

AESP-14 AX.25 Telemetry Decoder

Version 1.0 – 2015-01-23

AX.25 frame properties

Frame type	Type 0xF0
FROM call sign	AESP14
TO call sign	QST

Byte and bit order notes

Byte order	Least significant byte first
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Value range notes

Data messages	All data messages start with ID above 0x80 (ASCII high table)
CRAM messages	CRAM messages are ASCII low table

AX.25 Status frame contents

Group	Byte	Description	Interpretation	Unit	Format	Conversion
Header	0	Packet ID	139 (0x8B) Telemetry status			
	1	Flags	Bit 0 = EPS Status present Bit 1 = OBDH Status present Bit 2 = TT&C Status present			
	2 3 4 5	Reserved	Always 0			
EPS	6	EPS Internal State	Bits 0..6 = Internal State: 0 = Initializing 1 = Commissioning (Awaiting for power up) 2 = Powering on OBDH 3 = Powering on TT&C 4 = Active 5 = Low power 6 = Critical Power 7 = Dead Bit 7 = Indicates system has been reset by watchdog timer			
	7	OBDH output driver	Bit 0 = 3.3v On (1) / Off (0)		8-bit unsigned	
	8	TT&C output driver	Bit 1 = 3.3v over current detected		8-bit unsigned	
	9	Payload output driver	Bit 2 = 5.0v On (1) / Off (0)		8-bit unsigned	
	10	vBat	Battery voltage	V	8-bit unsigned	VALUE * 0.0344
	11	iBat	Battery current	mA	8-bit unsigned	VALUE * 2.353
	12	iSol	Solar panels current	mA	8-bit unsigned	VALUE * 2.353
	13	Temp	Processor Temperature	°C	8-bit signed	VALUE
OBDH	14 15 16 17	UTC	Seconds elapsed since 1970 Jan 1st	sec	32-bit unsigned	
	18	Memory Used	Amount of memory used 0 = 0%; 255 = 100%	percent	8-bit unsigned	VALUE * 0.392157
	19	Memory Errors	Memory R/W error counter, no overflow	occurrences	8-bit unsigned	
	20	Flags	Bit 3 = Write error Bit 4 = Read error Bit 5 = Log error Bit 7 = Indicates system has been reset by watchdog timer			
	21	Temp	Processor Temperature	°C	8-bit signed	VALUE
TT&C	22	TT&C Internal State	Bits 0..6 = Internal State: 0 = Initializing 1 = Awaiting for antenna deployment 2 = Deploying antenna 3 = Reserved 4 = Active 5 = Stand-by 6 = Communications inhibited 7 = Dead Bit 7 = Indicates system has been reset by watchdog timer			
	23	Deployment flags	Bit 0 = Load resistor on (1) / Off (0) Bit 1 = Deployment sensor 1 deployed (1) stowed (0) Bit 2 = Deployment sensor 2 deployed (1) stowed (0) Bit 3 = Modem disabled (1) / normal (0)			
	24	Temp	Processor Temperature	°C	8-bit signed	VALUE

AX.25 Telemetry data frame contents

General packet

Group	Byte	Description	Interpretation	Unit	Format	Conversion
Header	0	Packet ID	141 (0x8D) Telemetry data			
Data	up to 63	Data frame	This packet has multiple variable-length payload data logs at a total maximum size of 63 bytes. It means this packet must be decoded in a sequential way, log by log. Current logs are: System log and EPS log.			

AX.25 Telemetry log contents

System Log

Header	0	Log ID	0 (0x00) System log			
	1	Sub-sys ID	0 = EPS subsystem 1 = OBDH subsystem 2 = TT&C subsystem			
	2	Event	1 = Power event 2 = State-change event 3 = UTC update event			
Data	3	Power event parameters	Bit 0 = Subsystem powered off Bit 1 = Subsystem powered on Bit 2 = Subsystem went into stand-by Bit 3 = Subsystem was reset by watchdog timer			
Data	3	State-change event parameters	State value ¹			
Data	3 4 5 6	UTC update event parameters	Updated UTC value ²		32-bit unsigned	

AX.25 Telemetry log contents

EPS Log

Header	0	Log ID	1 (0x01) EPS voltage and current log 5 (0x05) EPS minimum values 6 (0x06) EPS maximum values			
	1 2 3 4	UTC	UTC time of generated log ²	sec	32-bit unsigned	
	5	EPS revision	Always read 6			
Volts	6	vBat	Battery Voltage	V	8-bit unsigned	VALUE * 0.0344
	7	vSS	Subsystems output voltage	V	8-bit unsigned	VALUE * 0.0344
Amps	8	iSol	Solar panels current	mA	8-bit unsigned	VALUE * 2.353
	9	iBat	Battery current	mA	8-bit unsigned	VALUE * 2.353
	10	iSS	Subsystems current	mA	8-bit unsigned	VALUE * 4.706
	11	i3obdh	OBDH current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	12	i3tt&c	TT&C current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	13	i3payload	Payload current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	14	i5obdh	OBDH current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353
	15	i5tt&c	TT&C current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353
	16	i5payload	Payload current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353

Note 1: For EPS states refer to byte 6 of Status frame; for TT&C states refer to byte 22 of Status frame; OBDH if powered on, always run active.

Note 2: For UTC description refer to bytes 14, 15, 16 and 17 of status frame.

AX.25 Emergency telemetry

Group	Byte	Description	Interpretation	Unit	Format	Conversion
Header	0	Packet ID	166 (0xA6) Emergency telemetry data			
	1	Log ID	1 (0x01) EPS voltage and current log 5 (0x05) EPS minimum values 6 (0x06) EPS maximum values			
	2 3 4 5	UTC	UTC time of generated log ²	sec	32-bit unsigned	
	6	EPS revision	Always read 6			
Volts	7	vBat	Battery Voltage	V	8-bit unsigned	VALUE * 0.0344
	8	vSS	Subsystems output voltage	V	8-bit unsigned	VALUE * 0.0344
Amps	9	iSol	Solar panels current	mA	8-bit unsigned	VALUE * 2.353
	10	iBat	Battery current	mA	8-bit unsigned	VALUE * 2.353
	11	iSS	Subsystems current	mA	8-bit unsigned	VALUE * 4.706
	12	i3obdh	OBDH current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	13	i3tt&c	TT&C current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	14	i3payload	Payload current for 3.3v output	mA	8-bit unsigned	VALUE * 2.353
	15	i5obdh	OBDH current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353
	16	i5tt&c	TT&C current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353
	17	i5payload	Payload current for 5.0v output	mA	8-bit unsigned	VALUE * 2.353

AX.25 CRAM message

Group	Byte	Description	Interpretation	Unit	Format	Conversion
Header	0 1 2 3	Header	Always read "CRAM"		char[]	
	4	Separator	Always read '-'		char	
	5	CRAM version	Current version is '1'		char	
	6	Separator	Always read ':'		char	
	7	Separator	Always read ' ' (space)		char	
Data	8 to 39	Hash	32-byte HEX string MD5 hash		char[]	
ETX	40	Terminator	Always read '\0'		char	