



CAS-6 Satellite Digital Telemetry Description

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The following includes digital telemetry transmission format and measurement equation of CAMSAT CAS-6 amateur radio satellite. The digital telemetry signal of CAS-6 satellite works on GMSK modulation system, the baseband transmission is AX.25 UI frames, telemetry transmission rate is 4.8kbps.

1、 CAS-6 digital telemetry transmission sequence





2、 CAS-6 digital telemetry frame structure

| Transmission word | Format | Purpose | Frame Number |
|-------------------|--------|------------------------------------|---------------|
| W0~W1 | EB90H | frame synchronous code | Frame1 |
| W2~W5 | xxH | Telemetry Data | |
| W6~W14 | xxxxH | Test data, reserved for future use | |
| W15 | xxH | Frame counter = 0 ~ 255 | |
| W16~W127 | xxxxH | Test data, reserved for future use | |
| W128~W129 | EB90H | frame synchronous code | Frame2 |
| W130~W133 | xxH | Telemetry Data | |
| W134~W142 | xxxxH | Test data, reserved for future use | |
| W143 | xxH | Frame counter = 0 ~ 255 | |
| W144~W255 | xxxxH | Test data, reserved for future use | |
| W256~W257 | EB90H | frame synchronous code | Frame3 |
| W258~W261 | xxH | Telemetry Data | |
| W262~W270 | xxxxH | Test data, reserved for future use | |
| W271 | xxH | Frame counter = 0 ~ 255 | |
| W272~W383 | xxxxH | Test data, reserved for future use | |
| W384~W385 | EB90H | frame synchronous code | Frame4 |
| W386~W389 | xxH | Telemetry Data | |
| W390~W398 | xxxxH | Test data, reserved for future use | |
| W399 | xxH | Frame counter = 0 ~ 255 | |
| W400~W511 | xxxxH | Test data, reserved for future use | |

3、 CAS-6 digital telemetry frames and equations

| Channel | Name of Parameter | Type | Data Structure | Description and Equation | Data Range |
|---------|----------------------------------|------|----------------|--|-------------|
| 1 | Primary power supply voltage | Data | W0 | 8bits, Unsigned binary integers $6 \times (3.3/255) \times N(\text{Measured value})$ (V) | 10V~13V |
| 2 | Primary power supply current | Data | W1 | 8bits, Unsigned binary integers $0.15 \times (3.3/255) \times N(\text{Measured value})$ (A) | 0.10A~0.20A |
| 3 | DC / DC converter output voltage | Data | W2 | 8bits, Unsigned binary integers $1.6 \times (3.3/255) \times N(\text{Measured value})$ (V) | 3.8V |
| 4 | DC / DC converter output current | Data | W3 | 8bits, Unsigned binary integers $0.2 \times (3.3/255) \times N(\text{Measured value})$ (A) | 0.4A~0.6A |
| 5 | OBC temperature | Data | W4 | 8bits, Unsigned binary integers N-64 (°C) | -64°C~125°C |
| 6 | RF power amplifier temperature | Data | W5 | 8bits, Unsigned binary integers N-64 (°C) | -64°C~125°C |
| 7 | Receiver AGC voltage | Data | W6 | 8bits, Unsigned binary integers $(3.3/255) \times N(\text{Measured value})$ (V) | 0~3.3V |
| 8 | RF forward power | Data | W7 | 8bits, Unsigned binary integers N(Measured value) (mW) | 0~500mW |
| 9 | RF reflected power | Data | W8 | 8bits, Unsigned binary integers N(Measured value)/10 (mW) | <50mW |



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| Channel | Name of Parameter | Type | Data Structure | Description and Equation | Data Range |
|---------|-----------------------------------|--------|----------------|---|------------|
| 10 | OBC power voltage | Data | W9 | 8bits, Unsigned binary integers $4 \times 2.4/256 \times N(\text{Measured value}) \text{ (V)}$ | 3.3V |
| 11 | OBC Reset counter | Data | W10 | Display in decimal | 0~255 |
| 12 | Telemetry data packet counter | Data | W11B7~B4 | Display in decimal | 0~15H |
| 13 | Satellite Number | Status | W11B3~B0 | 001: CAS-4A 010: CAS-4B Others: Reserved | 1-6 |
| 14 | Current operating mode | Status | W12B7~B4 | 001:Mode 1 (CW Beacon, Transmit Per 6 minutes) 010:Mode 2 (CW Beacon, Continuously) 011:Mode 3 (CW Beacon + Linear Transponder) 100:Mode 4 (CW Beacon + Telemetry) 101:Mode 5 (CW Beacon + Telemetry + Linear Transponder) 110:Mode 6 (Reserved) 111:Mode 7 (Test Mode) | 001~111B |
| 15 | Power on operating mode | Status | W12B3~B0 | 001:Mode 1 (CW Beacon, Transmit Per 6 minutes) 010:Mode 2 (CW Beacon, Continuously) 011:Mode 3 (CW Beacon + Linear Transponder) 100:Mode 4 (CW Beacon + Telemetry) 101:Mode 5 (CW Beacon + Telemetry + Linear Transponder) 110:Mode 6 (Reserved) 111:Mode 7 (Test Mode) | 001~111B |
| 16 | I2C software watchdog switch flag | Status | W13B7 | 0: On, 1: Off | 0-1B |



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| Channel | Name of Parameter | Type | Data Structure | Description and Equation | Data Range |
|---------|---|--------|----------------|--------------------------|------------|
| 17 | I2C reconnecting initialized counter | Data | W13B6~B4 | Display in decimal | 0-7H |
| 18 | TC software watchdog switch flag | Status | W13B3 | 0: On, 1: Off | 0-1B |
| 19 | TC software watchdog reset counter | Data | W13B2~B0 | Display in decimal | 0-7H |
| 20 | ADC software watchdog switch flag | Status | W14B7 | 0: On, 1: Off | 0-1B |
| 21 | ADC software watchdog reset times counter | Data | W14B6~B4 | Display in decimal | 0-7H |
| 22 | SPI software watchdog switch flag | Status | W14B3 | 0: On, 1: Off | 0-1B |
| 23 | SPI reconnecting initialized counter | Data | W14B2~B0 | Display in decimal | 0-7H |
| 24 | CPU analog acquisition watchdog switch flag | Status | W15B7 | 0: On, 1: Off | 0-1B |
| 25 | CPU analog acquisition frequency counter watchdog reset | Data | W15B6~B4 | Display in decimal | 0-7H |