6,210)	
Data Length	2 words	UI	Data length in SAU. In case of I/O the SAU is 32-bit word, in any other case it is byte.	TC(6,210) TC(6,212) TC(6,215) TM(6,216) TC(6,219) TM(6,218)	
Memory ID Destination	1 word	E	Destination memory identifier. 1 => NVM1 EEPROM 11 => NVM2 EEPROM 21 => RAM 23 => I/O	TC(6,210)	
Start Address Destination	2 words	UI	Destination start address.	TC(6,210)	
Memory ID	1 word	E	Memory identifier. 1 => NVM1 EEPROM 11 => NVM2 EEPROM 21 => RAM 23 => I/O	TC(6,212) TC(6,215) TM(6,216) TC(6,219) TM(6,218)	
Start Address	2 words	UI	Start address	TC(6,212) TC(6,215) TM(6,216) TC(6,219) TM(6,218)	
CRC16	1 word	UI	CRC 16 checksum	TM(6,218)	
OAS ROM Address	2 words	UI	Indicates the address of the OAS image in the EEPROM	TC(6,241)	
Memory Page ID	1 word	E	Identification Number of the active user memory page. 0 => Memory Page 1 1 => Memory Page 2	TC(6,242)	
Source Memory ID	1 word	E	Identification of LCT TAPCO memory from which	TC(6,240)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			the data must be copied. Refer to Table 6.5-1 of [RD.09] for TAPCO Memory ID allocation.		
Source Start Address	2 words	UI	Start Address of the memory source for copying the data	TC(6,240)	
Destination Memory ID	1 word	E	Identification of LCT TAPCO memory to which the data must be loaded. Refer to Table 6.5-1 of [RD.09] for TAPCO Memory ID allocation.	TC(6,240)	
Destination Start Address	2 words	UI	Start Address of the memory destination for loading the data	TC(6,240)	
Length of Data Block	2 words	UI	Length in bytes (in SAU) of the data block to be copied	TC(6,240)	
N° of Data Words	1 word	UI	Number of 16-bit Data words contained in the TM(6,154) packet.	TM(6,154)	
N° of Image / Status Words	2 words	UI	Specifies the total number of words to be acquired from the CAM Box through the SL-HK DS-16 interface with the CAM Box.	TC(6,153)	
Report Type	2 bits	E	A field of the Image / Status ID Parameter. Indicates if the data format is an ‘image’ format or a ‘status’ format.	TC(6,153) TM(6,154)	
Image ID	7 bits	E	A field of the Image / Status ID Parameter . When the data content is ‘image’ data, indicates the CAM Box stored image ID.	TC(6,153) TM(6,154)	
Windowing Configuration	4 bits	E	A field of the Image / Status ID Parameter. When the data content is ‘image’ data, indicates the section of the image.	TC(6,153) TM(6,154)	
Undersampling Selection	1 bit	B	A field of the Image / Status ID Parameter. When the data content is ‘image’ data, indicates if undersampling has been applied or not.	TC(6,153) TM(6,154)	
Camera ID	2 bits	E	A field of the Image / Status ID Parameter. When the data content is ‘image’ data, indicates which camera generated the image.	TC(6,153) TM(6,154)	

9.7 SERVICE 8 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Sync Phase	1 word	E	Delay to be applied between TCU PSYNC input signal and TPSU 1 Sync output signal.	TC(8,221)	TCU TC to update Power Sync Phase Control Register
EFE HK Acquisition Cycle	1 word	E	Parameter controlling the frequency of HKM acquisition from the EFEs.	TC(8,222)	TCU TC to update RABCF Parameter
EFE Temp Comp Delta T	1 word	E	Change of TRM temperature which forces calculation of new compensated TRM settings and subsequent issue of corresponding CCMs to the EFEs.	TC(8,222)	
EFE Temp Comp Timeout	1 word	E	Number of PRIs without sending a CCM of type 2 or type 3, which – when exceeded – forces calculation of new compensated TRM settings and subsequent issue of corresponding CCMs to the EFEs	TC(8,222)	
Function ID	1 word	E	Identification number of the function to be activated	TC(8,1)	
Parameter 1/2	1 word	UI	Parameter relating to the function to be performed.	TC(8,1)	

9.8 SERVICE 9 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Delta OBT	3 words	RT	The value to be set in the SW variable Delta OBT to be added to the hardware counter. It can only set seconds and not sub-seconds. Time format as per Figure 3.5-2.	TC(9,144)	
Sign	1 bit	E	Indicates if to be added or subtracted. 0 => Add; 1 => Subtract	TC(9,145)	
Time Offset	3 words	RT	The time value in whole seconds to be added or subtracted to the SW variable Delta OBT. Time format as per Figure 3.5-2.	TC(9,145)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
New Onboard Time	2 words	AT	The two most significant words of the Onboard Time i.e. the number of whole seconds. Time format as per Figure 6.8.8-2.	TC(9,129)	
ICM PPS Sync Time	3 words	AT	The value of the Onboard Time recorded at the occurrence of the last PPS signal but prior to the adjustment of the Onboard Time value. This allows the drift of the ICM clock vs the external PPS. Time format as per Figure 6.8.10-2.	TM(9,160)	
DSHA PPS Sync Time	3 words	AT	The value of the Onboard Time recorded at the occurrence of the last PPS signal but prior to the adjustment of the Onboard Time value. This allows the drift of the DSHA clock vs the external PPS. The resolution of the PDHT time field in TM(9,224) is 3.96 ms which is the same as the Time Stamp field of TM packets. Time format as per Figure 4.3-2.	TM(9,224)	
LCT PPS Sync Time	3 words	AT	The value of the LCT Onboard Time recorded at the occurrence of the last PPS signal.	TM(9,241)	
TCM Current Time	3 words	AT	The current Onboard Time of the TCM module. Time format as per Figure 6.8.10-2.	TM(9,160)	
RxM H Current Time	3 words	AT	The current Onboard Time of the RxM-H module. Time format as per Figure 6.8.10-2.	TM(9,160)	
RxM V Current Time	3 words	AT	The current Onboard Time of the RxM-V module. Time format as per Figure 6.8.10-2.	TM(9,160)	

9.9 SERVICE 11 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N1	1 word	UI	Number of records that follow.	TC(11,1) TC(11,2) TC(11,6) TC(11,144) TC(11,8) TC(11,145) TM(11,19)	
Sub-Schedule ID	11 bits	E	Identifies a set of TC which have been linked by Ground by assigning the same Sub-Schedule identifier for operational convenience. Setting Subshedule ID to 0 for TC(11,1), TC(11,2) and TC(11,6) means all SSID.	TC(11,1) TC(11,2) TC(11,4) TC(11,6) TC(11,8) TM(11,10) TM(11,13) TM(11,19)	
N° of TC Packets	5 bits	UI	Number of TC packets in TC(11,4)	TC(11,4)	
N2	1 word	UI	The number records that follow.	TC(11,1) TC(11,2) TM(11,19)	
PID	7 bits	E	Identifies the destination process.	TC(11,1) TC(11,2) TC(11,5) TC(11,144) TC(11,7) TC(11,145) TC(11,16) TM(11,19)	
N	1 word	UI	The number of records that follow.	TC(11,5) TM(11,13)	
Sequence Count	14 bits	UI	Specifies the sequence count of the first telecommand packet in the Time Tag Schedule with the specified PID which is to be deleted or time-shifted or dumped. The (PID, Sequence Count) pair uniquely identifies a telecommand packet.	TC(11,5) TC(11,7) TC(11,16)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Number of Telecommands	1 word	UI	The number of successive telecommand packets in the Time Tag Schedule from the specified telecommand packet which are to be deleted or time-shifted.	TC(11,5) TC(11,7)	
Range	1 word	E	Indicates the time interval where: 0 => All - from the beginning to the end of the command schedule. 1 => Between - between Time Tag 1 and Time Tag 2 inclusive 2 => Before - less than or equal to Time Tag 1. 3 => After - greater than or equal to Time Tag 1.	TC(11,6) TC(11,144) TC(11,8) TC(11,145)	
Time Tag 1	3 words	AT	The earliest absolute time if Range is “Between” or “After”. The latest absolute time if Range is “Before”. This parameter is not used (i.e. don’t care) if Range is “All”. The Time Tag 1 format is as per Figure 3.5-2.	TC(11,6) TC(11,144) TC(11,8) TC(11,145)	
Time Tag 2	3 words	AT	The latest absolute time if Range is “Between”. This parameter is not used (i.e. don’t care) if Range is either “All”, “Before” or “After”. The Time Tag 2 format is as per Figure 3.5-2.	TC(11,6) TC(11,144) TC(11,8) TC(11,145)	
Time Offset	3 words	RT	Specifies the delta time for the requested time-shift operation. The Time Offset format is as per Figure 3.5-2.	TC(11,7) TC(11,8) TC(11,145) TC(11,15)	
Sign of Time Offset	1 word	E	Specifies if the Time Offset is positive or negative. 0 => Plus : the Time-Tag of the selected TT-TC are shifted forward. 1 => Negative : the Time-Tag of the selected TT-TC are shifted backwards.	TC(11,7) TC(11,8) TC(11,145) TC(11,15)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(11,10) TM(11,13) TM(11,19)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(11,10) TM(11,13) TM(11,19)	
Time Tag	3 words	AT	Execution time of the TC in TT-TC Schedule. Time format as per Figure 3.5-2.	TM(11,10) TM(11,13)	
N° of TC Packet Words	1 word	UI	Number of 16-bit words of the TC Packet contained in the TM report packet.	TM(11,10)	
TC Packet Header	3 words	OS	TC Packet Header of the TC in TT-TC Schedule.	TM(11,13)	
TC Packet Data Field Header	2 words	OS	TC Packet Data Field of the TC in TT-TC Schedule	TM(11,13)	
Status	1 bit	E	Enable / disable status. 0 => Disabled; 1 => Enabled.	TM(11,19)	

9.10 SERVICE 12 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N_12_1	1 word	UI	The number of parameters whose monitoring must be enabled or disabled. By convention, N = 0 means “enable/disable monitoring at service level”. If N_12_1 > 0, each parameter in the request must be processed in turn and its parameter level monitoring status must be set to “enabled” or “disabled, depending on the request subtype.	TC(12,1) TC(12,2)	
NPAR	1 word	UI	The number of parameters to be added to the monitoring list.	TC(12,225) TC(12,227) TM(12,229)	
N_12_6	1 word	UI	The number of parameters to be deleted from the monitoring list.	TC(12,6)	
N_12_9	1 word	UI	The number of Parameter ID and associated checks specified in the telemetry packet.	TM(12,162)	
N_12_11	1 word	UI	The number of Out-of-Limit Parameter ID checks that are contained in the telemetry packet.	TM(12,11)	
N_12_7	1 word	UI	The number of Parameter ID included in the telecommand.	TC(12,163)	
N	1 word	UI	The number of monitoring items contained in the telecommand or telemetry packet.	TC(12,7) TM(12,9) TC(12,144) TC(12,161) TM(12,155)	
N1	1 word	UI	The number of MDS contained in the telemetry packet.	TM(12,153)	
N2	1 word	UI	The number of monitoring items belonging to the MDS that are out-of-limit.	TM(12,153)	
Parameter #	2 words	UI	The identification of a parameter.	TC(12,1) TC(12,2) TC(12,225) TC(12,6) TC(12,7) TM(12,9) TM(12,11) TM(12,155) TM(12,229)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Parameter Monitoring Interval	1 byte	E	The interval between performing monitoring checks on the associated parameters where for ICM: 0 => 125 ms; 1 => 250 ms; 2 => 500 ms; 3 => 1 s; 4 => 2 s; 5 => 4 s; 6 => 8 s; 7 = 16 s; 8 = 32 s.	TM(12,9) TC(12,161) TM(12,162)	
Parameter Monitoring Status	1 word	E	Indicates the monitoring status of the corresponding Parameter.	TM(12,9) TM(12,162) TM(12,229)	
Acquisition Slice	1 byte	E	Identifies a position in the TM Frame cycle. The cycle is of 32 seconds duration. Each second is divided into 8 slices. The Acquisition Slice is expressed in the format (second,slice) and specifies the point in the TM Frame cycle at which a telemetry value is acquired.	TC(12,161) TM(12,162)	
Recovery Action	1 bit	E	Indicates if a recovery action is to be performed. 0 => No: 1 => Yes.	TC(12,225) TM(12,229)	
OOL Number	4 bits	UI	Out-Of-Limit Number defines the number of times an out-of-limit has to occur before starting the related recovery action.	TC(12,225) TC(12,227) TM(12,229)	
NOL	1 word	UI	The number of limit-check definitions.	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	
NOE	1 word	UI	The number of expected-value-check definitions.	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	
Low Limit	2 words	UI	The type and format of the Low Limit must be the same as the type and format of the parameter to be monitored.	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
High Limit	2 words	UI	The type and format of the High Limit must be the same as the type and format of the parameter to be monitored	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	
Expected Value	2 words	UI	Expected value with which the actual value of the parameter is compared.	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	
RID	1 word	E	The identifier of the event report to be generated in the event of a monitoring violation. By convention, the value 0 for RID means “no event report is generated”.	TC(12,225) TC(12,7) TM(12,9) TC(12,161) TM(12,162) TC(12,163) TC(12,227) TM(12,229)	
Check Position	1 byte	E	This indicates which check definition (for the given parameter) is deleted, added or replaced with a new check definition. A positive Check Position value indicates that the corresponding check definition for the parameter must be replaced by the new check definition which follows. A negative Check Position value indicates that the corresponding check definition in the positive range must be deleted (the positions of succeeding check definitions are decremented). No check definition must follow in this case. The service must refuse to delete the last remaining check definition of a parameter and must report the error. If the Check Position value is 0, this indicates that the check definition which follows should be added to the monitoring list. NOTE: The “Check Position” parameter is not relevant to the TCU, in TM(12,9) the TCU reports the corresponding value from last TC(12,7).	TC(12,7) TM(12,9)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			The TCU supports only one check per parameter, either limit check or expected value check. That is, in TC(12,7) if NOE = 1 for the same parameter NOL must be '0' and vice versa.		
ICM Check Position	1 word	SI	Defines whether check definition(s) must be replaced or deleted for the associated Parameter. A positive value (+1) indicates that the Check Definition(s) are to be defined for the Modes in accordance with the associated Check Selection parameter. A negative value (-1) indicates that the Check Definition(s) must be removed for the Modes corresponding to the associated Check Selection parameter. The last Check Definition for a Parameter cannot be removed.	TC(12,163)	
Check Selection	1 byte	E	An array of bit flags, each bit representing the Mode in which the associated parameter check is applied. NOTE: The "Check Selection" parameter is not relevant to the TCU. In TM(12,9) the TCU reports the corresponding value from the last TC(12,7).	TC(12,7) TM(12,9)	
ICM Check Selection #	1 word	E	This parameter is an array of bit flags, each bit representing the Mode in which the associated parameter check must be applied. The least significant byte indicates: 0xxxxxx1 => Standby 0xxxxx1x => Standby Refuse 0xxxx1xx => Pause 0xxx1xxx => Pause Refuse 0xx1xxxx => Ready 0x1xxxxx => Test 01xxxxxx => Measurement	TC(12,161) TM(12,162) TC(12,163)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(12,9) TM(12,11) TM(12,162) TM(12,153) TM(12,155) TM(12,229)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(12,9) TM(12,11) TM(12,162) TM(12,153) TM(12,155) TM(12,229)	
Monitoring Status	1 byte	E	This indicates whether the overall monitoring is “enabled” or “disabled”.	TM(12,9) TM(12,162) TM(12,229)	
Maximum Reporting Delay	1 byte	E	The maximum reporting delay between a check transition occurring and the associated report (12,12) being made. It is not applicable to SES as (12,12) is not supported. Hence it is set to a fixed value of 0.	TM(12,9) TM(12,162)	
Parameter Value	2 words	UI	The parameter value of the Parameter #. A fixed 32-bit format. When the parameter size is less than 32-bits (e.g. 3-bits) the parameter value is reported in the least significant bits.	TM(12,11)	
Limit Crossed	2 words	UI	This is the value of the Low Limit, High Limit or Expected Value which has been crossed or violated. It has the same format and length as the value of the parameter itself. Hence a fixed 32-bit format. When the Limit Crossed size is less than 32-bits (e.g. 3-bits) the Limit Crossed value is reported in the least significant bits.	TM(12,11)	
Previous Checking Status	1 byte	E	This indicates the checking status of the parameter before the transition to the current checking status. The possible values are:	TM(12,11)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			0: Expected Value, Within Limits, Within Threshold 1: Unchecked 2: Invalid 3: unselected 4: Unexpected Value, Below Low Limit, Below Low Threshold. 5: Above High Limit, Above High Threshold.		
Current Checking Status	1 byte	E	This indicates the current checking status of the parameter. The possible values are as per Previous Checking Status.	TM(12,11)	
Transition Time	3 words	AT	The time at which the transition occurred, i.e. the time of the first sample used to elaborate the current checking status. Time format as per Figure 4.3-2.	TM(12,11)	
MDS ID	1 byte	UI	Identifier of the Monitoring Data Set (MDS)	TC (12,144) TC(12,145) TC(12,148) TC(12,149) TC(12,151) TC(12,152) TC(12,154) TM(12,153) TM(12,155)	
Monitoring ID	1 byte	UI	Identifier of the monitoring item,	TC(12,144) TC(12,145) TC(12,152) TM(12,153) TM(12,155)	
Out-of-Limit Status	1 byte	E	Specifies the limit that has been exceeded. 1 => Low threshold has been exceeded 2 => High threshold has been exceeded	TM(12,153)	
EN-DIS Status	4 bits	E	Enable/disable status of monitoring item. 0 => Disabled; 1 => Enabled.	TC(12,144) TC(12,145) TM(12,155)	
Repeat Flag	4 bits	E	Controls whether the confirmed out-of-range event is triggered continuously or only re-triggered after a back-in-limit event.	TC(12,144) TM(12,155)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			0 => only re-triggered after a back-in-limit eevent 1 => confirmed out-of-range event is triggered continuously.		
TAG ID	2 words	UI	TAG identifier of the Parameter in the TM Data Pool	TC(12,144)	
Validity Parameter 1	2 words	UI	TAG ID of the first Validity Parameter.	TC(12,144) TM(12,155)	
Validity Parameter 2	2 words	UI	TAG ID of the second Validity Parameter	TC(12,144) TM(12,155)	
Data Type	1 byte	E	Type of the parameter to be monitored. 1 => 16-Bit Unsigned Integer Value (including Bit and Byte value). 2 => 32-Bit Float value.	TC(12,144) TM(12,155)	
HK Filter	3 bytes	UI	Number of out-of-range consecutive samples for event signalling.	TC(12,144) TM(12,155)	
Low Threshold	2 words	UI	Low Threshold of the Validity Range.	TC(12,144) TM(12,155)	Note: The Expected Value can be achieved by setting Low Threshold and High Threshold the same value.
High Threshold	2 words	UI	High Threshold of the Validity Range.	TC(12,144) TM(12,155)	
Event Handler 1	1 word	UI	Identifier of the event triggered in case of confirmed out-of-range low.	TC(12,144) TM(12,155)	
Event Handler 2	1 word	UI	Identifier of the event triggered in case of confirmed out-of-range high.	TC(12,144) TM(12,155)	
Event Handler 3	1 word	UI	Identifier of the event triggered in case of back-in-limit.	TC(12,144) TM(12,155)	
MDS TC Option	1 bit	E	Specifies whether TC(12,148)/TC(12,149 act on MDS Disable/Enable Status or on the MDS Suspend/Resume Status. 0 => Disable/Enable MDS 1 => Suspend/Resume MDS (the Suspend state has a configurable time-out period). This feature has been designed to be used by the ASW only.	TC(12,148) TC(12,149)	

9.11 SERVICE 14 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
PID	7 bits	E	Identifies the destination process.	TC(14,1) TC(14,2) TM(14,4)	
N2	1 word	UI	The number of specified Types of the PID. When N2=0 indicates all Types and associated Subtypes of the PID.	TC(14,1) TC(14,2) TM(14,4)	
N3	1 word	UI	The number of specified Subtypes of the Type of the PID. When N3=0 indicates all Subtypes of the Type of the PID.	TC(14,1) TC(14,2)	
N	1 word	UI	The number of specified SID.	TC(14,144) TC(14,145) TM(14,146) TC(14,147) TC(14,148) TM(14,149)	
Type	1 byte	E	PUS Service Type.	TC(14,1) TC(14,2) TM(14,4)	
Subtype	1 byte	E	Subtype of the PUS Service Type.	TC(14,1) TC(14,2) TM(14,4)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(14,4)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(14,4)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
SID	1 word	E	The unique structure identification associated to a housekeeping or diagnostic parameter report.	TC(14,144) TC(14,145) TM(14,146) TC(14,147) TC(14,148) TM(14,149)	

9.12 SERVICE 15 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N	1 word	UI	The number of packet stores to be controlled or reported. By convention, N = 0 means “all packet stores”.	TC(15,1) TC(15,2) TC(15,11) TC(15,12) TC(15,129) TC(15,144) TC(15,146) TC(15,147) TM(15,224) TC(15,225) TC(228)	
Store ID	1 word	E	A packet store is uniquely identified by a “Store ID”.	TC(15,1) TC(15,2) TC(15,3) TC(15,4) TC(15,5) TM(15,6) TC(15,9) TC(15,11) TC(15,128) TC(15,129) TC(15,144) TC(15,146) TC(15,147) TC(15,149) TM(15,224) TC(15,225) TC(15,226) TC(15,227) TC(15,228) TC(15,233) TC(15,234)	
Store ID – Pol.H	1 word	E	Specifies the Packet Store where the pass-through H-Polarisation is performed.	TC(15,229) TC(15,227)	
Store ID – Pol.V	1 word	E	Specifies the Packet Store where the pass-through H-Polarisation is performed	TC(15,229) TC(15,227)	
PID	7 bits	E	The identification of the application process which is addressed by the TC or which has generated the TM packet.	TC(15,3) TC(15,4) TM(15,6)	
N2	1 word	UI	The number of specified Types of the PID. When N2=0 indicates all Types and associated Subtypes of the PID.	TC(15,3) TC(15,4) TM(15,6)	
N3	1 word	UI	The number of specified Subtypes of the Type of	TC(15,3) TC(15,4) TM(15,6)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			the PID. When N3=0 indicates all Subtypes of the Type of the PID.		
Type	1 byte	E	PUS Service Type.	TC(15,3) TC(15,4) TM(15,6)	
Subtype	1 byte	E	Subtype of the PUS Service Type.	TC(15,3) TC(15,4) TM(15,6)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(15,6) TM(15,224)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(15,6) TM(15,224)	
Time Span	1 word	E	Type of Packet Range. It can be: 0 => All (Full contents of the Packet Store); 1=> Between (Set of packets whose storage time are between Storage Time 1 and Storage Time 2 inclusive); 2 => Before (Set of packets whose storage time are less then or equal to Storage Time 1); 3 => After (Set of packets whose storage time are greater then or equal to Storage Time 1)	TC(15,9)	
Storage Time 1	3 words	AT	The absolute time defining the lower boundary of the range of packets for downlink. Storage Time 1 is not used (i.e. is don't care) when Time Span is set to "All". Storage Time 1 format is as per Figure 3.5-2.	TC(15,9) TC(15,149)	
Storage Time 2	3 words	AT	The absolute time defining the upper boundary of the range of packets for downlink. Storage Time 2 is only used when Time Span is set to	TC(15,9) TC(15,149)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			"Between". Storage Time 2 format is as per Figure 3.5-2.		
APID 1	11 bits	E	Specified TM Packet 1 APID	TC(15,149)	
Source Sequence Count 1	14 bits	UI	Specified TM Packet 1 Source Sequence Count	TC(15,149)	
APID 2	11 bits	E	Specified TM Packet 2 APID	TC(15,149)	
Source Sequence Count 2	14 bits	UI	Specified TM Packet 2 Source Sequence Count	TC(15,149)	
End Time	3 words	AT	The absolute time defining the upper boundary (inclusive) of the packet range to be deleted. End Time format is as per Figure 3.5-2.	TC(15,11)	
Time	3 words	AT	The absolute time defining the storage time from where the next read operation will start. Time parameter format is as per Figure 3.5-2.	TC(15,128)	
Address	2 words	UI	Specifies the physical start address of the Packet Store.	TC(15,144)	
Mode	1 word	E	The Packet Store mode of operation. 0 => Not overwrite mode 1 => Overwrite mode.	TC(15,144)	
Size	2 words	UI	SMU Packet Store size in bytes.	TC(15,144)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
TMM Identifier	1 word	E	SMU TMM Module Identifier, where: 1 = TMM-1 2 = TMM-2	TC(15,150)	
MM Identifier	1 word	E	SMU Mass Memory identifier, where: 0 = Local 1 = Partner	TC(15,144) TC(15,151) TC(15,152) TC(15,153) TC(15,154) TC(15,155) TC(15,156) TC(15,157) TC(15,159)	
End Address	2 words	UI	Specifies the memory area to scrub where the specified End Address is not scrubbed but all addresses from start address which is fixed to address 00000000_{16} until the last address before the end address is scrubbed. The scrubber burst length is 16 bytes and the selected address range must be aligned with the burst length.	TC(15,152)	
Scrubbing Rate	2 words	UI	Specifies the memory scrubbing access rate, that is the number of clock cycles between the start of each 16 bytes burst access.	TC(15,152) TM(15,160)	
Position 0 Bank ID	2 words	E	Position 0 Bank identifier	TC(15,155)	
Position 1 Bank ID	2 words	E	Position 1 Bank identifier	TC(15,155)	
Position 2 Bank ID	2 words	E	Position 2 Bank identifier	TC(15,155)	
Position 3 Bank ID	2 words	E	Position 3 Bank identifier	TC(15,155)	
Start Address	2 words	UI	Mass Memory start address.	TC(15,156) TC(15,158)	
End Address	2 words	UI	Mass Memory end address.	TC(15,156) TC(15,158)	
Pattern Type	2 words	E	Mass Memory pattern type to be used for the filling / checking operations, where: 0 = Fixed 1 = Random	TC(15,156) TC(15,158)	
Pattern Value	2 words	UI	Mass Memory filling / checking pattern value.	TC(15,156) TC(15,158)	
EDAC Function Status	2 words	E	The status of the EDAC function, where: 0 = Disabled.	TM(15,160)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			1 = Enabled.		
Memory Scrubbing Status	2 words	E	The status of the memory scrubbing function, where: 0 = Disabled 1 = Enabled.	TM(15,160)	
First Address after Scrub Area	2 words	UI	First address after the defined scrubbing area.	TM(15,160)	
Current Scrubber Address	2 words	UI	The current scrubber address.	TM(15,160)	
N° of Words Corrected Bank 0	1 byte	UI	Number of words corrected by scrubber for bank 0.	TM(15,160)	
N° of Words Corrected Bank 1	1 byte	UI	Number of words corrected by scrubber for bank 1.	TM(15,160)	
N° of Words Corrected Bank 2	1 byte	UI	Number of words corrected by scrubber for bank 2.	TM(15,160)	
N° of Words Corrected Bank 3	1 byte	UI	Number of words corrected by scrubber for bank 3.	TM(15,160)	
First Failing Address	2 words	UI	The address of the first failing word accessed by scrubber or cache since last read-out.	TM(15,160)	
Validity of First Failing Address	2 words	E	Validity of First Failing Address.	TM(15,160)	
MM Process Status	1 word	E	Mass Memory process status, where: 0 = On Going 1 = Completed 2 = Aborted 3 = Forced Abort	TM(15,161) TM(15,162)	
MM Current Address	2 words	UI	Mass Memory current address	TM(15,161) TM(15,162)	
MM Check Status	2 words	E	Mass Memory check status report, where: 0 = no mismatch 1 = mismatch.	TM(15,161) TM(15,162)	
Free Sector Count	1 word	UI	Number of Sectors (4 MB) available for storage.	TM(15,224)	
Overwrite Status	1 bit	E	Specifies whether the PS is in overwrite status or not. 0 => Not Overwritten; 1 => Overwritten	TM(15,224)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Packet Store Type	1 bit	E	Reports the PS Type: Bounded or Circular 0 => Bounded; 1 => Circular	TM(15,224) TC(15,226)	
Virtual Channel ID	6 bits	E	Reports the PS associated Virtual Channel	TM(15,224) TC(15,226)	
EN-DIS Status	1 bit	E	Reports the PS enable/disable status 0 => Disabled; 1 => Enabled	TM(15,224)	
OK-NOK Status	1 bit	E	Reports the OK-NOK status of PS in terms of correctness of data content 0 => OK; 1 => NOK.	TM(15,224)	
Start Pointer	1 word	UI	Absolute logical addresses expressed as number of sectors (4 MB).	TM(15,224)	
Write Pointer	1 word	UI	Absolute logical addresses expressed as number of sectors (4 MB).	TM(15,224)	
Read Pointer	1 word	UI	Absolute logical addresses expressed as number of sectors (4 MB).	TM(15,224)	
PS Size	1 word	UI	Reports PS filled memory area expressed in sectors (4 MB)	TM(15,224)	
Max Size	1 word	UI	Reports the maximum number of sectors that the Packet Store is allowed to contain. It is expressed in number of sectors (4 MB). A minimum size of 3 sectors is required.	TC(15,226)	
	1 bit	E	Interleaved downlink on H-Polarisation Flag. 0 = Not Active, 1 = Active	TC(15,229)	
	1 bit	E	Interleaved downlink on V-Polarisation Flag. 0 = Not Active, 1 = Active	TC(15,229)	
SDI Within Time-Out Flag	1 bit	E	Establishes whether to use the default value or the value specified in the telecommand for the time-out value between successive source packets. 0 => Default value; 1 => New value.	TC(15,227) TC(15,229)	
SDI Initial Time-Out Flag	1 bit	E	Establishes whether to use the default value or the value specified in the telecommand for the time-out value for the first source packet of the	TC(15,227) TC(15,229)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			Data Take. 0 => Default value; 1 => New value.		
Enable Store – Pol. V	1 bit	E	Specifies whether to perform or not the store of SAR Data V-Polarisation. 0 => No Store; 1 => Store.	TC(15,227)	
Enable Store – Pol. H	1 bit	E	Specifies whether to perform or not the store of SAR Data H-Polarisation. 0 => No Store; 1 => Store.	TC(15,227)	
Initial Time Out Value	1 word	UI	Initial Time Out value to be used when the “SDI Initial Time-Out Flag” is set to “New Value”. The Initial Time Out Value is the time-out for the first source packet of a Data Take.	TC(15,227) TC(15,229)	
Within Time Out Value	1 word	UI	Within Time Out value to be used when the “SDI Within Time-Out Flag” is set to “New Value”. The Within Time Out Value is the time-out between successive source packets of a Data Take.	TC(15,227) TC(15,229)	
Number of Sectors	1 word	UI	Specifies the total number of sectors (4MB) to be downlinked	TC(15,228)	
SIGN Fill Data	7 bits	UI	Reserved. Set to zero.	TC(15,228) TC(15,230)	
SIGN Fill Data - Pol. H	7 bits	UI	Reserved. Set to zero.	TC(15,229)	
SIGN Fill Data – Pol. V	7 bits	UI	Reserved. Set to zero.	TC(15,229)	
Carrier Selection	1 bit	E	Downlink carrier selection. L1 or L2. 0 => Select L1; 1 => Select L2	TC(15,228) TC(15,230)	
Carrier Selection – Pol. H	1 bit	E	Downlink carrier selection for pass-through H-Polarisation. L1 or L2. 0 => Select L1; 1 => Select L2	TC(15,229)	
Carrier Selection – Pol. V	1 bit	E	Downlink carrier selection for pass-through V-Polarisation. L1 or L2. 0 => Select L1; 1 => Select L2	TC(15,229)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Data Strategy	1 bit	E	Selects if to retain or delete data after downlink of the Packet Store. 0 => Retain; 1 => Delete.	TC(15,228)	
Data Strategy – Pol. H	1 bit	E	Selects if to retain or delete data after downlink H-Polarisation. 0 => Retain; 1 => Delete	TC(15,229)	
Data Strategy – Pol. V	1 bit	E	Selects if to retain or delete data after downlink V-Polarisation 0 => Retain; 1 => Delete	TC(15,229)	
Read Pointer Setting	1 bit	E	Specifies if to enable or disable the setting of the Read Pointer to the last sector downlinked 0 => Disabled; 1 = Enabled.	TC(15,228)	
Enable Pass Through V-Polarisation	1 bit	E	Specifies whether to perform or not the pass-through of V-Polarisation 0 => No Pass Through; 1 => Pass Through	TC(15,229)	
Enable Pass Through H-Polarisation	1 bit	E	Specifies whether to perform or not the pass-through of H-Polarisation 0 => No Pass Through; 1 => Pass Through	TC(15,229)	
Pass Through Delay V-Polarisation	1 word	E	Specifies the delay before pass-through V-Polarisation start. Delay defined in steps of 125 ms. Max delay is 12 minutes.	TC(15,229)	
Pass Through Delay H-Polarisation	1 word	E	Specifies the delay before pass-through H-Polarisation start. Delay defined in steps of 125 ms. Max delay is 12 minutes	TC(15,229)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Pass Through Time Duration V-Polarisation	1 word	E	Specifies the time to be considered for downlink phase of pass-through V-Polarisation. Time defined at 125 ms steps. Max time is 20 minutes.	TC(15,229)	
Pass Through Time Duration H-Polarisation	1 word	E	Specifies the time to be considered for downlink phase of pass-through H-Polarisation. Time defined at 125 ms steps. Max time is 20 minutes.	TC(15,229)	
Interleaved DL PS ID - Pol. H	1 word	E	Interleaved downlink Packet Store ID on H-Polarisation.	TC(15,229)	
Interleaved DL PS ID - Pol. V	1 word	E	Interleaved downlink Packet Store ID on V-Polarisation.	TC(15,229)	
Overwriting BITE	1 bit	E	Specifies whether to perform BITE with overwriting data or not. 0 => Overwriting OFF; 1 => Overwriting ON	TC(15,230)	
Memory Module On/Off Switch	1 bit	E	Specifies whether to perform BITE with or without selection of the Memory Module. 0 => Without selection of Memory Module 1 => Select Memory Module	TC(15,230)	
Memory Module Selection	3 bit	E	Specifies the Memory Module to perform BITE. 0 => MM-0; 1 => MM-1; 2 => MM-2; 3 => MM-3; 4 => MM-4; 5 => MM-5; 6 => MM-6; 7 => MM-7	TC(15,230)	
BITE Filler Word	1 word	UI	Provides the 16-bits data sequence to be cyclically stored in one memory module for the data downlink.	TC(15,230)	
Test Abort	1 bit	E	Specifies whether to continue or abort an on-going memory module test. 0 => Continue; 1 => Abort	TC(15,232)	
BITE Abort	1 bit	E	Specifies whether to continue or abort an on-going BITE. 0 => Continue; 1 => Abort	TC(15,232)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
SAR Data Store Abort V-Pol	1 bit	E	Specifies whether to continue or abort an on-going Store from SAR V-Polarisation. 0 => Continue; 1 => Abort	TC(15,232)	
SAR Data Store Abort H-Pol	1 bit	E	Specifies whether to continue or abort an on-going Store from SAR H-Polarisation 0 => Continue; 1 => Abort	TC(15,232)	
L2 Downlink Abort	1 bit	E	Specifies whether to continue or abort an on-going L2 downlink 0 => Continue; 1 => Abort	TC(15,232)	
L1 Downlink Abort	1 bit	E	Specifies whether to continue or abort an on-going L1 downlink 0 => Continue; 1 => Abort	TC(15,232)	
Pass Through Abort V-Pol	1 bit	E	Specifies whether to continue or abort an on-going V-Polarisation pass-through 0 => Continue; 1 => Abort	TC(15,232)	
Pass Through Abort H-Pol	1 bit	E	Specifies whether to continue or abort an on-going H-Polarisation pass-through 0 => Continue; 1 => Abort	TC(15,232)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Sectors Shift	1 word	E	Specifies the position to move the Read Pointer. It can be moved back a specified number of sectors or moved to the first sector of the non deleted sectors (0000 value) or forward to the last sector stored (FFFF value) i.e. to the Write Pointer sector.	TC(15,233)	

9.13 SERVICE 18 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
OBOP ID	2 words	E	Identifies an Onboard Operation Procedure (OBOP). Note: The OBOP ID is applicable to both the ASW and ICM. ICM supports only 32 OBOP and OBOP ID value also assigns a priority where the lower numbers have a higher priority. The ASW has structured the OBOP ID into two sub-fields Section ID and Procedure ID to indicate the storage area. Hence S1 Specific PUS refers only to the generic OBOP ID applicable to ICM and ASW.	TC(18,144) TC(18,160) TC(18,2) TC(18,3) TC(18,4) TM(18,146) TC(18,130) TC(18,147) TC(18,148) TM(18,164) TM(18,163) TM(18,11) TM(18,150)	
Commands in OBOP	1 word	UI	Total number of commands in OBOP.	TC(18,144) TM(18,150)	
Command Offset	1 word	UI	First command in OBOP to be modified or dumped	TC(18,144) TM(18,150)	
N	1 word	UI	Number of commands in the TC or TM packet which are to be Add/Modify in the OBOP or are reported respectively.	TC(18,144) TM(18,150)	
OBCD Command ID	2 words	E	Identifier of the command in the OnBoard Command Data Base	TC(18,144)	
Time Delay	2 words	UI	Time delay before the scheduling and execution of the command of the OBOP. It is defined as number of 125 ms increments.	TC(18,144)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Execution Delay	1 byte	UI	Defines the time delay in 125 ms increments before executing the associated telecommand in the active OBOP. A value of zero will be interpreted as no delay.	TC(18,160) TM(18,164)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(18,146) TM(18,163) TM(18,164) TM(18,11) TM(18,150)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(18,146) TM(18,163) TM(18,164) TM(18,11) TM(18,150)	
NPROC	1 word	UI	Number of OBOP	TM(18,146) TTC(18,147) TC(18,148) TM(18,11)	
Status	1 word	E	Enable / disable status of OBOP 1 => Enabled; 2 => Disabled	TM(18,146)	
Current Step ID	1 byte	UI	Gives the current Procedure Step of an OBOP that is either Suspended or Executing. A value of zero indicates that the OBOP is either undefined or inactive.	TM(18,163)	
OBOP (i) Status	1 byte	E	Gives the current status of an Onboard Operation Procedure as stored within the SES OBOP Database (where i = 0..31). The OBOP has a priority assigned based on its ID number where a lower number equals a higher priority i.e. 0 = highest; 255 = lowest. SES supports a maximum of 32 OBOPs. 0 => Undefined 1 => Inactive	TM(18,163)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
			2 => Suspended 3 => Active 4 => Pending		
NSTEPS	1 word	UI	The number of OBOP Procedure Steps (comprising the Step number, Execution Delay, TC Packet and Packet Word count) defined in the telemetry packet.	TM(18,164)	
Step ID	1 byte	UI	Specifies the Procedure Step number in the associated OBOP at which the telecommand defined within the current telecommand packet will be inserted	TC(18,160) TM(18,164)	
No. of TC Packet Words	1 word	UI	Number of TC Packet words contained in the telemetry packet	TM(18,164) TC(18,160)	
Step	1 word	UI	OBOP command step	TM(18,11)	
Parameter #	2 words	UI	The identification of a parameter.	TC(18,149)	
Low Limit	2 words	UI	Low limit value	TC(18,149)	
High Limit	2 words	UI	High limit value.	TC(18,149)	
Data Type	1 word	E	Type of the parameter to be checked. 0 => 32-bit Unsigned Integer 1 => 32-bit Signed Integer 2 => 32-bit Floating Point 3 => 16-bit Unsigned Integer 4 => 16-bit Signed Integer 5 => 8-bit Unsigned Integer 6 => 8-bit Signed Integer	TC(18,149)	
Step Offset	1 word	SI	Number of OBOP Step to be jumped. It is a signed value.	TC(18,149)	
Section ID	1 word	E	Section ID identifies one of the two sections of the On Board Command Database (OBCD)	TM(18,150)	
Command ID	1 word	E	Command ID uniquely identifies the TC in the Section ID	TM(18,150)	

9.14 SERVICE 19 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N	1 word	UI	The number of RID contained in the telecommand or the number of Event Detections listed in the telemetry report.	TC(19,1) TC(19,2) TC(19,4) TC(19,5) TM(19,7) TC(19,160)	
RID	1 word	E	The Report ID identifies a specific event report.	TC(19,1) TC(19,2) TC(19,4) TC(19,5) TM(19,7) TC(19,128) TM(19,129) TC(19,160) TC(19,158)	
TC Packet	variable	OS	Complete TC packet	TC(19,1) TC(19,160)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(19,7) TM(19,129) TM(19,149) TM(19,151) TM(19,153) TM(19,155)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(19,7) TM(19,129) TM(19,149) TM(19,151) TM(19,153) TM(19,155)	
Action Status	1 word	E	Indicates whether an Event Action associated with a RID is enabled or disabled.	TM(19,7)	
N° of TC Packet Words	1 word	UI	Provides the number of words contained of the TC packet which in TM(19,129) can be part of a TC packet whereas in TC(19,160) is a complete TC packet.	TM(19,129) TC(19,160)	
First RID	1 word	E	First RID to be modified.	TC(19,144) TC(19,145) TM(19,149) TM(19,151) TM(19,153) TM(19,155)	
First Event	1 word	E	First Event to be modified.	TC(19,146) TC(19,147)	
N Records	1 word	UI	Number of RID-Event Table elements	TC(19,144) TC(19,145)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
				TC(19,146) TC(19,147) TM(19,149) TM(19,151) TM(19,153) TM(19,155)	
OK Event ID	1 word	E	Defines the Event identifier that links the RID for the case of an OK condition (NOK to OK transition).	TC(19,144) TM(19,149)	
NOK Event ID	1 word	E	Defines the Event identifier that links the RID for the case of a NOK condition (OK to NOK transition).	TC(19,144) TM(19,149)	
RID Status	1 byte	E	Enable / Disable Status of RID. 0 => Disabled; 1 => Enabled.	TC(19,145) TM(19,151)	
Last OK/NOK Condition	1 byte	E	Status of the last occurrence of the RID where the last occurrence can be OK (within limits) or NOK (out-of-limits). It is used if the event is to be raised on RID status change instead of on RID occurrence. The selection is established by the application requesting the service and not by Ground configuration. 0 => NOK; 1 => OK.	TC(19,145) TM(19,151)	
RECO 1 Filter	1 byte	UI	Confirmation threshold for the first level of recovery. That is, the number of events which must be received to trigger the recovery.	TC(19,146) TM(19,153)	
RECO 2 Filter	1 byte	UI	Confirmation threshold for the second level of recovery. It specifies a delta value with respect to RECO 1 Filter.	TC(19,146) TM(19,153)	
RECO 3 Filter	1 byte	UI	Confirmation threshold for the third level of recovery It specifies a delta value with respect to RECO 2 Filter.	TC(19,146) TM(19,153)	
Event Handler Enable /Disable	1 bit	E	Event handler enable / disable. 0 => Disabled; 1 => Enabled.	TC(19,146) TM(19,153)	
Recovery Action Enable /Disable	1 bit	E	Recovery action enable / disable. 0 => Disabled; 1 => Enabled.	TC(19,146) TM(19,153)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Telemetry Enable /Disable	1 bit	E	Telemetry enable / disable. 0 => Disabled; 1 => Enabled.	TC(19,146) TM(19,153)	
Suspend MDS RECO 1	1 bit	E	Flag to suspend MDS after first level of recovery.	TC(19,146) TM(19,153)	
Disable Monitoring RECO 1	1 bit	E	Flag to disable Monitoring after first level recovery. 0 => Disabled; 1 => Enabled.	TC(19,146) TM(19,153)	
Suspend MDS RECO 2	1 bit	E	Flag to suspend MDS after second level of recovery. 0 => Disabled; 1 => Enabled	TC(19,146) TM(19,153)	
Disable Monitoring RECO 2	1 bit	E	Flag to disable Monitoring after second level recovery. 0 => Disabled; 1 => Enabled.	TC(19,146) TM(19,153)	
Suspend MDS RECO 3	1 bit	E	Flag to suspend MDS after third level of recovery. 0 => Disabled; 1 => Enabled	TC(19,146) TM(19,153)	
Disable Monitoring RECO 3	1 bit	E	Flag to disable Monitoring after third level recovery. 0 => Disabled; 1 => Enabled	TC(19,146) TM(19,153)	
Nominal / Recovery Flag	1 bit	E	Flag indicates if Nominal or Recovery.	TC(19,146) TM(19,153)	
RECO 1 Type	2 bits	E	Specifies the first level recovery executor where it can be an OBCD telecommand, OBCP or Ada Coded procedure	TC(19,146) TM(19,153)	
RECO 2 Type	2 bits	E	Specifies the second level recovery executor where it can be an OBCD telecommand, OBCP or Ada Coded procedure	TC(19,146) TM(19,153)	
RECO 3 Type	2 bits	E	Specifies the third level recovery executor where it can be an OBCD telecommand, OBCP or Ada Coded procedure	TC(19,146) TM(19,153)	
RECO 1 ID	2 words	E	Identifier of the Recovery Action for the first level recovery.	TC(19,146) TM(19,153)	
RECO 2 ID	2 words	E	Identifier of the Recovery Action for the second level recovery	TC(19,146) TM(19,153)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
RECO 3 ID	2 words	E	Identifier of the Recovery Action for the third level recovery	TC(19,146) TM(19,153)	
Fail Mark Data	2 words	E	Identifies where the Fail Hardware Channel information has to be stored. It is identified by a Tag ID.	TC(19,146) TM(19,153)	
Fail Mark Level	1 word	E	Level of recovery when the “Failed Hardware Channel” has to be set. It can be: 0 => the condition has not to be set 1-3 => level of recovery	TC(19,146) TM(19,153)	
Status of Event-Action Entry	1 word	E	Enable / disable status of the Event Action Table entry. 0 => Disabled; 1 => Enabled	TC(19,147)	
Event E/D Status	1 byte	E	Event enable / disable status. 0 => Disable; 1 => Enable	TM(19,155)	
Action E/D Status	1 byte	E	Action enable / disable status. 0 => Disable; 1 => Enable	TM(19,155)	
Error Code	1 word	E	Error code relevant to the RID to be raised.	TC(19,158)	
MDS ID	1 byte	UI	Identifier of the Monitoring Data Set (MDS)	TC(19,158)	
Monitoring ID	1 byte	UI	Identifier of the monitoring item,	TC(19,158)	
Auxiliary Data	2 words	UI	Auxiliary data relevant to the RID to be raised.	TC(19,158)	

9.15 ERVICE 130 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Section ID	1 word	E	Section ID identifies one of the two spare sections of the On Board Command Database (OBCD)	TC(130,1) TC(130,5) TM(130,6) TC(130,7) TC(130,8) TC(130,9) TC(130,10) TM(130,12)	
Command ID	1 word	E	Command ID uniquely identifies the TC in the Section ID	TC(130,1) TC(130,5) TM(130,6) TC(130,7) TC(130,8) TC(130,9)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
				TC(130,10) TM(130,12)	
Free Memory	1 word	UI	Size in 16 bit words of the free space in the spare section of the OBCD.	TM(130,4)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(130,6) TM(130,12)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(130,6) TM(130,12)	
N° of TC Packet Words	1 word	UI	Number of words of the TC Packet of the OBCD being dumped contained in the telemetry packet	TM(130,6)	
N	1 word	UI	Number of TC status contained in the telemetry report.	TM(130,12)	
TC Enable / Disable Status	1 word	E	The OBCD TC enable / disable status. 0 => Disabled; 1 => Enabled	TM(130,12)	

9.16 SERVICE 132 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N1	1 word	UI	Number of records that follow.	TC(132,1) TC(132,2) TC(132,6) TC(132,144) TM(132,19)	
Sub-Schedule ID	11-bits	E	Identifies a set of TC which have been linked by Ground by assigning the same Sub-Schedule identifier (SSID) for operational convenience. Setting Subshedule ID to 0 for TC(132,1), TC(132,2) and TC(132,6) means all SSID.	TC(132,1) TC(132,2) TC(132,6) TM(132,10) TM(132,13) TM(132,19)	
N2	1 word	UI	The number records that follow.	TC(132,1) TC(132,2)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
				TM(132,19)	
PID	7 bits	E	Identifies the destination process.	TC(132,1) TC(132,2) TC(132,5) TC(132,144) TC(132,16) TM(132,19)	
N	1 word	UI	The number of records that follow.	TC(132,5) TM(132,13)	
Packet Sequence Count	14 bits	UI	Specifies the sequence count of the first telecommand packet in the Position Tag Schedule with the specified PID which is to be deleted or dumped.	TC(132,5) TC(132,16)	
Number of Telecommands	1 word	UI	The number of successive telecommand packets in the Position Tag Schedule from the specified telecommand packet which are to be deleted.	TC(132,5)	
Range	1 word	E	Indicates the position interval where: 0 => All - from the beginning to the end of the command schedule. 1 => Between – between Position Tag 1 and Position Tag 2 inclusive 2 => Before - less than or equal to Position Tag 1 3 => After - greater than or equal to Position Tag 1	TC(132,6) TC(132,144)	
Position Tag 1	3 words	Fig. 3.6-2	Position Tag 1 which is used when Range specifies “Between”, “Before” or “After”. It is not used (i.e. don’t care) when Range specifies “All”. The Position Tag 1 format is as per Figure 3.6-2.	TC(132,6) TC(132,144)	
Position Tag 2	3 words	Fig. 3.6-2	Position Tag 2 which is only used when Range specifies “Between”. It is not used (i.e. don’t care) when Range specifies “All”, Before” or “After”. The Position Tag 2 format is as per Figure 3.6-2.	TC(132,6) TC(132,144)	

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(132,10) TM(132,13) TM(132,19)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(132,10) TM(132,13) TM(132,19)	
Position Tag	3 words	Fig. 3.6-2	The Position Tag value of the TC Packet being reported either in detailed form or summary form. The Position Tag format is as per Figure 3.6-2.	TM(132,10) TM(132,13)	
N° of TC Packet Words	1 word	UI	Number of 16-bit words of the TC Packet contained in the telemetry report	TM(132,10)	
TC Packet Header	3 words	OS	TC Packet Header of the TC in PT-TC Schedule.	TM(132,13)	
TC Packet Data Field Header	2 words	OS	TC Packet Data Field of the TC in PT-TC Schedule	TM(132,13)	
Status	1 bit	E	Enable / disable status. 0 => Disabled; 1 => Enabled	TM(132,19)	

9.17 SERVICE 133 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
Arm TC Packet	variable	OS	The TC contained in TC(133,1) to be "Armed" onboard and only executed on reception of the corresponding TC(133,5) Fire TC.	TC(133,1)	
Last Packet	1 bit	E	Indicates when the last packet has been reached in the telemetry report which could be composed of a sequence of multiple packets. The sequence order of the telemetry packets is provided by the Report Integrity Counter. 0 => Continuation Packet; 1 => Final Packet	TM(133,3)	
Report Integrity Counter	15 bits	UI	Provides the sequence order of the telemetry packets composing a telemetry report. The last packet of the sequence is provided by the Last Packet field.	TM(133,3)	
N° of TC Packet Words	1 word	UI	Number of words of the Arm TC Packet which are contained in the telemetry report	TM(133,3)	
Arm TC Packet Words	variable	OS	Part or the complete Arm TC packet which is contained in the telemetry report	TM(133,3)	
Arm TC Packet Header	3 words	OS	TC Packet Header of the Arm TC	TC(133,5)	
Arm TC Packet Data Field Header	2 words	OS	TC Packet Data Field of the Arm TC	TC(133,5)	

9.18 SERVICE 134 PARAMETERS

PARAMETER	SIZE	TYPE	DESCRIPTION	USED BY	REMARKS
N° of TC Packets (P)	1 word	UI	The number of TC Packets contained in the TC	TC(134,1)	
TC Packet-P	variable	OS	One of the TC Packets contained in TC(134,1)	TC(134,1)	

DISTRIBUTION LIST

Name	Q.ty	Name	Q.ty
M. Masci	1	ESA	1
G. Campolo	1	ASTRIUM	1
F. Cesaro	1	TASI-MI DSHA Team	1
D. Pascucci	1	TASI-RM PDHT Team	1
G. Altini	1	TASI-RM AVS Team	1
M. L'Abbate	1		
P. Venditti	1		
R. Croci	1		
A. Panetti	1		

END OF DOCUMENT