Satellite	NORAD-ID	Frequency	Modulation	Baudrate	Output power	Callsign
SONATE	TBD	437.025 MHz	GMSK	9600	27-30 dBm	DP0SNT

SONATE is compatible to standard G3RUH 9600 baud terminal node controllers.

The telemetry is ecapsulated transfer frames and source packets as defined in the CCSDS Recommendations 102.0-B-5 for Packet Telemetry, using AX.25 packets as the master channel:

			Frame	Name	Description	ParamType	ParamFormat	Interpretation	DecimalCnt	BitLength	Size [Byte]	Default Values
MASTER CHANNEL AX.25 (total of 283 byte)			AX25Head	Flag	begin of AX25 frame marker	Unsigned Int	Parameter		0	40		5 x 0x7E
			AX25Head	Address	callsign destination	String	Parameter		0	56		0x86 0xA2 0x40 0x40 0x40 0x40 0xE0
					callsign source	String	Parameter		0	56		0x88 0xA0 0x60 0xA6 0x9C 0xA8 0xE1
			AX25Head	Control		Unsigned Int	Parameter		0	8		0x3E
			AX25Head	PID		Unsigned Int	Parameter		0	8	21	0xF0
	CCSDS TRANSFER FRAME =AX25Info (total of 255 byte)		TFHead	TFVN	Transfer frame version number	Unsigned Int	Parameter		0	2		0x0
			TFHead	SCID	Spacecraft Identifier	Unsigned Int	Parameter		0	10		23
			TFHead	VCID	Virtual channel identifier	Unsigned Int	VcID	0=Online Std HK (APID 100), 1=Offline Std HK (APID 110), 2= Extended TM of Sat Bus (APID 200 - 700), 3=Extended HK ASAP-Light (APID 1000), 4=Extended HK ADIA-Light (APID 1100), 5=Payload Data AROS, Reaction Wheels (APID1200 - 1400) 6=Payload Data ASAP-Light (APID 1010)	0	3		
			TFHead	OCFF	Operational control field flag	Boolean	Parameter		0	1		0x0
			TFHead	MCFC	Master channel frame count	Unsigned Int	Parameter		0	8		
			TFHead	VCFC	Virtual channel frame count	Unsigned Int	Parameter		0	8		
			TFHead	TF_SHF	TF secondary header flag	Boolean	Parameter		0	1		0x0
			TFHead	SYNCHFLAG	Synchronisation flag	Boolean	Parameter		0	1		0x0
			TFHead	POF	Packet order flag	Boolean	Parameter		0	1		0x0
			TFHead	SLID	Segment length identifier	Unsigned Int	Parameter		0	2		0x3
			TFHead	FHP	First header pointer	Unsigned Int	Parameter	0x7FF=no SourcePacket header in this TransferFrame	0	11	6	
		CCSDS SOURCE PACKET 1 (min 6 byte, up to 65542 byte)	SPHead	PVN	Packet version number	Unsigned Int	Parameter		0	3		0x0
			SPHead	PT	Packet Type Indicator	Boolean	Parameter		0	1		0x0
			SPHead	**SHF**	**Packet Secondary header flag**	**Boolean**	**Parameter**	0=no Secondary Header 1=contains Secondary Header	**0**	**1**		
			SPHead	**APID**	**Application process identifier**	**Unsigned Int**	**APID**		**0**	**11**		
			SPHead	SEQFLAG	GroupingFlags	Unsigned Int	Parameter	1= first Source Packet of a new Group 0= next Source Packet of the current Group 2= last Source Packet of the current Group 3= no Grouping	0	2		
			SPHead	PSC	Source Sequence Count	Unsigned Int	Parameter		0	14		
			SPHead	PDL	Packet data length	Unsigned Int	Parameter		0	16	6	
			SOURCEPACKET SECONDARY HEADER (0 or 4 byte)	UTCTIM	UTC Timestamp	Unsigned Int	Parameter	**seconds since 01/01/1970 00:00:00 UTC included for all APIDs but APID100 and APID110**		0 or 32	0 or 4	
			DATA (up to 241 bytes per Transfer Frame)		**The actual structure of the included data depends on the APID. Please see the corresponding sheet of this document. The data of one APID may both spread over several Transfer Frames (indicated by the Source Sequence Count and Packet data length) and also several Source Packets (i.e. indicated by the Grouping Flags)**						max 241	
		CCSDS SOURCE PACKET 2 ... n (min 6 byte, up to 65542 byte)	**Source Pacekt 2 ... n of the same Virtual Channel. If no more Source Packets are available for the Virtual Channel, but the payload field of the Transfer Frame of fixed size is not yet full, a so called Idle Frame (APID 2047) is included. The Packet data length of the Idle Frame is set to align to the Transfer Frame payload field. It contains random data**											
			TFFoot	FECFD	Frame Error Control Field Data	String	Parameter	CRC-16 with Polynom = 0x8005, Initial Value = 0x0000, Final XOR Value = 0x0000	0	16	2	
			AX25Foot	FCS		String	Parameter		0	16		
			AX25Foot	Flag	end of AX25 frame marker	String	ErrorMarker		0	40	7	5 x 0x7E

APID 100 - Standard-Housekeepings Online

ID	Description	Calibration*	Unit	Start Byte	Start Bit	Bit Length	Datatype
UTCTIM	Coordinated Universal Time as synchronized onboard of the satellite	UNIX Time	s	0	0	32	INT
ADC1PW	ADCS 1 power status	0=OFF 1=ON		4	0	1	INT
ADC2PW	ADCS 2 power status	0=OFF 1=ON		4	1	1	INT
ADCACT	active ADCS system, source for the following telemetry of ADCS	0=ADCS1 1=ADCS2		4	2	1	INT
ADCMOD	ADCS control mode	0=IDLE 1=DETUMBLE 2=NADIR_PT 3=SUN_PT 4=INERTIAL_PT 5=SLEW		4	3	3	INT
SSX1NP	Sun Sensor in -X direction on bus 1, power status	0=OFF 1=ON		4	6	1	INT
SSX2NP	Sun Sensor in -X direction on bus 2, power status	0=OFF 1=ON		4	7	1	INT
ADCECN	ADCS error counter			5	0	8	INT
ADCECO	ADCS error code			6	0	8	INT
SSX1PP	Sun Sensor in +X direction on bus 1, power status	0=OFF 1=ON		7	0	1	INT
SSX2PP	Sun Sensor in +X direction on bus 2, power status	0=OFF 1=ON		7	1	1	INT
SSY1NP	Sun Sensor in -Y direction on bus 1, power status	0=OFF 1=ON		7	2	1	INT
SSY2NP	Sun Sensor in -Y direction on bus 2, power status	0=OFF 1=ON		7	3	1	INT
SSY1PP	Sun Sensor in +Y direction on bus 1, power status	0=OFF 1=ON		7	4	1	INT
SSY2PP	Sun Sensor in +Y direction on bus 2, power status	0=OFF 1=ON		7	5	1	INT
SSZ1NP	Sun Sensor in -Z direction on bus 1, power status	0=OFF 1=ON		7	6	1	INT
SSZ2NP	Sun Sensor in -Z direction on bus 2, power status	0=OFF 1=ON		7	7	1	INT
SSZ1PP	Sun Sensor in +Z direction on bus 1, power status	0=OFF 1=ON		8	0	1	INT
SSZ2PP	Sun Sensor in +Z direction on bus 2, power status	0=OFF 1=ON		8	1	1	INT
MM1USE	magnetoinductive magnetometer RM3100, used for magnetic field measurement	0=FALSE 1=TRUE		8	2	1	INT
MM2USE	magnetoresistive magnetometer HMC5883L, used for magnetic field measurement	0=FALSE 1=TRUE		8	3	1	INT
GY1USE	gyroscope ADXRS453 , used for rotational speed measurement	0=FALSE 1=TRUE		8	4	1	INT
GY2USE	gyroscope CRM100/200, used for rotational speed measurement	0=FALSE 1=TRUE		8	5	1	INT
MTX1US	magnetorquer in X1 direction on bus 1, in use for control	0=FALSE 1=TRUE		8	6	1	INT
MTX2US	magnetorquer in X2 direction on bus 2, in use for control	0=FALSE 1=TRUE		8	7	1	INT
MTYMUS	magnetorquer in -Y direction on bus 1, in use for control	0=FALSE 1=TRUE		9	0	1	INT
MTYPUS	magnetorquer in +Y direction on bus 2, in use for control	0=FALSE 1=TRUE		9	1	1	INT
MTZMUS	magnetorquer in -Z direction on bus 1, in use for control	0=FALSE 1=TRUE		9	2	1	INT
MTZPUS	magnetorquer in +Z direction on bus 2, in use for control	0=FALSE 1=TRUE		9	3	1	INT
SSUSXM	Sun sensor on -X axis used as the source of the Sun vector	0=NO 1=YES		9	4	1	INT
SSUSXP	Sun sensor on +X axis used as the source of the Sun vector	0=NO 1=YES		9	5	1	INT
SSUSYM	Sun sensor on -Y axis used as the source of the Sun vector	0=NO 1=YES		9	6	1	INT
SSUSYP	Sun sensor on +Y axis used as the source of the Sun vector	0=NO 1=YES		9	7	1	INT
SSTICT	SSTV counter of transmitted image frames			10	0	8	INT
SSXMEA	measured Sun vector, using Sun Sensors, X component	1 -1 0.0000305 1804379		11	0	16	INT
SSZMEA	measured Sun vector, using Sun Sensors, Z component	1 -1 0.0000305 1804379		13	0	16	INT
SSYMEA	measured Sun vector, using Sun Sensors, Y component	1 -1 0.0000305 1804379		15	0	16	INT
MMX1BF	magnetometer measurement in X direction, magnetic field strength	1 -800 0.02441443503	µT	17	0	16	INT
MMY1BF	magnetometer measurement in Y direction, magnetic field strength	1 -800 0.02441443503	µT	19	0	16	INT
MMZ1BF	magnetometer measurement in Z direction, magnetic field strength	1 -800 0.02441443503	µT	21	0	16	INT
GYRROX	measured rotational speed around X-axis of active gyro	1 -300 0.009155413138	°/s	23	0	16	INT
GYRROY	measured rotational speed around Y-axis of active gyro	1 -300 0.009155413138	°/s	25	0	16	INT
GYRROZ	measured rotational speed around Z-axis of active gyro	1 -300 0.009155413138	°/s	27	0	16	INT
ADCSF1	ADCS sensor fusion result quaternion 1			29	0	32	FLOAT
ADCSF2	ADCS sensor fusion result quaternion 2			33	0	32	FLOAT
ADCSF3	ADCS sensor fusion result quaternion 3			37	0	32	FLOAT
ADCSF4	ADCS sensor fusion result quaternion 4			41	0	32	FLOAT
ADFIMV	ADCS sensor fusion result includes magnetic field vector from active magnetometer	0=NO 1=YES		45	0	1	INT
ADFIGV	ADCS sensor fusion result includes rotation from active gyroscope	0=NO 1=YES		45	1	1	INT
ADFIST	ADCS sensor fusion result includes orientation from active OP1 star sensor	0=NO 1=YES		45	2	1	INT
ADFALG	algorithm used by the ADCS for sensor fusion	0=NONE 1=TRIAD 2=QUEST 3=KALMAN		45	3	2	INT
ACMTUS	ADCS control uses magnetic torquers	0=NO 1=YES		45	5	1	INT
ACRWUS	ADCS control uses reaction wheels	0=NO 1=YES		45	6	1	INT
MTXDIR	active Magnetorquer in Y direction, commanded direction	0=CW 1=CCW		45	7	1	INT
MTXCUR	active Magnetorquer in X direction, measured current	0 0.4901960748	mA	46	0	8	INT
MTZPWM	active Magnetorquer in Z direction, commanded PWM	0 .3921568627	%	47	0	8	INT
MTYCUR	active Magnetorquer in Y direction, measured current	0 0.4901960748	mA	48	0	8	INT
MTZCUR	active Magnetorquer in Z direction, measured current	0 0.4901960748	mA	49	0	8	INT
MM1PLY	plausibility status of the magnetoinductive magnetometer RM3100	0=NOT_OK 1=OK		50	0	1	INT
MM2PLY	plausibility status of the magnetoresistive magnetometer HMC5883L	0=NOT_OK 1=OK		50	1	1	INT
GY1PLY	plausibility status of the gyroscope ADXRS453	0=NOT_OK 1=OK		50	2	1	INT
GY2PLY	plausibility status of the gyroscope CRM100/200	0=NOT_OK 1=OK		50	3	1	INT
PDU1PG	power-good signal of bus 1 current limiter	0=YES 1=NO		50	4	1	INT
IFB2PW	payload interface board bus 2 power status	0=OFF 1=ON		50	5	1	INT
TB1PWR	termination board bus 1 power status	0=OFF 1=ON		50	6	1	INT
TB2PWR	termination board bus 2 power status	0=OFF 1=ON		50	7	1	INT
ADCTMP	ADCS main board temperature	1 -55 0.7137254902	°C	51	0	8	INT
ADCCUR	ADCS main board current	0 1.568627451	mA	52	0	8	INT
ADCVOL	ADCS main board supply voltage	0 0.02156862745	V	53	0	8	INT
SSXMTM	temperature of active Sun sensor in -X direction	1 -30 0.5019607843	°C	54	0	8	INT
SSXPTM	temperature of active Sun sensor in +X direction	1 -30 0.5019607843	°C	55	0	8	INT
SSYMTM	temperature of active Sun sensor in -Y direction	1 -30 0.5019607843	°C	56	0	8	INT
SSYPTM	temperature of active Sun sensor in +Y direction	1 -30 0.5019607843	°C	57	0	8	INT
SSZMTM	temperature of active Sun sensor in -Z direction	1 -30 0.5019607843	°C	58	0	8	INT
SSZPTM	temperature of active Sun sensor in +Z direction	1 -30 0.5019607843	°C	59	0	8	INT
PDU1FP	power-fault switch signal of bus 1 current limiter	0=FAULT 1=NO_FAULT		60	0	1	INT
PCU1UC	bus 1 step-up converter enable signal	1=OFF 0=ON		60	1	1	INT
PCU1BP	bus 1 power-enable signal of current limiter	1=OFF 0=ON		60	2	1	INT
PCU1DS	power-disable sync signal of bus 2 received by bus 1	0=RESET 1=SET		60	3	1	INT
PDU2PG	power-good signal of bus 2 current limiter	0=YES 1=NO		60	4	1	INT
PDU2FP	power-fault switch signal of bus 2 current limiter	0=FAULT 1=NO_FAULT		60	5	1	INT
PCU2UC	bus 2 step-up converter enable signal	1=OFF 0=ON		60	6	1	INT
PCU2BP	bus 2 power-enable signal of current limiter	1=OFF 0=ON		60	7	1	INT
PCU2DS	power-disable sync signal of bus 2 received by bus 2	0=RESET 1=SET		61	0	1	INT
SPZMSR	sensor source for -Z solar panel current and voltage measurement	0=BUS1 1=BUS2		61	1	1	INT
SPZPSR	sensor source for+Z solar panel current and voltage measurement	0=BUS1 1=BUS2		61	2	1	INT
SPYMSR	sensor source for -Y solar panel current and voltage measurement	0=BUS1 1=BUS2		61	3	1	INT
SPYPSR	sensor source for+Y solar panel current and voltage measurement	0=BUS1 1=BUS2		61	4	1	INT
BA1CDM	battery 1 charge/discharge mode	0=DISCHARGE 1=CHARGE		61	5	1	INT
BA2CDM	battery 2 charge/discharge mode	0=DISCHARGE 1=CHARGE		61	6	1	INT
IFB1PW	payload interface board bus 1 power status	0=OFF 1=ON		61	7	1	INT
SPZMCU	current of -Z solar panel	0 0.01568627451	A	62	0	8	INT
SPZMVO	voltage of -Z solar panel	0 0.02156862745	V	63	0	8	INT
SPZPCU	current of +Z solar panel	0 0.01568627451	A	64	0	8	INT
SPZPVO	voltage of +Z solar panel	0 0.02156862745	V	65	0	8	INT
SPYMCU	current of -Y solar panel	0 0.01568627451	A	66	0	8	INT
SPYMVO	voltage of -Y solar panel	0 0.02156862745	V	67	0	8	INT
SPYPCU	current of +Y solar panel	0 0.01568627451	A	68	0	8	INT
SPYPVO	voltage of +Y solar panel	0 0.02156862745	V	69	0	8	INT
SPR1VO	voltage from solar bus 1 and battery 1 into step-up converter	0 0.020130719	V	70	0	8	INT
SPR1CU	current from solar bus 1 and battery 1 into step-up converter	0 0.0287581699	A	71	0	8	INT
SPR2VO	voltage from solar bus 2 and battery 2 into step-up converter	0 0.020130719	V	72	0	8	INT
SPR2CU	current from solar bus 2 and battery 2 into step-up converter	0 0.0287581699	A	73	0	8	INT
BA1VOL	battery 1 voltage	0 0.0193548388	V	74	0	8	INT
BA1CUR	battery 1 charge/discharge current	0 0.0286738352	A	75	0	8	INT
BA1TMP	battery 1 temperature	1 -40 0.4705882353	°C	76	0	8	INT
BA2VOL	battery 2 voltage	0 0.0193548388	V	77	0	8	INT
BA2CUR	battery 2 charge/discharge current	0 0.0286738352	A	78	0	8	INT
BA2TMP	battery 2 temperature	1 -40 0.4705882353	°C	79	0	8	INT
PCU1TM	PCU 1 temperature	1 -55 0.7137254902	°C	80	0	8	INT
PCU2TM	PCU 2 temperature	1 -55 0.7137254902	°C	81	0	8	INT
IFBSRC	Which payload interface board microcontroller is the source for the board's telemetry?	0=µC1 1=µC2		82	0	1	INT
SYPITS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	1	1	INT
SYPOTS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	2	1	INT
SZNITS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	3	1	INT
SZNOTS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	4	1	INT
SZPITS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	5	1	INT
SZPOTS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		82	6	1	INT
SSYPPL	plausibility status of Sun sensor in +Y direction	0=NOT_OK 1=OK		82	7	1	INT
IFBTMP	payload interface board bus temperature	1 -55 0.7137254902	°C	83	0	8	INT
VOLSV1	voltage on 1st 5 V satellite bus	0 0.0200716844	V	84	0	8	INT
CURSV1	current on 1st 5 V satellite bus	0 0.0286738352	A	85	0	8	INT
VOLSV2	voltage on 2nd 5 V satellite bus	0 0.0200716844	V	86	0	8	INT
CURSV2	current on 2nd 5 V satellite bus	0 0.0286738352	A	87	0	8	INT
TBDTMP	termination board temperature	1 -55 0.7137254902	°C	88	0	8	INT
TB1CUR	termination board bus 1 total current	0 3.921568627	mA	89	0	8	INT
TB1VOL	termination board bus 1 input voltage	0 0.02156862745	V	90	0	8	INT
TB2CUR	termination board bus 2 total current	0 3.921568627	mA	91	0	8	INT
TB2VOL	termination board bus 2 input voltage	0 0.02156862745	V	92	0	8	INT
PWRECN	error counter of the power subsystem (PCU, IFB, TB)			93	0	8	INT
PWRECO	last error code of the power subsystem (PCU, IFB, TB)	0=NO_ERR 1=PCU_GW_NOT_RDY 2=ALP_GW_NOT_RDY 3=IFP_GW_NOT_RDY 4=IFP_NACK 5=IFP_CRC_OK 6=IFP_CRC_NOK 7=IFP_BLOCKING 32=TB_ILLEGAL_CMD 33=VHF_DP_ERR 34=UHF_DP_ERR 35=FAULT_TORQ_X 36=FAULT_FORQ_Y 37=FAULT_TORQ_Z 38=TB_CFG_RESET 39=VHF_DP_OC 40=UHF_DP_OC 41=X_TORQ_OC 42=Y_TORQ_OC 43=Z_TORQ_OC 48=AROS_OC 49=RW13_OC 50=RW2_OC 51=ASAP_PWR_FLT 52=ASAP_N_PG 64=HI_TLM_CRC 65=HI_FW_CRC 66=HI_CFG_CRC 67=HI_VERSION_ERR 68=HI_RATE_ERR 69=HI_PWR_ERR 70=HI_FREQ_ERR 71=HI_STATE_ERR 72=HI_IF_ERR		94	0	8	INT
ARBOOT	state of the AROS bootloader pin	0=RUN 1=PROGRAM		95	0	1	INT
ASPROG	state of the ASAP-Light PROGRAM pin	0=STOP 1=RUNNING		95	1	1	INT
ASBTM0	state of the ASAP-Light M0 pin	0=LOW 1=HIGH		95	2	1	INT
ASBTM1	state of the ASAP-Light M1 pin	0=LOW 1=HIGH		95	3	1	INT
ASMUXE	state of the ASAP-Light MUX enable pin	0=DISABLED 1=ENABLED		95	4	1	INT
ASMUXA	ASAP-Light MUX address	0=F1 1=F2 2=F3 3=F4		95	5	2	INT
ASLSRC	payload interface board is controlling the ASAP-Light pins	0=NO 1=YES		95	7	1	INT
ASDONE	ASAP-Light FPGA configuration done	0=FALSE 1=TRUE		96	0	1	INT
ASINIT	ASAP-Light FPGA configuration running	0=FALSE 1=TRUE		96	1	1	INT
ASSPIE	SPI of the payload interface boards microcontoller is activated for programming the ASAL-Light program memory	0=FALSE 1=TRUE		96	2	1	INT

***Calibration:**
If no direkt assignment, first number decides calibration function:
Scalar: "0 9.22" means "9.22*x"
Polynomial: "1 2.0 10-4.8 -0.98" means "2.0x^0+10x^1-4.8x^2-0.98x^3"
Logarithmic: "5 10 10 0.5 -8 30" means "10log 10(0.5x-8)+30"

IFBSTA	internal operational mode of the payload interface board	0=STBY 1=AROS_CONN 2=ERASING 3=WRITING 4=CALC_CRC 5=COPY 6=DELTA_UPD		96	3	3	INT
SYNITS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		96	6	1	INT
SYNOTS	source of solar panel temperature: bus 1 or 2	0=BUS1 1=BUS2		96	7	1	INT
SYNITM	solar panel in -Y direction, inside temperature	1 -55 0.7137254902	°C	97	0	8	INT
SYNOTM	solar panel in -Y direction, outside temperature	1 -55 0.8235294118	°C	98	0	8	INT
SYPITM	solar panel in +Y direction, inside temperature	1 -55 0.7137254902	°C	99	0	8	INT
SYPOTM	solar panel in +Y direction, outside temperature	1 -55 0.8235294118	°C	100	0	8	INT
SZNITM	solar panel in -Z direction, inside temperature	1 -55 0.7137254902	°C	101	0	8	INT
SZNOTM	solar panel in -Z direction, outside temperature	1 -55 0.8235294118	°C	102	0	8	INT
SZPITM	solar panel in +Z direction, inside temperature	1 -55 0.7137254902	°C	103	0	8	INT
SZPOTM	solar panel in +Z direction, outside temperature	1 -55 0.8235294118	°C	104	0	8	INT
RSTTM1	time elapsed since last OBDH 1 reboot		s	105	0	24	INT
RSTTM2	time elapsed since last OBDH 2 reboot		s	108	0	24	INT
RSTTM3	time elapsed since last OBDH 3 reboot		s	111	0	24	INT
RSTTM4	time elapsed since last OBDH 4 reboot		s	114	0	24	INT
RSTCN1	OBDH 1 reset counter			117	0	8	INT
RSTCN2	OBDH 2 reset counter			118	0	8	INT
RSTCN3	OBDH 3 reset counter			119	0	8	INT
RSTCN4	OBDH 4 reset counter			120	0	8	INT
OB1EXE	OBDH 1 executing either OBC or PDH software	0=NONE 1=OBC_ACT 2=OBC_PASS 3=PDH_ACT 4=PDH_PASS		121	0	3	INT
OB2EXE	OBDH 2 executing either OBC or PDH software	0=NONE 1=OBC_ACT 2=OBC_PASS 3=PDH_ACT 4=PDH_PASS		121	3	3	INT
OB3EXE	OBDH 3 executing either OBC or PDH software	0=NONE 1=OBC_ACT 2=OBC_PASS 3=PDH_ACT 4=PDH_PASS		121	6	3	INT
OB4EXE	OBDH 4 executing either OBC or PDH software	0=NONE 1=OBC_ACT 2=OBC_PASS 3=PDH_ACT 4=PDH_PASS		122	1	3	INT
CMDEED	command execution error code			122	4	4	INT
OB1TMP	temperature of OBDH1	1 -55 0.7137254902	°C	123	0	8	INT
OB2TMP	temperature of OBDH2	1 -55 0.7137254902	°C	124	0	8	INT
OB3TMP	temperature of OBDH3	1 -55 0.7137254902	°C	125	0	8	INT
OB4TMP	temperature of OBDH4	1 -55 0.7137254902	°C	126	0	8	INT
OB1VOL	OBDH1 bus voltage	0 0.0137254902	V	127	0	8	INT
OB2VOL	OBDH2 bus voltage	0 0.0137254902	V	128	0	8	INT
OB3VOL	OBDH3 bus voltage	0 0.0137254902	V	129	0	8	INT
OB4VOL	OBDH4 bus voltage	0 0.0137254902	V	130	0	8	INT
OB1CUR	OBDH1 bus current	0 1.568627451	mA	131	0	8	INT
OB2CUR	OBDH2 bus current	0 1.568627451	mA	132	0	8	INT
OB3CUR	OBDH3 bus current	0 1.568627451	mA	133	0	8	INT
OB4CUR	OBDH4 bus current	0 1.568627451	mA	134	0	8	INT
CMDCNT	command counter			135	0	16	INT
CMDECE	command counter error counter			137	0	8	INT
SCMODE	spacecraft mode	0=START_MODE 1=SAFE_MODE 2=HK_CAPTURE_MODE 3=PROCEDURE_MODE 4=NORMAL_COMM_MODE 5=FAST_MODE 6=UPDATE_MODE 7=LEOP_MODE		138	0	3	INT
CMDLCN	number of commands in active command list			138	3	13	INT
CMDPCN	number of commands in passiv command list			140	0	13	INT
SSUSZM	Sun sensor on -Z axis used as the source of the Sun vector	0=NO 1=YES		141	5	1	INT
SSUSZP	Sun sensor on +Z axis used as the source of the Sun vector	0=NO 1=YES		141	6	1	INT
ADFISV	ADCS sensor fusion result includes Sun vector from active Sun sensors	0=NO 1=YES		141	7	1	INT
CMDACN	number of commands in active command list of ASAP-Light			142	0	8	INT
CMDEEC	command execution error counter			143	0	8	INT
OB1ECN	OBDH 1 error counter			144	0	8	INT
OB1ECO	OBDH 1 last error code	0=NONE 1=ROLE_MNGR 2=MODE_MNGR 3=TIME_MNGR 4=PWR_MNGR 5=COMM_MNGR 6=OBDH_IF 7=SWUP 8=CONFIG 9=STORE_MGR 32=TC_INT 33=TC_SAV 34=STMUP 35=TC_EXEC 36=TM_PROC 37=HK 38=EXT_HK 40=OBC_IF 41=AVRUP 42=ADIAUP 64=ADIA_MITM 65=SSTV_XFER 66=SPI_XFER 67=PDH_SSTV_IF 97=WD 98=PWR_MON 99=TEMP_MON 100=ADIA_IF 112=CURR_VIOL 113=VOLT_VIOL 114=TEMP_VIOL		145	0	8	INT
OB2ECN	OBDH 2 error counter			146	0	8	INT
OB2ECO	OBDH 2 last error code	0=NONE 1=ROLE_MNGR 2=MODE_MNGR 3=TIME_MNGR 4=PWR_MNGR 5=COMM_MNGR 6=OBDH_IF 7=SWUP 8=CONFIG 9=STORE_MGR 32=TC_INT 33=TC_SAV 34=STMUP 35=TC_EXEC 36=TM_PROC 37=HK 38=EXT_HK 40=OBC_IF 41=AVRUP 42=ADIAUP 64=ADIA_MITM 65=SSTV_XFER 66=SPI_XFER 67=PDH_SSTV_IF 97=WD 98=PWR_MON 99=TEMP_MON 100=ADIA_IF 112=CURR_VIOL 113=VOLT_VIOL 114=TEMP_VIOL		147	0	8	INT
OB3ECN	OBDH 3 error counter			148	0	8	INT
OB3ECO	OBDH 3 last error code	0=NONE 1=ROLE_MNGR 2=MODE_MNGR 3=TIME_MNGR 4=PWR_MNGR 5=COMM_MNGR 6=OBDH_IF 7=SWUP 8=CONFIG 9=STORE_MGR 32=TC_INT 33=TC_SAV 34=STMUP 35=TC_EXEC 36=TM_PROC 37=HK 38=EXT_HK 40=OBC_IF 41=AVRUP 42=ADIAUP 64=ADIA_MITM 65=SSTV_XFER 66=SPI_XFER 67=PDH_SSTV_IF 97=WD 98=PWR_MON 99=TEMP_MON 100=ADIA_IF 112=CURR_VIOL 113=VOLT_VIOL 114=TEMP_VIOL		149	0	8	INT
OB4ECN	OBDH 4 error counter			150	0	8	INT
OB4ECO	OBDH 4 last error code	0=NONE 1=ROLE_MNGR 2=MODE_MNGR 3=TIME_MNGR 4=PWR_MNGR 5=COMM_MNGR 6=OBDH_IF 7=SWUP 8=CONFIG 9=STORE_MGR 32=TC_INT 33=TC_SAV 34=STMUP 35=TC_EXEC 36=TM_PROC 37=HK 38=EXT_HK 40=OBC_IF 41=AVRUP 42=ADIAUP 64=ADIA_MITM 65=SSTV_XFER 66=SPI_XFER 67=PDH_SSTV_IF 97=WD 98=PWR_MON 99=TEMP_MON 100=ADIA_IF 112=CURR_VIOL 113=VOLT_VIOL 114=TEMP_VIOL		151	0	8	INT
CANEC1	CAN-Bus 1 error count according to CAN standard			152	0	8	INT
CANEC2	CAN-Bus 2 error count according to CAN standard			153	0	8	INT
TRX1MO	transceiver 1 (UHF 1) operational mode	0=RX 1=RXTX		154	0	1	INT
TRX2MO	transceiver 2 (UHF 2) operational mode	0=RX 1=RXTX		154	1	1	INT
TRX3PW	transceiver 3 (SSTV 1) power status	0=OFF 1=ON		154	2	1	INT
TRX3MO	transceiver 3 (SSTV 1) operational mode	0=RX 1=TX		154	3	1	INT
TRX3TP	transceiver 3 (SSTV 1) transmit power	0=0 1=27	dBm	154	4	1	INT
ANT4MS	UHF antenna 2 deployment motor status	0=STOP 1=TURN		154	5	1	INT
STX2PW	S-Band transmitter 2 power status	0=OFF 1=ON		154	6	1	INT
TRX4TP	transceiver 4 (SSTV 2) transmit power	0=0 1=27	dBm	154	7	1	INT
TRX1RS	transceiver 1 (UHF 1) received signal strength	1 0 -1	dBm	155	0	8	INT
MTXPWM	active Magnetorquer in X direction, commanded PWM	0 .3921568627	%	156	0	8	INT
TRX1TP	transceiver 1 (UHF 1) transmit power	5 10 10 0.04801142857 -5.946238095 30	dBm	157	0	8	INT
TRX2RS	transceiver 2 (UHF 2) received signal strength	1 0 -1	dBm	158	0	8	INT
MTYPWM	active Magnetorquer in Y direction, commanded PWM	0 .3921568627	%	159	0	8	INT
TRX2TP	transceiver 2 (UHF 2) transmit power	5 10 10 0.0186628571 -2.26507619 30	dBm	160	0	8	INT
TRX3RS	transceiver 3 (SSTV 1) received signal strength	1 0 -1	dBm	161	0	8	INT
TRX3TM	transceiver 3 (SSTV 1) temperature	1 -128 1	°C	162	0	8	INT
TRX4RS	transceiver 4 (SSTV 2) received signal strength	1 0 -1	dBm	163	0	8	INT
TRX4TM	transceiver 4 (SSTV 2) temperature	1 -128 1	°C	164	0	8	INT
COMERR	communication subsystem error code of the last error	0=NONE 1=SSTV_RX_TO 2=SSTV_RX_OVR 3=SSTV_RX_ERR 4=SSTV_AUTORANGE 5=LI_TIMEOUT 6=LI_UNEXP_RES 7=LI_NACK 8=LI_SIZE_ERR 9=LI_UNSUPP_RES		165	0	4	INT
ANT1DS	VHF antenna 1 deploy status	0=STOWED 1=DEPLOYED		165	4	1	INT
ANT1MS	VHF antenna 1 deployment motor status	0=STOP 1=TURN		165	5	1	INT
ANT2DS	VHF antenna 2 deploy status	0=STOWED 1=DEPLOYED		165	6	1	INT
ANT2MS	VHF antenna 2 deployment motor status	0=STOP 1=TURN		165	7	1	INT
PDHDTS	current mode of the PDH data transfer application	0=IDLE 1=ERASE 2=ASAP_RX 3=SBAND_TX		166	0	2	INT
PDHIMG	current mode of the PDH SSTV image converter application	0=IDLE 1=ERASE 2=PREP_IMG 3=RW_IMG		166	2	2	INT
CANCO1	error code of the last bus error on CAN-Bus 1	0=NO_ERR 1=STUFF_ERR 2=FORM_ERR 3=ACK_ERR 4=RECESS_ERR 5=DOMIN_ERR 6=CRC_ERR 7=SW_ERR		166	4	3	INT
CANCO2	error code of the last bus error on CAN-Bus 2	0=NO_ERR 1=STUFF_ERR 2=FORM_ERR 3=ACK_ERR 4=RECESS_ERR 5=DOMIN_ERR 6=CRC_ERR 7=SW_ERR		166	7	3	INT
PDHPRG	progress of the current PDH application mode	0 1.5625	%	167	2	6	INT
TRX1VO	transceiver 1 (UHF 1) voltage	0 0.02156862745	V	168	0	8	INT
TRX2VO	transceiver 2 (UHF 2) voltage	0 0.02156862745	V	169	0	8	INT
SST1VO	transceiver 3 (SSTV 1) voltage	0 0.02156862745	V	170	0	8	INT
SST2VO	transceiver 4 (SSTV 2) voltage	0 0.02156862745	V	171	0	8	INT
TRX1CU	transceiver 1 (UHF 1) current	0 7.843137255	mA	172	0	8	INT
TRX2CU	transceiver 2 (UHF 2) current	0 7.843137255	mA	173	0	8	INT
SST1CU	transceiver 3 (SSTV 1) current	0 7.843137255	mA	174	0	8	INT
SST2CU	transceiver 4 (SSTV 2) current	0 7.843137255	mA	175	0	8	INT
COMECN	communication subsystem error counter			176	0	8	INT
ANT3DS	UHF antenna 1 deploy status	0=STOWED 1=DEPLOYED		177	0	1	INT
ANT3MS	UHF antenna 1 deployment motor status	0=STOP 1=TURN		177	1	1	INT
ANT4DS	UHF antenna 2 deploy status	0=STOWED 1=DEPLOYED		177	2	1	INT
TRX4PW	transceiver 4 (SSTV 2) power status	0=OFF 1=ON		177	3	1	INT
STX1PW	S-Band transmitter 1 power status	0=OFF 1=ON		177	4	1	INT
TRX4MO	transceiver 4 (SSTV 2) operational mode	0=RX 1=TX		177	5	1	INT
STXMOD	S-Band transmitter mode	0=TX 1=INIT_ERR		177	6	1	INT
ASOPWR	power state of ASAP - L	1=OFF 0=ON		177	7	1	INT
HKUPDR	housekeeping telemetry update interval		s	178	0	6	INT
STXBIM	S-Band transmitter bitrate	0=1650 1=680 2=1020 3=1650	kbps	178	6	2	INT
STXTMP	S-Band transmitter temperature	1 -128 1	°C	179	0	8	INT
ADL1PW	power status ADIA-Light 1	1=ON 0=OFF		180	0	1	INT
ADL2PW	power status ADIA-Light 2	1=ON 0=OFF		180	1	1	INT
AR1PWR	AROS star sensor YN power status	1=ON 0=OFF		180	2	1	INT
AR2PWR	AROS star sensor YP power status	1=ON 0=OFF		180	3	1	INT
ARSMOD	AROS star sensor operational mode	0=SLEEP 1=RUN 2=DEL_FLASH 3=TAKE_IMG 4=CALC_CRC 5=CALC_DB 6=COPY 7=HIP_CHECK		180	4	3	INT
ARSPLY	plausibility of the AROS star sensor attitude measurement	0=NOT_OK 1=OK		180	7	1	INT
ASIPST	Image Processing Status	0=OFF 1=ON 2=ON_CNT_DET 3=ON_CHECK_EVT 4=ON_SAVE_EVT 5=ON_READ2FLASH 6=ERR_DDR3		181	0	3	INT
ASIPMO	Image Processing Mode	0=XOR 1=EDGE_DETECT 2=THRESHOLD_DEV 3=THRESHOLD_FIX		181	3	3	INT
ASIRST	Image Recorder Status	0=OFF 1=ON_REC 2=ON_TX 3=ERR_DDR3		181	6	2	INT
ASFRST	Flash Recoder Status	0=IDLE 1=DATA_IN 2=DATA_OUT 3=ERASE		182	0	2	INT
ASFPST	Flash Processing Status	0=IDLE 1=DATA_IN 2=DATA_OUT 3=ERASE		182	2	2	INT
ASFRWR	Flash Recorder Written	0=ERASED_UNKNOWN 1=WRITTEN		182	4	1	INT
ASFPWR	Flash Processing Written	0=ERASED_UNKNOWN 1=WRITTEN		182	5	1	INT
ASCMV4	CMV4000 Status	0=OFF 1=ON 2=ERR_BIT_ALIGN 3=ERR_WORD_ALIGN		182	6	2	INT
ASDTCT	Image Processing Count of Detections			183	0	8	INT
ASVOLT	ASAP-Light supply voltage	0 0.064	V	184	0	8	INT
ASTEMP	ASAP-Light temperature	1 -128 1	°C	185	0	8	INT
ASCURR	ASAP-Light total current	0 12.8	mA	186	0	8	INT
ADLMOD	current operational mode of ADIA-L	0=INIT 1=IDLE 2=SW_UPDATE 3=ANALYSIS 4=STANDBY 5=ERROR		187	0	8	INT
ADLERR	number of reboots counted during operation of ADIA-L			188	0	8	INT
ADLLSF	UNIX timestamp (UTC) of the last housekeeping frame with detected anomalies		s	189	0	32	INT
ADLDUR	duration of the last finished diagnostic cycle		ms	193	0	23	INT

ADLSDU	duration of the last finished determination of the conflict set		ms	195	7	23	INT
ADLDUD	duration of the last finished determination of a hit		ms	198	6	23	INT
ADLNED	number of available diagnoses			201	5	8	INT
ASIDCT	Image Processing Count of Interesting Detections			202	5	4	INT
MTYDIR	active Magnetorquer in Y direction, commanded direction	0=CW 1=CCW		203	1	1	INT
MTZDIR	active Magnetorquer in Z direction, commanded direction	0=CW 1=CCW		203	2	1	INT
SSXMPL	plausibility status of Sun sensor in -X direction	0=NOT_OK 1=OK		203	3	1	INT
SSXPPL	plausibility status of Sun sensor in +X direction	0=NOT_OK 1=OK		203	4	1	INT
SSYMPL	plausibility status of Sun sensor in -Y direction	0=NOT_OK 1=OK		203	5	1	INT
ADLTMP	temperature of ADIA-Light board	1 -55 0.7137254902	°C	204	0	8	INT
ADLCUR	total current of ADIA-Light board	0 2.117647059	mA	205	0	8	INT
ADLVOL	supply voltage of ADIA-Light board	0 0.02156862745	V	206	0	8	INT
ARSECT	AROS star sensor error counter			207	0	8	INT
ARSMCT	AROS star sensor measurement counter			208	0	8	INT
ARSQ01	AROS star sensor attitude quaternion 1	1 -1 0.0000305185094 8		209	0	16	INT
ARSQ02	AROS star sensor attitude quaternion 2	1 -1 0.0000305185094 8		211	0	16	INT
ARSQ03	AROS star sensor attitude quaternion 3	1 -1 0.0000305185094 8		213	0	16	INT
ARSQ04	AROS star sensor attitude quaternion 4	1 -1 0.0000305185094 8		215	0	16	INT
ARSTM1	AROS star sensor sensor temperature	1 -50 1	°C	217	0	8	INT
ARSTM2	AROS star sensor mainboard temperature	1 -50 1	°C	218	0	8	INT
ARSCUR	AROS star sensor current consumption	0 1.568627451	mA	219	0	8	INT
ARSVOL	AROS star sensor supply voltage	0 0.02156862745	V	220	0	8	INT
ARSECO	AROS star sensor last error code			221	0	8	INT
ARSERR	AROS star sensor last error code	0=CRC_ERR 1=ILLEG_CMD 2=START_FAIL 3=AD_FAIL 5=FLASH_ERR 6=CAPT_ERR 7=IMG_TX_ERR 8=DBG_ERR 9=CALIB_ERR 10=CFG1_ERR 11=CFG2_ERR 12=CFG3_ERR 13=CFG4_ERR 14=CFG5_ERR 15=CFG6_ERR 16=DBCALC_ERR 17=CFG_RESET 18=TIMEOUT 19=HANDLER_ERR 20=WRONG_ANS 21=CMD_FIFO_FULL		221	0	5	INT
ARSE12	AROS star sensor last error code details on wrong answer from star sensor error	0=WRONG_CODE 1=CRC_ERROR		221	5	3	INT
ARSE01	AROS star sensor last error code details on illegal command error	0=ID_LEN_MISMATCH 1=MODE_ERR 2=UNKNOWN_CMD		221	5	3	INT
ARSE02	AROS star sensor last error code details on attitude determination start error	7=I2C_ERR 6=SENSOR_ERR		221	5	3	INT
ARSE03	AROS star sensor last error code details on attitude determination error	1=NO_3_STARS 2=CTR_UNIDENT 3=N1_UNIDENT 4=N2_UNIDENT 5=BIG_OBJECT 6=TOO_BRIGHT		221	5	3	INT
ARSE04	AROS star sensor last error code details on image capture error	7=I2C_ERR 6=SENSOR_ERR		221	5	3	INT
ARSE05	AROS star sensor last error code details on image sensor config error	0=I_GAIN 1=I_EXPO 2=I2C_ERR 3=SENSOR_ERR		221	5	3	INT
ARSE06	AROS star sensor last error code details on star recognition config error	0=I_THRESHOLD 1=I_MAX_STAR_SIZE 2=I_XOFFSET 3=I_YOFFSET		221	5	3	INT
ARSE07	AROS star sensor last error code details on pattern recognition config error	0=I_MIN_DIST 1=I_FOCAL 2=I_MIN_STAR_SIZE		221	5	3	INT
ARSE08	AROS star sensor last error code details on star catalog search config error	0=I_UL 1=I_LL 2=I_VEC_ACC		221	5	3	INT
ARSE09	AROS star sensor last error code details on star catalog config error	0=I_NOS 1=I_BITVECLEN 3=I_DB_LEN 4=I_DB_START 5=I_SEN_MAG		221	5	3	INT
ARSE10	AROS star sensor last error code details on distortion correction coefficient config error	0=I_P1 1=I_P2 2=I_S1 3=I_S2 4=I_K1 5=I_K2		221	5	3	INT
ARSE11	AROS star sensor last error code details on star catalog calculation error	0=WRONG_MODE 1=RING_LIMIT 2=STARS_LIMIT 3=MEM_LIMIT		221	5	3	INT
RW1PWR	reaction wheel 1 power status	1=ON 0=OFF		222	0	1	INT
RW2PWR	reaction wheel 2 power status	1=ON 0=OFF		222	1	1	INT
RW1MOD	reaction wheel 1 operational mode	0=SLEEP 1=FPGA_FLASH 2=MOTOR_CTRL		222	2	3	INT
RW1CTR	reaction wheel 1 control mode	0=MAN 1=PID 2=M_CTRL		222	5	3	INT
RWECOD	error code of last error of the reaction wheels			223	0	6	INT
RWERAD	source of of last error of the reaction wheels	0=RW1 1=RW2 2=RW3		223	0	2	INT
RW1ERR	error code of last error of reaction wheel 1	0=NO_ERROR 1=FPGA_UART_ERR 2=ENC1_ERR 3=ENC2_ERR 4=HALL_ERR 5=INV_RATE 6=CTRL_OVRUN 7=FPGA_PROG_ERR 8=SUSPICIOUS_I 9=ILLEG_TC_VAL		223	2	4	INT
RW2ERR	error code of last error of reaction wheel 2	0=NO_ERROR 1=FPGA_UART_ERR 2=ENC1_ERR 3=ENC2_ERR 4=HALL_ERR 5=INV_RATE 6=CTRL_OVRUN 7=FPGA_PROG_ERR 8=SUSPICIOUS_I 9=ILLEG_TC_VAL		223	2	4	INT
RW3ERR	error code of last error of reaction wheel 3	0=NO_ERROR 1=FPGA_UART_ERR 2=ENC1_ERR 3=ENC2_ERR 4=HALL_ERR 5=INV_RATE 6=CTRL_OVRUN 7=FPGA_PROG_ERR 8=SUSPICIOUS_I 9=ILLEG_TC_VAL		223	2	4	INT
RW3PWR	reaction wheel 3 power status	1=ON 0=OFF		223	6	1	INT
RW1PWC	reaction wheel 1 motor current	0 1.960784314	mA	224	0	8	INT
RW1RPM	reaction wheel 1 measured rotational speed	1 -5501.34 2.686202686	RPM	225	0	12	INT
RW1RPC	reaction wheel 1 commanded rotational speed	1 -5505.38 10.75268817	RPM	226	4	10	INT
RW2RPC	reaction wheel 2 commanded rotational speed	1 -5505.38 10.75268817	RPM	227	6	10	INT
RW2RPM	reaction wheel 2 measured rotational speed	1 -5501.34 2.686202686	RPM	229	0	12	INT
RW3RPM	reaction wheel 3 measured rotational speed	1 -5501.34 2.686202686	RPM	230	4	12	INT
RW3RPC	reaction wheel 3 commanded rotational speed	1 -5505.38 10.75268817	RPM	232	0	10	INT
RW2MOD	reaction wheel 2 operational mode	0=SLEEP 1=FPGA_FLASH 2=MOTOR_CTRL		233	2	3	INT
RW2CTR	reaction wheel 2 control mode	0=MAN 1=PID 2=M_CTRL		233	5	3	INT
RW1TM2	reaction wheel 1 motor temperature	1 -50 1	°C	234	0	8	INT
RW2PWC	reaction wheel 2 motor current	0 1.960784314	mA	235	0	8	INT
RW2TM2	reaction wheel 2 motor temperature	1 -50 1	°C	236	0	8	INT
RW3PWC	reaction wheel 3 motor current	0 1.960784314	mA	237	0	8	INT
RW3TM2	reaction wheel 3 motor temperature	1 -50 1	°C	238	0	8	INT
RWECNT	error counter of the reaction wheels			239	0	8	INT
RW3MOD	reaction wheel 3 operational mode	0=SLEEP 1=FPGA_FLASH 2=MOTOR_CTRL		240	0	3	INT
RW3CTR	reaction wheel 3 control mode	0=MAN 1=PID 2=M_CTRL		240	3	3	INT
SSZMPL	plausibility status of Sun sensor in -Z direction	0=NOT_OK 1=OK		240	6	1	INT
SSZPPL	plausibility status of Sun sensor in +Z direction	0=NOT_OK 1=OK		240	7	1	INT