

ISIS QB50p AX.25 beacon decoder

version: 1.1, 2015-11-02

AX.25 frame properties

Frametype UI frame
FROM callsign QB50P1-0 or QB50P2-0
TO callsign QB50P1-0 or QB50P2-0

Byte and bit order notes

Byte order Least significant byte first on multi-byte numbers
Bit order Most significant bit first

AX.25 frame contents - AX.25 beacon 1

Data group	Byte	Description	Interpretation	Unit	Format	Conversion	
FRAMEHEADER	0	Software ID	1 = LEOPS software 2 = V2 software				
	1	Satellite ID	1 = QB50p1 2 = QB50p2				
	2 3	Frametype	Always 1 for AX.25 beacon - 1				
	4	Operational mode	0 = Idle mode 1 = Deployment mode 2 = Nominal mode 130 = Nominal mode + safe flag				
	5 6	Boot counter	Incrementing satellite boot counter, increments every satellite boot or reset	# of boots	16 bit unsigned	VALUE	
	7 8	Packet counter	Incrementing packet identification number, resets every boot	# of packets	16 bit unsigned	VALUE	
	9	Commands received	Number of received commands	# of cmds	8 bit unsigned	VALUE	
	10	Commands valid	Number of received commands that are valid	# of cmds	8 bit unsigned	VALUE	
	11 12 13 14	Satellite uptime	Number of seconds passed since the satellite booted	seconds	32 bit unsigned	VALUE	
	15	Data valid 1	Data validity markers, block 1		hexadecimal		
	16	Data valid 2	Data validity markers, block 2		hexadecimal		
	17	Data valid 3	Data validity markers, block 3		hexadecimal		
	TRXUV	18 19	TRXUV Doppler	Doppler offset indicator		16 bit unsigned	
		20 21	TRXUV RSSI	Received Signal Strength Indicator of the receiver of TRXUV		16 bit unsigned	
22 23		TRXUV Reflected power	Reflected power indicator of the TRXUV	mW	16 bit unsigned	VALUE * VALUE * 0.000239	
24 25		TRXUV Forward power	Forward power indicator of the TRXUV	mW	16 bit unsigned	VALUE * VALUE * 0.000239	
26 27		TRXUV TX Current	Current consumption of the transmitter of TRXUV	mA	16 bit unsigned	VALUE * 0.395	
28 29		TRXUV RX Current	Current consumption of the receiver of TRXUV	mA	16 bit unsigned	VALUE * 0.395	
30 31		TRXUV PA Temperature	Temperature of the TRXUV power amplifier	deg. C	16 bit unsigned	VALUE * -0.2959 + 190	
32 33		TRXUV Bus Voltage	Battery bus voltage	V	16 bit unsigned	VALUE * 0.0161290	

Antenna	34 35	Antenna deployment status - A	Deployment status of antenna system - side A		hexadecimal	
	36 37	Antenna temperature - A	Temperature of antenna system - side A	degrees C.	16 bit unsigned	VALUE * -0.2922 + 190.65
	38 39	Antenna deployment status - B	Deployment status of antenna system - side B		hexadecimal	
	40 41	Antenna temperature - B	Temperature of antenna system - side B	degrees C.	16 bit unsigned	VALUE * -0.2922 + 190.65

ELECTRICAL POWER SUBSYSTEM (EPS)	42 43	Boost Converter 1 Voltage	Voltage delivered by solar panel string 1	mV	16 bit unsigned	VALUE
	44 45	Boost Converter 2 Voltage	Voltage delivered by solar panel string 2	mV	16 bit unsigned	VALUE
	46 47	Boost Converter 3 Voltage	Voltage delivered by solar panel string 3	mV	16 bit unsigned	VALUE
	48 49	Battery voltage	Battery voltage of the satellite battery	mV	16 bit unsigned	VALUE
	50 51	Boost Converter 1 Current	Current delivered by solar panel string 1	mA	16 bit unsigned	VALUE
	52 53	Boost Converter 2 Current	Current delivered by solar panel string 2	mA	16 bit unsigned	VALUE
	54 55	Boost Converter 3 Current	Current delivered by solar panel string 3	mA	16 bit unsigned	VALUE
	56 57	Total photovoltaic current	Total current delivered by the solar panels to the EPS	mA	16 bit unsigned	VALUE
	58 59	Total system current	Total current consumption of the satellite	mA	16 bit unsigned	VALUE
	60 61	Switched channel current - 3v3 #1	Current consumption on 3v3 switched channel #1	mA	16 bit unsigned	VALUE
	62 63	Switched channel current - 3v3 #2	Current consumption on 3v3 switched channel #2	mA	16 bit unsigned	VALUE
	64 65	Switched channel current - 3v3 #3	Current consumption on 3v3 switched channel #3	mA	16 bit unsigned	VALUE
	66 67	Switched channel current - 5v #1	Current consumption on 5v switched channel #1	mA	16 bit unsigned	VALUE
	68 69	Switched channel current - 5v #2	Current consumption on 5v switched channel #2	mA	16 bit unsigned	VALUE
	70 71	Switched channel current - 5v #3	Current consumption on 5v switched channel #3	mA	16 bit unsigned	VALUE
	72 73	Boost Converter 1 Temperature	Temperature of boost converter 1	deg. C	16 bit 2s complement	VALUE
	74 75	Boost Converter 2 Temperature	Temperature of boost converter 2	deg. C	16 bit 2s complement	VALUE
	76 77	Boost Converter 3 Temperature	Temperature of boost converter 3	deg. C	16 bit 2s complement	VALUE
	78 79	Battery Temperature	Temperature of the battery	deg. C	16 bit 2s complement	VALUE
	80	Channel status	Status of the 3v3 and 5v switched channels		hexadecimal	
	81	EPS boot cause	Cause of the last reset of the EPS		hexadecimal	
	82	EPS battery mode	0 = Begin 1 = Critical 2 = Safe 3 = Normal 4 = Full			
	83	EPS Powerpoint tracking mode	0 = Hardware default 1 = Maximum Power Point Tracking 2 = SW fixed point			

SOLAR PANELS	84	Solar panel 0 temperature	Temperature of solar panel 0	deg. C	16 bit 2s complement	<i>VALUE</i> * 0.015625
	85					
	86	Solar panel 1 temperature	Temperature of solar panel 1	deg. C	16 bit 2s complement	<i>VALUE</i> * 0.015625
	87					
	88	Solar panel 2 temperature	Temperature of solar panel 2	deg. C	16 bit 2s complement	<i>VALUE</i> * 0.015625
	89					
90	Solar panel 3 temperature	Temperature of solar panel 3	deg. C	16 bit 2s complement	<i>VALUE</i> * 0.015625	
91						
92	Solar panel 4 temperature	Temperature of solar panel 4	deg. C	16 bit 2s complement	<i>VALUE</i> * 0.015625	
93						

V2 OPERATIONS <small>(only available in V2 software)</small>	94	SU last response ID	ID of last response packet received from the science unit (INMS / FIPEX)		hexadecimal	
	95	SU thermocouple temperature	Temperature of thermocouple on the science unit (INMS / FIPEX)	deg. C	16 bit unsigned	<i>VALUE</i> * 1.221896383 - 273
	97	Log OK markers	Markers indicating if on-board loggings is working ok or not		hexadecimal	
	98	WOD log entries	Number of entries in the whole orbit data log	# of entries	32 bit unsigned	<i>VALUE</i>
	102	SU log entries	Number of entries in the science data log	# of entries	32 bit unsigned	<i>VALUE</i>

AX.25 frame contents - AX.25 beacon 2

Data group	Byte	Description	Interpretation	Unit	Format	Conversion
FRAMEHEADER	0	Software ID	1 = LEOPS software 2 = V2 software			
	1	Satellite ID	1 = QB50p1 2 = QB50p2			
	2	Frametype	Always 2 for AX.25 beacon - 2			
	3					
	4	Operational mode	0 = Idle mode 1 = Deployment mode 2 = Nominal mode 130 = Nominal mode + safe flag			
	5	Boot counter	Incrementing satellite boot counter, increments every satellite boot or reset			
	6					
	7	Packet counter	Incrementing packet identification number, resets every boot			
	8					
	9	Commands received	Number of received commands	# of cmds	8 bit unsigned	<i>VALUE</i>
	10	Commands valid	Number of received commands that are valid	# of cmds	8 bit unsigned	<i>VALUE</i>
	11	Satellite uptime	Number of seconds passed since the satellite booted			
	12					
	13					
14						
15	Data valid 1	Data validity markers, block 1		hexadecimal		
16	Data valid 2	Data validity markers, block 2		hexadecimal		
17	Data valid 3	Data validity markers, block 3		hexadecimal		

OBC SUPERVISOR	18	OBC Supervisor status	Status of the OBC supervisor		hexadecimal	
	19	OBC Supervisor uptime	Number of seconds passed since the supervisor booted	seconds	32 bit unsigned	VALUE
	20					
	21					
	22					
	23	OBC Supervisor OBC uptime	Number of seconds passed since the supervisor powered the OBC	seconds	32 bit unsigned	VALUE
	24					
	25					
	26					
	27	OBC Supervisor reset count	Number of times the supervisor has reset the OBC	count	32 bit unsigned	VALUE
	28					
	29					
	30					
	31	OBC Supervisor temperature	Temperature of the OBC supervisor	deg. C	16 bit unsigned	VALUE * -0.2922 + 191.97
	32	OBC Supervisor 3v3 in	3v3 input voltage provided to the OBC supervisor	mV	16 bit unsigned	VALUE * 4.888
33						
34	OBC Supervisor 3v3 supply	Output voltage on the 3v3 output	mV	16 bit unsigned	VALUE * 4.888	
35						
36	OBC Supervisor 2v5 reference	Voltage reference for the OBC supervisor	mV	16 bit unsigned	VALUE * 2.444	
37						
38	OBC Supervisor 1v8 supply	Output voltage on the 1v8 output	mV	16 bit unsigned	VALUE * 2.444	
39						
40	OBC Supervisor 1v0 supply	Output voltage on the 1v0 output	mV	16 bit unsigned	VALUE * 2.444	
41						
42	OBC Supervisor 3v3 current	Current consumption on the 3v3 output	mA	16 bit unsigned	VALUE * 0.347	
43						
44	OBC Supervisor 1v8 current	Current consumption on the 1v8 output	mA	16 bit unsigned	VALUE * 0.122	
45						
46	OBC Supervisor 1v0 current	Current consumption on the 1v0 output	mA	16 bit unsigned	VALUE * 0.164	
47						
48	OBC Supervisor RTC supply	Supply voltage for the OBC real-time clock	mV	16 bit unsigned	VALUE * 4.888	
49						
50						

OBC EXTENDED STATUS	51	OBC Safeflag trigger	<ul style="list-style-type: none"> 0 = None 1 = Unknown mode 2 = Deployment complete 3 = Battery voltage 4 = Unexpected reset 5 = Ground contact timeout 6 = CubeSense current - 3v3 7 = CubeControl current - 3v3 8 = CubeControl current - 5v 9 = CubeControl current - batt v 			
	52	OBC Safeflag uptime	Uptime at which last safeflag trigger occurred	seconds	32 bit unsigned	VALUE
	53					
	54					
	55					
56	OBC Epoch	Number of seconds passed since 01-01-1970 00:00:00 UTC	seconds	32 bit unsigned	VALUE	
57						
58						
59						
60	ADCS mode	<ul style="list-style-type: none"> 0 = Off 1 = Idle 2 = Estimate 3 = Detumbling 4 = Detumbling using MEMS sensor (only in V2 software) 5 = Estimation using Full EKF (only in V2 software) 6 = Detumbling using Full EKF (only in V2 software) 				
61	OBC switch state	State of OBC power switches		hexadecimal		

ATTITUDE DETERMINATION AND CONTROL SYSTEM (ADCS)

62	ADCS estimation mode	0 = Off 1 = Enabled 2 = Triggered		low nibble		
62	ADCS control mode	0 = None 1 = MEMS 2 = Magneto rate 3 = Magneto rate + pitch 4 = Full state EKF 5 = Magneto + TRIAD		high nibble		
63	ADCS flags - 1	ADCS status and error flags - byte 1				
64	ADCS flags - 2	ADCS status and error flags - byte 2				
65	ADCS flags - 3	ADCS status and error flags - byte 3				
66	ADCS flags - 4	ADCS status and error flags - byte 4				
67	ADCS flags - 5	ADCS status and error flags - byte 5				
68 69	ADCS rate X	Estimated angular rate around X axis	degrees/sec	16 bit 2s complement	VALUE * 0.001	
70 71	ADCS rate Y	Estimated angular rate around Y axis	degrees/sec	16 bit 2s complement	VALUE * 0.001	
72 73	ADCS rate Z	Estimated angular rate around Z axis	degrees/sec	16 bit 2s complement	VALUE * 0.001	
74 75	ADCS angular rate Y	Calibrated angular rate around Y axis	degrees/sec	16 bit 2s complement	VALUE * 0.001	
76 77	Magnetic field X	Magnetic field measurement in X axis direction	ADC count	16 bit 2s complement	VALUE	
78 79	Magnetic field Y	Magnetic field measurement in Y axis direction	ADC count	16 bit 2s complement	VALUE	
80 81	Magnetic field Z	Magnetic field measurement in Z axis direction	ADC count	16 bit 2s complement	VALUE	
82	Coarse sun sensor 1	Raw measurement of coarse sun sensor 1	ADC count	8 bit unsigned	VALUE	
83	Coarse sun sensor 2	Raw measurement of coarse sun sensor 2	ADC count	8 bit unsigned	VALUE	
84	Coarse sun sensor 3	Raw measurement of coarse sun sensor 3	ADC count	8 bit unsigned	VALUE	
85	Coarse sun sensor 4	Raw measurement of coarse sun sensor 4	ADC count	8 bit unsigned	VALUE	
86	Coarse sun sensor 5	Raw measurement of coarse sun sensor 5	ADC count	8 bit unsigned	VALUE	
87	Coarse sun sensor 6	Raw measurement of coarse sun sensor 6	ADC count	8 bit unsigned	VALUE	
88 89	Cubesense 3v3 current	Cubesense current consumption at 3v3	mA	16 bit unsigned	VALUE * 0.1	
90 91	Cubesense NADIR SRAM current	Cubesense current consumption of NADIR sensor SRAM	mA	16 bit unsigned	VALUE * 0.1	
92 93	Cubesense SUN SRAM current	Cubesense current consumption of SUN sensor SRAM	mA	16 bit unsigned	VALUE * 0.1	
94 95	Cubecontrol 3v3 current	Cubecontrol current consumption at 3v3	mA	16 bit unsigned	VALUE * 0.1	
96 97	Cubecontrol 5v current	Cubecontrol current consumption at 5v	mA	16 bit unsigned	VALUE * 0.1	
98 99	Cubecontrol battery current	Cubecontrol current consumption at battery voltage	mA	16 bit unsigned	VALUE * 0.1	
100 101	Magnetorquer current	Current consumption of magnetorquer	mA	16 bit unsigned	VALUE * 0.1	
102 103	Momentum wheel current	Current consumption of momentum wheel	mA	16 bit unsigned	VALUE * 0.1	
104	Rate sensor temperature	Temperature of the ADCS rate sensor	deg. C	8 bit 2s complement	VALUE	
105	ARM CPU temperature	Temperature of the ADCS ARM computer	deg. C	8 bit 2s complement	VALUE	