HSU-SAT1 CW Telemetry Format

作成			
戸波			

改定履歴

本書の改定履歴は、以下の通りである。

改訂履歴			
訂番	日付	内容	作成
0	2022/02/23	初版	戸波
1	2022/08/20	英語に翻訳	神澤

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1. Overview

HSU-SAT1 has the capability to transmit CW telemetry indicating the satellite's own status.

This CW telemetry is constantly transmitted during operation.

The transmission interval depends on the mode of the satellite.

In the case of " Stationary mode," which is the mode used during normal operations, the transmission interval is approximately 1 minute.

2. Specifications of CW

Downlink frequency	437.28	MHz
Transmit power	100	mW
Length of dots	65	ms
Length of dashes	195	ms
Length of spaces	65	ms
Character spacing	130	ms
Word spacing	260	ms

3. Contents of CW telemetry

An example of CW telemetry in stationary mode is shown below.

0 JS1YHS HSUSAT1 0 4.19V −0.02A 30.18D EEEEETETTTE

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Reset notice

Indicates whether or not the satellite power supply has a reset notice during telemetry transmission (0: no reset notice, 1: reset notice).

The power supply of HSU-SAT1 is reset every 24 hours. The reset notice signal is output from 100 s before this reset until just before the reset.

In the above example, the reset notice signal is not output.

② Call sign

Represents the identification signal of a satellite station.

③ Satellite name

Indicates the name of the satellite (HSU-SAT1).

④ Satellite mode

The mode of the satellite during telemetry transmission is indicated by a mode number.

The mode numbers of the main modes are as follows

0: Stationary mode
1: Power saving mode
2: Custom mode
9: Off-the-Air mode (no telemetry is transmitted)
10: AOCS (Attitude and Orbit Control Subsystem) mode

In the above example, the mode of the satellite is " stationary mode ".

⑤ Battery voltage

Indicates battery voltage during telemetry transmission. Unit is V.

The battery voltage is measured by the battery monitoring sensor (INA226). The measured value is transmitted to two decimal places (not rounded).

In the above example, the battery voltage is 4.19 V.

⑥ Battery current

Indicates the battery current during telemetry transmission (positive value: charging, negative value: discharging). Unit is A.

The battery current is measured by the battery monitoring sensor (INA226). The measured value is transmitted to two decimal places (not rounded).

In the above example, the battery current is 0.02 A (discharge).

⑦ Battery temperature

Indicates the battery temperature during telemetry transmission. The unit is ℃.

The battery temperature is measured by a temperature sensor (MCP9700AT-E/TT). The measured value is transmitted to two decimal place (not rounded off).

In the above example, the battery temperature is 30.18 ℃.

⑧ Power Switch Status

Indicates the state of the power switch during telemetry transmission.

From left to right, it represents SW1 to SW11 ON/OFF (E: OFF, T: ON). The correspondence between switches and components is as follows.

SW1: Audio IC
SW2: Missing number
SW3: Magnetic Torquer
SW4: IR module
SW5: Camera, DDS, SD card
SW6: Temperature Sensor
SW7: Magnetic sensor, Gyro sensor
SW8: Real-time clock
SW9: Missing number
SW10: Sub-microcontroller, EEPROM, sun sensor
SW11: Antenna deployment unit

In the above example, SW6 (temperature sensor), SW8 (real-time clock), and SW10 (sub-microcontroller, EEPROM, sun sensor) are in the ON state.

4. CW telemetry content and transmission interval in each mode

4.1. Stationary mode

An example of CW telemetry in stationary mode is shown below.

0 JS1YHS HSUSAT1 0 4.19V −0.02A 30.18D EEEEETETTTE

In stationary mode, all telemetry is transmitted. Transmission takes approximately 30 s. After the telemetry is sent, there is a 30 s wait for DTMF commands (no commands can be received while telemetry is being sent).

The interval between telemetry transmissions is 30 + 30 = 60 s.

4.2. Power saving mode

An example of CW telemetry in power saving mode is shown below.

0 JS1YHS 1 4.19V

In power saving mode, only the reset notice, call sign, satellite mode, and battery voltage are transmitted. Transmission takes approximately 15 s. After the telemetry is sent, there is a 60 s wait for DTMF commands (no commands can be received while telemetry is being sent).

The interval between telemetry transmissions is 15 + 60 = 75 s.

4.3. Custom mode

In custom mode, the content of CW telemetry to be sent and the length of the wait for receiving DTMF commands can be freely set (reset notice is always sent)

4.4. Off-the-Air mode

In Off-the-Air mode, no CW telemetry is transmitted. In this mode, the satellite only waits to receive DTMF commands.

4.5. Other mode

With respect to transmitting CW telemetry and waiting to receive DTMF commands, the operation is the same as in stationary mode.