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## PROCESS AND METHODOLOGY OF DEVELOPING CASSINI G&C TELEMETRY DICTIONARY

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### **ABSTRACT**

While the Cassini spacecraft telemetry design had taken on the new approach of "packetized telemetry", the AACS (Attitude and Articulation Subsystem) had further extended into the design of "mini-packets" in its telemetry system. Such telemetry packet and mini-packet design produced the AACS Telemetry Dictionary, iterations of the latter in turn provided changes to the former. The ultimate goals were to achieve maximum telemetry packing density, optimize the "freshness" of more time-critical data, and to effectuate flexibility, i.e. multiple AACS data collection schemes without needing to change the overall spacecraft telemetry mode. This paper describes such a systematic process and methodology, evidenced by various design products related to, or as part of, the AACS Telemetry Dictionary.

## INTRODUCTION

An efficient ground data system and effective telemetry data processing / analysis system stem from good engineering design with respect to timeliness, frequency, accuracy, and sufficiency of the data contents in the telemetry stream. The human interaction with the data, thence consumption of the data, can also be enhanced by human-engineered telemetry displays and systematic organization of the telemetry measurements.

Such objectives can be achieved, in part, by an up front design of a flexible and efficient telemetry handling system on board the spacecraft, and of an equally efficient ground data analysis system. A common thread between the flight and ground systems is the Telemetry Dictionary.

In the present context, the Telemetry Dictionary is more than just a collection of telemetry

measurements with their descriptions, arranged in some alphabetical ordering. The development process of the Dictionary is intertwined and iterative with the design process of the telemetry system. In fact, the Dictionary is not simply the child-of-the-parent of the telemetry design; it is also the parent-of-the-child. The Dictionary evolves from the telemetry design process; and through iterations, the Dictionary development in turn provides improvement and optimization to the telemetry design.

This iterative process was particularly necessary for the Cassini AACS (Attitude and Articulation Subsystem) because of its new approach of using a "packetized telemetry" system versus the widely used "time division multiplex" (TDM) system. The AACS further extended the packet design to include the "mini-packet" design.

The ultimate goals of the mini-packet and packet telemetry design were to achieve maximum telemetry packing density, optimize the "freshness" of more time-critical data, and to effectuate flexibility, i.e. multiple AACS data collection schemes without needing to change the overall spacecraft telemetry mode.

The Cassini AACS telemetry design also responded to the object-oriented design approach of the AACS flight software. The fundamental entity of telemetry collection was to be based on each software object. A bottoms-up approach was used to assemble and analyze the telemetry measurements per software object. A database was constructed in which each measurement (i.e. record) was associated with attributes including measurement-number (E-numbers in Cassini), mini-packet, software object, channel type, bit assignment, scale factor etc.

<sup>1 &</sup>quot;Channels" are herein used synonomously with telemetry "measurements", and should not be confused with "telecommunication channel, bandwidth".

Through iterative analysis, the collection of measurements was screened, organized, and assigned to the fundamental unit of a telemetry mini-packet. Mini-packets were created that grouped measurements by similar functions and/or similar collection periods. A systematic optimization of mini-packet assignments led to the consolidation of the database, from which statistics were synthesized and analyzed. AACS telemetry modes were designed corresponding to the overall spacecraft telemetry modes - a virtue of the flexibility of a mini-packet packetized telemetry system. Telemetry maps specifying the periodicity of telemetry mini-packets were designed, satisfying overall spacecraft telemetry bandwidth allocation requirements.

This paper describes such a systematic process and methodology, evidenced by various design products related to, or as part of, the AACS Telemetry Dictionary. This work was performed during the first part of Fiscal Year 1994, and was completed before the AACS Flight Software Critical Design Review.

### FEATURES OF A TELEMETRY **DICTIONARY**

References to the AACS Telemetry Dictionary of Galileo (ref. 1), Mars Observer (ref. 2), and Cassini (ref. 3) reveal the common features of a telemetry dictionary of a major-size spacecraft. Putting aside those spacecraft-specific design features that should always be documented, the following list shows the major features to be included in the telemetry dictionary:

Spacecraft telemetry system description

Subsystem (e.g. AACS) telemetry system

desciption

Telemetry design: data acquisition, processing, storing, and transmission; telemetry maps, rates, modes (overall spacecraft mode versus subsystem mode)

Telemetry detailed design: data format, headers, trailers, fillers, engineering "transfer

frames", major frames

Telemetry packets, mini-packets

Special telemetry modes

Telemetry Indices: by channel number, display mnemonics, data type, subsystem flight software name, and association, frequency (periodicity)

Telemetry data sheet (by channel number)

- Telemetry subcommutation map (for TDM) design; packet and mini-packet tables (for "packetized" design)

Telemetry modes, transitions, relationship between spacecraft mode and subsystem

(telemetry / operation) mode

Parent-to-child relationship between channels (child-channels are usually derived in Ground Data System in order to relieve spacecraft downlink burden)

Spreadsheet or database documentation of channel data is ideal not only for sorting / indexing purposes, but also invaluable in the analysis / synthesis of telemetry modes, rate (periodicity) association, decommutation and mini-packet / packet design. Spreadsheet columns, i.e. attributes, should at least include channel number, display mnemonics, data type, subsystem association, flight software name, and frequency (periodicity).

In fact, the basis of the Cassini AACS Telemetry Dictionary used for the mini-packet / packet design, rate group association, and overall downlink channel bandwidth optimization, was a spreadsheet documentation of all telemetry channels.

Additional attributes included in the Cassini AACS Telemetry Dictionary spreadsheets were associations to software object, hardware unit, and mini-packet function (hence mini-packet name). Desired data frequency (periodicity) was a very important attribute, used in the iterative design of the mini-packets. The desired periodicity expressed the "freshness" requirement, and was represented by cardinal ratings of F, FM, M, MS, and S (i.e. fast, fastmedium, medium-slow, and slow). Attributes of data types (signed integer, unsigned integer, floating-point, digital, state and ASCII) and number of data bits were included for channel bandwidth optimization and statistics summarization.

## PACKET / MINI-PACKET DESIGN vs TDM (Time Division Multiplex) DESIGN

The gist of the design differences between packet / mini-packet design versus TDM design is the absence vs presence of a "telemetry decommutation map".

In a TDM design, a channel will be included in the telemetry stream (regardless of whether the stream is to be downlinked or stored on-board) at a fixed location according to the decommutation map. A map covers all locations of a complete unit of telemetry stream (also known in Galileo as Major Frame, in Mars Observer as Engineering Transfer Frame). At a given bit rate, the "frame" always spans the same duration of time. (Hence, the scheme is called TDM.)

Within a decommutation map, the same channel can appear once or multiple times. In the former case, the channel is said to be in the "slow deck"; in the latter, "medium" or "fast" deck, depending on the repetition rate. In Galileo, there are basically three rates, the "ninety-one-deck", "thirteen-deck", and "zero-deck", ranging from slow to fast. For 1200 bps telemetry rate, the periods are 60 2/3 sec., 8 2/3 sec, and 2/3 sec. In Mars Observer, in the 2000 bps Engineering Mode, there are the 32 sec., 8 sec., 1 sec. "decks" for the flight computer processed data.

Decommutation maps are large. There can be multiple maps, one for each Spacecraft "mission" mode. In Mars Observer, there are four modes: Engineering, Mission, Emergency and Safe Mode; with different bit rates ranging from fast to slow, respectively. In Galileo, even though bit rate can change from 1200 bps down to 8 bps, the same decommutation map still applies; however, there is an extra "Variable Telemetry Map" that can be selected from four choices. All Variable Telemetry Maps provide 22.5 (16-bit) words, equivalently 18 plus 9 one-half channels at the zero-deck rate.

Changes to decommutation maps are possible normally via memory loads at specific memory addresses. Such a change process is laborintensive.

For Cassini, if TDM were used, the maps would be even larger (about five times as large as Galileo, and one-and-a-half times larger than Mars Observer). This is not simply due to complexity of the spacecraft, i.e. number of subsystems, but is due to increase of computation power of the on-board computers.

Without using the packet / mini-packet design, Cassini would suffer excessive sluggishness in AACS telemetry - where the fastest allocation downlink rate was at 1896 bps, with 576 bps allocated to AACS.

The mini-packet design provides AACS with total freedom to assign desired / appropriate mini-packets to the fixed packet size allocated to AACS. Each Spacecraft Subsystem is allocated a certain packet size. Multiple (not necessarily integral number of) packets can be included in an "engineering transfer frame".

Flexibility is achieved by associating AACS Telemetry Modes for certain AACS Operation Modes, and against all Spacecraft Mode. Instead of having the TDM decommutation map(s), maps of telemetry channels in mini-packets (regardless of modes), and maps of mini-packets in packets (per AACS Telemetry Mode) are stored. The first set of maps are much smaller than a TDM decommutation map. The second set of maps are basically tables of "(m,n) frequency" allocation of mini-packets to packets.

"(m,n)" frequency in Cassini means that, for that AACS Telemetry Mode, m mini-packets will be contained in n packets. E.g. (8,1) is the fastest rate and (1,64) is the slowest rate in Cassini. At an AACS packet period of 8 sec., they represent mini-packet periods of 1 sec and 512 sec.

For more details on TDM, mini-packets, guaranteed delivery of mini-packets in packets, see (ref.1 - 4)

# CASSINI PROCESS & METHODOLOGY of Telemetry Dictionary Development

The Cassini AACS telemetry design and Telemetry Dictionary development was an interactive and iterative process. Using project organization terminology, it was a cooperative task performed between the AACS Subsystem Group, Control Analysis Group, Flight Software Group, Hardware & Electronics Group, and the Ground Data Systems / Mission Operations Group.

While generic telemetry channel requirements were synthesized by the Subsystem Group, specific candidates were proposed by the Hardware Group, Analysis Group, and the Software Group. Inheritance from the Galileo and Mars Observer designs was duly observed. In fact, a one-to-one comparison was made

between the Galileo AACS Telemetry Dictionary and the candidate Cassini Dictionary, revealing potential omissions and confirming completeness.

From the respective AACS Groups, requirements for candidate telemetry channel, periodicity, data bits (resolution, precision), and format were drawn on hardware (sensors, actuators, hardware-to-electronics interfaces); control states, intermediate and observable variables; flight computer hardware data, hardware configuration and overall fault protection data. The Ground System Group was consulted regarding mission operations requirements and channel bandwidth optimization. engineered mnemonics and channel type assignment were prescribed to all measurements, conforming with JPL's AMMOS (Advanced Multi-Mission Operations System) ground software standards.

The object-oriented software design of the AACS flight software design (some 20 objects) (ref. 5) provided an easy association of telemetry to software objects. The list of object names and their statistics are given in Table 1. Telemetry Manager is one such object.) Table 2 is a sample of this initial compilation of telemetry dictionary, for the Software Object of "Accelerometer\_Telemetry\_Manager". object-oriented software design has distinct input output data flow, the same telemetry can be tapped from either the source or destination. A rule of thumb was adopted to tap the telemetry from the source, unless certain functional groupings made it more desirable to tap from the destination

A spreadsheet for all telemetry channels was then composed, where all attributes were entered, including their cardinal ordering of periodicity.

At that point, mini-packets were designed which attempted to group telemetry by

functionality

- similarity in periodicity requirement

- manageable size of mini-packet.

The number of mini-packets were kept to a minimum, compromising with the uniformity (diversity) of the functionality and periodicity of the channels grouped within the same minipacket.

The mini-packet attribute was then added to the spreadsheet. With each iteration, new packet / mini-packet design was synthesized and their statistics analyzed. Iterations on the spreadsheet, good engineering practice, and negotiations with the engineer(s) requiring the specific channels (and other requirements), then led to a compromised mini-packet design.

While the design work was approaching completion, bandwidth allocation had yet to be analyzed. This was when the cardinal ordering of mini-packet periodicity was translated into ordinal (m,n) association.

New spreadsheets were prepared (Table 3), which were linked to the Telemetry Dictionary spreadsheet, linked for channel attributes such as data bit size and mini-packet association. An iterative analysis and synthesis further led to optimized (m,n) periodicity associations, addition/deletion/merging of mini-packets, and final assignment of channels to mini-packets.

Finally, an overall design of AACS Telemetry Modes, corresponding to all AACS Operation Modes and Spacecraft "Mission" Modes led to more rounds of iterations and finalization of the telemetry design, mini-packet / packet design, and, above all, the AACS Telemetry Dictionary.

Samples of the Final Dictionary (as of Jan., 94) are given in Table 4 and 5, where the telemetry channels are ordered by channel-numbers (i.e. "E-numbers", also by Software Objects), and by mini-packets.

All in all, 1088 channels in 67 mini-packets were assembled in the AACS Telemetry Dictionary. Out of these 67 mini-packets, 6 contained the less used off-diagonal covariance and Kalman gain elements (161 measurements), which are non-essential during normal mission operations. Eliminating those left 947 measurements in 61 mini-packets. A total of seven telemetry maps corresponding to 7 AACS telemetry modes were constructed. These modes are: (1) Record; (2) Nominal Cruise; (3) Medium Slow Cruise; (4) Slow Cruise; (5) Orbital Ops; (6)  $\Delta v$ ; (7) ATE (Attitude Estimator) Calibration. These 7 maps cover all spacecraft telemetry modes. For further information about mode transitions, and for details of the AACS Telemetry Dictionary, refer to (ref. 3 and 6.)

## **CONCLUSION**

The process of bottoms-up development, use of human engineering skills, and the construction of the database had permitted a systematic way of sorting, synthesizing and analyzing all Cassini AACS telemetry measurements. Maximizing the use of database formulas and linking databases also permitted expedient parametric variation and analysis of bottom-line figures; examples of the latter were dictionary statistics, and bandwidth consumption (vs allocation) for specific telemetry modes. Hence, an effective and flexible packet / mini-packet design scheme.

This process of developing the packet / minipacket design and the establishment of the AACS Telemetry Dictionary had proven to be closely intertwined and cross-productive. The end result also provided the design for the "Telemetry Manager" flight software object. The process helped to bind a contract, i.e. interface specification of telemetry measurement between software objects. It further provided important feedback to software control algorithm designers for finalizing design parameters.

In conclusion, not only was this Cassini process a means to an end - the Telemetry Dictionary, it was also a team-player in the overall AACS flight software design.

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#### REFERENCES

- 1. Anon., "Galileo AACS Telemetry Dictionary," Document GLL-OET-91-393, Jet Propulsion Laboratory, Pasadena, Ca., USA, 10/30/91.
- Anon., "Mars Observer: Engineering Telemetry & Command Dictionary," CTD-3271152 Vol. 1 & 2, Contract #957444, prepared by Astro-Space Division, General Electric Company for Jet Propulsion Laboratory, Pasadena, Ca., USA, 9/11/92.
- 3. Anon., "Cassini AACS Telemetry Dictionary, Vol. 1 and 2," JPL Document #D-11796, Jet Propulsion Laboratory, Pasadena, Ca., USA, 5/9/94.
- Anon., "Cassini Functional Requirements: Telemetry Format and Measurements," JPL Document #699-3-281, Jet Propulsion Laboratory, Pasadena, Ca., USA, Apr. 1994.
- Hackney, J., D. Bernard & R. Rasmussen, "Cassini Spacecraft Object Oriented Flight Control Software," Paper 93-033, Proc. AIAA AAS Conf., Jan. 1993.
- Kan, E. P., "The Cassini AACS Telemetry Dictionary -Development Process and Results," presentation on 1/5/94, also IOM# GLL-OET-93-667, Jet Propulsion Laboratory, Pasadena, Ca., USA, 12/28/93.

TABLE 1. Summary Statistics - # of Channels vs Software Object

Software	Object	Software		
		Hdwe ass'n	# channels	Notes
ACL	Attitude Control		29	
ACM	Attitude Commander	Software	43	
ADC	Attitude Determinat'n Commander	Software	1	
ATE	Attitude Estimator	Software	244	161 cov & K not essential
CFG	Configuration Manager	XXX	124	101 00 Car not essential
CMD	Command Manager	Software		
CMT	Constraint Manager	Software	13	
FPA	Fault Protection & Analyzer	XXX		24 assigned: 256 TRD
FPR	Fault Protection Recovery	Software		21 designed, 250 IBD
FSX	Flight Software Executive	EFC	-	
IOUmgr	Input_Output_Unit Manager	XXX		
IVP	Inertial Vector Propagator	Software	1	
MOD	Mode Commander	Software	$\hat{5}$	
PROM	PROM_Control	Software	6	
SID	Star ID (identification)	Software	-	
TLM	Telemetry Manager	Software		
XBA	Cross-string Bus Adapter	Software	24	
ACC	Accelerometer Manager	Hdwe Mgr	7	
EGA	Engine Gimbal Actuator	Hdwe_Mgr	10	
IRU	Inertial Reference Unit	Hdwe_Mgr	12	
PMS	Propulsion Module System	Hdwe_Mgr	10	
RWA	Reaction Wheel Assembly	Hdwe Mgr	48	TOTAL # -L L 1004
SRU	Stellar Reference Unit	Hdwe_Mgr	18	TOTAL # ch.'s = 1094
SSA	Sun Sensor Assembly	Hdwe_Mgr	10	less non-ess. ATE = 933 less TBD FPA ch = 677

Table 2. Telemetry List for Accelerometer\_Manager Software Object

	Ch# (new#)	Mnemonics	Mini Pkt#	Attribute prime	Hardware associat'n	Software			Туре	Bit	Scale
			2 12 0 11	PLIME	associat n	object	ruise				Facto
E	1001	ACCstate	4	Sfwe_State2	ACC	HdweMgr	М		s	4	
E	1002	ACC_calBIAS	21	deltaV	ACC	HdweMgr	Z	"driftDelta" - calib prior to deltaV	т	16	
E	1003	deltaV_ACC	21	deltaV	ACC	HdweMgr	z	"deltaV" - after scale factor compensati	c T	16	
E	1004	ACC_totBIAS	21	deltaV	ACC	HdweMgr	MS	"drift"= driftNominal+driftDelta	· ·		
E	1005	deltaV_tmtg	21	deltaV	ACC	HdweMgr	7.	"deltaVTimeTag", used to compute "diffTi	1	16	
E	1006	ACC_tmtg	21	deltaV	ACC	HdweMar	7.	"timeTag"; 8+8 bits		16	
E	1007	raw_ACC_CT	22	IRU/ACC_data	ACC	HdweMgr	MS	"accumDeltaV" - before scale factor comp	υ - τ	16 16	
1	egend:	Rate (cruise	F = f	ast: M = medium	n. S- clow.	PM - modiu		MG 11			
								; MS = medium slow: Z = zero, except in	speci	al mo	ode
E	1394	ACC_cycle	26	IRU/ACC_stat	ACC	FM = mediu CFG	m fast S	; MS = medium slow: Z = zero, except in	speci.	al mo	ode
E E	1394 1395	ACC_cycle ACC_ONtime	26 26	IRU/ACC_stat IRU/ACC_stat			S	; MS = medium slow: Z = zero, except in unit in second		8	ode
E E	1394 1395 1650	ACC_cycle ACC_ONtime ACC_RESETct	26 26 37	IRU/ACC_stat	ACC	CFG	S		U U	8 16	ode
E E E	1394 1395 1650 1665	ACC_cycle ACC_ONtime ACC_RESETct ACC_ERR	26 26 37 38	IRU/ACC_stat IRU/ACC_stat	ACC ACC	CFG CFG	s s		U U	8 16 8	ode 
E E E	1394 1395 1650 1665 1666	ACC_cycle ACC_ONtime ACC_RESETct ACC_ERR ACC_ERR_ct	26 26 37	IRU/ACC_stat IRU/ACC_stat Reset_count	ACC ACC ACC	CFG CFG IOU_mgr	: ::		U U U	8 16 8 8	ode —
E E E	1394 1395 1650 1665 1666	ACC_cycle ACC_ONtime ACC_RESETct ACC_ERR	26 26 37 38	IRU/ACC_stat IRU/ACC_stat Reset_count Bus_error	ACC ACC ACC ACC	CFG CFG IOU_mgr IOU_mgr			U U	8 16 8	ode ———

Table 4. AACS Telemetry Dictionary - sorted by Channel# and Software Object (page 1 of XX)

СЪ	Ch#	Mnemonics	Mini		Hardware	Software	Rate	Notes	m-	D4 +	·
	(new#)	)	Pkt#	prime	associat'n	object	cruise		Type	BIT	Scale Factor
_											FACCOL
E	1001	ACCstate	4	Sfwe_State2	ACC	HdweMgr	М		S	2	1
E	1002	ACC_calBIAS	21	deltaV	ACC	HdweMgr	Z	ACC_mgr: "driftDelta" - calib prior to de		16	5.0 E6
E	1003	deltaV_ACC	21	deltaV	ACC	HdweMgr	Z	ACC_Mgr: "deltaV" - after scale factor co	. т	20	500
E	1004	ACC_totBIAS	21	deltaV	ACC	HdweMgr	2	ACC_mgr: "drift"= driftNominal+driftDelta	· I	16	5.0 E6
E	1005	deltaV_tmtg	21	deltaV	ACC	HdweMgr	Z	ACC_mgr: "deltaVTimeTag", used to compute			
Ε	1006	ACC_tmtg	21	deltaV	ACC	HdweMgr	Z	ACC_mgr: "timeTag"; 12+8 bits	Ü		BITcrop
Ε	1007	raw_ACC_CT	22	IRU/ACC_data	ACC	HdweMgr	MS	ACC_Mgr: "accumDeltaV" - before scale fac	I	24	BITcrop 1
E	1021	momUNLOADst	3	Sfwe_State	Sfwe	ACL	FM	PCC / ACL . Winson in a (municipal)			
Е	1022	MANUVR_st	3	Sfwe_State	Sfwe	ACL		RCS/ACL: "inactive/THRUSTR_WARMUP/UNloadi		2	1
Е	1023	ATT_CNTR_st	4	Sfwe_State2	Sfwe	ACL	M	TVC/RCS_deltaV/ACL: "off/TVC_enabled/RCS		2	1
Е	1024	POSdadBND_X	6	SC_pointg2	Sfwe	ACL		DCC /ACT	S	4	1
Е	1025	POSdadBND_Y	6	SC_pointg2	Sfwe	ACL	S	RCS/ACL: changes by +/-20% during cruise;	U		1.0 E5
E	1026	POSdadBND_Z	6	SC_pointg2	Sfwe	ACL	S	RCS/ACL: changes by +/-20% during cruise;	U	16	1.0 E5
E	1027	RATEddBND_X	6	SC_pointg2	Sfwe	ACL	s	RCS/ACL: changes by +/-20% during cruise;			1.0 E5
Е	1028	RATEddBND_Y	6	SC_pointg2	Sfwe	ACL		RCS/ACL: constants RCS/ACL: constants	Ū		1.0 E6
E	1029	RATEddBND_Z	6	SC_pointg2	Sfwe	ACL		RCS/ACL: constants	U		1.0 E6
E	1030	ddBND_IbitX	6	SC_pointg2	Sfwe	ACL			U	16	1.0 E6
E	1031	ddBND_IbitY	6	SC_pointg2	Sfwe	ACL	S	RCS/ACL: impulse bang-bang ctrl S/C att c	U	16	TBD
Е	1032	ddBND_IbitZ	6	SC_pointg2	Sfwe	ACL	S	RCS/ACL: impulse bang-bang ctrl S/C att c	U	16	TBD
E	1033	POSerr_X	8	Att_cntrl	Sfwe	ACL	FM	RCS/ACL: impulse bang-bang ctrl S/C att c	U	16	TBD
Е	1034	POSerr_Y	8	Att_cntrl	Siwe	ACL	FM FM	Same measurement for RCS, RWA, TVC. RCS: d€	Ι	16	2.0 E5
E	1035	POSerr Z	8	Att_cntrl	Siwe	ACL		Same measurement for RCS, RWA, TVC. RCS: de	Ι	16	2.0 E5
E	1036	RATErr_X	8	Att_cntrl	Sfwe	ACL	FM	Same measurement for RCS, RWA, TVC. RCS: $d\epsilon$	1	16	2.0 E5
E	1037	RATErr Y	8	Att_cntrl	Sfwe	ACL	FM FM	Same measurement for RCS/RWA/TVC. RCS: de	I	16	1.0 E6
E	1038	RATErr Z	8	Att_cntrl	Sfwe	ACL	FM S	ditto [IRU res of 0.25µrad/pulse/0.25 sec	I	16 1	1.0 E6
E	1039	cmdTORQUE_X	11	RWA cntrl	Siwe	ACL	FM Z	ditto [IRU res of 0.25µrad/pulse/0.25 sec	1	16 1	1.0 E6
E	1040	cmdTORQUE_Y	11	RWA cntrl	Sfwe	ACL	Z Z	RWA/ACL: Different form RWA_TQ's. Here:	Ι	16 2	2.0 E5
E	1041	cmdTORQUE_Z	11	RWA cntrl	Sfwe	ACL	z	RWA/ACL: Different form RWA_TQ's. Here:	I	16 2	2.0 E5
E	1042	cmd_S/C_H_X	11	RWA cntrl	Sfwe	ACL	z Z	RWA/ACL: Different form RWA_TQ's. Here:	I	16 2	2.0 E5
Е	1043	cmd_S/C_H_Y	11	RWA cntrl	Siwe	ACL	- 8	RWA/ACL: Different from ATE's momemntum	I	16 1	0 E3
Ε	1044	cmd_S/C_H_Z	11	RWA cntrl	Siwe	ACL	Z 2	RWA/ACL: Different from ATE's momemntum	I	16 1	.0 E3
Ξ	1045	cmd_thrustX	21	deltaV	Siwe		2	RWA/ACL: Different from ATE's momemntum	I	16 1	.0 E3
<b>Ξ</b>	1046	cmd_thrustY	21	deltaV	Siwe	ACL		TVC/ACL: "TsubC"	I	16	TBD
Ξ	1047	cmd_thrustZ	21	deltaV	Siwe	ACL		TVC/ACL: "TsubC"	I	16	TBD
3	1048	BURN_time	21	deltaV	Siwe	ACL		TVC/ACL: "TsubC"	I	16	TBD
3	1049	deltaV_pred	21	deltaV	Siwe	ACL	2	16+8 bits. 0.004 sec res 2^16 = 65536 sec	U ;	24 B	ITcrop
			21	dercav	SIWE	ACL	Z 1	TVC/ACL: predict of the time profile of ${ t T}$	U :	20	500
3		TURN_status	3	Sfwe_State	Sfwe	ACM	FM	Completed/Rate_Matching/POS_matching/COA	s	2	1
3		ATT_CMD_st	4	Sfwe_State2	Sfwe	ACM	М			4	1
		cmdSC_Q1	5	SC_pointing	Sfwe	ACM	MS	base_attitude"			2768
2	etc	etc	etc	etc.	etc.	etc.		nt a	tc e	-	2768 etc
									6		510

Mini-Backet Name	House   Periodic Stoe (Ne)   # 600	Mini-Packet Name		AACS Packe Assignable F Period (sec)^^ 1 1 32 4 16 16 128 256 256 256 256 256 256 64 64 64 64 64 64 77		
High Packet Name		Mini-Packet Name		AACS Packe Assignable E  1 1 32 4 4 16 16 256 256 256 256 256 256 256 256 256 25		
Estimated Attitude   6   132   184   194   194   194   192   192   194	Estimated Attitude Controller   6   132   184   18   18   19   19   19   19   19   19	Mini-Packet Name         # channels           Estimated Attitude         6           Hardware Configuration         13           Software State         30           Software State         30           Software State         30           Spacecraft Pointing         15           Spacecraft Pointing         20           Tum telemetry         19           Attitude Controller         6           Constraint Attitude Controll         10           RWA General Data         8           RWA Controller         8           Attitude Estimator (ATE) Metric         9           Attitude Estimator (ATE) Data         22           ATE Auto-Calibration Data         12           ATE Star Pre-Filter Data         12           ATE Star Pre-Filter Data         10           SID: Star 34 & 5 Data         34           SID: Star 34 & 5 Data         19           SID: Star 34 & 5 Data         12           RW & ACC Output Data         22           RWA Output Data         28           NA Maneuver Data         14           RW & GED Data         14           RW & CO Coutput Data         28           VDE & EGE Data	++	Period (sec)/  1 32 4 4 16 16 256 256 256 256 256 256 256 256 256 25	132.00 5.75 17.25 9.00 16.50 2.06 1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	23% 23% 3% 3% 3% 0% 0% 0% 0% 0% 0% 0% 0%
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Software State   19   184   184   184   187   187   187   188	Individual Configuration   13   184   12   12   12   12   12   12   12   1	Hardware Configuration   13	· · · · · · · · · · · · · · · · · ·	32 4 4 16 16 256 256 256 256 2 128 128 64 64 64 64 64 64 64 64 64 64	5.75 17.25 9.00 16.50 2.06 1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	2.3% 2.3% 2.3% 3.3% 3.3% 0.0%
Software State         8         6.9         2         4         17.25           Spacecatt Pointing         15         2.64         2         16         10.00           Spacecatt Pointing         15         2.64         2         16         10.00           Tum learneity         19         3.28         3.26         2.06         1.20           Tum learneity Altitude Cartrollar         10         184         6         5.26         1.20           Consistain Altitude Estimator (ATE) Meric         9         166         1.20         1.28         1.28         0.00           AMILIOS Estimator (ATE) Data         2.2         3.76         6         5.12         0.34           AMILIOS Estimator (ATE) Data         1.2         1.6         4         5.2         0.00           ATE Coversion Data         1.2         1.6         4         5.1         1.4         4         0.00           ATE Coversion Data         1.2         1.6         4.0         3.2         2.6         1.6         1.0         4         5.2         0.0         0.0         4         5.2         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0	Software State         8         69         2         4         17.25           Spacecatt Pointing         15         2.64         2         16         9.00           Spacecatt Pointing         15         2.64         2         16         9.00           Tum learneity         19         3.28         1.26         1.26         1.26           Attitude Estimator (ATE) Metric         9         1.84         6         5.12         6.00           Attitude Estimator (ATE) Metric         9         1.64         2         6.4         5.26         1.26           Attitude Estimator (ATE) Metric         9         1.64         5.2         6.4         5.2         6.00           ATE Star tot-fluct of ATE) Data         1.2         1.64         5.1         6.4         5.2         6.0           ATE Star tot-fluct of ATE) Data         1.2         2.76         6.4         5.1         6.4         5.2         6.0         0.0           ATE Star tot-fluct of ATE) Data         1.2         2.76         6.4         5.1         6.4         5.1         0.35         6.4         5.1         0.35         6.4         5.1         0.0         0.35         0.0         0.0         0.35	Software State   Software State   Software State   Software State   2   30     Spacecraft Pointing   15     Spacecraft Pointing   2   20     Turn telemetry   19   19     Attitude Controller   6     Constraint Attitude Control   10     RWA General Data   8     RWA Controller   10     Attitude Estimator (ATE) Metric   9     ATE Auto-Calibration Data   12   22     ATE Auto-Calibration Data   12   22     ATE Star Poeraline Data   12   22     ATE Star Poeral Data   9   1     SiD: Star 1 & 2 Data   19   3     SID: Star 1 & 2 Data   19   3     SID: Star 3,4 & 5 Data   19   3     SID: Star 3,4 & 5 Data   19   3     SID: Star 1 & 2 Data   14   2     SSA & SRU Cutput Data   2   8     SSA & SRU Statistics   6     SSA & SRU Statistics   8   1     EGA Statistics   11   12   11     EGA Statistics   11   12   11     Table	n	16 256 256 256 256 256 2 512 128 64 64 64 64 64 64 64 64 16	17.25 9.00 16.50 2.06 1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	2 % 8 % 8 % 8 % 9 % 9 % 9 % 9 % 9 % 9 % 9
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Spacecraft Pointing 2   20   204   32   256   126   126   100   204   205   206   126   206	Spacecraft Pointing 2         10         264         3         256         156           Ornstraint Attude Control         19         328         32         256         108           Attude Controller         6         120         64         512         600           RWA Controller         10         184         120         64         512         600           RWA Controller         10         184         120         64         512         600           RWA Controller         10         184         120         64         512         600           ARIT Action Estimator (ATE) Data         22         376         6         512         64         512         64           ARIE Covariance Data         12         168         64         512         64         512         64           ARIE Star Pre-Time         22         376         6         512         64         512         64         512         64         64         610         64         610         64         610         64         610         610         610         610         610         610         610         610         610         610         610         610	Spacecraft Pointing 2   20   10   10   10   10   10   10		256 256 256 2 2 512 128 128 64 64 64 64 64 64 64 64 64 64 64 64 64	2.06 2.06 1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	9% 0% 0% 0% 0% 0% 0% 0% 0% 0%
Turn telemetry	Tum belenatory         10         20         25         25         25         20         20           Attitude Controller         6         120         4         25         256         1.28           RWA General Data         8         120         163         2         256         1.28           Attitude Estimator (ATE) Matric         9         168         126         128         144           Attitude Estimator (ATE) Matric         9         168         126         128         64         23.60           Attitude Estimator (ATE) Data         2         376         6         4         23.60         3.50           ATE Covariance Data         12         168         126         164         5.12         0.34           ATE San Per Filer Data         12         16         2         64         5.12         0.42           SID Star 18 Z Data         19         168         176         4         4.50         0.35           SID Star 18 Z Data         19         176         4.40         1.72         4.40         0.42         5.60         0.42           SID Star 18 Z Data         19         1.72         2.44         6.4         5.12         0.42	Turn telemetry		256 256 2 2 512 128 128 64 64 64 64 64 64 64 64 64 64 64 64 64	2.06 1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	0% 0% 0% 0% 0% 0% 0% 0% 0%
Authurde Controller	Affittide Controller	Attitude Controller	. 4 4	2 512 128 128 128 64 64 64 64 64 64 16	1.28 60.00 0.36 0.94 1.44 84.00 23.50 3.38 5.88	0% 0 0% 0 0% 0 0% 0 0% 0 0% 0 0% 0 0%
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Name	RVAN Controlled Data	RWA General Data   8		128 128 2 2 64 64 64 512 512 512 712	0.94 1.44 84.00 23.50 3.38 5.88 0.42	0% 0% 0% 0% 0% 0%
Attitude Estimator (ATE) Bate   194   16   128   1.44     Attitude Estimator (ATE) Bate   22   376   16   23.50     ATE Covariance Data   12   216   16   23.50     ATE Covariance Data   12   216   16   23.50     ATE Covariance Data   12   216   16   216   23.50     ATE Covariance Data   12   216   16   216   23.50     ATE Covariance Data   12   246   16   22.50     ATE Covariance Data   12   248   126   16   22.50     ATE Covariance Data   22   246   23.50     ATE Covariance Data   22   246   23.50     ATE Covariance Data   22   246   23.50     ATE Covariance Data   22   246   240   32   256   256     ATE Covariance Data   22   246   23.50     ATE Collection Type Data   22   246   32   256   256     ATE Constructor Data   24   240   32   256   256     ATE Constructor Data   24   24   240   32   256   240     ATE Constructor Data   24   240   32   240   32   240     ATE Callectheater Cycles   26   240   36   240   36   36   36   36   36   36   36   3	Attitude Estimator (ATE) Metric   10   184   16   128   1.44     Attitude Estimator (ATE) Data   22   376   168   4.00     ATE Covariance Data   12   2.16   1.65   1.65     ATE Covariance Data   1.2   3.76   1.68   1.60     ATE Covariance Data   1.2   3.76   1.69   1.60     ATE Covariance Data   1.2   3.76   1.60   1.60     ATE Covariance Data   1.2   3.76   1.60     ATE Covariance Data   1.2   3.76   1.60   1.72   3.80     ATE Covariance Data   1.2   3.76   1.60   1.72   3.80     ATE Covariance Data   1.2   3.76   1.72   3.80     ATE Covariance Data   1.2   3.76   1.72   3.80     ATE Covariance Data   1.2   3.76   3.76   3.80     ATE Covariance Data   1.2   3.76   3.80     ATE Covariance Data   1.2   3.80   3.80     ATE Covariance Data   1.72   3.80     ATE Covariance Data   1.72   3.80     ATE Covariance Data   1.80   3.80   3.80     ATE Covariance Data   1.80   3.80   3.80     ATE Cannarian Marks   1.80   3.80   3.80     ATE Cannarian Marks   1.80   3.80   3.80     ATE Cannariance Data   1.80   3.80   3.80     ATE Cannariance Data   1.80     ATE Cannariance Data   1.80     ATE Cannariance	HWA Controller		128 2 2 64 64 64 512 512 4 16	1.44 84.00 23.50 3.38 5.88 0.42	15% 15% 16% 17% 17% 17% 17% 17% 17%
Attlitude Estimator (ALE) Meinre         9         168         4         2         64         9         168         4         9         168         4         9         168         4         9         168         16         23.50         23.50         23.50         23.50 <t< td=""><td>Affiltude Estimator (ALE) Meirre         9         168         4         5         64         93.60           Aff Auto-Calibration Data         12         216         16         23.50         16         23.50           ATE Auto-Calibration Data         12         216         6         64         5.86           ATE Covariance Data         12         216         6         512         0.33           ATE Ediman Gain Data         12         216         6         512         0.33           SID: Start &amp; Explain         19         184         2         6         512         0.33           SID: Start &amp; Explain         19         184         6         512         0.35           SID: Start &amp; Explain         12         248         126         4.94         4.94           SID: Start &amp; Explain         12         248         16         4.94         4.94           SID: Start &amp; Explain         12         2.48         1.6         5.50         1.95           SSA &amp; SRU Unipu Data         22         2.64         3         6         2.50         1.95           SSA &amp; SRU Statistics         6         2.84         6         5.12         0.19         1.84</td><td>  Attitude Estimator (ATE) Metric   9     ATTITUDE Estimator (ATE) Data   22     ATE Auto-Calibration Data   12     ATE Star Perfette Data   22     ATE Covariance Data   12     ATE Kalman Gain Data   9     SID: Star 1 &amp; 2 Data   10     SID: Star 3 &amp; 8 5 Data   19     SID: Star 3 &amp; 8 5 Data   19     SID: Calibration-Type Data   12     AV Maneuver Data   12     RIV &amp; ACC Output Data   22     RWA Output Data   24     SSA &amp; SRU Output Data   14     RIV &amp; ACC Statistics   6     SSA &amp; SRU Statistics   6     EGA Statistics   8     EGA Statistics   12     EGA Statistics   14     EGA Statistics   15     EGA</td><td>4+</td><td>2 16 64 64 64 512 512 4 4 16</td><td>23.50 23.50 3.38 5.88 0.42</td><td>15% 4 4% 1 1% 0 0% 0 0% 1 3% 1 1% 0 0%</td></t<>	Affiltude Estimator (ALE) Meirre         9         168         4         5         64         93.60           Aff Auto-Calibration Data         12         216         16         23.50         16         23.50           ATE Auto-Calibration Data         12         216         6         64         5.86           ATE Covariance Data         12         216         6         512         0.33           ATE Ediman Gain Data         12         216         6         512         0.33           SID: Start & Explain         19         184         2         6         512         0.33           SID: Start & Explain         19         184         6         512         0.35           SID: Start & Explain         12         248         126         4.94         4.94           SID: Start & Explain         12         248         16         4.94         4.94           SID: Start & Explain         12         2.48         1.6         5.50         1.95           SSA & SRU Unipu Data         22         2.64         3         6         2.50         1.95           SSA & SRU Statistics         6         2.84         6         5.12         0.19         1.84	Attitude Estimator (ATE) Metric   9     ATTITUDE Estimator (ATE) Data   22     ATE Auto-Calibration Data   12     ATE Star Perfette Data   22     ATE Covariance Data   12     ATE Kalman Gain Data   9     SID: Star 1 & 2 Data   10     SID: Star 3 & 8 5 Data   19     SID: Star 3 & 8 5 Data   19     SID: Calibration-Type Data   12     AV Maneuver Data   12     RIV & ACC Output Data   22     RWA Output Data   24     SSA & SRU Output Data   14     RIV & ACC Statistics   6     SSA & SRU Statistics   6     EGA Statistics   8     EGA Statistics   12     EGA Statistics   14     EGA Statistics   15     EGA	4+	2 16 64 64 64 512 512 4 4 16	23.50 23.50 3.38 5.88 0.42	15% 4 4% 1 1% 0 0% 0 0% 1 3% 1 1% 0 0%
All E Star Pre-Filter Data   12   216   23.50     AITE Star Pre-Filter Data   12   216   64   518   64   518     AITE Star Pre-Filter Data   12   216   64   518   64   518     AITE Covariance Data   12   216   64   512   0.42     AITE Covariance Data   10   184   2   164   419     AITE Covariance Data   10   184   2   164   518   0.42     SID: Star 1 & 2 Data   10   184   2   164   419     SID: Star 2 & 2 Data   12   248   12   46   0.93     SID: Star 3 & 5 Data   12   248   12   46   0.93     SID: Star 3 & 4 & 5 Data   12   248   12   40   40     SID: Star 3 & 4 & 5 Data   12   248   12   40   40     SID: Star 3 & 4 & 5 Data   12   248   12   40   40     SID: Star 3 & 4 & 5 Data   12   248   12   40   40     SID: Star 3 & 4 & 5 Data   12   248   12   40   40   40     SSA & SRU Output Data   2   2   2   2   40   40   40   40     SSA & SRU Output Data   2   2   2   2   40   40   40   40     SSA & SRU Output Data   2   2   2   2   40   40   40   40   4	All E Star Pre-Filter Data   12   216   23.50     AITE Star Pre-Filter Data   12   216   64   5.18     AITE Star Pre-Filter Data   12   216   64   5.18     AITE Star Pre-Filter Data   12   216   64   5.18     AITE Star Pack Data   19   184   2.58   64   5.12   0.42     SID: Star 1 & 2 Data   19   184   2.58   164   4.54   46.00     SID: Star 1 & 2 Data   12   2.48   1.68   1.65   1.72     AIVE Materior Data   12   2.48   1.26   2.56   0.97     SID: Star 2 & S. Data   1.2   2.48   1.2   2.56   0.97     SID: Catiloration Type Data   2.2   2.48   1.2   2.56   0.97     SID: Star 2 & S. Data   2.2   2.48   1.2   2.56   0.97     SID: Star 3 & S. Data   2.2   2.64   4.94   4.94     SID: Catiloration Type Data   2.9   2.64   5.12   0.18     SID: Catiloration Type Data   2.9   2.49   4.94   4.94   4.94     SID: Catiloration Type Data   2.9   2.49   4.94   4.94   4.94     SID: Catiloration Type Data   2.9   2.49   4.94   4.94   4.94     SID: Catiloration Type Data   2.9   2.49   4.94   4.94   4.94   4.94     SID: Catiloration Type Data   2.9   2.49   4.94   4.94   4.94   4.94   4.94     SID: Catiloration Type Data   2.9   2.49   4.94	ATTE Auto-Calibration Data 12  ATE Auto-Calibration Data 12  ATE Star Pre-Filter Data 22  ATE Covariance Data 12  ATE Kalman Gain Data 9  SID: Star 1 & 2 Data 10  SID: Star 3,4 & 5 Data 19  SID: Star 3,4 & 5 Data 19  SID: Calibration-Type Data 3,4  AV Maneuver Data 3,4  AV Maneuver Data 12  RWA Output Data 9  SSA & SRU Output Data 22  RWA Output Data 28  VDE & EGE Data 14  RU & ACC Statistics 6  SSA & SRU Statistics 6  EGA Statistics 12		16 64 64 64 512 512 4 4 16	23.50 3.38 5.88 0.42	1% 1 1% 0 0% 0 0% 1 1% 0 0%
ATE Star Pre-Filter Data   12   216   64   512   0.42     ATE Covariance Data   19   306   22   16   19.25     ATE Covariance Data   19   308   22   268   46.00     ATE Covariance Data   19   308   22   268   46.00     ATE Covariance Data   19   308   22   268   46.00     ATE Covariance Data   22   248   32   25.80     ATE Covariance Data   22   248   32   25.80     ATE Covariance Data   22   248   32   32   32     ATE Covariance Data   22   248   32   32   32     ATE Covariance Data   23   240   32   32   32     ATE Covariance Data   24   24   25   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   240   32   32   32   32     ATE Covariance Data   25   260   32   32   32   32     ATE Covariance Data   25   260   32   32   32   32     ATE Covariance Data   25   260   32   32   32   32     ATE Covariance Data   25   260   32   32   32   32     ATE Covariance Data   25   36   36   35   32   32   32     ATE Covariance Data   25   36   36   36   36   36   36   36   3	All Extra continuation   12   216   8   64   3.38     Alf Extra continuation   12   216   64   512   0.42     Alf Extra continuation   12   216   64   512   0.43     SID: Start is & Data   19   308   308   16   16   16   16     SID: Start is & Data   19   308   308   16   16   16   16     SID: Start is & Data   19   308   308   16   16   16   16     SID: Start is & Data   19   308   308   16   16   16   16     SID: Start is & Data   19   308   308   16   16   16   16     SID: Start is & Data   19   308   176   128   16   16     SID: Start is & Data   19   308   176   172   184   172     RWA Output Data   22   264   440   18   18   18   18   18   18   18   1	ATE Star Pre-Filter Data   12     ATE Star Pre-Filter Data   22     ATE Kalman Gain Data   12     ATE Kalman Gain Data   9     SID: Star 1 & 2 Data   10     SID: Star 3,4 & 5 Data   19     SID: Star 3,4 & 5 Data   19     SID: Calibration-Type Data   34     AV Maneuver Data   12     RVA ACC Output Data   9     SSA & SRU Output Data   22     RWA Output Data   24     RVA Cot Statistics   6     SSA & SRU Statistics   6     SSA & SRU Statistics   6     SSA & SRU Statistics   6     EGA Statistics   12     EGA Statistics   13     EGA Statistics   14     EGA Statistics   15     EGA Statistics   16     EGA Statistics   16     EGA Statistics   16     EGA Statistics   17     EGA	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	64 64 512 512 4 4 128	3.38 5.88 0.42	1% 1 % 0 % 8 % 8 % 1 % 0 %
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ATE Kalman Galin Data         9         168         64         512         0.42           SID: Star 1 & 2 Data         10         184         64         512         0.03           SID: Star 1 & 2 Data         10         184         64         512         0.03           SID: Star 1 & 2 Data         19         16         4         46.00         0.03           SID: Star 3 & 4 & Data         19         12         248         176         4         49.4           SID: Star 3 & 4 & Data         22         248         176         4         32         5.60           SSA & SRU Output Data         22         264         440         32         2.66         1.72           NVA E ECEP Data         14         200         4         32         5.60           NVA E ECEP Data         14         200         4         32         6.25           FWA Datasitics         6         120         4         512         0.19           FG Statistics         16         280         4         512         0.13           FMA Statistics         16         280         4         512         0.13           FMA Statistics         16         28	ATE Kalman Gain Data         1 / 2         21B         64         512         0.42           SID: Star 1 & 2 Data         10         184         7         4         46.00           SID: Star 1 & 2 Data         10         184         6.25         16         19.25           SID: Star 1 & 2 Data         19         12         2.48         7         4         46.00           SID: Star 3 & Data         19         1.26         1.6         19.25         15.0           SID: Calibration Type Data         2.2         2.48         3.2         2.56         0.37           SA & SHU Output Data         2.2         2.64         3.2         2.56         1.72           RWA ACC Output Data         2.2         2.64         3.2         2.66         1.72           SAA & SHU Cuput Data         2.2         2.64         3.2         2.56         1.72           NVA A SARISISCS         6         3.2         6.4         5.12         0.23           ROA SARISISCS         6         3.2         6.4         5.12         0.23           PMS LatchYalve & ME Statistics         16         2.80         6.4         5.12         0.23           PMS Ene Fire Time         8	ATE Kallman Cada   SID: Star 1 & 2 Data   10   SID: Star 1 & 2 Data   10   SID: Star 3.4 & 5 Data   19   SID: Calibration-Type Data   34   AV Maneuver Data   12   RV & ACC Output Data   9   SSA & SRU Output Data   9   SSA & SRU Output Data   22   RWA Output Data   28   VDE & EGE Data   14   RU & ACC Statistics   6   SSA & SRU Statistics   6   SSA & SRU Statistics   6   EGA Statistics   8   EGA Statistics   12		512 512 4 4 16 158	0.42	0% 8% 3% 1% 0%
SID: Start it & Data         10         160         184         512         0.33           SID: Start it & Data         19         308         1         4         46.00           SID: Start at & Data         19         308         1         1         128         4.94           SID: Card At & Data         19         308         176         1         128         4.94           SID: Card At & Data         12         248         176         1         22         1.64           SSA & SRU Output Data         22         264         4         32         2.56         1.92           RWA Output Data         28         176         4         32         2.56         1.94           NDE & EEGE Data         114         200         4         32         2.56         1.72           RWA Output Data         28         120         4         512         0.19         1.72           RWA Output Data         12         20         4         512         0.19         1.72         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12         1.12	SID: Star 1 & 2 Data         10         184         2         64         512         0.33           SID: Star 1 & 2 Data         19         308         1         184         46.00         19.25           SID: Star 3 & 5 Data         19         308         176         1         128         4.94           SID: Calibration-Type Data         12         248         176         1         256         1.925           AV Maneuver Data         12         248         176         4         32         256         1.94           SSA & SRU Output Data         22         264         4         32         256         6.25           RWA Output Data         28         4         32         256         6.25           RWA Coutput Data         28         120         6.4         512         0.19           RWA Coutput Data         28         440         32         256         6.25         8.25           RWA Coutput Data         28         120         6.4         512         0.19         1.72         1.72           RWA Coutput Data         28         120         6.4         512         0.19         1.72         1.83         1.83         1.83	SID: Star 1 & 2 Data       10         SID: Star 3,4 & 5 Data       19         SID: Calibration-Type Data       34         AV Maneuver Data       12         IRU & ACC Output Data       9         SSA & SRU Output Data       22         RWA Output Data       28         VDE & EGE Data       14         IRU & ACC Statistics       6         SSA & SRU Statistics       6         EGA Statistics       8         EGA Statistics       12	- 0	16 16 128	0 33	0% 8% 3% 1% 0%
SID: Star 3.4 & 5 Data         19         308         4         46,00           AV Maneure Institution Properties         34         632         16         16.25           AV Maneure Institution Properties         12         248         126         15.6         19.25           AV Maneure Institution Properties         22         264         12         25.6         0.97           SSA & SRIU Output Data         22         264         12         25.6         1.72           NDE & LeGE Data         14         200         64         51.2         6.25           VIDE & LeGE Data         14         200         64         51.2         6.25           IRU & ACC Statistics         6         96         64         51.2         0.23           IRU & ACC Statistics         16         24.8         64         51.2         0.23           IRU & ACC Statistics         16         24.8         64         51.2         0.23           PWS A Statistics         16         24.8         64         51.2         0.23           PWS A Statistics         16         24.8         64         51.2         0.23           PWS A Statistics         16         2.48         64	SID: Star 3.4 & 5 Data         19         308         2         4         46,00           SID: Star 3.4 & 5 Data         19         308         16         4         46,00           SID: Calibration I yee Data         34         632         176         128         4.194           AV Manteuver Data         12         22         264         32         256         0.97           SSA & SHO Output Data         22         264         4         32         256         0.97           RWA Output Data         22         264         4         32         256         1.72           RWA Output Data         14         200         4         32         256         1.72           NSA & SHU Statistics         6         96         64         512         0.19         6.25           SSA & SHU Statistics         16         248         64         512         0.19         6.25           RWA Statistics         16         22         28         216         512         0.19           PMS LatchValve & ME Statistics         16         216         512         0.19         64         512         0.19           PMS LatchValve & ME Statistics         16	SID: Star 3.4 & 5 Data       19         SID: Calibration-Type Data       34         AV Maneuver Data       12         IRU & ACC Output Data       9         SSA & SRU Output Data       22         RWA Output Data       28         VDE & EGE Data       14         IRU & ACC Statistics       6         SSA & SRU Statistics       6         EGA Statistics       8         EGA Statistics       12	7	16	22.50	8% 3% 1% 0%
SID: Calibration-Type Data         34         632         64         19.25           IRU & ACC Output Data         12         248         12         256         0.97           IRU & ACC Output Data         22         264         40         32         5.50           SSA & SRU Output Data         28         440         16         256         1.72           VDE & REE Data         14         200         4         32         6.25           NDE & REE Data         12         120         4         32         6.25           NDE & REE Data         12         120         4         32         6.25           NSA & SHU Statistics         6         96         4         512         0.23           FOMS LatchYalve & ME Statistics         15         128         64         512         0.36           PMS LatchYalve & ME Statistics         16         280         16         512         0.36           PMS LatchYalve & ME Statistics         16         280         16         512         0.36           PMS Date FireTime         8         216         512         0.36         512         0.19           PMS AFIRETIME         8         216         528	SID: Calibration-Type Data         3.4         6.00         7         16         18.25           AV Maneuver Data         12         2.48         12         2.56         1.97           IRU & ACC Couptup Data         22         2.64         32         2.50         1.72           RWA Output Data         22         2.64         32         2.56         1.72           RWA Cuptu Data         22         2.64         32         2.50         1.72           RWA Statistics         6         6.4         512         0.23         1.62           RWA Statistics         16         2.80         6.4         512         0.23         1.6           RWA Statistics         16         2.80         6.4         512         0.23         1.6         1.8         0.23         1.6	SID: Calibration-Type Data         34           AV Maneuver Data         12           IRU & ACC Output Data         9           SSA & SRU Output Data         22           RWA Output Data         28           VDE & EGE Data         14           IRU & ACC Statistics         6           SSA & SRU Statistics         6           EGA Statistics         8           EGA Statistics         12		128	46.00	1%
AV Maneuver Data         12         2.02         128         4.94           RUA AcrOuptu Data         9         176         4         32         2.56         0.97           RWA Output Data         22         4.64         32         2.56         1.72           RWA Output Data         28         4.64         32         8.25           RWA S & S R S R S R S R S R S S R S R S S R S S R S	AV Maneuver Data         12         2.02         128         4.94           RIV & ACC Output Data         9         176         4         32         2.56         0.97           RIV & ACC Output Data         9         176         4         32         2.56         6.75           RWA Coutput Data         2.8         4.40         4         3.2         8.25         6.25           RWA Coutput Data         2.8         4.40         4         3.2         6.25         6.25           NDE & EGE Data         1.4         2.00         4         3.2         6.25         6.25           RVA & CS Statistics         6         9.6         6.4         5.12         0.13         6.4         5.12         0.13           PMS LatchValvae & ME Statistics         1.6         2.46         6.4         5.12         0.78         0.48         0.16         4         5.12         0.18         0.18         0.16         1.69         1.6         2.19         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18         0.18	AV Maneuver Data  IRU & ACC Output Data  SSA & SRU Output Data  PWA Output Data  VDE & EGE Data  IRU & ACC Statistics  SSA & SRU Statistics  EGA Statistics  8  EGA Statistics		128	19.25	1%0
IRU & ACC Output Data   9   176	FILU & ACC Output Data   9   176	IRU & ACC Output Data   9     SSA & SRU Output Data   22     RWA Output Data   28     VDE & EGE Data   14     RU & ACC Statistics   6     SSA & SRU Statistics   6     EGA Statistics   8     EGA Statistics   12	, 7		4.94	%0
SSA & SRU Output Data         22         264         7         35         8.25           RWA Count Data         28         440         7         256         1.72           NDE & ECEC Data         14         200         4         32         6.25           IRU & ACC Statistics         6         96         512         0.23         8.25           IRU & ACC Statistics         12         184         512         0.23         8.25           IRU & ACC Statistics         6         96         512         0.23         8.25           IRU & ACC Statistics         12         1248         512         0.23         9.28           IRU & ACC Statistics         16         248         512         0.23         9.88           IRW Statistics         16         280         16         512         0.36           PMS Latch Valve & ME Statistics         16         280         16         128         2.19           PMS Latch Valve & ME Statistics         16         280         16         128         2.19           PMS CatBed Heater Cycles         16         280         16         512         0.56           PMS CatBed Heater Cycles         16         280	SSA & SRU Output Data         22         264         172         5.50           RWA Output Data         28         440         32         256         1.72           VDE & EGE Data         14         200         4         32         6.25           RIU & ACC Statistics         6         96         512         0.19           EGA Statistics         12         184         64         512         0.18           EGA Statistics         16         248         64         512         0.18           PMS LatchValve & ME Statistics         15         176         64         512         0.18           PMS LatchValve & ME Statistics         16         280         16         128         1.69           PMS LatchValve & ME Statistics         16         280         16         128         1.69           PMS LatchValve & ME Statistics         16         280         16         128         1.69           PMS LatchValve & ME Statistics         16         280         16         1.28         1.69           PMS CatBedheater Cycles         16         280         16         512         0.36           Reset Counters         10         280         264         512	SSA & SRU Output Data         22           RWA Output Data         28           VDE & EGE Data         14           RU & ACC Statistics         6           SSA & SRU Statistics         8           EGA Statistics         8	7 C 7 C C C C	007	0.97	
NAME of the part of the control of	Number   N	RWA Output Data         28           VDE & EGE Data         14           RU & ACC Statistics         6           SSA & SRU Statistics         8           EGA Statistics         12		32	5.50	%
Fig. 8   Color     Fig. 8   Co	NUL & EGE Data	VDE & EGE Data         14           IRU & ACC Statistics         6           SSA & SRU Statistics         8           EGA Statistics         12	~	256	1 79	%1
SSA SRU Statistics         6         96         96         10         64         512         0.19           EGA Statistics         120         120         16         248         512         0.23           RWA Statistics         16         248         64         512         0.34           PMS LatchValve & ME Statistics         15         176         176         176         176         178         0.34           PMS Thuster Cycles         16         280         16         216         128         2.19           PMS TriefTime         8         216         16         128         1.69         1.69           PMS A FirefTime         8         216         16         128         1.69         1.69           PMS A FirefTime         8         216         16         128         1.69         1.69           PMS A FirefTime         8         216         16         128         1.69         1.69           PMS A FirefTime         8         216         16         128         1.69         1.69           PMS A FirefTime         8         216         1.6         1.64         512         0.19           PMS A FirefTime         13 <td>SSA SRU Statistics         6         96         96         120         64         512         0.19           EGA Statistics         120         184         512         0.23           RWA Statistics         16         248         64         512         0.34           PMS LatchValve &amp; ME Statistics         15         176         64         512         0.34           PMS Thatester Cycles         16         280         16         216         176         128         2.19           PMS The Fire Time         8         216         16         280         16         128         2.19           PMS CatBedHeater Cycles         16         280         16         216         16         216           PMS CatBedHeater Cycles         16         280         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         512         0.56           Reset Counters         13         286         64         512         0.56           Reset Counters         20         264         512         0.56           &lt;</td> <td>SSA &amp; SPU Statistics 6 EGA Statistics 8 EGA Statistics 12</td> <td>- · · · ·</td> <td>32</td> <td>6.25</td> <td>9 %</td>	SSA SRU Statistics         6         96         96         120         64         512         0.19           EGA Statistics         120         184         512         0.23           RWA Statistics         16         248         64         512         0.34           PMS LatchValve & ME Statistics         15         176         64         512         0.34           PMS Thatester Cycles         16         280         16         216         176         128         2.19           PMS The Fire Time         8         216         16         280         16         128         2.19           PMS CatBedHeater Cycles         16         280         16         216         16         216           PMS CatBedHeater Cycles         16         280         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         512         0.56           Reset Counters         13         286         64         512         0.56           Reset Counters         20         264         512         0.56           <	SSA & SPU Statistics 6 EGA Statistics 8 EGA Statistics 12	- · · · ·	32	6.25	9 %
RWA Statistics	BWA Statistics         120         64         512         0.23           RWA Statistics         16         248         512         0.36           PMS LatchValve & ME Statistics         16         280         16         512         0.36           PMS Thruster Cycles         16         280         16         128         1.69           PMS Thruster Cycles         16         280         16         128         1.69           PMS A FireTime         8         216         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           FFC Emors         13         288         64         512         0.56           AFC Emors         13         288         64         512         0.58           AFC Emors         15         144         64         512         0.58           Backup AFC Hardware Status         20         404         8         64         512         0.58           Backup AFC Hardware Status         20         328         64         512         0.64 <td>EGA Statistics 12</td> <td>4 44 .</td> <td>512</td> <td>0.19</td> <td>%0</td>	EGA Statistics 12	4 44 .	512	0.19	%0
PMS Latasitics	PMS Latchtole & ME Statistics   12	LGA Statistics	** :	512	0.23	%0
PMS Triuster Cycles         16         248         64         512         0.48           PMS Triuster Cycles         16         216         176         64         512         0.34           PMS Triuster Cycles         16         216         178         128         2.19           PMS A FireTime         8         216         16         128         1.69           PMS CatBod-leader Cycles         16         280         16         128         1.69           PMS CatBod-leader Cycles         16         280         16         128         1.69           ACE Errors         28         264         512         0.56           ACS Bus Errors         30         264         512         0.56           AACS Bus Errors         30         264         512         0.56           AACS Bus Errors         30         264         512         0.56           AACS Bus Errors         30         264         512         0.56           Backup ErC Errors         30         264         512         0.56           Backup ErC Errors         30         328         64         512         0.64           Backup ErC Errors         17         412	PMS Introduction of the PMS Trinuster Cycles         16         248         64         512         0.48           PMS Trinuster Cycles         16         216         176         64         512         0.34           PMS Trinuster Cycles         16         216         17         128         2.19           PMS A FireTime         8         216         17         128         2.19           PMS B FireTime         8         216         16         128         1.69           PMS CatBedHearter Cycles         16         280         16         128         1.69           AFC Errors         13         288         16         512         0.56           ACS Bus Errors         15         144         64         512         0.56           AACS Bus Errors         30         264         512         0.56           AACS Bus Errors         30         264         512         0.56           Backup AFC Errors         20         328         64         512         0.58           Backup AFC Hardware Status         20         328         64         512         0.73           Backup AFC Hardware Status         17         412         4         51	RWA Statistics	,	512	0.36	%0
PMS A FireTime	PMS_A FireTime         15         176         16         512         0.34           PMS_A FireTime         8         216         15         128         2.19           PMS_B FireTime         8         216         16         128         2.19           PMS_B FireTime         8         216         16         128         1.69           PMS_CatBedHeater Cycles         16         280         16         128         1.69           AFC Errors         13         288         64         512         0.56           EFC Errors         28         540         16         1.69         2.16           AACS Bus Errors         30         264         512         0.56           AACS Bus Errors         30         264         512         0.56           Backup AFC Hardware Status         20         404         1         8         64         512         0.56           Backup AFC Hardware Status         20         326         1         64         512         0.56           Backup AFC Hardware Status         20         326         1         64         512         0.64           Bus Mesesage Status         17         412         4	PMS I stehlydra 9 MT States	*	512	0.48	%0
PMS CatBedHeater Cycles         16         280         1 fs         128         2.19           PMS CatBedHeater Cycles         16         216         16         128         1.69           PMS CatBedHeater Cycles         16         280         1 fs         128         1.69           AFC Errors         13         288         64         512         0.18           AFC Errors         28         540         64         512         0.28           Reset Counters         15         144         64         512         0.28           Reset Counters         20         264         512         0.28           AACS Bus Errors         30         264         512         0.58           Prime AFC Hardware Status         20         328         64         512         0.58           Backup AFC Errors         20         328         64         512         0.56           Backup AFC Hardware Status         20         372         64         512         0.58           Backup AFC Hardware Status         20         372         64         512         0.54           Backup AFC Hardware Status         17         412         4         54         12.88 </td <td>PMS A FireTime         8         216         16         128         2.19           PMS B FireTime         8         216         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           AFC Errors         13         288         16         4512         0.56           AFC Errors         28         540         16         512         0.56           AFC Errors         28         540         164         512         0.56           AFC Errors         20         404         164         512         0.56           AGCS Bus Errors         30         264         512         0.56           Backup AFC Hardware Status         20         404         164         512         0.58           Backup AFC Errors         20         328         164         512         0.56           Backup AFC Errors         20         372         164         512         0.64           Backup AFC Errors         20         372         164         512         0.73           Bus Message Status         17         412         4         32         12           Anomaly</td> <td>PMC Thristor Ordes</td> <td>~ 64</td> <td>512</td> <td>0.34</td> <td>%0</td>	PMS A FireTime         8         216         16         128         2.19           PMS B FireTime         8         216         16         128         1.69           PMS CatBedHeater Cycles         16         280         16         128         1.69           AFC Errors         13         288         16         4512         0.56           AFC Errors         28         540         16         512         0.56           AFC Errors         28         540         164         512         0.56           AFC Errors         20         404         164         512         0.56           AGCS Bus Errors         30         264         512         0.56           Backup AFC Hardware Status         20         404         164         512         0.58           Backup AFC Errors         20         328         164         512         0.56           Backup AFC Errors         20         372         164         512         0.64           Backup AFC Errors         20         372         164         512         0.73           Bus Message Status         17         412         4         32         12           Anomaly	PMC Thristor Ordes	~ 64	512	0.34	%0
PMS_BETEFITIONS         8         216         15         128         169           PMS_CatBedHeater Cycles         16         280         16         280         16         128         1.69           AFC Errors         13         288         16         4512         0.56         219           AFC Errors         28         540         16         512         0.56         0.58           AFC Errors         20         264         64         512         0.58         0.58           AGS Bus Errors         20         264         64         512         0.58         0.58           Prime AGC Hardware Status         20         328         64         512         0.58           Backup AFC Hardware Status         20         372         64         512         0.58           Backup AFC Hardware Status         20         372         64         512         0.58           Backup AFC Hardware Status         20         372         64         512         0.58           Backup AFC Hardware Status         17         412         64         512         0.58           Backup AFC Hardware Status         17         412         4         32         12.88	PMS Briefine	PMS A FireTime	 	128	2.19	%0
PMS CatBedHeater Cycles         16         210         15         128         1.69           AFC Errors         16         280         1         64         512         0.56           AFC Errors         15         144         64         512         0.56           Best Counters         15         144         64         512         0.56           AACS Bus Errors         30         264         1         64         512         0.52           AACS Bus Errors         30         264         64         512         0.52           Backup Erc Errors         9         184         64         512         0.52           Backup ErC Errors         9         184         64         512         0.52           Backup ErC Errors         9         184         64         512         0.52           Backup ErC Errors         20         328         64         512         0.52           Backup Fr Cerrors         12         18         64         512         0.64           Bus Message Status         17         412         4         4         4           Anomaly Status         12         10         76         8         64<	PMS CatBedHeater Cycles         16         210         15         128         1.69           AFC Errors         4FC Errors         13         288         16         4512         2.19           AFC Errors         15         144         64         512         0.56           Reset Counters         15         144         64         512         0.28           AACS Bus Errors         30         264         64         512         0.28           AACS Bus Errors         20         404         8         64         512         0.28           Prime AFC Hardware Status         20         404         8         64         512         0.28           Backup AFC Errors         9         184         64         512         0.36           Backup AFC Hardware Status         20         372         64         512         0.36           Backup AFC Hardware Status         18         256         17         64         512         0.73           Bus Message Status         17         412         4         32         12.88           Anomaly Status         17         76         8         64         1.98           Anomaly Status         105<	PMS B FireTime	\$ . **	128	1.69	%0
AFC Errors         17         2.80         1 64         512         2.19           EFC Errors         28         540         1 64         512         0.56           Reset Counters         15         144         64         512         0.56           AACS Bus Errors         30         264         1 64         512         0.28           AACS Bus Errors         30         264         1 64         512         0.28           Backup Erc Errors         9         184         64         512         0.52           Backup FC Errors         20         328         64         512         0.52           Backup FC Errors         20         328         64         512         0.52           Backup FC Errors         20         372         64         512         0.64           Backup AFC Hardware Status         18         18         64         512         0.64           Bus Message Status         17         412         4         4         4         4           Fault Protection Status         13         176         8         64         512         4.38           Anomaly Status         128         280 x 8         164         <	AFC Errors         17         2.80         1 64         512         2.19           EFC Errors         28         540         64         512         0.56           Reset Counters         15         144         64         512         0.56           AACS Bus Errors         30         264         1         64         512         0.28           Prime AFC Hardware Status         20         404         8         64         512         0.28           Backup AFC Errors         9         184         64         512         0.52           Backup AFC Hardware Status         20         328         64         512         0.36           Backup AFC Hardware Status         18         256         1         64         512         0.36           Backup AFC Hardware Status         18         256         1         64         512         0.36           Buckup AFC Errors         19         18         256         54         512         0.73           Buckup AFC Errors         10         76         512         0.73         12.8           Anomaly Status         17         4         32         12.88           Anomaly Status         128 </td <td>PMS CatBedHeater Cycles 18</td> <td>ν ( - ,</td> <td>128</td> <td>1.69</td> <td>%0</td>	PMS CatBedHeater Cycles 18	ν ( - ,	128	1.69	%0
FFC Emors   28   540   64   512   1.056	Peset Counters   28   540   64   512   1.056     AACS Bus Errors   15   1444   64   512   1.05     AACS Bus Errors   30   264   1 64   512   0.28     Prime AFC Hardware Status   20   404   1 8   64   512   0.52     Backup AFC Errors   9   184   1 64   512   0.52     Backup AFC Errors   9   184   1 64   512   0.36     Backup AFC Errors   20   372   64   512   0.36     Backup AFC Hardware Status   18   256   18   8   32.00     Fault Profection Status   17   412   8   64   2.75     Anomaly Status   128   280 x 8   64   512   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     ATE Covariance Data 2//5   105   1776   0.64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   664   #DIV/0!   0.00     This "Becord" Telemetry Mode is contact of the c	AFC Errors 13	0 × 0	128	2.19	%0
AACS Bus Errors   15   144   1 64   512   1.05     AACS Bus Errors   30   264   1 64   512   0.28     Prime AFC Hardware Status   20   404   1 8   64   512   0.52     Backup AFC Errors   20   328   64   512   0.36     Backup AFC Hardware Status   20   372   64   512   0.64     Backup AFC Hardware Status   18   256   512   0.64     Backup AFC Hardware Status   18   256   512   0.64     Backup AFC Hardware Status   18   256   54   512   0.73     Backup AFC Hardware Status   18   256   54   512   0.64     Anomaly Status   13   176   8   64   1.19     Anomaly Status   128   280 x 8   64   512   4.38     Anomaly Status   128   280 x 8   64   512   4.38     Anomaly Status   128   280 x 8   64   512   4.38     ATE Covariance Data 2//5   105   1776   0.64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   4365   534.33     Total bps   1986   13865   534.33     Total bps   1094   13865   534.33	Peset Counters	EFC Errors 28	, , , ,	512	0.56	%0
AACS Bus Errors         30         264         1         64         512         0.50           Prime AFC Hardware Status         20         404         1         8         64         512         0.52           Backup AFC Errors         9         184         1         64         512         0.36           Backup AFC Errors         20         372         64         512         0.36           Backup EFC Errors         20         372         64         512         0.36           Backup AFC Hardware Status         20         372         64         512         0.64           Bus Message Status         17         412         3         8         32.00           Anomaly Status         17         412         4         5.75           Anomaly Status         12         280 x 8         64         5.12         4.38           Anomaly Status         128         280 x 8         64         5.12         4.38           Anomaly Status         128         280 x 8         64         5.12         4.38           ATE Covariance Data 2/5         105         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         60	AACS Bus Errors         30         264         1         64         512         0.26           Prime AFC Hardware Status         20         404         1         8         64         512         0.52           Backup AFC Errors         9         184         1         64         512         0.52           Backup AFC Hardware Status         20         328         64         512         0.64           Bus Message Status         18         256         1         64         512         0.64           Bus Message Status         17         412         4         32         0.64           Anomaly Status         17         412         4         32         12.88           Anomaly Status         10         76         8         64         1.19           High Water Marks         128         280 x 8         64         1.19           ATE Covariance Data 2//5         105         1776         64         4.38           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         534.33         534.33	Reset Counters 15		510	1.05	%5
Prime AFC Hardware Status   20   404   1   8   64   6.31     Backup AFC Errors   9   184   184   6.31     Backup AFC Errors   20   328   64   512   0.36     Backup AFC Hardware Status   20   372   64   512   0.64     Bus Message Status   18   256   18   8   32.00     Fault Protection Status   17   412   4   32   12.88     Anomaly Status   128   280 x 8   64   5.12   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     Anomaly Status   128   280 x 8   64   5.12   4.38     ATE Covariance Data 2/5   105   1776   66   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   66   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   66   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   66   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   66   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   67   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   67   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   67   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   67   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   67   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   600   600   600     ATE Kalman Gain Data 2   36   600   600   600   600     ATE Kalman Gain Data 2   36   600   600   600   600   600     ATE Kalman Gain Data 2   36   600   600   600   600   600     ATE Kalman Gain Data 2   36   600   60	Prime AFC Hardware Status   20   404   1   8   64   6.31     Backup AFC Errors   9   184   164   6.31     Backup EFC Errors   20   328   64   512   0.56     Backup AFC Hardware Status   20   372   64   512   0.54     Bus Message Status   18   256   18   8   32.00     Fault Protection Status   17   412   4   32   12.88     Anomaly Status   128   280 x 8   64   512   4.38     High Water Marks   128   280 x 8   64   512   4.38     ATE Covariance Data 2//5   105   1776   0 64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   6 4   #DIV/0!   0.00     This "Becord" Telemetry Mode Secret Arrors   13865   534.33     This "Becord" Telemetry Mode Secret Arrors   13865   534.33	AACS Bus Errors 30	9	510	0.20	%0
Backup AFC Errors         9         184         1         64         512         0.36           Backup EFC Errors         20         328         64         512         0.36           Backup AFC Hardware Status         20         372         64         512         0.63           Bus Message Status         18         256         1         8         32.00           Fault Protection Status         17         412         4         32         12.88           Anomaly Status         13         176         8         64         2.75           Anomaly Status         10         76         8         64         2.75           High Water Marks         128         280 x 8         1         64         512         4.38           ATE Covariance Data 2/5         105         1776         9         64         512         4.38           ATE Kalman Gain Data 2         36         600         6.4         512         4.38           ATE Kalman Gain Data 2         36         600         6.4         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         534.33	Backup AFC Errors         9         184         1         64         512         0.01           Backup EFC Errors         20         328         64         512         0.64           Backup EFC Errors         20         372         64         512         0.64           Bus Message Status         18         256         18         32.00         0.73           Fault Protection Status         17         412         4         32         12.86           Anomaly Status         13         176         8         64         1.19           Anomaly Status         10         76         8         64         1.19           High Water Marks         128         280 x 8         64         1.19           ATE Covariance Data 2//5         105         1776         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         534.33         534.33	Prime AFC Hardware Status 20	\ ∞ ⊷	64	6 31	%0
Backup EFC Errors         20         328         6 4         512         0.054           Backup AFC Hardware Status         20         372         64         512         0.64           Bus Message Status         18         256         32         0.64           Fault Protection Status         17         412         4         32         12.88           Anomaly Status         13         176         8         64         2.75           High Water Marks         128         280 x 8         164         2.75           High Water Marks         128         280 x 8         64         1.19           ATE Covariance Data 2//5         105         1776         64         512         4.38           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         534.33           * This "Record" Telemetry Mode is one out of 7 modes: (1) Record; (2) Nominal Crinise: (3) Madrime Clauser (3) Madrime Clauser (3) Madrime Clauser (3) Madrime C	Backup EFC Errors         20         328         64         512         0.00           Backup AFC Hardware Status         20         372         64         512         0.73           Bus Message Status         18         256         18         8         32.00           Fault Protection Status         17         412         4         32         12.88           Anomaly Status         10         76         8         64         2.75           High Water Marks         128         280 x 8         184         1.19           Persistence High Water Marks         128         280 x 8         64         1.19           ATE Covariance Data 2//5         105         1776         0.64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         534.33	Backup AFC Errors 9	1 64	512	36.0	0/2
Bus Message Status   18   256   18   8   32.00     Fault Protection Status   17   412   4   32   12.88     Fault Protection Status   13   176   8   64   2.75     Anomaly Status   12   280 × 8   64   512   4.38     Anomaly Status   12   280 × 8   64   1.19     High Water Marks   12   280 × 8   64   512   4.38     High Water Marks   12   280 × 8   64   512   4.38     ATE Covariance Data 2//5   105   1776   0 64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   36   36   400   0.00     ATE Kalman Gain Data 2   36   36   36   400   0.00     ATE Kalman Gain Data 2   36   36   36   400   0.00     ATE Kalman Gain Data 2   36   36   36   36   36   36   36	Bus Message Status	Backup EFC Errors 20	64	512	0.50	%0
Buls Message Status         18         256         1         8         32.00           Fault Protection Status         17         412         4         32         12.88           Anomaly Status         13         176         8         64         2.75           Anomaly Status         10         76         8         64         2.75           High Water Marks         128         280 x 8         164         5.12         4.38           High Water Marks         128         280 x 8         64         1.19         4.38           ATE Covariance Data 2//5         105         1776         64         #DIV/01         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/01         0.00           ATE Kalman Gain Data 2         1094         13865         #DIV/01         0.00           ATE Kalman Gain Data 2         1094         13865         534.33	bus Message Status         18         256         18         256         18         32.00           Fault Protection Status         17         412         4         32         12.88           Anomaly Status         13         176         18         64         2.75           Anomaly Status         10         76         18         64         2.75           High Water Marks         128         280 x 8         164         1.19           Persistence High Water Marks         105         1776         64         512         4.38           ATE Covariance Data 2//5         105         1776         0 64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1034         13865         7.34.33         7.01al bps           * This "Record" Telemetry Mode is contact?         7.01al #bits         7.01al #bits         7.01al bps         534.33	Backup AFC Hardware Status 20	1 49 %	512	0.73	%0
Fauli Protection Status   17   412   4   32   12.88   4   4   12   12.88   4   4   13   176   10   10   1   1   1   1   1   1   1	Anomaly Status	Bus Message Status		8	32.00	%
Anomaly Status	Anomaly Status         13         176         \$ 64         2.75           Anomaly Status 2         10         76         \$ 64         2.75           High Water Marks         128         280 x 8         \$ 64         1.19           Persistence High Water Marks         128         280 x 8         \$ 64         1.19           ATE Covariance Data 2//5         105         1776         0 64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         1094         13865         Total bps         534.33	Fault Protection Status	**	32	12.88	2%
Anomaly Status 2	Anomaly Status 2	Anomaly Status 13	<b>89</b>	64	2.75	000
High Water Marks   128   280 x 8   1	High Water Marks   128   280 x 8   1 64   512   4.38   4.33   4.38   4	Anomaly Status 2	88	64	1 19	%O
Persistence High Water Marks   128   280 x 8   64   512   4.38     ATE Covariance Data 2//5   105   1776   0 64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   0 64   #DIV/0!   0.00     Total #ch's   Total #bits   Total #bits   1094   13865   534.33     Total bps   Total #ch's   Total #bits   Total bps   534.33     Total bps   Total #ch's   Total #ch's   Total ps   Total ps   534.33     Total bps   Total	Persistence High Water Marks   128   280 x 8   1 64   512   4.38     ATE Covariance Data 2//5   105   1776   0 64   #DIV/0!   0.00     ATE Kalman Gain Data 2   36   600   0 64   #DIV/0!   0.00     Total #ch's   Total #bits   Total #bits   Total bps   534.33     This "Record" Telemetry Mode is not at 17   1865   534.33	High Water Marks 128	***	512	4 3R	70,
ATE Kalman Gain Data 2         36         1776         9         64         #DIV/0!         0.00           ATE Kalman Gain Data 2         36         600         6.3         #DIV/0!         0.00           Total #ch's Total #bits         Total bps         1094         13865         534.33           * This "Record" Telemetry Mode is one out of 7 modes: (1) Record: (2) Nominal Cruise: (3) Madring Share Chair Chai	ATE Kalman Gain Data 2         75         105         1776         0 64         #DIV/0!         0 00           ATE Kalman Gain Data 2         36         600         0 64         #DIV/0!         0 00           This "Becord" Telemetry Mode is not at 1094         1014 #bits         Total #bits         Total bps           * This "Becord" Telemetry Mode is not at 10 ft	Persistence High Water Marks 128	1 64	512	4 38	1%
A I E Kalman Gain Data 2   36   600   0   64   #DIV/0!   0.00	A I E Kalman Gain Data 2   36   600   0   64   #DIV/0!   0.000	ATE Covariance Data 2//5 105		#DIV/0!	0.00	%-
Total bits 13865 534.33 modes: (1) Record: (2) Nominal Critiser (3) Modium Share Chair	s Total #bits Total bps 13865 534.33	ATE Naiman Gain Data 2 36		#DIV/0!	0.00	%0
13865 534.33 modes: (1) Record: (2) Nominal Critisar (3) Marting Share Control	13865 Total bps 13865 534.33	4				
modes: (1) Record: (2) Nominal Cruisa: (3) Macfirm Cloud	6006		+		-	otal bdwl
modes: (1) Record:		-			534.33	95%
100001	modes: (1) Hecord:	* This "Record" Telemetry Mode is one out of 7 modes: (1) Record	1. (2) Nominal (	Prileo (3) Madii	المرابع المرام	

Table 5. AACS Telemetry Dictionary - sorted by Mini\_Packet# (page 1 of XX)

СЬ		Mnemonica			Hardware	Software			Туре	Bit	Scale
-	(new#	1	Pkt	# prime	associat'n	object	ruis	e*			Facto
E	1121	BODY_Z_RA	1	Est_Att	Cfrio		_				
Е	1122	BODY_Z_DEC	1	Est_Att	Sfwe Sfwe	ATE	F	20 bit: 6 μrad resolution	1	20	2^19/
Ε	1123	BODY_Z_TWIS		Est_Att	Siwe	ATE ATE	F F	20 bit: 6 µrad resolution	I	20	2^19/
E	1124	X_rate	1	Est_Att	Sfwe	ATE	F	20 bit: 6 μrad resolution	I	20	2^19/
E	1125	Y_rate	1	Est_Att	Sfwe	ATE	F		I	16	2.0 E
E	1126	Z_rate	1	Est_Att	Sfwe	ATE	F		I	16	2.0 E
			1				•		1	16	2.0 E
Ε	1381	BUS_prime	2	Hdwe_config	EFC	CFG	М		_		
Ε	1382	SNSR_pwr	2	Hdwe_config	Hdwe	CFG	М		D	16	1
Е	1383	ACTR_pwr	2	Hdwe_config	Hdwe	CFG	М		D	8	1
Ε	1384	SNSR_prime	2	Hdwe_config	Hdwe	CFG	М		D	8	1
E	1385	ACTR_prime	2	Hdwe_config	Hdwe	CFG	М		D D	4 8	1 1
E	1386	SNSR_hlth	2	Hdwe_config	Hdwe	CFG	М		D	16	1
E	1387	ACTR_hlth	2	Hdwe_config	Hdwe	CFG	М		D	16	1
Ξ	1388	VDE_pwr	2	Hdwe_config	PMS	CFG	М		D	12	1
E	1389	VDE_prime	2	Hdwe_config	PMS	CFG	M		D	12	1
E	1390	VDE_hlth	2	Hdwe_config	PMS	CFG	М		D	20	1
E E	1391	RCS_prime	2	Hdwe_config	PMS	CFG	М		D	8	1
E	1392	RCS_A_hlth	2	Hdwe_config	PMS	CFG	М		D	16	1
2	1393	RCS_B_hlth	2	Hdwe_config	PMS	CFG	М		D	16	1
Ε	1001		2							10	•
E	1021 1022	momUNLOADst	3	Sfwe_State	Sfwe	ACL	FM	RCS/ACL: "inactive/THRUSTR_WARMUP/UNloadi	S	2	1
Ξ Ξ	1061	MANUVR_st	3	Sfwe_State	Sfwe	ACL	FM	TVC/RCS_deltaV/ACL: "off/TVC_enabled/RCS	S	2	1
3	1127	TURN_status	3	Sfwe_State	Sfwe	ACM	FM	"Completed/Rate_Matching/POS_matching/COA	S	2	1
3	1541	SunEphm_chk	3	Sfwe_State	Sfwe	ATE	FM	SSA sun_vect not equal (with tolerance) t	S	1	1
5	1741	CMT_status	3	Sfwe_State	Sfwe	CMT	FM	"Nominal/noJ2000/withJ2000/timeout"	s	2	1
2	1741	AACS_mode AACS_stat1	3	Sfwe_State	Sfwe	MOD	FM		S	4	1
2	1743	AACS_stat1	3	Sfwe_State	Sfwe	MOD	FM		D	16	1
•	1,43	AACS_SCACZ	3	Sfwe_State	Sfwe	MOD	FM		D	16	1
2	1023	ATT_CNTR_st	4	06			1				
3		ATT_CMD_st		Sfwe_State2	Sfwe	ACL	М		S	4	1
:		ADC_state	4 4	Sfwe_State2	Sfwe	ACM	М		s	4	1
:		ATT_EST_st		Sfwe_State2	Sfwe	ADC	М		s	4	1
:	1129	deltaV_ESst	4 4	Sfwe_State2	Sfwe	ATE	м		S	4	1
		AVOID_state	4	Sfwe_State2	Sfwe	ATE	М	TYC/RCS_delta_V/ACL: "idle/acc/timer/impu	s	2	1
:		PTGviolatST	4	Sfwe_State2	Sfwe	CMT	М	"Celestial_vect/body_vect"	S	4	TBD
		ACCstate	4	Sfwe_State2 Sfwe_State2	Sfwe	CMT	М	"body_vect/thermal violation_duration"	S	4	TBD
		EGAA_state	4		ACC	HdweMgr	М		S	2	1
		EGAB_state	4	Sfwe_State2 Sfwe_State2	EGA	HdweMgr	M g		S	2	1
		IRUA_state	4	Sfwe_State2	EGA	HdweMgr	M S		S	2	1
		IRUB_state	4	Sfwe_State2 Sfwe_State2	IRU	HdweMgr	9	"on/off"	S	2	1
		IRUA_status	4		IRU	HdweMgr	М	on/off"	S	2	1
		IRUB_status	4	Sfwe_State2 Sfwe_State2	IRU	HdweMgr	М	<pre>'max_pulse_viol;max_acc_viol;A&amp;B_consiste</pre>	D	8	1
		PMSA_state	4	Sfwe_State2	IRU	HdweMgr	М	<pre>'max_pulse_viol;max_acc_viol;A&amp;B_consiste</pre>	D	8	1
		PMSB_state	4	Sfwe_State2	PMS PMS	HdweMgr	М	on/off;idle;ME_critical_enabled;ME_pulse	D	8	1
		RWA1_state	4	Sfwe_State2	RWA	HdweMgr	М	on/off;idle;ME_critical_enabled;ME_pulse	D	8	1
		RWA2_state	4	Sfwe_State2	RWA	HdweMgr	М		S	3	1
		RWA3_state	4	Sfwe_State2	RWA	HdweMgr	М		S	3	1
		RWA4_state	4	Sfwe_State2	RWA	HdweMgr	М		S	3	1
		SRUA_state	4	Sfwe_State2	SRU	HdweMgr	М		S	3	1
	1932 \$	GRUB_state	4	Sfwe_State2	SRU	HdweMgr HdweMgr	М		S	2	1
	1961 3	SSAA_state	4	Sfwe_State2	SSA	HdweMgr	м м "	1 - 66 "	S	2	1
	1962 9	SAB_state	4	Sfwe_State2	SSA	HdweMgr	3	on/off"	S .	2	1
	1963 8	SAA_status	4	Sfwe_State2	SSA	HdweMgr	2	on/off"	S :	2	1
	1964 5	SAB_status	4	Sfwe_State2	SSA	HdweMgr	M .	auto/grd_cmd'd_thrshld;sun_there;sun_sta	D :	8	1
	1731 I	VP_status	4	Sfwe_State2	Sfwe	IVP	М " Ма	la CIT TUD OF 1		В	1
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