A.1 Beacon Content

A.1.1 Beacon of type 1: general

The Beacon of type 1 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
OBD_MODE	Current OBDH platform mode	1	UNSIGNED8			Ref. Table 1
OBD_ACTIVE_TASK	OBDH task currently executing	1	UNSIGNED8			Ref. Table 2
OBD_EQUIPMENT_STATUS	ON/OFF status of equipment/payload	4	UNSIGNED32			Ref. Table 3
OBD_CPU_ERROR	CPU fault errors, defined bit per bit	4	UNSIGNED32			Ref. Table 4
OBD_CAN_TIMEOUT_ERROR	CAN/CANopen interface timeout error	4	UNSIGNED32			
OBD_WD_RESET_COUNT	Number of watchdog resets	1	UNSIGNED8			
OBD_RS422M_ERR_COUNT	TMTC USART interface main error counter	2	UNSIGNED16			
OBD_RS422R_ERR_COUNT	TMTC USART interface redundant error counter	2	UNSIGNED16			
OBD_ERROR_COUNT	OBDH internal error counter	2	UNSIGNED16			
OBD_TC_ERROR_1	Internal telecommand routing TC error	4	UNSIGNED32			Ref. Table 5
OBD_TC_ERROR_2	Internal telecommand routing TC error	4	UNSIGNED32			Ref. Table 6
OBD_RS422_STATUS	TMTC USART status defined bit per bit	4	UNSIGNED32			Ref. Table 7
OBD_RS422_ERROR	TMTC USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 8
OBD_RS485_STATUS	MWM USART interface status	4	UNSIGNED32			Ref. Table 9
OBD_RS485_ERROR	MWM USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 10
OBD_STATUS	OBDH status	4	UNSIGNED32			Ref. Table 11
ACS_STATE	AOCS mode of the state machine	1	UNSIGNED8			1 – Damping & Safe 2 – Nominal

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Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
ACS_OMEGA_P	Roll angular velocity	4	REAL32		deg/s	
ACS_OMEGA_Q	Pitch angular velocity	4	REAL32		deg/s	
ACS_OMEGA_R	Yaw angular velocity	4	REAL32		deg/s	
PM_Current_Bp1	Current of the battery pack 1	2	SIGNED16		mA	
PM_Current_Bp2	Current of the battery pack 2	2	SIGNED16		mA	
PM_Current_Bp3	Current of the battery pack 3	2	SIGNED16		mA	
PM_Current_Bp4	Current of the battery pack 4	2	SIGNED16		mA	
PM_Current_Bp5	Current of the battery pack 5	2	SIGNED16		mA	
PM_Current_Bp6	Current of the battery pack 6	2	SIGNED16		mA	
PM_Voltage_Mb	Voltage of the Main Bus	2	UNSIGNED16		mV	
PM_SAFE_OPERATING_MODE	Operating mode of the power system	1	UNSIGNED8			Ref. Table 12
PM_ERROR_1	Defined bit-per-bit (x- active PMU)	4	UNSIGNED32			Ref. Table 13
TT_TX_STATUS	TMTC Main Transmitter STATUS condition	1	UNSIGNED8			Ref. Table 51
TT_ERROR	TTM error condition defined bit-per-bit	2	UNSIGNED16			Ref. Table 14
PLATFORM_FDIR	TTM FDIR platform status	4	UNSIGNED32			Ref. Table 15
TT_TX_STATUS	TMTC Redundant Transmitter STATUS condition	1	UNSIGNED8			Ref. Table 51
TT_ERROR	TTR error condition defined bit-per-bit	2	UNSIGNED16			Ref. Table 14
PLATFORM_FDIR	TTR FDIR platform status	4	UNSIGNED32			Ref. Table 15
SS_ERROR_1	SSM Error matrix defined bit-per-bit	4	UNSIGNED32			Ref. Table 16
SS_ERROR_1	SSM Error matrix defined bit-per-bit	4	UNSIGNED32			Ref. Table 19
ESE_ERROR	ESE Fail matrix defined bit-per-bit below	2	UNSIGNED16			Ref. Table 20
MWR_ERROR	Wheel driver fault condition	2	UNSIGNED16			Ref. Table 22
MWM_STATUS	Status of reaction wheel	4	UNSIGNED32			Ref. Table 23
MM_ERROR	MMM Fail code defined bit-per-bit	2	UNSIGNED16			Ref. Table 24
MM_ERROR	MMR Fail code defined bit-per-bit	2	UNSIGNED16			Ref. Table 24

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
MT_ERROR	MTM Fail code defined bit-per-bit	2	UNSIGNED16			Ref. Table 25
MT_ERROR	MTR Fail code defined bit-per-bit	2	UNSIGNED16			Ref. Table 25
TT_TX_STATUS	TMTC Redundant Transmitter STATUS condition	1	UNSIGNED8			
TT_ERROR	TTR error condition defined bit-per-bit	2	UNSIGNED16			Ref. Table 14
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A.1.2   Beacon of type 2: power system

The Beacon of type 2 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
PM_VOLTAGE_SP1_STRING_1_2	Voltage of a single string of the solar panel 1	2	UNSIGNED16		mV	
PM_VOLTAGE_SP1_STRING_3_4	Voltage of a single string of the solar panel 1	2	UNSIGNED16		mV	
PM_VOLTAGE_SP2_STRING_1_2	Voltage of a single string of the solar panel 1	2	UNSIGNED16		mV	
PM_VOLTAGE_SP2_STRING_3_4	Voltage of a single string of the solar panel 1	2	UNSIGNED16		mV	
PM_VOLTAGE_SP3_STRING_1_2	Voltage of a single string of the solar panel 2	2	UNSIGNED16		mV	
PM_VOLTAGE_SP3_STRING_3_4	Voltage of a single string of the solar panel 2	2	UNSIGNED16		mV	
PM_Shunt_section_1	Current of shunt section 1	2	UNSIGNED16		mA	
PM_Shunt_section_2	Current of shunt section 2	2	UNSIGNED16		mA	
PM_Shunt_section_3	Current of shunt section 3	2	UNSIGNED16		mA	
PM_Shunt_section_4	Current of shunt section 4	2	UNSIGNED16		mA	
PM_Shunt_section_5	Current of shunt section 5	2	UNSIGNED16		mA	
PM_Shunt_section_6	Current of shunt section 6	2	UNSIGNED16		mA	
PM_Temp_Sp1_Sens_1	Temperature of the solar panel 1	2	SIGNED16	0.1	°C	
PM_Temp_Sp2_Sens_1	Temperature of the solar panel 2	2	SIGNED16	0.1	°C	
PM_Temp_Sp3_Sens_1	Temperature of the solar panel 3	2	SIGNED16	0.1	°C	
PM_Current_Bp1	Current of the battery pack 1	2	SIGNED16		mA	
PM_Current_Bp2	Current of the battery pack 2	2	SIGNED16		mA	
PM_Current_Bp3	Current of the battery pack 3	2	SIGNED16		mA	
PM_Current_Bp4	Current of the battery pack 4	2	SIGNED16		mA	
PM_Current_Bp5	Current of the battery pack 5	2	SIGNED16		mA	
PM_Current_Bp6	Current of the battery pack 6	2	SIGNED16		mA	
PM_Temp_Bp1_Sens_1	Temperature of the battery pack 1	2	SIGNED16	0.1	°C	
PM_Temp_Bp2_Sens_1	Temperature of the battery pack 2	2	SIGNED16	0.1	°C	
PM_Temp_Bp3_Sens_1	Temperature of the battery pack 3	2	SIGNED16	0.1	°C	

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Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
PM_Temp_Bp4_Sens_1	Temperature of the battery pack 4	2	SIGNED16	0.1	°C	
PM_Temp_Bp5_Sens_1	Temperature of the battery pack 5	2	SIGNED16	0.1	°C	
PM_Temp_Bp6_Sens_1	Temperature of the battery pack 6	2	SIGNED16	0.1	°C	
PM_Voltage_Mb	Voltage of the Main Bus	2	UNSIGNED16		mV	
PM_SAFE_OPERATING_MODE	Operating mode of the power system	1	UNSIGNED8			Ref. Table 12
PM_PDU_CONTROL	PDU Control	1	UNSIGNED8			Ref. Table 27
PM_TEMP1	Temperature of the power board - Sensor 1	2	UNSIGNED16	0.1	°C	
PM_TEMP2	Temperature of the power board - Sensor 2	2	UNSIGNED16	0.1	°C	
PM_OBDH_MAIN_CURRENT	Current drawn by OBDH main	2	UNSIGNED16		mA	
PM_RX_MAIN_CURRENT	Current drawn by the main RX	2	UNSIGNED16		mA	
PM_TX_MAIN_CURRENT	Current drawn by the main TX	2	UNSIGNED16		mA	
PM_SS_MAIN_CURRENT	Current drawn by the main Sun Sensor	2	UNSIGNED16		mA	
PM_MM_MAIN_CURRENT	Current drawn by the main magnetometer	2	UNSIGNED16		mA	
PM_MW_MAIN_CURRENT	Current drawn by the main Momentum Wheel	2	UNSIGNED16		mA	
PM_MT_MAIN_CURRENT	Current drawn by the main Magneto Torquer	2	UNSIGNED16		mA	
PM_MPS_CURRENT	Current drawn by MPS	2	UNSIGNED16		mA	
PM_TRITEL_CURRENT	Current drawn by TRITEL	2	UNSIGNED16		mA	
PM_HSTX_CURRENT	Current drawn by HSTX	2	UNSIGNED16		mA	
PM_GPS_CURRENT	Current drawn by GPS	2	UNSIGNED16		mA	
PM_MPS_VALVE_M_CURRENT	Current drawn by the MPS Start Valve main	2	UNSIGNED16		mA	
PM_DOM_1_CURRENT	Current drawn by the DOM actuator 1	2	UNSIGNED16		mA	
PM_OBDH_RED_CURRENT	Current drawn by OBDH redundant	2	UNSIGNED16		mA	
PM_RX_RED_CURRENT	Current drawn by the redundant RX	2	UNSIGNED16		mA	
PM_TX_RED_CURRENT	Current drawn by the redundant TX	2	UNSIGNED16		mA	
PM_SS_RED_CURRENT	Current drawn by the redundant Sun Sensor	2	UNSIGNED16		mA	
PM_MM_RED_CURRENT	Current drawn by the redundant magnetometer	2	UNSIGNED16		mA	

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
PM_MW_RED_CURRENT	Current drawn by the redundant Momentum Wheel	2	UNSIGNED16		mA	
PM_MT_RED_CURRENT	Current drawn by the redundant Magneto Torquer	2	UNSIGNED16		mA	
PM_ES_CURRENT	Current drawn by ES	2	UNSIGNED16		mA	
PM_uCAM	Current drawn by uCAM	2	UNSIGNED16		mA	
PM_AMSAT_CURRENT	Current drawn by the AMSAT payload	2	UNSIGNED16		mA	
PM_LMP_CURRENT	Current drawn by LMP	2	UNSIGNED16		mA	
PM_EQ_PL_STATUS	ON-OFF equipment status (1-ON, 0-OFF)	4	UNSIGNED32			Ref. Table 28
PM_ERROR_1	Defined bit-per-bit	4	UNSIGNED32			Ref. Table 13
PM_ERROR_2	Defined bit-per-bit	4	UNSIGNED32			Ref. Table 30
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A.1.3   Beacon of type 3: OBDH

The Beacon of type 3 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
OBD_MODE	Current OBDH platform mode	1	UNSIGNED8			Ref. Table 1
OBD_OLD_MODE	Previous OBDH platform mode	1	UNSIGNED8			Ref. Table 1
OBD_ACTIVE_TASK	OBDH task currently executing	1	UNSIGNED8			Ref. Table 2
OBD_EQUIPMENT_STATUS	ON/OFF status of equipment/payload	4	UNSIGNED32			Ref. Table 3
OBD_EQUIPMENT_HEALTH	Equipment health (1 healthy, 0 faulty)	4	UNSIGNED32			Ref. Table 3
OBD_CPU_ERROR	CPU fault errors, defined bit per bit	4	UNSIGNED32			Ref. Table 4
OBD_CAN_STATUS	CAN status defined bit per bit	4	UNSIGNED32			Ref. **Table 31**
OBD_PLCAN_M_ERROR	CAN/CANopen platform main interface errors	4	UNSIGNED32			Ref. **Table 32**
OBD_PLCAN_R_ERROR	CAN/CANopen platform redundant interface errors	4	UNSIGNED32			Ref. **Table 33**
OBD_PYCAN_M_ERROR	CAN/CANopen payload main interface errors	4	UNSIGNED32			Ref. **Table 34**
OBD_PYCAN_R_ERROR	CAN/CANopen payload redundant interface errors	4	UNSIGNED32			Ref. **Table 35**
OBD_CAN_TIMEOUT_ERROR	CAN/CANopen interface timeout error	4	UNSIGNED32			Ref. Table 36
OBD_HK_STATUS	HK data request status	4	UNSIGNED32			Ref. **Table 37**
OBD_POWER_TIME	Seconds past OBDH activation	8	UNSIGNED64		sec	
OBD_MODE_TRANSITION	Second past last mode transition	8	UNSIGNED64		sec	
OBD_WD_RESET_COUNT	Number of watchdog resets	1	UNSIGNED8			
OBD_TEMP1_PDU1	Temperature sensor 1	2	SIGNED16	0.1	°C	
OBD_TEMP2_BAT1	Temperature sensor 2	2	SIGNED16	0.1	°C	
OBD_TEMP3_PMB	Temperature sensor 3	2	SIGNED16	0.1	°C	
OBD_TEMP4_HPA2	Temperature sensor 4	2	SIGNED16	0.1	°C	
OBD_TEMP8_HPA1	Temperature sensor 5	2	SIGNED16	0.1	°C	
OBD_TEMP10_TNK	Temperature sensor 6	2	SIGNED16	0.1	°C	
OBD_TEMP11_BAT2	Temperature sensor 7	2	SIGNED16	0.1	°C	
OBD_TEMP12_MWM	Temperature sensor 8	2	SIGNED16	0.1	°C	
OBD_TEMP13_MWR	Temperature sensor 9	2	SIGNED16	0.1	°C	

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
OBD_TEMP14_MMM	Temperature sensor 10	2	SIGNED16	0.1	°C	
OBD_TEMP15_MMR	Temperature sensor 11	2	SIGNED16	0.1	°C	
OBD_RS422M_ERR_COUNT	TMTC USART interface main error counter	2	UNSIGNED16			
OBD_RS422R_ERR_COUNT	TMTC USART interface redundant error counter	2	UNSIGNED16			
OBD_HK_ERROR	HK data request error	4	UNSIGNED32			Ref. **Table 38**
OBD_RS422_STATUS	TMTC USART status defined bit per bit	4	UNSIGNED32			Ref. Table 7
OBD_RS422_ERROR	TMTC USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 8
OBD_RS485_STATUS	MWM USART interface status	4	UNSIGNED32			Ref. Table 9
OBD_RS485_ERROR	MWM USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 10
OBD_STATUS	OBDH status	4	UNSIGNED32			Ref. Table 11
OBD_ERROR	OBDH internal error	4	UNSIGNED32			Ref. **Table 39**
OBD_TEMP_ERROR	OBDH temperatures error	2	UNSIGNED16			Ref. **Table 40**
OBD_ERROR	OBDH internal error	4	UNSIGNED32			Ref. Table 39
OBD_TEMP_ERROR	OBDH temperatures error	2	UNSIGNED16			Ref. **Table 40**
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A.1.4 Beacon of type 4: AOCS and sensor/actuator

The Beacon of type 4 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
ACS_STATE	AOCS mode of the state machine	1	UNSIGNED8			1 – Damping & Safe 2 – Nominal
ACS_SUN_MODE	ACS sun-eclipse evaluation mode	1	UNSIGNED8			Ref. Table 42
ACS_ERR	AOCS Error table	4	UNSIGNED32			Ref. Table 41
ACS_ATTITUDE_Q1	First component of AOCS quaternion vector	4	REAL32			-1 to 1
ACS_ATTITUDE_Q2	Second component of AOCS quaternion vector	4	REAL32			-1 to 1
ACS_ATTITUDE_Q3	Third component of AOCS quaternion vector	4	REAL32			-1 to 1
ACS_ATTITUDE_Q4	Scalar component of AOCS quaternion vector	4	REAL32			-1 to 1
ACS_OMEGA_P	Roll angular velocity	4	REAL32		deg/s	
ACS_OMEGA_Q	Pitch angular velocity	4	REAL32		deg/s	
ACS_OMEGA_R	Yaw angular velocity	4	REAL32		deg/s	
ACS_ORBIT_x	SGP4 x component	4	REAL32		km	
ACS_ORBIT_y	SGP4 y component	4	REAL32		km	
ACS_ORBIT_z	SGP4 z component	4	REAL32		km	
ACS_ORBIT_Vx	SGP4 Vx component	4	REAL32		km/s	
ACS_ORBIT_Vy	SGP4 Vy component	4	REAL32		km/s	
ACS_ORBIT_Vz	SGP4 Vz component	4	REAL32		km/s	
ACS_STATE_TRANSITION	Seconds past from the last transition	8	UNSIGNED64		sec	
ACS_FDIR_MPS_time_err	If a maneuver is aborted the variable returns the time	4	REAL32		sec	
PM_SPIN_RATE	Spin rate calculated by PMM through Coarse Sun Sensors	4	UNSIGNED32			
SSM_uC_PCB_TEMP	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
SS_ADC1_PCB_TEMP	Internal temperature sensor ADC1	2	SIGNED16	0.1	°C	
SS_ADC2_PCB_TEMP	Internal temperature sensor ADC2	2	SIGNED16	0.1	°C	

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
SSM_TOPCASE_TEMP	External TMP36 sensor on top side of case	2	SIGNED16	0.1	°C	
SSM_SIDECASE_TEMP	External TMP36 sensor on lateral side of case	2	SIGNED16	0.1	°C	
SSR_uC_PCB_TEMP	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
SS_ADC1_PCB_TEMP	Internal temperature sensor ADC1	2	SIGNED16	0.1	°C	
SS_ADC2_PCB_TEMP	Internal temperature sensor ADC2	2	SIGNED16	0.1	°C	
SS_DCDC_TEMP	External temperature sensor on top side of case	2	SIGNED16	0.1	°C	
SS_SIDECASE_TEMP	External TMP36 sensor on lateral side of case	2	SIGNED16	0.1	°C	
ESE_uC_PCB_TEMP	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
ESE_TAU_TEMP	Internal TAU Camera temperature	2	SIGNED16	0.1	°C	
MWR_TEMP	Wheel temperature at TRP	2	SIGNED16	0.1	°C	
MWR_IF_TEMP1	Wheel interface board temperature at TRP	2	SIGNED16	0.1	°C	
MWM_TEMPERATURE_1	Motor temperature	2	SIGNED16	0.1	°C	
MWM_TEMPERATURE_2	PCB temperature (power)	2	SIGNED16	0.1	°C	
MWM_TEMPERATURE_3	PCB temperature (controller)	2	SIGNED16	0.1	°C	
MPS_HPT01	High Pressure Transducer measures tank pressure	2	UNSIGNED16		kPa	
MPS_LPT01	Pressure downstream the pressure regulator	2	UNSIGNED16		hPa	
MPS_PVTT01	Pressure Vessel Temperature Transducer	2	SIGNED16	0.1	°C	
MM_DC_DC_TEMP	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
MM_DC_DC_TEMP	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
MT_TEMP1	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
MT_TEMP1	TMP36 sensor inside Digital PCB	2	SIGNED16	0.1	°C	
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A.1.5   Beacon of type 5: FDIR and TMTC

The Beacon of type 5 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
OBD_PLCAN_M_TXERR_COUNT	CAN/CANopen platform interface main Tx error counter	2	UNSIGNED16			
OBD_PLCAN_M_RXERR_COUNT	CAN/CANopen platform interface main Rx error counter	2	UNSIGNED16			
OBD_PLCAN_R_TXERR_COUNT	CAN/CANopen platform interface redundant Tx error counter	2	UNSIGNED16			
OBD_PLCAN_R_RXERR_COUNT	CAN/CANopen platform interface redundant Rx error counter	2	UNSIGNED16			
OBD_PYCAN_M_TXERR_COUNT	CAN/CANopen payload interface main Tx error counter	2	UNSIGNED16			
OBD_PYCAN_M_RXERR_COUNT	CAN/CANopen payload interface main Rx error counter	2	UNSIGNED16			
OBD_PYCAN_R_TXERR_COUNT	CAN/CANopen payload interface redundant Tx error counter	2	UNSIGNED16			
OBD_PYCAN_R_RXERR_COUNT	CAN/CANopen payload interface redundant Rx error counter	2	UNSIGNED16			
OBD_EDAC_ERROR_COUNT	Number of EDAC errors since OBDH reset	4	UNSIGNED32			
OBD_RS422M_ERR_COUNT	TMTC USART interface main error counter	2	UNSIGNED16			
OBD_RS422R_ERR_COUNT	TMTC USART interface redundant error counter	2	UNSIGNED16			
OBD_ERROR_COUNT	OBDH internal error counter	2	UNSIGNED16			
OBD_HK_ERROR	HK data request error	4	UNSIGNED16			Ref. Table 38
OBD_TC_ERROR_1	Internal telecommand routing TC error	4	UNSIGNED32			Ref. Table 5
OBD_TC_ERROR_2	Internal telecommand routing TC error	4	UNSIGNED32			Ref. Table 6
OBD_RS422_STATUS	TMTC USART status defined bit per bit	4	UNSIGNED32			Ref. Table 7
OBD_RS422_ERROR	TMTC USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 8
OBD_RS485_STATUS	MWM USART interface status	4	UNSIGNED32			Ref. Table 9
OBD_RS485_ERROR	MWM USART interface errors, defined bit per bit	4	UNSIGNED32			Ref. Table 10
OBD_ERROR	OBDH internal error	4	UNSIGNED32			Ref. Table 39

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
OBD_TEMP_ERROR	OBDH temperatures error	2	UNSIGNED16			Ref. Table 40
ACS_ERR	AOCS Error table	4	UNSIGNED32			Ref. Table 41
ACS_FDIR_MPS_time_err	If a maneuver is aborted the variable returns the time	4	REAL32		sec	
PM_Voltage_Mb	Voltage of the Main Bus	2	UNSIGNED16		mV	
PM_SAFE_OPERATING_MODE	Operating mode of the power system	1	UNSIGNED8			Ref. Table 12
PM_EQ_PL_STATUS	ON-OFF equipment status (1-ON, 0-OFF)	4	UNSIGNED32			Ref. Table 28
PM_UNDERVOLTAGE_STATUS	Undervoltage status (1-undervoltage, 0-normal)	4	UNSIGNED32			Ref. Table 28
TT_TX_STATUS	TMTC Main Transmitter STATUS condition	1	UNSIGNED8			
TT_TX_STATUS_1	TMTC Main charge pump current of the TX section	1	UNSIGNED8		µA	
TT_RX_STATUS	TMTC Main Receiver STATUS condition (Ref. Table 37)	1	UNSIGNED8			
TT_RX_STATUS_1	TMTC Main charge pump current of the RX section	1	UNSIGNED8			
TT_RX_RSSI	TMTC Main RSSI register of the RX section	1	SIGNED8		dBm	
TT_ERROR	TTM error condition defined bit-per-bit (Ref. Table 38)	2	UNSIGNED16			Ref. Table 14
TT_TEMP_1	Temperature of the DC/DC section monitored on board	2	SIGNED16	0.1	°C	
TT_TEMP_2	Temperature of the RF front-end monitored on board	2	SIGNED16	0.1	°C	
TT_RX_AFC	TMTC Main frequency deviation from IF of the RX section	1	SIGNED8	1/16	Hz	
PLATFORM_FDIR	TTM FDIR platform status	4	UNSIGNED32			Ref. Table 15
TT_TX_STATUS	TMTC Redundant Transmitter STATUS condition	1	UNSIGNED8			
TT_TX_STATUS_1	TMTC Redundant charge pump current of the TX section	1	UNSIGNED8		µA	
TT_RX_STATUS	TMTC Redundant Receiver STATUS condition	1	UNSIGNED8			
TT_RX_STATUS_1	TMTC Redundant charge pump current of the RX section	1	UNSIGNED8			
TT_RX_RSSI	TMTC Redundant RSSI register of the RX section	1	SIGNED8		dBm	
TT_ERROR	TTR error condition defined bit-per-bit	2	UNSIGNED16			Ref. Table 14
TT_TEMP_1	Temperature of the DC/DC section monitored on board	2	SIGNED16	0.1	°C	
TT_TEMP_2	Temperature of the RF front-end monitored on board	2	SIGNED16	0.1	°C	
TT_RX_AFC	TMTC Redundant frequency deviation from IF of the RX section	1	SIGNED8	1/16	Hz	

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
PLATFORM_FDIR	TTR FDIR platform status	4	UNSIGNED32			Ref. Table 15
PLATFORM_FDIR	TTR FDIR platform status	4	UNSIGNED32			Ref. Table 15
PLATFORM_FDIR	TTR FDIR platform status	4	UNSIGNED32			Ref. Table 15
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A.1.6   Beacon of type 6: payload

The Beacon of type 6 includes the following items

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
TRI_TMPX	X-axis detector temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPY	Y-axis detector temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPZ	Z-axis detector temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPPSU	Power Supply Unit temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPCPU	Central Processing Unit temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPADCX	X-axis ADC-converter temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPADCY	Y-axis ADC-converter temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_TMPADCZ	Z-axis ADC-converter temperature	1	UNSIGNED8	*(0.5)-40	°C	
TRI_UINPUT	Input voltage	1	UNSIGNED8	150	mV	
TRI_IINPUT	Input current intensity	1	UNSIGNED8	2	mA	
TRI_60V	Internal 60 V	1	UNSIGNED8	300	mV	
TRI_5V	Internal 5V	1	UNSIGNED8	30	mV	
TRI_3_3V	Internal 3.3V	1	UNSIGNED8	20	mV	
TRI_NEG10V	Internal -10V	1	UNSIGNED8	100	mV	
TRI_6_5V	Internal 6.5V	1	UNSIGNED8	50	mV	
TRI_NEG6_5V	Internal -6.5V	1	UNSIGNED8	50	mV	
TRI_MODE	Measurement mode	1	UNSIGNED8			
TRI_FREQ	Impulse generator frequency	1	UNSIGNED8		Hz	
TRI_ERROR	HK parameter warnings / errors	1	UNSIGNED8			
EEPROM	EEPROM corruption	1	UNSIGNED8			
LMP_TT-PSU	Temperature Telemetry	1	SIGNED8	1	°C	
LMP_VT+12	+12V Power Supply Voltage Telemetry	1	UNSIGNED8	0.078	V	
LMP_VT-12	-12V Power Supply Voltage Telemetry	1	UNSIGNED8	-0.078	V	
LMP_VT+5	+5V Power Supply Voltage Telemetry	1	UNSIGNED8	0.029	V	

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Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
LMP_VT-5	-5 Power Supply Voltage Telemetry	1	UNSIGNED8	-0.028	V	
LMP_CT-DIG	+3.3V Power Supply Current Telemetry	1	UNSIGNED8	1.259	mA	
LMP_VT-DIG	+3.3V Power Supply Voltage Telemetry	1	UNSIGNED8	0.020	V	
LMP_MEM	8 bit that indicates the memory usage of the external flash memory	1	UNSIGNED8	4096	byte	
LMP_OFST	Measures the offset voltage of the signal conditioning circuitry of the A/D converter.	1	SIGNED8	4.88	mV	
LMP_SW	24bits that indicate the state of the LMP experiment including status information on hardware, strat-up configuration and actual status of the software.	3	UNSIGNED24			
PCAM_MCUR_CURR	MCU + SRAM current consumption	1	UNSIGNED8	1	mA	
PCAM_IMG_CURR	Image sensor current consumption	1	UNSIGNED8	1	mA	
PCAM_MCU_TEMP	MCU temperature	2	SIGNED16	0.1	◦C	
PCAM_IMG_TEMP	Image sensor temperature	2	SIGNED16	0.1	◦C	
PCAM_DCDC_TEMP	DC-DC converter temperature	2	SIGNED16	0.1	◦C	
SCAM_MCU_CURR	MCU current consumption	1	UNSIGNED8	1	mA	
SCAM_IMG_CURR	Image sensor current consumption	1	UNSIGNED8	1	mA	
SCAM_RAM_CURR	SDRAM current consumption	1	UNSIGNED8	1	mA	
SCAM_MCU_TEMP	MCU temperature	2	SIGNED16	0.1	◦C	
SCAM_IMG_TEMP	Image sensor temperature	2	SIGNED16	0.1	◦C	
SCAM_SDR1_TEMP	SDRAM1 temperature	2	SIGNED16	0.1	◦C	
SCAM_SDR2_TEMP	SDRAM2 temperature	2	SIGNED16	0.1	◦C	
AMS_OBC_P_UP	Uplink packet counter	4	UNSIGNED32			
AMS_OBC_P_UP_DROPPED	Failed uplink packet counter	4	UNSIGNED32			
AMS_OBC_MEM_STAT_1	RAM Read/Write/ECC Checks	4	UNSIGNED32			
AMS_OBC_MEM_STAT_2	FLASH Read/Write/ECC Checks	4	UNSIGNED32			
AMS_EPS_DCDC_T	EPS DC/DC Converter temperature	1	UNSIGNED8		◦C	

Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
AMS_VHF_FM_PA_T	FM power amplifier temperature	1	UNSIGNED8		◦ C	
AMS_VHF_BPSK_PA_T	BPSK power amplifier temperature	1	UNSIGNED8		◦ C	
STX_VOL_1	DC/DC converter output voltage (RF Power Amplifier dc supply)	1	UNSIGNED8	50	mV	
STX_VOL_2	DC/DC converter output voltage (Digital board dc supply)	1	UNSIGNED8	20	mV	
STX_CUR_1	DC/DC converter output current (RF Power Amplifier dc supply)	1	UNSIGNED8	10	mA	
STX_CUR_2	DC/DC converter output current (Digital board dc supply)	1	UNSIGNED8	10	mA	
STX_TEMP_1	FPGA temperature	1	UNSIGNED8	*0.5+230	K	
STX_TEMP_2	Transceiver Chip temperature (RF modulator LIME RF circuit)	1	UNSIGNED8	*0.5+230	K	
STX_TEMP_3	DC/DC converter temperature (microwave Power Amplifier dc supply)	1	UNSIGNED8	*0.5+230	K	
STX_TEMP_4	DC/DC converter temperature (Digital supply)	1	UNSIGNED8	*0.5+230	K	
STX_STAT	HSTX status condition, described below.	4	UNSIGNED32			Ref. Table 43
STX_COM	HSTX communication condition, described below.	4	UNSIGNED32			Ref. Table 44
STX_MEM	HSTX memory condition, described below.	4	UNSIGNED32			Ref. Table 45
GPS_Current_3V3	Current absorption on 3V3 power bus	2	UNSIGNED16		mA	
GPS_Current_5V	Current absorption on 5V power bus	2	UNSIGNED16		mA	
GPS_WEEK	GPS week	2	UNSIGNED16			
GPS_TEMPERATURE_1	PCB mounted temperature sensor value	2	SIGNED16	0.1	°C	
GPS_TEMPERATURE_2	Chassis mounted temperature sensor value	2	SIGNED16	0.1	°C	
GPS_FREND_M_VOLT	Main COTS front-end input voltage	2	UNSIGNED16	1.0	mV	
GPS_FREND_R_VOLT	Redundant COTS front-end input voltage	2	UNSIGNED16	1.0	mV	
GPS_SECONDS_OF_WEEK	Seconds of the GPS week accurate to the millisecond	4	UNSIGNED32		msec	
ADE_In_Estimator_on	Indicates which estimator is on	1	UNSIGNED8			

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Item	Description	Byte number	Type	Scale	Measure Unit	Bit Reference
ADE_In_Omega	Indicates which angular velocity estimate is used: 0 as computed by the ESEO AOCS, 1 as computed by ADE MEKF algorithm	1	UNSIGNED8			0 – ESEO AOCS 1 – ADE MEKF
ADE_OPRQ_Q_1	First element of the quaternion estimated from the filtered K matrix	4	REAL32		rad	
ADE_OPRQ_Q_2	Second element of the quaternion estimated from the filtered K matrix	4	REAL32		rad	
ADE_OPRQ_Q_3	Third element of the quaternion estimated from the filtered K matrix	4	REAL32		rad	
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It has a constant info length of 126 bytes, divided as described below:

- 90 bytes for PMM HK data
- 18 bytes for TMM HK data
- 18 bytes for TMR HK data

Index	Field Name	Dimension [B]	Type	Scale	Measure Unit	Bit Reference
1	PMM Voltage Sp1 – String 1/2	2	UNSIGNED16		mV	
2	PMM Voltage Sp1 – String 3/4	2	UNSIGNED16		mV	
3	PMM Voltage Sp2 – String 1/2	2	UNSIGNED16		mV	
4	PMM Voltage Sp2 – String 3/4	2	UNSIGNED16		mV	
5	PMM Voltage Sp3 – String 1/2	2	UNSIGNED16		mV	
6	PMM Voltage Sp3 – String 3/4	2	UNSIGNED16		mV	
7	*PMM_Shunt_Section_1	2	UNSIGNED16		mA	
8	*PMM_ Shunt_Section_2	2	UNSIGNED16		mA	
9	*PMM_ Shunt_Section_3	2	UNSIGNED16		mA	
10	PMM Temp Sp1 – Sens 1	2	SIGNED16	0.1	°C	
11	PMM Temp Sp1 – Sens 2	2	SIGNED16	0.1	°C	
12	PMM Temp Sp2 – Sens 1	2	SIGNED16	0.1	°C	
13	PMM Temp Sp2 – Sens 2	2	SIGNED16	0.1	°C	
14	PMM Temp Sp3 – Sens 1	2	SIGNED16	0.1	°C	
15	PMM Temp Sp3 – Sens 2	2	SIGNED16	0.1	°C	
16	PMM Current Bp1	2	SIGNED16		mA	
17	PMM Current Bp2	2	SIGNED16		mA	
18	PMM Current Bp3	2	SIGNED16		mA	
19	PMM Current Bp4	2	SIGNED16		mA	
20	PMM Current Bp5	2	SIGNED16		mA	
21	PMM Current Bp6	2	SIGNED16		mA	

22	PMM Temp Bp1 – Sens 1	2	SIGNED16	0.1	°C	
23	PMM Temp Bp1 – Sens 2	2	SIGNED16	0.1	°C	
24	PMM Temp Bp2 – Sens 1	2	SIGNED16	0.1	°C	
25	PMM Temp Bp2 – Sens 2	2	SIGNED16	0.1	°C	
26	PMM Temp Bp3 – Sens 1	2	SIGNED16	0.1	°C	
27	PMM Temp Bp3 – Sens 2	2	SIGNED16	0.1	°C	
28	PMM Temp Bp4 – Sens 1	2	SIGNED16	0.1	°C	
29	PMM Temp Bp4 – Sens 2	2	SIGNED16	0.1	°C	
30	PMM Temp Bp5 – Sens 1	2	SIGNED16	0.1	°C	
31	PMM Temp Bp5 – Sens 2	2	SIGNED16	0.1	°C	
32	PMM Temp Bp6 – Sens 1	2	SIGNED16	0.1	°C	
33	PMM Temp Bp6 – Sens 2	2	SIGNED16	0.1	°C	
34	PMM Voltage Mb	2	UNSIGNED16		mV	
35	PMM Init Failures	2	UNSIGNED16			Ref. **Table 47**
36	PMM Safe OpMode	1	UNSIGNED8			Ref. Table 12
37	PMM Pdu Control	1	UNSIGNED8			Ref. Table 27
38	PMM Temp1	2	SIGNED16	0.1	°C	
39	PMM Temp2	2	SIGNED16	0.1	°C	
40	PMM Rx Main Current	2	UNSIGNED16		mA	
41	PMM Tx Main Current	2	UNSIGNED16		mA	
42	PMM Rx Red Current	2	UNSIGNED16		mA	
43	PMM Tx Red Current	2	UNSIGNED16		mA	
44	PMM Arm Status	2	UNSIGNED16			Ref. **Table 48**
45	PMM Spin Rate	4	UNSIGNED32		mA	
46	TMM OpMode	1	UNSIGNED8			Ref. Table 49
47	TMM SM Mode	1	UNSIGNED8			
48	TMM Tx Status	1	UNSIGNED8			Ref. Table 51
49	TMM Rx Status	1	UNSIGNED8			Ref. Table 51
50	TMM Rx AFC	1	SIGNED8	1/16	Hz	

51	TMM Asw Error	1	UNSIGNED8			Ref. Table 52
52	TMM Temp DCDC	2	SIGNED16	0.1	°C	
53	TMM Temp RTX	2	SIGNED16	0.1	°C	
54	TMM Current HPA	2	SIGNED16		mA	
55	TMM Current LNA-RTX	2	SIGNED16		mA	
56	TMM Platform FDIR	4	UNSIGNED32			Ref. Table 15
57	TMR OpMode	1	UNSIGNED8			Ref. Table 49
58	TMR SM Mode	1	UNSIGNED8			
59	TMR Tx Status	1	UNSIGNED8			Ref. Table 51
60	TMR Rx Status	1	UNSIGNED8			Ref. Table 51
61	TMR Rx AFC	1	SIGNED8	1/16	Hz	
62	TMR Asw Error	1	UNSIGNED8			Ref. Table 52
63	TMR Temp DCDC	2	SIGNED16	0.1	°C	
64	TMR Temp RTX	2	SIGNED16	0.1	°C	
65	TMR Current HPA	2	SIGNED16		mA	
66	TMR Current LNA-RTX	2	SIGNED16		mA	
67	TMR Platform FDIR	4	UNSIGNED32			Ref. Table 15

A.1.8   REFERENCE TABLES

OBD_MODE value	OBD_MODE and OBD_OLD_MODE definition
0x00	EGSE mode
0x01	OBDH power up
0x02	AOCS initialization
0x03	AOCS damping
0x04	AOCS nominal SUN/ECLIPSE
0xF0	Re-entry mode (TBC)
0xF1	Safe mode S1: minor main bus power down
0xF2	Safe mode S2: sever main bus power down
0xF3	Safe mode S3: major main bus power down
0xF4	Safe mode S4: silent main bus power down

Table 1: OBDH OBD_MODE and OBDH_OLD_MODE definition

OBD_ACTIVE_TASK value	OBD_ACTIVE_TASK definition
0x01	Task 1: Platform time synchronization
0x02	Task 2: HK and TC management
0x04	Task 3: AOCS FDIR
0x08	Task 4: AOCS operations
0x10	Task 5: TU-Delft attitude estimation

Table 2: OBDH OBD_ACTIVE_TASK definition

Bit	OBD_EQUIPMENT_SATUS
0	Reserved (OBDH)
1	Reserved (AOCS)
2	Power Management Unit main ON/OFF
3	Power Management Unit redundant ON/OFF
4	TMTC main ON/OFF
5	TMTC redundant ON/OFF
6	Sun sensor main ON/OFF
7	Sun sensor redundant ON/OFF

8	Earth sensor ON/OFF
9	Momentum Wheel main ON/OFF
10	Momentum Wheel redundant ON/OFF
11	Micropropulsion ON/OFF
12	Magnetometer main ON/OFF
13	Magnetometer redundant ON/OFF
14	Magnetic Torquer main ON/OFF
15	Magnetic Torquer redundant ON/OFF
16	TRITEL ON/OFF
17	Langmuir Probe ON/OFF
18	PCAM ON/OFF
19	AMSAT-UK ON/OFF
20	S-Band ON/OFF
21	GPS receiver ON/OFF
22	ADE
23	SCAM
24	De-orbit mechanism ON/OFF
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 3: OBDH OBD_EQUIPMENT_STATUS definition

Bit	OBD_CPU_ERROR
0	Hard fault VECTTBL: forced hard fault generated by escalation
1	Hard fault FORCED: hard fault during exception processing
2	Mem manage IACCVIOL: Instruction access violating flag
3	Mem manage DACCVIOL: data access violating flag
4	Mem manage MSTKERR: memory manager fault on unstacking for a return from exception
5	Mem manage MUNKSERR: memory manage fault on stacking for exception entry
6	Mem manage MLSPERR: fault occurred during floating point state preservation
7	Bus error STKERR: bus fault on stacking for exception entry
8	Bus error UNSTKERR: bus fault on unstacking for a return on exception

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9	Bus error IBUSERR: instruction bus error
10	Bus error LSPERR: nus fault on floating point lazy state preservation
11	Bus error PRECISERR: precise data bus error
12	Bus error IMPRECISERR: imprecise data bus error
13	Usage fault NOCP: no coprocessor usage fault
14	Usage fault UNDEFINSTR: undefined instruction usage fault
15	Usage fault INVSTATE: Invalid state usage fault
16	Usage fault INVCP: Invalid PC load usage fault
17	Usage fault UNALIGNED: unaligned access usage fault
18	Usage fault DIVBYZERO: division by zero fault
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	
25	
26	
27	
28	
29	
30	
31	

Table 4: OBDH OBD_CPU_ERROR definition

Bit	OBD_TC_ERROR_1
0	Reserved (OBDH)
1	Reserved (ACS)
2	PMM last TC request not answered
3	PMR last TC request not answered
4	TMM last TC request not answered
5	TMR last TC request not answered
6	SSM last TC request not answered
7	SSR last TC request not answered
8	ESE last TC request not answered
9	MWR last TC request not answered

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10	MWM last TC request not answered
11	MPS last TC request not answered
12	MMM last TC request not answered
13	MMR last TC request not answered
14	MTM last TC request not answered
15	MTR last TC request not answered
16	TRI last TC request not answered
17	LMP last TC request not answered
18	CAM last TC request not answered
19	AMS last TC request not answered
20	STX last TC request not answered
21	GPS last TC request not answered
22	Reserved (ADE)
23	SCAM
24	Reserved (DOM)
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 5: OBDH OBD_TC_ERROR_1 definition

Bit	OBD_TC_ERROR_2
0	Reserved (OBDH)
1	Reserved (ACS)
2	PMM TC request error counter reached 10
3	PMR TC request error counter reached 10
4	TMM TC request error counter reached 10
5	TMR TC request error counter reached 10
6	SSM TC request error counter reached 10
7	SSR TC request error counter reached 10
8	ESE TC request error counter reached 10
9	MWR TC request error counter reached 10
10	MWM TC request error counter reached 10

11	MPS TC request error counter reached 10
12	MMM TC request error counter reached 10
13	MMR TC request error counter reached 10
14	MTM TC request error counter reached 10
15	MTR TC request error counter reached 10
16	TRI TC request error counter reached 10
17	LMP TC request error counter reached 10
18	CAM TC request error counter reached 10
19	AMS TC request error counter reached 10
20	STX TC request error counter reached 10
21	GPS TC request error counter reached 10
22	ADE TC request error counter reached
23	SCAM
24	Reserved (DOM)
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 6: OBDH OBD_TC_ERROR_2 definition

Bit	OBD_RS422_STATUS
0	USART TMTC Main initialized correctly
1	USART TMTC Main marked as active
2	USART TMTC Main RTS status
3	USART TMTC Main CTS status
4	USART TMTC Main previous transmission completed
5	USART TMTC Main idle line detected
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved

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12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	USART TMTC Redundant initialized correctly
17	USART TMTC Redundant marked as active
18	USART TMTC Redundant RTS status
19	USART TMTC Redundant CTS status
20	USART TMTC Redundant previous transmission completed
21	USART TMTC Redundant idle line detected
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 7: OBDH OBD_RS422_STATUS definition

Bit	OBD_RS422_ERROR
0	USART TMTC Main error configuration BRR
1	USART TMTC Main error configuration CR1
2	USART TMTC Main error configuration CR2
3	USART TMTC Main error configuration CR3
4	USART TMTC Main error interrupt
5	USART TMTC Main error buffer all
6	USART TMTC Main error timer configuration
7	USART TMTC Main error TX full
8	USART TMTC Main error RX overrun
9	USART TMTC Main error Noise
10	USART TMTC Main error framing
11	USART TMTC Main error parity
12	USART TMTC Main error timeout

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13	Reserved
14	Reserved
15	Reserved
16	USART TMTC Redundant error configuration BRR
17	USART TMTC Redundant error configuration CR1
18	USART TMTC Redundant error configuration CR2
19	USART TMTC Redundant error configuration CR3
20	USART TMTC Redundant error interrupt
21	USART TMTC Redundant error buffer all
22	USART TMTC Redundant error timer configuration
23	USART TMTC Redundant error TX full
24	USART TMTC Redundant error RX overrun
25	USART TMTC Redundant error Noise
26	USART TMTC Redundant error framing
27	USART TMTC Redundant error parity
28	USART TMTC Redundant error timeout
29	Reserved
30	Reserved
31	Reserved

Table 8: OBDH OBD_RS422_ERROR definition

Bit	OBD_RS485_STATUS
0	USART MWM initialized correctly
1	USART MWM marked as active
2	USART MWM RTS status
3	USART MWM CTS status
4	USART MWM previous transmission completed
5	USART MWM idle line detected
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved

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14	Reserved
15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 9: OBDH OBD_RS485_STATUS definition

Bit	OBD_RS485_ERROR
0	USART MWM error configuration BRR
1	USART MWM error configuration CR1
2	USART MWM error configuration CR2
3	USART MWM error configuration CR3
4	USART MWM error interrupt
5	USART MWM error buffer all
6	USART MWM error timer configuration
7	USART MWM error TX full
8	USART MWM error RX overrun
9	USART MWM error Noise
10	USART MWM error framing
11	USART MWM error parity
12	USART MWM error timeout
13	Reserved
14	Reserved

15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 10: OBDH OBD_RS485_ERROR definition

Bit	OBD_ STATUS
0	INIT ASM OK
1	INIT COPY SECTION OK
2	INIT CLEAR BSS OK
3	INIT CLOCK OK
4	INIT CPU OK
5	INIT FLASH RW OK
6	INIT GPIO OK
7	INIT INTERRUPT OK
8	INIT INTERRUPT TEST OK
9	INIT USART OK
10	INIT CPU TIMER OK
11	INIT RTC OK
12	INIT WDG OK
13	INIT FAULT HAND OK
14	INIT FLASH OK
15	INIT SPI BUS OK

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16	INIT CAN CONF OK
17	INIT CAN TEST OK
18	INIT ADC OK
19	INIT TIMER OK
20	INIT CONSOLE OK
21	INIT POW ON RESET
22	INIT WD RESET
23	INIT ASW IMAGE OK
24	INIT COMPLETED
25	INIT STAND BY ACTIVE
26	INIT TAU OK
27	INIT PDU ADC OK
28	INITCANOPEN OK
29	Reserved
30	Reserved
31	Reserved

Table 11: OBDH OBD_STATUS definition

Value	PMM_SAFE_OPERATING_MODE definition
0x00	No safe
0x01	Safe mode 1: minor main bus power down
0x02	Safe mode 2: severe main bus power down
0x04	Safe mode 3: critical main bus power down
0x08	Safe mode 4: silent main bus power down

Table 12: PMM PMM_SAFE_OPERATING_MODE definition

Bit	PMM_ERROR_1 definition
0	Solar panel 1 Sensor 1 Temperature out of range
1	Solar panel 1 Sensor 2 Temperature out of range
2	Solar panel 2 Sensor 1 Temperature out of range
3	Solar panel 2 Sensor 2 Temperature out of range
4	Solar panel 3 Sensor 1 Temperature out of range
5	Solar panel 3 Sensor 2 Temperature out of range
6	Reserved
7	Battery pack 1 current out of range

8	Battery pack 2 current out of range
9	Battery pack 3 current out of range
10	Battery pack 4 current out of range
11	Battery pack 5 current out of range
12	Battery pack 6 current out of range
13	Battery pack 1 Sensor 1 Temperature out of range
14	Battery pack 1 Sensor 2 Temperature out of range
15	Battery pack 2 Sensor 1 Temperature out of range
16	Battery pack 2 Sensor 2 Temperature out of range
17	Battery pack 3 Sensor 1 Temperature out of range
18	Battery pack 3 Sensor 2 Temperature out of range
19	Battery pack 4 Sensor 1 Temperature out of range
20	Battery pack 4 Sensor 2 Temperature out of range
21	Battery pack 5 Sensor 1 Temperature out of range
22	Battery pack 5 Sensor 2 Temperature out of range
23	Battery pack 6 Sensor 1 Temperature out of range
24	Battery pack 6 Sensor 2 Temperature out of range
25	Reserved
26	Main bus voltage out of range
27	Power board, Sensor 1 Temperature out of range
28	Power board, Sensor 2 Temperature out of range
29	Reserved
30	Reserved
31	Reserved

Table 13: PMM PMM_ERROR_1 definition

Bit		TTM_TX_ERROR definition
0x0001	0	PLL failed to lock in the transmitter
0x0002	1	Charge pump current exceeded limits in TX
0x0004	2	PLL failed to lock in the receiver
0x0008	3	Charge pump current exceeded limits in RX
0x0010	4	RSSI lower than the sensitivity threshold
0x0020	5	PKT to GS exceed max limit
0x0040	6	Maximum allowed frequency deviation exceeded

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0x0080	7	WDT Error
0x0100	8	RTEMS Error (Death Report)
0x0200	9	Temperature of the RF section exceeded limits
0x0400	10	Temperature of the DC/DC section exceeded limits
0x0800	11	Stand-by flag
0x1000	12	Current of the HPA is insufficient, DC/DC inhibited
0x2000	13	Current of the HPA exceeded limit
0x4000	14	Current of the LNA/RTX exceeded limit
0x8000	15	Reserved

Table 14: TTM TTM_ERROR definition

Bit		PLATFORM_FDIR
0x00000001	0	PMM ON
0x00000002	1	PMR ON
0x00000004	2	PMM Ping failed
0x00000008	3	PMR Ping failed
0x00000010	4	OBDH main ON
0x00000020	5	OBDH main boot-mode ON
0x00000040	6	OBDH redundant ON
0x00000080	7	OBDH redundant boot-mode ON
0x00000100	8	OBD M Ping failed
0x00000200	9	OBD R Ping Failed
0x00000400	10	TMM ON
0x00000800	11	TMR ON
0x00001000	12	TMM Ping failed
0x00002000	13	TMR Ping failed
0x00004000	14	S3 Flag
0x00008000	15	S4 Flag
0x00010000	16	Isolation Switch ON
0x00020000	17	DOM pyro fire ON
0x00040000	18	Reserved
0x00080000	19	Reserved
0x00100000	20	OBDH Reprogramming failed
0x00200000	21	OBDH Reprogramming OK
0x00400000	22	Reserved
0x00800000	23	Reserved

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0x01000000	24	Reserved
0x02000000	25	Reserved
0x04000000	26	Reserved
0x08000000	27	Reserved
0x10000000	28	Reserved
0x20000000	29	Reserved
0x40000000	30	Reserved
0x80000000	31	Reserved

Table 15: TTM PLATFORM_FDIR definition

Bit	SSM_ERROR_1 definition
0	ADC1 Channel A status, see Table 17
1	
2	ADC1 Channel B status, see Table 17
3	
4	ADC1 Channel C status, see Table 17
5	
6	ADC1 Channel D status, see Table 17
7	
8	ADC2 Channel A status, see Table 17
9	
10	ADC2 Channel B status, see Table 17
11	
12	ADC2 Channel C status, see Table 17
13	
14	ADC2 Channel D status, see Table 17
15	
16	Channel A fail SS KO
17	Channel B FAIL SS KO
18	Channel C FAIL SS KO
19	Channel D FAIL SS KO
20	SSM Status 1, see Table 18: SSM Status
21	SSM Status 2, see Table 18: SSM Status
22	SSM Status 3, see Table 18: SSM Status
23	uC PCB OUT of TEMP (80% of Bit Reference)

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24	ADC1 PCB OUT of TEMP (80% of Bit Reference)
25	ADC2 PCB OUT of TEMP (80% of Bit Reference)
26	EXT CASE OUT of TEMP (80% of Bit Reference)
27	DCDC OUT of TEMP (80% of Bit Reference)
28	4.78V BUS Current OUT of Threshold (= LCL – 15%)
29	3.3V BUS Current OUT of Threshold (= LCL – 15%)
30	4.78V BUS Voltage OUT of Threshold
31	3.3V BUS Voltage OUT of Threshold

Table 16: SSM SSM_ERROR1 definition

SSM ADC Channel Status		
0	0	OK
0	1	CH OUT = 0
1	0	CH Fix value
1	1	CH value > TH

Table 17: SSM ADC Channel status

SSM Status			
0	0	0	Ok
0	0	1	WDT Reboot error
0	1	0	RTEMS Error
0	1	1	Reserved
1	0	0	Stand-by flag
1	0	1	Reserved
1	1	0	Reserved
1	1	1	Reserved

Table 18: SSM Status

Bit	SSM_ERROR2 definition
0	ADC1 Ch0 usable: 0 = good, 1 = fail (can't use)
1	ADC1 Ch1 usable: 0 = good, 1 = fail (can't use)
2	ADC1 Ch2 usable: 0 = good, 1 = fail (can't use)
3	ADC1 Ch3 usable: 0 = good, 1 = fail (can't use)
4	ADC1 Ch4 usable: 0 = good, 1 = fail (can't use)
5	ADC1 Ch5 usable: 0 = good, 1 = fail (can't use)

6	ADC1 Ch6 usable: 0 = good, 1 = fail (can't use)
7	ADC1 Ch7 usable: 0 = good, 1 = fail (can't use)
8	ADC1 Ch8 usable: 0 = good, 1 = fail (can't use)
9	ADC1 Ch9 usable: 0 = good, 1 = fail (can't use)
10	ADC1 Ch10 usable: 0 = good, 1 = fail (can't use)
11	ADC1 Ch11 usable: 0 = good, 1 = fail (can't use)
12	ADC2 Ch0 usable: 0 = good, 1 = fail (can't use)
13	ADC2 Ch1 usable: 0 = good, 1 = fail (can't use)
14	ADC2 Ch2 usable: 0 = good, 1 = fail (can't use)
15	ADC2 Ch3 usable: 0 = good, 1 = fail (can't use)
16	ADC2 Ch4 usable: 0 = good, 1 = fail (can't use)
17	ADC2 Ch5 usable: 0 = good, 1 = fail (can't use)
18	ADC2 Ch6 usable: 0 = good, 1 = fail (can't use)
18	ADC2 Ch7 usable: 0 = good, 1 = fail (can't use)
20	ADC2 Ch8 usable: 0 = good, 1 = fail (can't use)
21	ADC2 Ch9 usable: 0 = good, 1 = fail (can't use)
22	ADC2 Ch10 usable: 0 = good, 1 = fail (can't use)
23	ADC2 Ch11 usable: 0 = good, 1 = fail (can't use)
24	Reserved, value stuck to 0
25	Reserved, value stuck to 0
26	Reserved, value stuck to 0
27	Reserved, value stuck to 0
28	Reserved, value stuck to 0
29	Reserved, value stuck to 0
30	Reserved, value stuck to 0
31	Reserved, value stuck to 0

Table 19: SSM SSM_ERROR2 definition

Bit	ESE_ERROR definition
0	TAU internal error
1	TAU Timeout Error
2	TAU Edge Detection Error
3	Stand-by flag
4	ESE Status 1, see Table 21
5	ESE Status 2, see Table 21
6	ESE Status 3, see Table 21

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7	ESE Init Error
8	TAU out of temperature range
9	uC PCB out of temperature range
10	uC ESE Power PCB OUT OF TEMP
11	Reserved
12	5.0V Bus Currents Out of Threshold value
13	3.3V Bus Currents Out of Threshold value
14	5.0V Out of Threshold value (= LCL – 15%)
15	3.3V Out of Threshold value (= LCL – 15%)

Table 20: ESE ESE_ERROR definition

ESE Status			
0	0	0	Ok
0	0	1	WDT Reboot error
0	1	0	RTEMS Error
0	1	1	Reserved
1	0	0	Reserved
1	0	1	Reserved
1	1	0	Reserved
1	1	1	Reserved

Table 21: ESE Status

Bit	0-NO ERROR/1-ERROR
0	Wheel Driver fault
1	Wheel Driver overheat
2	Wheel IF 3.3V overheat
3	Wheel Driver overcurrent
4	Wheel IF overcurrent
5	Wheel IF 15V overheat
6	Wheel overcurrent
7	WDT reboot error
8	RTEMS error
9	Wheel Driver Serial Error
10	Stand-by flag
11	Wheel angular velocity error
12	Init Error

13	Reserved
14	Reserved
15	Reserved

Table 22: MWR MWR_ERROR definition

Bit	MWM_STATUS definition	
0	Internal used	
1	Internal used	
2	Internal used	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Parameter set: 0 - Normal conditions 1 - Vacuum conditions	
8 … 11	0	Deleted (with "ClearResetType" command)
	1	Normal power on reset / Latch-Up or reversible fuse (It is recommended to clear the reset class after power on to detect a latch-up or high current)
	2	Softreset
	3	Watchdog reset
	4	CPU exception
	5	Parameter verification error
	6	Program flow error
	7	Communication timeout (command watchdog)
	8	Boot loader started (per command)
	9	Program CRC error
	10	Idle
	11	Idle
	12	Forbidden interrupt
12 … 15	0	Running boot loader
	1	Running memory 1
	2	Running memory 2
	5	Flashing memory 1
	6	Flashing memory 2
16	Boot loader ok (no checksum error)	

17	Memory 1 ok (no checksum error)
18	Memory 2 ok (no checksum error)
19	Memory preference: 0 - Memory 1 preferred at program start (if no error) 1 - Memory 2 preferred at program start (if no error)
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Reserved
25	Overtemperature Error: Internal temperatures out of range, mode set to MODE_ERROR
26	Temperature Error: Internal temperatures critical, power index set to index 0 results in reduced reaction wheel performance
27	Temperature Warning: Warning – temperature nearing or in excess of critical limit
28	Reserved
29	EE_Restored: One or more parameters in EEPROM have been restored
30	EE_Write Error: EEPROM write error
31	EE_Read Error: EEPROM read error -> error when reading parameter; recovery unsuccessful

Table 23: MWM MWM_STATUS definition

Bit	MMM_ERROR definition
0	Reserved (internal error)
1	Watchdog Reboot Error
2	MMM Serial Error
3	Reserved (Gen Error)
4	RTEMS error
5	Stand-by flag
6	Reserved
7	MMM 5V overcurrent
8	Reserved
9	MMM DC/DC out of temperature range
10	Reserved
11	Reserved
12	Reserved

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13	Reserved
14	Reserved
15	Reserved

Table 24: MM MM_ERROR definition

Bit	MTM_ERROR definition (0-ok/1-error)
0	MTM internal error
1	Watchdog Reboot Error
2	MTM Communication Error
3	MTM Gen Error
4	MTM x coil error
5	MTM y coil error
6	MTM z coil error
7	RTEMS Error
8	Stand-by flag
9	MTM DC/DC 12 out of temperature range
10	MTM DC/DC 5 out of temperature range
11	MTM 12V overcurrent
12	MTM 5V overcurrent
13	Reserved
14	Reserved
15	Reserved

Table 25: MT MTM_ERROR definition

Value	PMM_SAFE_OPERATING_MODE definition
0x00	No safe
0x01	Safe mode 1: minor main bus power down
0x02	Safe mode 2: severe main bus power down
0x04	Safe mode 3: critical main bus power down
0x08	Safe mode 4: silent main bus power down

Table 26: PMM PMM_SAFE_OPERATING_MODE definition

Bit 7..4 (PDU2)	Bit 3..0 (PDU1)	PMM_FDIR_ERROR definition
-	5 (hex)	PDU_1 Local Access

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-	A (hex)	PDU_1 Remote Access
5 (hex)	-	PDU_2 Local Access
A (hex)	-	PDU_2 Remote Access

Table 27: PMM_PDU_CONTROL definition

Bit	PMM_EQ_PL_STATUS PMM_UNDERVOLTAGE_STATUS
0	OBDH Main ON/OFF
1	Reserved (ACS)
2	Reserved (PMM) ~~Power Management Unit main ON/OFF~~
3	Reserved (PMR) ~~Power Management Unit redundant ON/OFF~~
4	TMTC main ON/OFF
5	TMTC redundant ON/OFF
6	Sun sensor main ON/OFF
7	Sun sensor redundant ON/OFF
8	Earth sensor ON/OFF
9	Momentum Wheel redundant ON/OFF
10	Momentum Wheel main ON/OFF
11	MPS ON/OFF
12	Magnetometer main ON/OFF
13	Magnetometer redundant ON/OFF
14	Magnetic Torquer main ON/OFF
15	Magnetic Torquer redundant ON/OFF
16	TRITEL ON/OFF
17	Langmuir Probe ON/OFF
18	PCAM ON/OFF
19	AMSAT-UK ON/OFF
20	STX ON/OFF
21	GPS receiver ON/OFF
22	Reserved (ADE)
23	SCAM
24	De-orbit mechanism 1 ON/OFF
25	OBDH Redundant ON/OFF

26	HPA Main
27	HPA redundant
28	MPS Valve 1
29	MPS Valve 12
30	De-orbit mechanism 2 ON/OFF
31	Reserved

Table 28: PMM PMM_EQ_PL_STATUS and PMM_UNDERVOLTAGE_STATUS definition

Bit	PMM_ERROR_1 definition
0	Solar panel 1 Sensor 1 Temperature out of range
1	Solar panel 1 Sensor 2 Temperature out of range
2	Solar panel 2 Sensor 1 Temperature out of range
3	Solar panel 2 Sensor 2 Temperature out of range
4	Solar panel 3 Sensor 1 Temperature out of range
5	Solar panel 3 Sensor 2 Temperature out of range
6	Reserved
7	Battery pack 1 current out of range
8	Battery pack 2 current out of range
9	Battery pack 3 current out of range
10	Battery pack 4 current out of range
11	Battery pack 5 current out of range
12	Battery pack 6 current out of range
13	Battery pack 1 Sensor 1 Temperature out of range
14	Battery pack 1 Sensor 2 Temperature out of range
15	Battery pack 2 Sensor 1 Temperature out of range
16	Battery pack 2 Sensor 2 Temperature out of range
17	Battery pack 3 Sensor 1 Temperature out of range
18	Battery pack 3 Sensor 2 Temperature out of range
19	Battery pack 4 Sensor 1 Temperature out of range
20	Battery pack 4 Sensor 2 Temperature out of range
21	Battery pack 5 Sensor 1 Temperature out of range
22	Battery pack 5 Sensor 2 Temperature out of range
23	Battery pack 6 Sensor 1 Temperature out of range
24	Battery pack 6 Sensor 2 Temperature out of range
25	Reserved
26	Main bus voltage out of range

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27	Power board, Sensor 1 Temperature out of range
28	Power board, Sensor 2 Temperature out of range
29	Reserved
30	Reserved
31	Reserved

Table 29: PMM PMM_ERROR_1 definition

Bit	PMM_ERROR_2 definition
0	OBDH Main current out of range
1	Reserved (ACS)
2	Reserved (PMM)
3	Reserved (PMR)
4	TMTC (RX) Main current out of range
5	TMTC (RX) Redundant current out of range
6	Sun Sensor Main current out of range
7	Sun Sensor Redundant current out of range
8	Earth Sensor current out of range
9	Momentum Wheel Redundant current out of range
10	Momentum Wheel Main current out of range
11	Micropropulsion current out of range
12	Magnetometer Main current out of range
13	Magnetometer Redundant current out of range
14	Magneto Torquer Main current out of range
15	Magneto Torquer Redundant current out of range
16	TRITEL current out of range
17	LMP current out of range
18	uCAM current out of range
19	AMSAT current out of range
20	STX current out of range
21	GPS current out of range
22	Reserved (ADE)
23	SCAM
24	De-orbit mechanism ON/OFF
25	OBDH Redundant current out of range
26	TX Main current out of range
27	TX Redundant current out of range

28	Micropropulsion start valve current out of range
29	Micropropulsion start valve Redundant out of range
30	DOM actuator 1 current out of range
31	DOM actuator 2 current out of range

Table 30: PMM PMM_ERROR_2 definition

Bit	OBD_CAN_STATUS
0	CAN platform main controller correctly initialized
1	CAN platform main controller in normal mode
2	CAN platform main controller in loopback mode
3	CAN platform main controller in silent mode
4	CAN platform main controller in silent loopback mode
5	CAN platform main transceiver loopback active
6	CAN platform main marked as active bus
7	Reserved
8	CAN platform redundant controller correctly initialized
9	CAN platform redundant controller in normal mode
10	CAN platform redundant controller in loopback mode
11	CAN platform redundant controller in silent mode
12	CAN platform redundant controller in silent loopback mode
13	CAN platform redundant transceiver loopback active
14	CAN platform redundant marked as active bus
15	Reserved
16	CAN payload main controller correctly initialized
17	CAN payload main controller in normal mode
18	CAN payload main controller in loopback mode
19	CAN payload main controller in silent mode
20	CAN payload main transceiver loopback active
21	CAN payload main marked as active bus
22	Reserved
23	Reserved
24	CAN payload redundant controller correctly initialized
25	CAN payload redundant controller in normal mode
26	CAN payload redundant controller in loopback mode

27	CAN payload redundant controller in silent mode
28	CAN payload redundant transceiver loopback active
29	CAN payload redundant marked as active bus
30	Reserved
31	Reserved

Table 31: OBDH OBD_CAN_STATUS definition

Bit	OBD_PLCAN_M_ERROR
0	CAN controller register driver: failed to register device
1	CAN controller register driver: failed to register name
2	CAN controller initialization: semaphore error
3	CAN controller initialization: failed to install interrupt handler
4	CAN controller initialization: failed to enter initialization mode
5	CAN controller initialization: failed to exit initialization status
6	CAN controller initialization: loopback check failed
7	CAN controller open: failed to allocate Tx buffer
8	CAN controller open: failed to allocate Rx buffer
9	CAN controller open: semaphore request failed
10	CAN controller write: Tx buffer full
11	CAN controller write: no Tx mailbox available
12	CAN controller write: the previous transmission failed
13	CAN controller read: Rx buffer full
14	CAN controller read: FIFO0 overrun
15	CAN controller read: FIFO0 full
16	CAN controller read: FIFO1 overrun
17	CAN controller read: FIFO1 full
18	CAN controller last error code (see TBD)
19	
20	
21	CAN controller buss-off flag
22	CAN controller error passive flag
23	CAN controller error warning flag
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved

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29	Reserved
30	Reserved
31	Reserved

Table 32: OBDH OBD_PLCAN_M_ERROR definition

Bit	OBD_PLCAN_R_ERROR
0	CAN controller register driver: failed to register device
1	CAN controller register driver: failed to register name
2	CAN controller initialization: semaphore error
3	CAN controller initialization: failed to install interrupt handler
4	CAN controller initialization: failed to enter initialization mode
5	CAN controller initialization: failed to exit initialization status
6	CAN controller initialization: loopback check failed
7	CAN controller open: failed to allocate Tx buffer
8	CAN controller open: failed to allocate Rx buffer
9	CAN controller open: semaphore request failed
10	CAN controller write: Tx buffer full
11	CAN controller write: no Tx mailbox available
12	CAN controller write: the previous transmission failed
13	CAN controller read: Rx buffer full
14	CAN controller read: FIFO0 overrun
15	CAN controller read: FIFO0 full
16	CAN controller read: FIFO1 overrun
17	CAN controller read: FIFO1 full
18	CAN controller last error code (see TBD)
19	
20	
21	CAN controller buss-off flag
22	CAN controller error passive flag
23	CAN controller error warning flag
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved

31	Reserved

Table 33: OBDH OBD_PLCAN_R_ERROR definition

Bit	OBD_PYCAN_M_ERROR
0	CAN controller register driver: failed to register device
1	CAN controller initialization: unidentified device
2	CAN controller initialization: semaphore error
3	CAN controller initialization: SPI configuration error
4	CAN controller initialization: failed to enter initialization
5	CAN controller initialization: failed to exit initialization
6	CAN controller initialization: controller configuration error
7	CAN controller initialization: loopback error
8	CAN controller open: failed to identify calling controller
9	CAN controller open: failed to allocate Tx buffer
10	CAN controller open: failed to allocate Rx buffer
11	CAN controller open: semaphore error
12	CAN controller open: failed to set controller registers
13	CAN controller Tx full error
14	CAN controller No mailbox available error
15	CAN controller Tx failed error
16	CAN controller Rx full error
17	CAN controller FIFO0 overrun
18	CAN controller FIFO1 overrun
19	CAN controller bus-off flag
20	CAN controller error passive flag
21	CAN controller error warning flag
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 34: OBDH OBD_PYCAN_M_ERROR definition

Bit	OBD_PYCAN_R_ERROR
0	CAN controller register driver: failed to register device
1	CAN controller initialization: unidentified device
2	CAN controller initialization: semaphore error
3	CAN controller initialization: SPI configuration error
4	CAN controller initialization: failed to enter initialization
5	CAN controller initialization: failed to exit initialization
6	CAN controller initialization: controller configuration error
7	CAN controller initialization: loopback error
8	CAN controller open: failed to identify calling controller
9	CAN controller open: failed to allocate Tx buffer
10	CAN controller open: failed to allocate Rx buffer
11	CAN controller open: semaphore error
12	CAN controller open: failed to set controller registers
13	CAN controller Tx full error
14	CAN controller No mailbox available error
15	CAN controller Tx failed error
16	CAN controller Rx full error
17	CAN controller FIFO0 overrun
18	CAN controller FIFO1 overrun
19	CAN controller bus-off flag
20	CAN controller error passive flag
21	CAN controller error warning flag
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 35: OBDH OBD_PYCAN_R_ERROR definition

Bit	OBD_CAN_TIMEOUT_ERROR
0	Reserved (OBDH)

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1	Reserved (AOCS)
2	PMM CAN request timeout
3	PMR CAN request timeout
4	TMM CAN request timeout
5	TMR CAN request timeout
6	SSM CAN request timeout
7	SSR CAN request timeout
8	ESE CAN request timeout
9	MWR CAN request timeout
10	Reserved (MWM)
11	MPS CAN request timeout
12	MMM CAN request timeout
13	MMR CAN request timeout
14	MTM CAN request timeout
15	MTR CAN request timeout
16	TRI CAN request timeout
17	LMP CAN request timeout
18	PCAM CAN request timeout
19	AMS CAN request timeout
20	STX CAN request timeout
21	GPS CAN request timeout
22	Reserved (ADE)
23	SCAM CAN request timeout
24	Reserved (De-Orbit)
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 36: OBDH OBD_CAN_TIMEOUT_ERROR definition

Bit	OBD_HK_STATUS
0	Reserved (OBDH)
1	Reserved (AOCS)
2	PMM HK request is active

3	PMR HK request is active
4	TMM HK request is active
5	TMR HK request is active
6	SSM HK request is active
7	SSR HK request is active
8	ESE HK request is active
9	MWR HK request is active
10	MWM HK request is active
11	MPS HK request is active
12	MMM HK request is active
13	MMR HK request is active
14	MTM HK request is active
15	MTR HK request is active
16	TRI HK request is active
17	LMP HK request is active
18	PCAM HK request is active
19	AMS HK request is active
20	STX HK request is active
21	GPS HK request is active
22	Reserved (ADE)
23	SCAM HK request is active
24	HK active beacon: automatic rotation
25	HK active beacon: general
26	HK active beacon: power
27	HK active beacon: OBD
28	HK active beacon: AOCS
29	HK active beacon: FDIR/TMTC
30	HK active beacon: payload
31	HK active beacon: disabled

Table 37: OBDH OBD_HK_STATUS definition

Bit	OBD_HK_ERROR
0	Reserved (OBDH)
1	Reserved (ACS)

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2	PMM last HK request failed
3	PMR last HK request failed
4	TMM last HK request failed
5	TMR last HK request failed
6	SSM last HK request failed
7	SSR last HK request failed
8	ESE last HK request failed
9	MWR last HK request failed
10	MWM last HK request failed
11	MPS last HK request failed
12	MMM last HK request failed
13	MMR last HK request failed
14	MTM last HK request failed
15	MTR last HK request failed
16	TRI last HK request failed
17	LMP last HK request failed
18	CAM last HK request failed
19	AMS last HK request failed
20	STX last HK request failed
21	GPS last HK request failed
22	Reserved (ADE)
23	SCAM
24	Reserved (De-Orbit)
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Reserved
31	Reserved

Table 38: OBDH OBD_HK_ERROR definition

Bit	OBD_ ERROR
0	INIT ERR CPU TEST FAILED
1	INIT ERR FLASH RW FAILED
2	INIT ERR INTERRUPT FAILED

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3	INIT ERR USART 1
4	INIT ERR USART 2
5	INIT ERR USART 3
6	INIT ERR USART 4
7	INIT ERR USART 5
8	INIT ERR CPU TIMER
9	INIT ERR RTC
10	INIT ERR WDG
11	INIT ERR FLASH
12	INIT ERR SPI 1
13	INIT ERR SPI 2
14	INIT ERR SPI 3
15	INIT ERR SPI DEVICE 1
16	INIT ERR SPI DEVICE 2
17	INIT ERR SPI DEVICE 3
18	INIT ERR SPI DEVICE 4
19	INIT ERR SPI DEVICE 5
20	INIT ERR SPI DEVICE 6
21	INIT ERR CAN 1
22	INIT ERR CAN 2
23	INIT ERR ADC
24	INIT ERR TIMER 1
25	INIT ERR TIMER 2
26	INIT ERR TIMER 3
27	INIT ERR TIMER 4
28	INIT ERR TIMER 5
29	INIT ERR TIMER 8
30	INIT ERR WD RESET LIMIT
31	INIT ERR ASW IMAGE FAILED

Table 39: OBDH OBD_ERROR definition

Bit	OBD_ TEMP_ERROR
0	OBD OBD_TEMP1_PDU1 sensor value out of range
1	OBD OBD_TEMP2_BAT1 sensor value out of range
2	OBD_TEMP3_PMB sensor value out of range
3	OBD_TEMP4_HPA2 sensor value out of range

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4	OBD_TEMP8_HPA1 sensor value out of range
5	OBD_TEMP10_TNK sensor value out of range
6	OBD_TEMP11_BAT2 sensor value out of range
7	OBD_TEMP12_MWM sensor value out of range
8	OBD_TEMP13_MWR sensor value out of range
9	OBD_TEMP14_MMM sensor value out of range
10	OBD_TEMP15_MMR sensor value out of range
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Table 40: OBDH OBD_TEMP_ERROR definition

Bit	Parameter	ACS_ERR Description	State
0	SAFE_MODE	Transition between Nominal to Detumbling & Safe has been triggered	1
		Nominal conditions	0
1	OMEGA_DET_WARNING	Angular velocity out of nominal range in Detumbling and Safe mode	1
		Nominal conditions	0
2	ATTITUDE_ERROR	Attitude Euler angles out of nominal range in Nominal mode	1
		Nominal conditions	0
3	OMEGA_ERROR	Angular velocity out of nominal range in Nominal mode	1
		Nominal conditions	0
4	MW_Failure	MW critical failure	1
		Nominal conditions	0
5	PWR_Failure	Severe low power (S2)	1
		Nominal conditions	0
6	COMM_Error	A communication error is occurred	1
		Nominal condition	0
7	ITEMS_MNG_Error	Error between the items used and the PMU feedback	1
		Nominal condition	0
8	MWM_State	MWM in nominal mode	0
		MWM not reliable - from FDIR algorithm	1
9	MWR_State	MWR in nominal mode	0
		MWR not reliable - from FDIR algorithm	1

Bit	Parameter	ACS_ERR Description	State
10	MTM_x_State(tbc)	MT Main on x-axis in nominal mode	0
		MT Main on x-axis not reliable - from FDIR algorithm	1
11	MTR_x_State(tbc)	MTR on x-axis in nominal mode	0
		MTR on x-axis not reliable - from FDIR algorithm	1
12	MTM_y_State(tbc)	MT Main on y-axis in nominal mode	0
		MT Main on y-axis not reliable - from FDIR algorithm	1
13	MTR_y_State(tbc)	MTR on y-axis in nominal mode	0
		MTR on y-axis not reliable - from FDIR algorithm	1
14	MTM_z_State(tbc)	MT Main on z-axis in nominal mode	0
		MT Main on z-axis not reliable - from FDIR algorithm	1
15	MTR_z_State (tbc)	MTR on z-axis in nominal mode	0
		MTR on z-axis not reliable - from FDIR algorithm	1
16	MTM_state	MT Main assembly in nominal mode	0
		MT Main assembly not reliable	1
17	MTR_state	MT Redundant assembly in nominal mode	0
		MT Redundant assembly not reliable	1
18	MPS_State	MPS in nominal mode	0
		MPS not reliable - from FDIR algorithm	1
19	SS1_State	SS1 in nominal mode	0
		SS1 not reliable - from FDIR algorithm	1
20	SS2_State	SS2 in nominal mode	0
		SS2 not reliable - from FDIR algorithm	1
21	CSS_State	CSS in nominal mode	0
		CSS not reliable - from FDIR algorithm	1
22	ES_State	ES in nominal mode	0
		ES not reliable - from FDIR algorithm	1
23	MMM_State	MM Main in nominal mode	0
		MM Main not reliable - from FDIR algorithm	1
24	MMR_State	MM Redundant in nominal mode	0
		MM Redundant not reliable - from FDIR algorithm	1
25	MPS_maneuver_ABORT	MPS maneuver performed nominally	0
		MPS maneuver aborted from FDIR (MPS not reliable) or AOCS not in Nominal state	1
26	RESERVED	N/A	0

Bit	Parameter	ACS_ERR Description	State
27	RESERVED	N/A	0
28	AOCS_SW_ERROR1	TC execution returns an error	1
		No error in TC execution	0
29	AOCS_SW_ERROR2	AOCS task overrun	1
		AOCS Task runs properly	0
30	AOCS_SW_ERROR3	AOCS FDIR task overrun	1
		AOCS FDIR Task runs properly	0
31	AOCS_SW_ERROR4	TBD	1
		TBD	0

Table 41: ACS ACS_ERR definition

Value	ACS_SUN_MODE Mode selected
0x00	Eclipse state
0x01	Sun state

Table 42: ACS ACS_SUN_MODE definition

STX_STAT															
Byte 3								Byte 2							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
STATERR	FPGA_E	STM2_SE	STM1_E	VCOC_E	LPF_E	TXLPF1_E	TXLPF0_E	LIME_E	VC_N_E	x	x	x	x	TX_INIT	HSTX_INIT
Byte 1								Byte 0							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
STE4_E	STE3_E	STE2_E	STE1_E	TEMP_4	TEMP_3	TEMP_2	TEMP_1	SVC2_E	SVC1_E	x	x	CUR_2	CUR_1	VOL_2	VOL_1

Table 43: STX STX_STAT definition

- Byte 0:
  o **Bit 0** – VOL_1 (def.: 0)
  Voltage 1 out of limits.
  o **Bit 1** – VOL_2 (def.: 0)
  Voltage 2 out of limits.
  o **Bit 2** – CUR_1 (def.: 0)
  Current 1 out of limits.

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- o **Bit 3** – CUR_2 (def.: 0)

Current 2 out of limits.

- o **Bits 5:4** – Reserved
- o **Bit 6 –** SVC1_E (def.:0)

Error in the communication between microprocessor and DC/DC output voltage and current sensor chip (Power Amplifier supply).

- o **Bit 7 –** SVC2_E (def.:0)

Error in the communication between microprocessor and DC/DC output voltage and current sensor chip (Digital supply).

- Byte 1:
  - o **Bit 8** – TEMP_1 (def.: 0)

  Temperature 1 out of limits.

  - o **Bit 9** – TEMP_2 (def.: 0)

  Temperature 2 out of limits.

  - o **Bit 10** – TEMP_3 (def.: 0)

  Temperature 3 out of limits.

  - o **Bit 11** – TEMP_4 (def.: 0)

  Temperature 4 out of limits.

  - o **Bit 12–** STE1_E (def.:0)

  Error in the communication between microprocessor temperature sensor 1 (sensor chip).

  - o **Bit 13 –** STE2_E (def.:0)

  Error in the communication between microprocessor temperature sensor 2 (sensor chip).

  - o **Bit 14 –** STE3_E (def.:0)

  Error in the communication between microprocessor temperature sensor 3 (sensor chip).

  - o **Bit 15 –** STE4_E (def.:0)

  Error in the communication between microprocessor temperature sensor 4 (sensor chip).

- Byte 2:
  - o **Bits 16 -** TX_INIT (def.:0)

  Transmit process calibrated and started – when '1' the device is transmitting

  - o **Bit 17 –** HSTX_INIT (def.:0)

  FPGA initiated – when '1' the device is ready to receiving and processing commands

  - o **Bits 18:21 –** Reserved
  - o **Bit 22 -** VC_N_E (def.: 0)

  Virtual channel number error – last attempt to write payload data was ignored due to wrong VC number (valid VC numbers are: 1 (OBDH),3,4,5,6,7).

  - o **Bit 23 –** LIME_E (def.:0)

  Error in the communication between FPGA and RF Transceiver chip (LIME modem).

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- Byte 3:
  o **Bit 24** TXLPF0_E (def.:0)
  Error in the 1st stage of the TX LPF offset calibration of the RF Transceiver chip (LIME modem).
  o **Bit 25 –** TXLPF1_E (def.:0)
  Error in the 2nd stage of the TX LPF offset calibration of the RF Transceiver chip (LIME modem).
  o **Bit 26 –** LPF_E (def.:0)
  Error in the DC offset calibration of LPF tuning mode of the RF Transceiver chip (LIME modem).
  o **Bit 27 –** VCOC_E (def.:0)
  Error in the vco capacitor tuning procedure during the calibration of the RF Transceiver chip (LIME modem).
  o **Bit 28 –** STM1_E (def.:0)
  Error in the communication schedule between FPGA and microprocessor no. 1 chip (this bit is set by FPGA).
  o **Bit 29 –** STM2_E (def.:0)
  Error in the communication schedule between FPGA and microprocessor no. 2 chip (this bit is set by FPGA).
  o **Bit 30–** FPGA_E (def.:0)
  Error in the communication between the FPGA and any microprocessor chip (no. 1 or no. 2; this bit is set by the microprocessor).

STX_COM															
Byte 3								Byte 2							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
COMERR	x	x	x	x	x	x	x	x	HRB	PLTC_INT	OBTC_INT	TC_SEQ	LEC0		
Byte 1								Byte 0							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CAN_REC								CAN_TEC							

Table 44: STX STX_COM definition

- Byte 0:
  - **Bits 7:0** – TEC (def.: 00)
  Can Controller Transmit Error Counter.
- Byte 1:
  - **Bits 15:8** - REC (def.:00)
  CAN Controller Received Error Counter.
- Byte 2:
  - **Bits 18:16** – LEC0 (def.:000)
  CAN Controller Last Error Code.
  - **Bit 19 –** TC_SEQ (def.:0)
  Error in interpreting TC from OBDH (sequence error)
  - **Bit 20** – TC_ADDR (def.:0)
  Error in interpreting TC from OBDH (address out of range)
  - **Bit 21** – PLTC_INT (def.:0)
  Error in interpreting data from HSTX
  - **Bit 22** – HRB (def.:0)
  Detection of the heartbeat messages on both CAN busses
  - **Bit 23** – Reserved
- Byte 3:
  - **Bits 30:24** – Reserved
  - **Bit 31** – COMMERR (def.:0)
  One or more errors in STX_COM_ERROR occurred.

Errore. Nel documento non esiste testo dello stile specificato.

STX_MEM															
Byte 3								Byte 2							
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
MEMERR	x	x	x	M7AFULL	M7FULL	M6AFULL	M6FULL	M5AFULL	M5FULL	M4AFULL	M4FULL	M3AFULL	M3FULL	M1AFULL	M1FULL
Byte 1								Byte 0							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
x	x	x	x	x	x	x	x	MBFAIL							

Table 45: STX STX_MEM definition

- Byte 0:
    - **Bits 7:0** – MBFAIL (def.:0x0)

    Number of death cells (def.: 00).
- Byte 1:
    - **Bit 15:8** – Reserved
- Byte 2:
    - **Bit 16** –M1FULL

    Memory buffer for virtual channel VC=1 is full.
    - **Bit 17** – M1AFULL

    Memory buffer for virtual channel VC=1 is almost full. (20% spare left).
    - **Bit 18** –M3FULL

    Memory buffer for virtual channel VC=3 is full.
    - **Bit 19** – M3AFULL

    Memory buffer for virtual channel VC=3 is almost full. (20% spare left).
    - **Bit 20** –M4FULL

    Memory buffer for virtual channel VC=4 is full.
    - **Bit 21** – M4AFULL

    Memory buffer for virtual channel VC=4 is almost full. (20% spare left).
    - **Bit 22** –M5FULL

    Memory buffer for virtual channel VC=5 is full.
- Byte 3:

Errore. Nel documento non esiste testo dello stile specificato.

- o **Bit 23** – M5AFULL

Memory buffer for virtual channel VC=5 is almost full. (20% spare left).

- o **Bit 14** –M6FULL

Memory buffer for virtual channel VC=6 is full.

- o **Bit 15** – M6AFULL

Memory buffer for virtual channel VC=6 is almost full. (20% spare left).

- o **Bit 16** –M7FULL

Memory buffer for virtual channel VC=7 is full.

- o **Bit 17** – M7AFULL

Memory buffer for virtual channel VC=7 is almost full. (20% spare left).

- o **Bits 18:25** – Reserved
- o **Bit 31** – MEMERR (def.:0)

One or more errors in STX_MEM_ERROR occurred.

Payload	Can ID	VC number
ADE (OBDH)	1	1
TRI	104	4
LMP	105	5
PCAM	103	3
SCAM	107	7
GPS	106	6

Table 46: Virtual Channel number assignment

Bit	PMM_INIT_FAILURES definition
0	WHATCH DOG TIMER
1	RTEMS ERROR
2	Stand-by flag
3	3V3 overcurrent

Errore. Nel documento non esiste testo dello stile specificato.

4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Table 47: PMM INIT FAILURES definition

Value	PMM_ARM_STATUS definition
0x0001	ARM Isolation Switch
0x0002	ARM the commutation of the Power Management Unit
0x0004	ARM subsystem/payloads
0x0008	ARM NEA SELECT Valve main
0x0010	ARM NEA SELECT Valve redundant
0x0020	ARM NEA SELECT DOM main
0x0030	ARM NEA SELECT DOM redundant
0x0080	ARM NEA STATUS Valve main
0x0100	ARM NEA STATUS Valve redundant
0x0200	ARM NEA STATUS DOM main
0x0400	ARM NEA STATUS DOM redundant

Table 48: PMM PMM_ARM_STATUS definition

Bit	TTM_OP_MODE
0x00001111	TMTC_MAIN
0x11110000	TMTC_REDUNDANT

Table 49:TTM TTM_OP_MODE definition

Errore. Nel documento non esiste testo dello stile specificato.

Bit	TTM_SM_MODE
0x00000000	TMTC_STD_Mode
0x11110000	TMTC_SafeMode_3
0x10101010	TMTC_SafeMode_4

Table 50:TTM TTM_SM_MODE definition

Bit	TTM_TX_STATUS definition
0	LOCK pin
1	DCLK pin
2	LOCK pin
3	Carrier sense
4	Continuous PLL lock indicator
5	Instantaneous PLL lock indicator
6	PLL failed lock at power-up
7	Calibration complete

Table 51: TTM TTM_TX_STATUS definition

Bit	TTM_ASW_ERROR definition
0	Barrier or RMP creation error
1	File descriptor error
2	Serial interface error
3	OBDH reprograming error
4	HKTC deadline error
5	Downlink deadline error
6	FDIR error
7	Task initialization error

Table 52: TTM TTM_ASW_ERROR definition