

Title: **FORMAT OF STR & GPS TELEMETRY TO BE
PROCESSED BY PDGS**

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1 INTRODUCTION

1.1 Scope of the Document

Information of the format and content of housekeeping telemetry packets is distributed over several documents generated by both ASD as the EarthCARE prime and its suppliers. At the EarthCARE system CDR it was pointed out that aggregation of the information subset required by the PDGS for the purpose of position and attitude processing is nontrivial.

The present document aims at aggregating all information required for the ground processing of position and attitude information recorded in-orbit.

1.2 References

1.2.1 Applicable Documents

1.2.2 Reference Documents

[RD 01]	Abbreviation List	EC.LI.ASD.SY.00001
[RD 02]	EarthCARE Packet Utilization Standard	EC.STD.ASD.SY.00001, Issue 9
[RD 03]	STR PUS ICD	GS2.ICD.JOP.STR.02402, Issue 5/f
[RD04]	Sentinel GPSR Measurement Data Interface Specification	S1-IF-AAE-SC-0002, Issue 13
[RD05]	Sentinel GPSR Command and Housekeeping Data Interface Specification	S1-IF-AAE-SC-0001, Issue 22
[RD06]	Satellite Operability Report	EC.RP.ASD.SY.00167, Issue 2

1.2.3 Normative Documents

1.3 Definitions

1.4 Abbreviations

General EarthCARE abbreviations are in [RD 01].

Specific abbreviations used in this document are given below.

STR	Star Tracker
GPSR	Global Positioning System Receiver

2 STR & GPS TELEMETRY DOCUMENTATION FOR PDGS

All STR and GPS HK packets which can be useful as input to the ground processing are distributed as Housekeeping Parameter Reports by Service (3,25). These packets are also the only HKTM packets nominally stored in the OBC/MMFU and sent to ground. Private services, e.g. GPS service (212,1) packets will nominally be disabled, or not routed to real packet stores.

The available (3,25) reports per Unit are listed in section 3.3 of the Satellite Operability Report (EC.RP.ASD.SY.00167), see export of this document (with original section numbers) below:

3.3.8 STR_A

Table 3-26: Service 3 Housekeeping and Diagnostic TM (STR_A)

Type	Structure ID	SRDB Name	TM Packet Description
TM(3,25)	1	SSY_HK_35502	TM_SDB_1
TM(3,25)	105	SSY_HK_35501	TM_ADB_1
TM(3,25)	105	SSY_HK_35501	TM_ADB_1
TM(3,26)	128	SSY_HK_35506	TM_EDB_1
TM(3,26)	188	SSY_HK_35504	TM_PDB_1

Note1: TM_ADB_1 is duplicated while TM_TDB_1 is missing, will be corrected with next document update.

Note2: Only TM_ADB and TM_SDB will be enabled by default.

3.3.9 STR_B

Table 3-27: Service 3 Housekeeping and Diagnostic TM (STR_B)

Type	Structure ID	SRDB Name	TM Packet Description
TM(3,25)	1	SSY_HK_35652	TM_SDB_2
TM(3,25)	105	SSY_HK_35651	TM_ADB_2
TM(3,25)	106	SSY_HK_35653	TM_TDB_2
TM(3,26)	128	SSY_HK_35656	TM_EDB_2
TM(3,26)	188	SSY_HK_35654	TM_PDB_2

3.3.10 GPS_A

Table 3-28: Service 3 Housekeeping TM (GPS_A)

Type	Structure ID	SRDB Name	TM Packet Description
TM(3,25)	HOUSEKEEPING	GSY_HK_37085	N_HK_Diag_Report_HousekeepingReport GPSR-A
TM(3,25)	NAV_SOL	GSY_HK_37086	N_HK_Diag_Report_NavigationSolution GPSR-A
TM(3,25)	TIME_CORR	GSY_HK_37087	N_TM_HK_Diag_Report_TimeCorrelation GPSR-A

Note: Structure IDs replaced by symbolic names, will be corrected with next document update.

3.3.10 GPS_B

Table 3-29: Service 3 Housekeeping TM (GPS_B)

Type	Structure ID	SRDB Name	TM Packet Description
TM(3,25)	HOUSEKEEPING	GSY_HK_37206	R_HK_Diag_Report_HousekeepingReport GPSR-B
TM(3,25)	NAV_SOL	GSY_HK_37207	R_HK_Diag_Report_NavigationSolution GPSR-B
TM(3,25)	TIME_CORR	GSY_HK_37208	R_TM_HK_Diag_Report_TimeCorrelation GPSR-B

The detailed content of the HK packets is defined in section 7.2 of GS2.ICD.JOP.STR.02402 for the StarTrackers and in section 5.4.1 of S1-IF-AAE-SC-0002 for the GPS. For GPS the information from tables 5-1 (Data Header Format) and 5-2 (Navigation Solution Data Record Format) needs to be combined. The HOUSEKEEPING TM of the GPS is defined in section 5.3.5. of S1-IF-AAE-SC-0001, which also contains a number of format definitions used in the HKTM packets.

The content of the Packet Header & Trailer and the Data Field Header information is defined in section 2.4 of the EarthCARE packet utilisation standard, EC.STD.ASD.SY.00001.

For nominal position and attitude processing, only the TM_ADB_n packets of the StarTrackers and the NAV_SOL packets of the active GPS receiver are required, the other packets contain mainly status information relevant for FOS, but potentially relevant for more detailed performance assessments.

Table 2-1: List of required and potential telemetry packets for position & attitude processing

Type	PRID	PCAT	SID	Length (Byte)	SRDB Name	Description	Nominal Frequency
Packets required for PDGS position & attitude processing							
(3,25)	37	6	105	59	SSY_HK_35501	TM_ADB_1 STR 1 Attitude Data Block	10 Hz
(3,25)	38	6	105	59	SSY_HK_35651	TM_ADB_2 STR 2 Attitude Data Block	10 Hz
(3,25)	48	4	213	124	GSY_HK_37086	NAV_SOL GPSR A Navigation Solution	1 Hz
(3,25)	49	4	213	124	GSY_HK_37207	NAV_SOL GPSR B Navigation Solution	1 Hz
Packets potentially useful for detailed performance tracking							
(3,25)	37	4	1	65	SSY_HK_35502	TM_SDB_1 Status and Health Data Block	1 Hz
(3,25)	38	4	1	65	SSY_HK_35652	TM_SDB_2 Status and Health Data Block	1 Hz
(3,25)	48	4	219	44	GSY_HK_37085	HOUSEKEEPING Housekeeping Parameter Report	1 Hz
(3,25)	49	4	219	44	GSY_HK_37206	HOUSEKEEPING Housekeeping Parameter Report	1 Hz
(3,25)	48	4	214	56	GSY_HK_37087	TIME_CORR Time Correlation Data Record	1 Hz
(3,25)	49	4	214	56	GSY_HK_37208	TIME_CORR Time Correlation Data Record	1 Hz

The complete setup of the nominally available (3,25) packets is reported below for convenience. Colour Coding is in line with the PUS standard document: Green for the Packet Header, Yellow for the Data Field Header, Red for the Data Field, and white for the Packet Trailer (CRC). Grey lines within the data fields are artificial SRDB names which collect several short variables into one full Byte or Word.

2.1 TM_ADB_1 (for Star Tracker 1)

	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
Packet Header	Packet Header	Packet Header	Version Number	CCSDS Version Number	0	3		0	
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0	
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1	
			PRID	Process ID (part of the APID)	5	7		37	
			PCAT	Packet category (part of the APID)	12	4		6	
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)	
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2 ¹⁴ -1, wrap around	
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		52	
Packet Data Fields	Data Field Header	Data Field Header	Spare 1	Not used	48	1		0	
			PUS Version Number		49	3		1	
			Spare 2	Filler to complete the byte	52	4		0	
			Service Type	Indicates the service to which the packet relates	56	8		3	
			Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
			Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC Unsolicited = GROUND	
			Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
			Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	Telemetry Data	SST01000	SID_1	SID the ID of this structure	144	8		105	
		SST00001	qv1_1	vector part of attitude quaternion, x component	152	32			2 ⁻³⁰
		SST00002	qv2_1	vector part of attitude quaternion, y component	184	32			2 ⁻³⁰
		SST00003	qv3_1	vector part of attitude quaternion, z component	216	32			2 ⁻³⁰
		SST00004	qs_1	scalar part of attitude quaternion	248	32			2 ⁻³⁰
		SST00005	rateX_1	angular rate in BRF	280	16			2 ⁻¹¹ °/s
		SST00006	rateY_1	angular rate in BRF	296	16			2 ⁻¹¹ °/s
		SST00007	rateZ_1	angular rate in BRF	312	16			2 ⁻¹¹ °/s
		SST00008	TimeStamp_1	centerOfIntegrationTime Stamp	328	48			2 ⁻¹⁶ s
		SST00009	julianDate_1	julianDate	376	16			Julian Days
		SST00010	vVectorSciX_1	velocityVectorSciX	392	16			2 ⁻²² c _{vac}
		SST00011	vVectorSciY_1	velocityVectorSciY	408	16			2 ⁻²² c _{vac}
		SST00012	vVectorSciZ_1	velocityVectorSciZ	424	16			2 ⁻²² c _{vac}
		SSTG0001	GloPar1ADB_1		440	8			
		SSTD0013	altitQuality_1	attitudeQuality	440	3		see AttitudeQuality enumeration	
		SSTD0014	isPrecCorr_1	isPrecessionCorrected	443	1			
		SSTD0015	isAbberCorr_1	isAberrationCorrected	444	1			
		SSTD0016	rateQuality_1	rateQuality	445	2		see RateQuality enumeration	
		SSTD0017	isValidRate_1	isValidRate	447	1			
		SST01017	attQualityIx_1	attitudeQualityIndex	448	8		≤240	
EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	456	16		CRC (specified in CCSDS-202.0-B-3)	

2.2 TM_ADB_2 (for Star Tracker 2)

	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit	
Packet Header			Version Number	CCSDS Version Number	0	3		0		
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0		
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1		
			PRID	Process ID (part of the APID)	5	7		38		
			PCAT	Packet category (part of the APID)	12	4		6		
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)		
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around		
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		52		
Packet Data Fields	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	Telemetry Data	SST04000	SID_2	SID	SID the ID of this structure	144	8		105	
		SST03001	qv1_2	qv1	vector part of attitude quaternion, x component	152	32			2 ⁻³⁰
		SST03002	qv2_2	qv2	vector part of attitude quaternion, y component	184	32			2 ⁻³⁰
		SST03003	qv3_2	qv3	vector part of attitude quaternion, z component	216	32			2 ⁻³⁰
		SST03004	qs_2	qs	scalar part of attitude quaternion	248	32			2 ⁻³⁰
		SST03005	rateX_2	rateX	angular rate in BRF	280	16			2 ⁻¹¹ °/s
		SST03006	rateY_2	rateY	angular rate in BRF	296	16			2 ⁻¹¹ °/s
		SST03007	rateZ_2	rateZ	angular rate in BRF	312	16			2 ⁻¹¹ °/s
		SST03008	TimeStamp_2	centerOfIntegrationTime Stamp	Time stamp of the center of integration associated with the attitude.	328	48			2 ⁻¹⁶ s
		SST03009	julianDate_2	julianDate	Julian date used for precession correction (if enabled)	376	16			Julian Days
		SST03010	vVectorSciX_2	velocityVectorSciX	If aberration correction is enabled: X coordinate of velocity vector (in SCI), Otherwise: 0	392	16			2 ⁻²² c _{vac}
		SST03011	vVectorSciY_2	velocityVectorSciY	If aberration correction is enabled: Y coordinate of velocity vector (in SCI), Otherwise: 0	408	16			2 ⁻²² c _{vac}
		SST03012	vVectorSciZ_2	velocityVectorSciZ	If aberration correction is enabled: Z coordinate of velocity vector (in SCI), Otherwise: 0	424	16			2 ⁻²² c _{vac}
		SSTG3001	GloPar1ADB_2			440	8			
		SSTD3013	altitQuality_2	attitudeQuality	attitude quality	440	3		see AttitudeQuality enumeration	
		SSTD3014	isPrecCorr_2	isPrecessionCorrected	if set to 1: precession correction has been applied	443	1			
		SSTD3015	isAbberCorr_2	isAberrationCorrected	if set to 1: aberration correction has been applied	444	1			
		SSTD3016	rateQuality_2	rateQuality	rate quality	445	2		see RateQuality enumeration	
		SSTD3017	isValidRate_2	isValidRate	if set to 1: the rate information is valid (i.e. derived from current measurements)	447	1			
	SST04017	attQualityIx_2	attitudeQualityIndex	sum of single-star qualities of attitude stars	448	8		≤240		
	EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	456	16		CRC (specified in CCSDS-202.0-B-3)	

2.3 TM_SDB_1 (for Star Tracker 1)

		Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit		
Packet Header		Packet Header		Version Number	CCSDS Version Number	0	3		0			
				Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0			
				Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1			
				PRID	Process ID (part of the APID)	5	7		37			
				PCAT	Packet category (part of the APID)	12	4		4			
				Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)			
				Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around			
				Packet Length	Number of bytes contained in the packet data field minus 1	32	16		58			
Packet Data Fields		Data Field Header		Spare 1	Not used	48	1		0			
				PUS Version Number		49	3		1			
				Spare 2	Filler to complete the byte	52	4		0			
				Service Type	Indicates the service to which the packet relates	56	8		3			
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25			
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC Unsolicited = GROUND			
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14			
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14			
		Telemetry Data		SST01000	SID_1	SID	the ID of this structure	144	8	UI	1	
				SST00018	cycle_1	Cycle	STR internal cycle counter	152	16	UI		
				SST00019	cycStartTimSt_1	cycleStartTimeStamp	Time stamp of the cycle start	168	48	T		2 ⁻¹⁶ s
				SSTG0002	GloPar1SDB_1			216	8			
				SSTD0020	cycleTriggerS_1	cycleTriggerSource	0: timer, 1: pre-processor, 2: external	216	2	UI		
				SSTD0021	opMode_1	opMode	STR operating mode	218	3	E	See OpMode enumeration	
				SSTD0022	isStreakMode_1	isStreakMode	1: streak processing mode is active	221	1	B		
				SSTD0023	tecMode_1	tecMode	Thermo electric cooler mode	222	2	E	see TecMode enumeration	
				SSTG0003	GloPar2SDB_1			224	8			
				SSTD0024	EepromErrApp_1	EepromErrApp	1: error in application part on EEPROM	224	1	B		
				SSTD0025	EepromErrCal_1	EepromErrCal	1: error in calibration data part on EEPROM	225	1	B		
				SSTD0026	ramError_1	ramError	1: RAM failure; see numEdacErrors for more information; can be reset by TC_ZERO_COUNTERS telecommand	226	1	B		
				SSTD0027	interfaceError_1	interfaceError	1: Failure during initialization of the operational interface; can be reset by TC_ZERO_COUNTERS telecommand	227	1	B		
				SSTD0028	watchdogError_1	watchdogError	1: Reboot was caused by the watchdog timer; can be reset by TC_ZERO_COUNTERS telecommand	228	1	B		
				SSTD0029	synchError_1	synchronizationError	1: External synchronization failed; can be reset by TC_ZERO_COUNTERS telecommand	229	1	B		
				SSTD0030	timingError_1	timingError	1: processing exceeded timing constraints	230	1	B		
				SSTD0031	fifoError_1	fifoError	1: the hardware FIFO capacity has been exceeded (e.g. too many objects detected in FullFrame mode)	231	1	B		
				SST00032	targetTemp_1	targetTemperature	target temperature for temperature control	232	16	SI		0.1 °C
				SST00033	tempDetector_1	temperatureDetector	detector temperature	248	16	SI		0.1 °C
				SST00034	tempOptics_1	temperatureOptics	optics temperature	264	16	SI		0.1 °C
				SST00035	tempHousing_1	temperatureHousing	housing temperature	280	16	SI		0.1 °C
				SST00036	numEdacErrors_1	numEdacErrors	Number of errors detected by RAM EDAC; can be reset by TC_ZERO_COUNTERS telecommand	296	8	UI		

	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
	SSTG0004	GloPar3SDB_1			304	8			
	SSTD0037	syncSource_1	syncSource	The source selected for external synchronization	304	2	E	see SyncSource enumeration	
	SSTD0038	secSinTimSync_1	secondsSinceTimeSync	The number of seconds since the latest received time synchronization; saturates at 63 seconds	306	6	UI		
	SST00039	meanBackgr_1	meanBackground	mean background	312	16	SI		
	SST00040	numObjDetected_1	numObjectsDetected	number of detected objects (FullFrame mode only)	328	16	UI		
	SST00041	numObjAcquired_1	numObjectsAcquired	number of acquired objects	344	16	UI		
	SST00042	numSinglePixR_1	numSinglePixelsRemoved	number of single pixels removed by h/w (FullFrame mode only)	360	16	UI		
	SST00043	numEoDetected_1	numEoDetected	number of extended objects detected by h/w (FullFrame mode only)	376	16	UI		
	SST00044	numStarsTracka_1	numStarsTrackable	number of trackable stars	392	8	UI		
	SST00045	numStarsTrack_1	numStarsTracked	number of stars tracked	400	8	UI		
	SST00046	numStarsForRa_1	numStarsUsedForRate	number of stars used for rate determination	408	8	UI		
	SST00047	numStarsIdent_1	numStarsIdentified	number of identified stars	416	8	UI		
	SST00048	numStarsUsedA_1	numStarsUsedForAttitude	number of stars used for attitude determination	424	8	UI		
	SST00049	numLostTrack_1	numLostTracking	number of fall-backs from NAT to AAD; can be reset by TC_ZERO_COUNTERS telecommand	432	8	UI		
	SST00050	latestCommId_1	spare	ID of latest received command (from SRDB, not in ICD)	440	16	UI		
	SST00051	latestCmdRes_1	spare	result of execution of the latest received command (from SRDB, not in ICD)	456	8	UI		
	SST00052	numTcErrors_1	numTcErrors	Number of telecommand errors; can be reset by TC_ZERO_COUNTERS telecommand	464	8	UI		
	SSTG0005	GloPar4SDB_1			472	0			
	SSTD0053	AttResult_1	AttResult	last result of attitude determination	472	4	E	see AttResult enumeration	
	SSTD0054	IdResult_1	IdResult	last result of star identification	476	4	E	see IdResult enumeration	
	SST00055	tInt_1	tInt	integration time	480	8	UI		1 ms
	SST00056	offset_1	offset	binarisation offset	488	16	UI		detector LSB
EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	504	16		CRC (specified in CCSDS-202.0-B-3)	

Note: The STR PUS ICD incorrectly describes two variables as spare, which are identified in the STR SRDB delivery as "latestCommId" and "latestCmdRes" with the long descriptions as given in the table above.

2.4 TM_SDB_2 (for Star Tracker 2)

		Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
Packet Header		Packet Header		Version Number	CCSDS Version Number	0	3		0	
				Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0	
				Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1	
				PRID	Process ID (part of the APID)	5	7		38	
				PCAT	Packet category (part of the APID)	12	4		4	
				Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)	
				Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around	
				Packet Length	Number of bytes contained in the packet data field minus 1	32	16		58	
Packet Data Fields	Data Field Header	Data Field Header		Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	Data Field	SST04000	SID_2	SID	the ID of this structure	144	8	UI	1	
		SST03018	cycle_2	Cycle	STR internal cycle counter	152	16	UI		
		SST03019	cycStartTimSt_2	cycleStartTimeStamp	Time stamp of the cycle start	168	48	T		2 ⁻¹⁶ s
		SSTG3002	GloPar1SDB_2			216	8			
		SSTD3020	cycleTriggerS_2	cycleTriggerSource	0: timer, 1: pre-processor, 2: external	216	2	UI		
		SSTD3021	opMode_2	opMode	STR operating mode	218	3	E	See OpMode enumeration	
		SSTD3022	isStreakMode_2	isStreakMode	1: streak processing mode is active	221	1	B		
		SSTD3023	tecMode_2	tecMode	Thermo electric cooler mode	222	2	E	see TecMode enumeration	
		SSTG3003	GloPar2SDB_2			224	8			
		SSTD3024	EepromErrApp_2	EepromErrApp	1: error in application part on EEPROM	224	1	B		
		SSTD3025	EepromErrCal_2	EepromErrCal	1: error in calibration data part on EEPROM	225	1	B		
		SSTD3026	ramError_2	ramError	1: RAM failure; see numEdacErrors for more information; can be reset by TC_ZERO_COUNTERS telecommand	226	1	B		
		SSTD3027	interfaceError_2	interfaceError	1: Failure during initialization of the operational interface; can be reset by TC_ZERO_COUNTERS telecommand	227	1	B		
		SSTD3028	watchdogError_2	watchdogError	1: Reboot was caused by the watchdog timer; can be reset by TC_ZERO_COUNTERS telecommand	228	1	B		
		SSTD3029	synchError_2	synchronizationError	1: External synchronization failed; can be reset by TC_ZERO_COUNTERS telecommand	229	1	B		
		SSTD3030	timingError_2	timingError	1: processing exceeded timing constraints	230	1	B		
		SSTD3031	fifoError_2	fifoError	1: the hardware FIFO capacity has been exceeded (e.g. too many objects detected in FullFrame mode)	231	1	B		
		SST03032	targetTemp_2	targetTemperature	target temperature for temperature control	232	16	SI		0.1 °C
		SST03033	tempDetector_2	temperatureDetector	detector temperature	248	16	SI		0.1 °C
		SST03034	tempOptics_2	temperatureOptics	optics temperature	264	16	SI		0.1 °C
		SST03035	tempHousing_2	temperatureHousing	housing temperature	280	16	SI		0.1 °C
		SST03036	numEdacErrors_2	numEdacErrors	Number of errors detected by RAM EDAC; can be reset by TC_ZERO_COUNTERS telecommand	296	8	UI		

	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
	SSTG3004	GloPar3SDB_2			304	8			
	SSTD3037	syncSource_2	syncSource	The source selected for external synchronization	304	2	E	see SyncSource enumeration	
	SSTD3038	secSinTimSync_2	secondsSinceTimeSync	The number of seconds since the latest received time synchronization; saturates at 63 seconds	306	6	UI		
	SST03039	meanBackgr_2	meanBackground	mean background	312	16	SI		
	SST03040	numObjDetected_2	numObjectsDetected	number of detected objects (FullFrame mode only)	328	16	UI		
	SST03041	numObjAcquired_2	numObjectsAcquired	number of acquired objects	344	16	UI		
	SST03042	numSinglePixR_2	numSinglePixelsRemoved	number of single pixels removed by h/w (FullFrame mode only)	360	16	UI		
	SST03043	numEoDetected_2	numEoDetected	number of extended objects detected by h/w (FullFrame mode only)	376	16	UI		
	SST03044	numStarsTracka_2	numStarsTrackable	number of trackable stars	392	8	UI		
	SST03045	numStarsTrack_2	numStarsTracked	number of stars tracked	400	8	UI		
	SST03046	numStarsForRa_2	numStarsUsedForRate	number of stars used for rate determination	408	8	UI		
	SST03047	numStarsIdent_2	numStarsIdentified	number of identified stars	416	8	UI		
	SST03048	numStarsUsedA_2	numStarsUsedForAttitude	number of stars used for attitude determination	424	8	UI		
	SST03049	numLostTrack_2	numLostTracking	number of fall-backs from NAT to AAD; can be reset by TC_ZERO_COUNTERS telecommand	432	8	UI		
	SST03050	latestCommId_2	spare	ID of latest received command (from SRDB, not in ICD)	440	16	UI		
	SST03051	latestCmdRes_2	spare	result of execution of the latest received command (from SRDB, not in ICD)	456	8	UI		
	SST03052	numTcErrors_2	numTcErrors	Number of telecommand errors; can be reset by TC_ZERO_COUNTERS telecommand	464	8	UI		
	SSTG3005	GloPar4SDB_2			472	0			
	SSTD3053	AttResult_2	AttResult	last result of attitude determination	472	4	E	see AttResult enumeration	
	SSTD3054	IdResult_2	IdResult	last result of star identification	476	4	E	see IdResult enumeration	
	SST03055	tlnt_2	tlnt	integration time	480	8	UI		1 ms
	SST03056	offset_2	offset	binarisation offset	488	16	UI		detector LSB
EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	504	16		CRC (specified in CCSDS-202.0-B-3)	

Note: The STR PUS ICD incorrectly describes two variables as spare, which are identified in the STR SRDB delivery as "latestCommId" and "latestCmdRes" with the long descriptions as given in the table above.

2.5 NAV_SOL (for the GPSR_A receiver)

		Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
Packet Header				Version Number	CCSDS Version Number	0	3		0	
				Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0	
				Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1	
				PRID	Process ID (part of the APID)	5	7		48	
				PCAT	Packet category (part of the APID)	12	4		4	
				Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)	
				Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around	
				Packet Length	Number of bytes contained in the packet data field minus 1	32	16		103	
Packet Data Field	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	TM Data Header	GST01627	Structure ID	SID	Structure Identifier	144	8		213	
		GST01639	FILLER		FILLER	152	24		0	
		GST0163A	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value
		GST0163B	ID	ID	Internal use only	184	8		Not used	
		GSTG02F2	SN_V_RMODE			192	8			
		GST0163C	SN	SN	Serial Number	192	4		Not used	
		GST0163D	V	V	Data valid flag	196	1		1 = All data in the data record is valid	
		GST0163E	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode	
	Telemetry Data Record	GST0163F	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1	
		GST01640	GPST_SEC	GPST	GPS time	208	32	GPS-type		
		GST01641	GPST_SUBSEC			240	32			
		GSTG02F3	NU3_NSM_QUALIN			272	16			
		GST01642	N_U_3	N/U	Not Used	272	1		0	
		GST01643	NSM	NSM	Navigation Solution Method	273	3		5 = estimated by Kalman filter See table 5-4 of S1-IF-AAE-SC-0002	
		GST01644	QUAL_INDEX	QUAL_INDEX	Quality Index	276	12		0-4095	m
		GST01645	GDOP	GDOP	Geometrical dilution of precision	288	16		0.00 to 655.34 or 65535	0.01
		GSTG02F4	MAXURA_MAXFIT_NU			304	16			
		GST01646	MAX_URA	MAX_URA	Maximum user range accuracy	304	5		-16 to +15, see URA index in IS-GPS-200	
		GST01647	MAX_FIT	MAX_FIT	Maximum curve fit interval taken from all SVs used in current navigation solution	309	4		0 - 9 or 15; See table 5-6 of S1-IF-AAE-SC-0002	
		GST01648	N_U_4	N/U	Not Used	313	3		0	
		GST01649	NOF_SV	NOF_SV	Number of SVs contributing to the Navigation Solution	316	4		0 - 8	
		GST0164A	POS_X_MSB	POS_X	X-coordinate	320	32		-2^47 to +2^47-1	mm
		GST0164B	POS_X_LSB			352	16			
		GST0164C	POS_Y_MSB	POS_Y	Y-coordinate	368	32		-2^47 to +2^47-1	mm
		GST0164D	POS_Y_LSB			400	16			
		GST0164E	POS_Z_MSB	POS_Z	Z-coordinate	416	32		-2^47 to +2^47-1	mm

	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
	GST0164F	POS_Z_LSB			448	16			
	GST01650	VEL_X	VEL_X	X-velocity	464	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST01651	VEL_Y	VEL_Y	Y-velocity	496	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST01652	VEL_Z	VELZ	Z-velocity	528	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST01653	PDOP	PDOP	Position dilution of precision	560	16		0.00 to 655.34 or 65535	0.01
	GST01654	TDOP	TDOP	Time dilution of precision	576	16		0.00 to 655.34 or 65535	0.01
	GST01655	delta_x	Δx	Position error in x direction	592	32		-2147.483648 km to +2147.483646 km or 2147483647	mm
	GST01656	delta_y	Δy	Position error in y direction	624	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm
	GST01657	delta_z	Δz	Position error in z direction	656	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm
	GST01658	delta_t	Δt	GNSS system time error	688	32		-2.147483648 s to +2.147483646 s or 2147483647	ns
	GST01659	delta_v_x	Δv_x	Velocity error in x direction	720	32		-2147.483648 km to +2147.483646 km or 2147483647	mm/s
	GST0165A	delta_v_y	Δv_y	Velocity error in y direction	752	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm/s
	GST0165B	delta_v_z	Δv_z	Velocity error in z direction	784	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm/s
	GST0165C	delta_f	Δf	Receiver clock frequency error	816	32		-2.147483648 MHz to +2.147483646 MHz or 2147483647	mHz
	GST0165D	HEIGHT	HEIGHT	Height above reference ellipsoid	848	32		0.00000 to 21474.83646 km Or 2147483647	cm
	GST0165E	VERTSPEED	VERTSPEED	Vertical speed	880	32		-21.47483648 km/s to +21.47483647 km/s	0.01 mm/s
	GST0165F	LONGITUDE	LONGITUDE	Longitude	912	32		-180.0000000 to +180.0000000	1E-7 deg
	GST01660	LATITUDE	LATITUDE	Latitude	944	32		-90.0000000 to +90.0000000	1E-7 deg
EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	976	16		CRC (specified in CCSDS-202.0-B-3)	

2.6 NAV_SOL (for the GPSR_B receiver)

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit	
Packet Header			Version Number	CCSDS Version Number	0	3		0		
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0		
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1		
			PRID	Process ID (part of the APID)	5	7		49		
			PCAT	Packet category (part of the APID)	12	4		4		
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)		
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around		
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		103		
Packet Data Field	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	TM Data Header	GST0B5B6	Structure ID	SID	Structure Identifier	144	8		213	
		GST0B5C8	FILLER		FILLER	152	24		0	
		GST0B5C9	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value
		GST0B5CA	ID	ID	Internal use only	184	8		Not used	
		GSTG1AA5	SN_V_RMODE			192	8			
		GST0B5CB	SN	SN	Serial Number	192	4		Not used	
		GST0B5CC	V	V	Data valid flag	196	1		1 = All data in the data record is valid	
		GST0B5CD	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode	
		GST0B5CE	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1	
	Telemetry Data Record	GST0B5CF	GPST_SEC	GPST	GPS time	208	32	GPS-type		
		GST0B5D0	GPST_SUBSEC			240	32			
		GSTG1AA6	NU3_NSM_QUALIN			272	16			
		GST0B5D1	N_U_3	N/U	Not Used	272	1			
		GST0B5D2	NSM	NSM	Navigation Solution Method	273	3		5 = estimated by Kalman filter See table 5-4 of S1-IF-AAE-SC-0002	
		GST0B5D3	QUAL_INDEX	QUAL_INDEX	Quality Index	276	12		0-4095	m
		GST0B5D4	GDOP	GDOP	Geometrical dilution of precision	288	16		0.00 to 655.34 or 65535	0.01
		GSTG1AA7	MAXURA_MAXFIT_NU			304	16			
		GST0B5D5	MAX_URA	MAX_URA	Maximum user range accuracy	304	5		-16 to +15, see URA index in IS-GPS-200	
		GST0B5D6	MAX_FIT	MAX_FIT	Maximum curve fit interval taken from all SVs used in current navigation solution	309	4		0 - 9 or 15; See table 5-6 of S1-IF-AAE-SC-0002	
		GST0B5D7	N_U_4	N/U	Not Used	313	3		0	
		GST0B5D8	NOF_SV	NOF_SV	Number of SVs contributing to the Navigation Solution	316	4		0 - 8	
		GST0B5D9	POS_X_MSB	POS_X	X-coordinate	320	32		-2^47 to +2^47-1	mm
		GST0B5DA	POS_X_LSB			352	16			
		GST0B5DB	POS_Y_MSB	POS_Y	Y-coordinate	368	32		-2^47 to +2^47-1	mm
	GST0B5DC	POS_Y_LSB	400			16				

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
	GST0B5DD	POS_Z_MSB	POS_Z	Z-coordinate	416	32		-2 ⁴⁷ to +2 ⁴⁷ -1	mm
	GST0B5DE	POS_Z_LSB			448	16			
	GST0B5DF	VEL_X	VEL_X	X-velocity	464	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST0B5E0	VEL_Y	VEL_Y	Y-velocity	496	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST0B5E1	VEL_Z	VEL_Z	Z-velocity	528	32		-2147.483648 km/s to +2147.483646 km/s	mm/s
	GST0B5E2	PDOP	PDOP	Position dilution of precision	560	16		0.00 to 655.34 or 65535	0.01
	GST0B5E3	TDOP	TDOP	Time dilution of precision	576	16		0.00 to 655.34 or 65535	0.01
	GST0B5E4	delta_x	Δx	Position error in x direction	592	32		-2147.483648 km to +2147.483646 km or 2147483647	mm
	GST0B5E5	delta_y	Δy	Position error in y direction	624	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm
	GST0B5E6	delta_z	Δz	Position error in z direction	656	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm
	GST0B5E7	delta_t	Δt	GNSS system time error	688	32		-2.147483648 s to +2.147483646 s or 2147483647	ns
	GST0B5E8	delta_v_x	Δv _x	Velocity error in x direction	720	32		-2147.483648 km to +2147.483646 km or 2147483647	mm/s
	GST0B5E9	delta_v_y	Δv _y	Velocity error in y direction	752	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm/s
	GST0B5EA	delta_v_z	Δv _z	Velocity error in z direction	784	32		-2,147.483648 km to +2,147.483646 km or 2147483647	mm/s
	GST0B5EB	delta_f	Δf	Receiver clock frequency error	816	32		-2.147483648 MHz to +2.147483646 MHz or 2147483647	mHz
	GST0B5EC	HEIGHT	HEIGHT	Height above reference ellipsoid	848	32		0.00000 to 21474.83646 km or 2147483647	cm
	GST0B5ED	VERTSPEED	VERTSPEED	Vertical speed	880	32		-21.47483648 km/s to +21.47483647 km/s	0.01 mm/s
	GST0B5EE	LONGITUDE	LONGITUDE	Longitude	912	32		-180.0000000 to +180.0000000	1E-7 deg
	GST0B5EF	LATITUDE	LATITUDE	Latitude	944	32		-90.0000000 to +90.0000000	1E-7 deg
EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	976	16		CRC (specified in CCSDS-202.0-B-3)	

2.7 HOUSEKEEPING (for the GPSR_A receiver)

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit	
Packet Header			Version Number	CCSDS Version Number	0	3		0		
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0		
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1		
			PRID	Process ID (part of the APID)	5	7		48		
			PCAT	Packet category (part of the APID)	12	4		4		
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)		
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around		
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		37		
Packet Data Field	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	TM Data Header	GST01627	SID	SID	Structure Identifier	144	8		219	
		GST01606	FILLER		FILLER	152	24		0	
		GST01607	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value
		GST01608	ID	ID	Internal use only	184	8		Not used	
		GSTG02EC	SN_V_RMODE			192	8			
		GST01609	SN	SN	Serial Number	192	4		Not used	
		GST0160A	V	V	Data valid flag	196	1		1 = All data in the data record is valid	
		GST0160B	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode	
		GST0160C	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1	
	Telemetry Data Record	GSTG02ED	SVACQ_SVSFTR			208	8			
		GST0160D	SV_ACQ	SV_ACQ	Number of SVs being acquired	208	4		0 to 8	
				SV_SF_TRK	Number of single frequency steady state tracked SVs with not yet all signal components in final tracking state				Number of single frequency steady state tracked GNSS satellites still in a transitional tracking state at the most recent PPS. The GPSR tries to achieve additional code and carrier loop locks for all available signals of the commanded tracking scheme.	
		GST0160E	SV_SF_TRK			212	4			
		GSTG02EE	SVMFTR_SVPVT			216	8			
				SV_MF_TRK	Number of tracked SVs in steady state tracking mode				GNSS satellites being tracked at the most recent PPS with all signal components in their final tracking state for their tracking scheme	
		GST0160F	SV_MF_TRK			216	4			
		GST01610	SV_PVT	SV_PVT	Number of SVs used for PVT	220	4		GNSS satellites being used for PVT at the PPS before the most recent PPS	
GSTG02EF		P_NSM_E_CNT			224	8				
GST01611	P	P	PROM EDAC Single bit or uncorrectable error	224	1		1 = At least one single bit or			

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
EC								uncorrectable error since last report	
	GST01612	NSM	NSM	Navigation Solution Method	225	3		See S1-IF-AAE-SC-0002	
	GST01613	E	E	SRAM EDAC Single bit error	228	1		1=At least one single bit error since last report	
	GST01614	CNT	CNT	Corrected Register File errors	229	3		Captured LEON register value	
	GSTG02F0	ITE_IDE_DTE_DDE			232	8			
	GST01615	ITE	ITE	Instr. Cache tag error counter	232	2		Captured LEON register value	
	GST01616	IDE	IDE	Instr. Cache data error counter	234	2		Captured LEON register value	
	GST01617	DTE	DTE	Data Cache tag error counter	236	2		Captured LEON register value	
	GST01618	DDE	DDE	Data Cache data error counter	238	2		Captured LEON register value	
	GST01619	TC_DISC	TC_DISC	Discarded TC packet counter	240	8		Number of TC packets discarded.	
	GST0161A	TM_DISC	TM_DISC	Discarded TM packet counter	248	8		Number of TM packets discarded.	
	GST0161B	TXBUF_OCC	TXBUF_OCC	Transmit buffer occupancy	256	16		Numberof bytes buffered for transmission	
	GST0161C	DUMP_STAT	DUMP_STAT	Memory Dump status	272	16		Number of TM packets to be generated until the current Memory Dump is finished.	
	GST0161D	CPU_LOAD	CPU_LOAD	Processor load	288	16		CPU Load of most recent PPS interval	0.01%
	GSTG02F1	CK_NU3_D_M_I_L			304	8			
	GST0161E	CK	CK	Clock Source	304	1		0 = external, 1 = internal	
	GST0161F	N_U_3			305	3			
	GST01620	D		MilBus I/F EDAC Double Bit Error	308	1		Always 0	
	GST01621	M		MilBus Protocol Selection Flag	309	1		1 = S2/S3 &EC protocol variant. (0=S1)	
	GST01622	I		Not used	310	1			
	GST01623	L		MilBus I/F EDAC Single Bit Error	311	1		Always 0	
	GST01624	PRECNT		MilBus transient protocol error count	312	8		This counter is cleared at the start of the instrument and increases for each MilBus anomaly detected.	
	GST01625	N_U_4			320	16			
	EC	Packet Error Control (CRC)	TM Packet Error Control	Provides packet error control information (CRC)	336	16		CRC (specified in CCSDS-202.0-B-3)	

2.8 HOUSEKEEPING (for the GPSR_B receiver)

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit	
Packet Header			Version Number	CCSDS Version Number	0	3		0		
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0		
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1		
			PRID	Process ID (part of the APID)	5	7		49		
			PCAT	Packet category (part of the APID)	12	4		4		
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)		
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around		
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		37		
Packet Data Field	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	TM Data Header	GST0B5B6	SID	SID	Structure Identifier	144	8		219	
		GST0B595	FILLER		FILLER	152	24		0	
		GST0B596	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value
		GST0B597	ID	ID	Internal use only	184	8		Not used	
		GSTG1A9F	SN_V_RMODE			192	8			
		GST0B598	SN	SN	Serial Number	192	4		Not used	
		GST0B599	V	V	Data valid flag	196	1		1 = All data in the data record is valid	
		GST0B59A	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode	
		GST0B59B	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1	
	Telemetry Data Record	GSTG1AA0	SVACQ_SVSFTR			208	8			
		GST0B59C	SV_ACQ	SV_ACQ	Number of SVs being acquired	208	4		0 to 8	
				SV_SF_TRK	Number of single frequency steady state tracked SVs with not yet all signal components in final tracking state				Number of single frequency steady state tracked GNSS satellites still in a transitional tracking state at the most recent PPS. The GPSR tries to achieve additional code and carrier loop locks for all available signals of the commanded tracking scheme.	
		GST0B59D	SV_SF_TRK			212	4			
		GSTG1AA1	SVMFTR_SVPVT			216	8			
				SV_MF_TRK	Number of tracked SVs in steady state tracking mode				GNSS satellites being tracked at the most recent PPS with all signal components in their final tracking state for their tracking scheme	
		GST0B59E	SV_MF_TRK			216	4			
		GST0B59F	SV_PVT	SV_PVT	Number of SVs used for PVT	220	4		GNSS satellites being used for PVT at the PPS before the most recent PPS	
		GSTG1AA2	P_NSM_E_CNT			224	8			
	GST0B5A0	P	P	PROM EDAC Single bit or uncorrectable error	224	1		1 = At least one single bit or		

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit
EC								uncorrectable error since last report	
	GST0B5A1	NSM	NSM	Navigation Solution Method	225	3		See S1-IF-AAE-SC-0002	
	GST0B5A2	E	E	SRAM EDAC Single bit error	228	1		1=At least one single bit error since last report	
	GST0B5A3	CNT	CNT	Corrected Register File errors	229	3		Captured LEON register value	
	GSTG1AA3	ITE_IDE_DTE_DDE			232	8			
	GST0B5A4	ITE	ITE	Instr. Cache tag error counter	232	2		Captured LEON register value	
	GST0B5A5	IDE	IDE	Instr. Cache data error counter	234	2		Captured LEON register value	
	GST0B5A6	DTE	DTE	Data Cache tag error counter	236	2		Captured LEON register value	
	GST0B5A7	DDE	DDE	Data Cache data error counter	238	2		Captured LEON register value	
	GST0B5A8	TC_DISC	TC_DISC	Discarded TC packet counter	240	8		Number of TC packets discarded.	
	GST0B5A9	TM_DISC	TM_DISC	Discarded TM packet counter	248	8		Number of TM packets discarded.	
	GST0B5AA	TXBUF_OCC	TXBUF_OCC	Transmit buffer occupancy	256	16		Numberof bytes buffered for transmission	
	GST0B5AB	DUMP_STAT	DUMP_STAT	Memory Dump status	272	16		Number of TM packets to be generated until the current Memory Dump is finished.	
	GST0B5AC	CPU_LOAD	CPU_LOAD	Processor load	288	16		CPU Load of most recent PPS interval	0.01%
	GSTG1AA4	CK_NU3_D_M_I_L			304	8			
	GST0B5AD	CK	CK	Clock Source	304	1		0 = external, 1 = internal	
	GST0B5AE	N_U_3			305	3			
	GST0B5AF	D		MilBus I/F EDAC Double Bit Error	308	1		Always 0	
	GST0B5B0	M		MilBus Protocol Selection Flag	309	1		1 = S2/S3 &EC protocol variant. (0=S1)	
	GST0B5B1	I		Not used	310	1			
	GST0B5B2	L		MilBus I/F EDAC Single Bit Error	311	1		Always 0	
	GST0B5B3	PRECNT		MilBus transient protocol error count	312	8		This counter is cleared at the start of the instrument and increases for each MilBus anomaly detected.	
	GST0B5B4	N_U_4			320	16			
	EC	Packet Error Control (CRC)	TM Packet Error Control	Provides packet error control information (CRC)	336	16		CRC (specified in CCSDS-202.0-B-3)	

2.9 TIME_CORR (for the GPSR_A receiver)

Group	Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit	
Packet Header			Version Number	CCSDS Version Number	0	3		0		
			Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0		
			Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1		
			PRID	Process ID (part of the APID)	5	7		48		
			PCAT	Packet category (part of the APID)	12	4		4		
			Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)		
			Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around		
			Packet Length	Number of bytes contained in the packet data field minus 1	32	16		49		
Packet Data Field	Data Field Header			Spare 1	Not used	48	1		0	
				PUS Version Number		49	3		1	
				Spare 2	Filler to complete the byte	52	4		0	
				Service Type	Indicates the service to which the packet relates	56	8		3	
				Service Subtype	Indicates the service subtype to which the packet relates	64	8		25	
				Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND	
				Time	Onboard time (OBT)	80	56		See PUS table 4.8-14	
				Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14	
	TM Data Header	GST01627	SID	SID	Structure Identifier	144	8		214	
		GST01675	FILLER		FILLER	152	24		0	
		GST01676	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value
		GST01677	ID	ID	Internal use only	184	8		Not used	
		GSTG02F5	SN_V_RMODE			192	8			
		GST01678	SN	SN	Serial Number	192	4		Not used	
		GST01679	V	V	Data valid flag	196	1		1 = All data in the data record is valid	
		GST0167A	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode	
		GST0167B	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1	
	Telemetry Data Record	GSTG02F6	NU2_NSM_QUALID			208	16			
		GST0167C	N_U_2		Not Used	208	1		0	
		GST0167D	NSM		Navigation Solution Method	209	3	UI	See S1-IF-AAE-SC-0002	
		GST0167E	QUAL_IDX		Quality index	212	12	UI	0 to 4095 ns	ns
		GST0167F	TDOP		Time dilution of precision	224	16	UI	0.00 to 655.34 or 65535	10 ⁻²
		GST01680	IMT_MSB		Instrument measurement time	240	32	IMT-type	IMT representation of the synchronisation time stamp. IMT type definition, see S1-IF-AAE-SC-0001	
		GST01681	IMT_LSB			272	32			
		GST01682	GPST_SEC		GPS time	304	32	GPS-type	GPST representation of the synchronisation time stamp. GPS type definition see S1-IF-AAE-SC-0001	
		GST01683	GPST_SUBSEC			336	32			
		GST01684	UTC_DAYS		UTC Time	368	16	UTC Format	UTC time representation of the synchronisation time stamp. The UTC Format is defined in S1-IF-AAE-SC-0001	
		GST01685	UTC_MSEC			384	32			
	EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)	336	16		CRC (specified in CCSDS-202.0-B-3)	

2.10 TIME_CORR (for the GPSR_B receiver)

Group		Name (SRDB)	Description (SRDB)	Name (PUS or JOP ICD)	Long Description (PUS or JOP ICD)	Offset (bit)	Length (bit)	Format	Range or Value	Unit		
Packet Header				Version Number	CCSDS Version Number	0	3		0			
				Type	Packet type (0 = telemetry, 1 = telecommand)	3	1		0			
				Data Field Header Flag	Indicates the presence of a secondary (data field) header (when set to 1)	4	1		1			
				PRID	Process ID (part of the APID)	5	7		49			
				PCAT	Packet category (part of the APID)	12	4		4			
				Grouping Flags	Indicates the grouping of TM source packets	16	2		3 (Standalone packet)			
				Source Sequence Count	Wrap around counter used to count each TM packet from a certain APID.	18	14		0 to 2^14-1, wrap around			
				Packet Length	Number of bytes contained in the packet data field minus 1	32	16		49			
Packet Data Field		Data Field Header			Spare 1	Not used	48	1		0		
					PUS Version Number		49	3		1		
					Spare 2	Filler to complete the byte	52	4		0		
					Service Type	Indicates the service to which the packet relates	56	8		3		
					Service Subtype	Indicates the service subtype to which the packet relates	64	8		25		
					Destination ID	Indicates the destination of the packet	72	8		Solicited = Source ID of related TC, Unsolicited = GROUND		
					Time	Onboard time (OBT)	80	56		See PUS table 4.8-14		
					Sync Time Quality	OBT status flag	136	8		See PUS table 4.8-14		
		TM Data Header	GST0B5B6	SID	SID	Structure Identifier	144	8		214		
			GST0B604	FILLER		FILLER	152	24		0		
			GST0B605	FE_TEMP	FE_TEMP	R/F front-end temperature	176	8			Raw Value	
			GST0B606	ID	ID	Internal use only	184	8		Not used		
			GSTG1AA8	SN_V_RMODE			192	8				
			GST0B607	SN	SN	Serial Number	192	4		Not used		
			GST0B608	V	V	Data valid flag	196	1		1 = All data in the data record is valid		
			GST0B609	R_MODE	R_MODE	Receiver Mode	197	3		1 Startup Mod, 2 Standby Mode, 3 Navigate Mode		
			GST0B60A	NOF_RECORD	NOF_REC	Number of records in data block	200	8		1		
			Telemetry Data Record	GSTG1AA9	NU2_NSM_QUALID			208	16			
				GST0B60B	N_U_2		Not Used	208	1		0	
		GST0B60C		NSM		Navigation Solution Method	209	3	UI	See S1-IF-AAE-SC-0002		
		GST0B60D		QUAL_IDX		Quality index	212	12	UI	0 to 4095 ns	ns	
		GST0B60E		TDOP		Time dilution of precision	224	16	UI	0.00 to 655.34 or 65535	10 ⁻²	
		GST0B60F		IMT_MSB		Instrument measurement time	240	32	IMT-type	IMT representation of the synchronisation time stamp. IMT type definition, see S1-IF-AAE-SC-0001		
		GST0B610		IMT_LSB			272	32				
		GST0B611		GPST_SEC		GPS time	304	32	GPS-type	GPST representation of the synchronisation time stamp. GPS type definition see S1-IF-AAE-SC-0001		
		GST0B612		GPST_SUBSEC			336	32				
		GST0B613		UTC_DAYS		UTC Time	368	16	UTC Format	UTC time representation of the synchronisation time stamp. The UTC Format is defined in S1-IF-AAE-SC-0001		
		GST0B614		UTC_MSEC			384	32				
		EC	Packet Error Control (CRC)		TM Packet Error Control	Provides packet error control information (CRC)		336	16		CRC (specified in CCSDS-202.0-B-3)	

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