CW Telemetry Data Format

HORYU-IV Project

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1	2016/02/09	Document creation for website use

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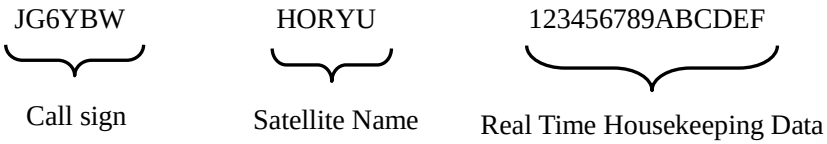
1. CW Telemetry Transmission

Downlink data of CW telemetry is done through UHF band at a frequency of 437.375MHz and a speed of 20wpm.

2. HORYU-IV CW Telemetry Format

HORYU-IV CW telemetry structure is defined as follows:



3. CW Data Format

Data format of CW transmission is described in Table 1 **CW Structure Format** and Table 2:

Table 1 CW Structure Format (1 cell contains 4 bit)

Data Number	Downlink Data (1 cell = 4 bit)
1	Battery Voltage
2	
3	Battery Current
4	
5	Battery Temperature_1
6	
7	Battery Temperature_2
8	
9	Antenna S-band temperature
A	
B	1200TX temperature
C	
D	Board temperature
E	
F	9600TX temperature
G	

Table 2 CW Structure Format (1 cell contains 1 bit)

Data Number	Downlink Data (1 cell = 1 bit)
H	Share memory Normal :1, Trouble: 0
	Reservation command Reserve:1, Nothing: 0
	Operation mode Mission:1, Nominal: 0
	Kill switch_main Normal:1, Kill: 0
I	Kill switch_COM Normal:1, Kill: 0
	Solar cell X Sunshine: 1, Shadow: 0
	Solar cell +Y Sunshine: 1, Shadow: 0
	Solar cell -Y Sunshine: 1, Shadow: 0
J	Solar cell +Z Sunshine: 1, Shadow: 0
	Solar cell -Z Sunshine: 1, Shadow: 0
	SW_AODS ON: 1, OFF: 0
	MUX_OBO ON: 1, OFF: 0
K	Time (hour from restart) 0~16 hour
L	Operation mode

4. Operation Modes

Description of the operation modes is given in Table 2 (in data number L) and in Table 3.

Table 3 Operation mode in CW

0x0	HVSA “Discharge count or I-V measurement”
0x1	HVSA + OBO “Simple waveform capture + counter” or "Full Waveform Capture + Counter"
0x3	HVSA + OBO + AVC ”Simple Waveform Capture + AVC + Counter" or "Full Waveform Capture + AVC + Counter”
0x5	HVSA + VAT + OBO “Waveform Capture + Counter”
0x6	HVSA + VAT + OBO + AVC “Waveform Capture + AVC + Counter”
0x7	AVC "AVC Reference Picture Mode"
0x8	DLP, PEC “Normal Measurement”
0x9	DLP + HVSA, ELF + HVSA, VAT + HVSA “Measurement with High Voltage Source”
0xA	CAM “Timer, Target, Normal Mode”
0xB	SNG
0xC	S-band downlink
0xD	S-band processing
0xE	Nominal
0xF	Processing satellite

5. Satellite Axis and Bus Solar Cells Position

HORYU-IV bus solar cells are mounted in +X, +/-Y, and +/-Z axis. Satellite axis and bus solar cells position are described in Figure 1 and Figure 2.

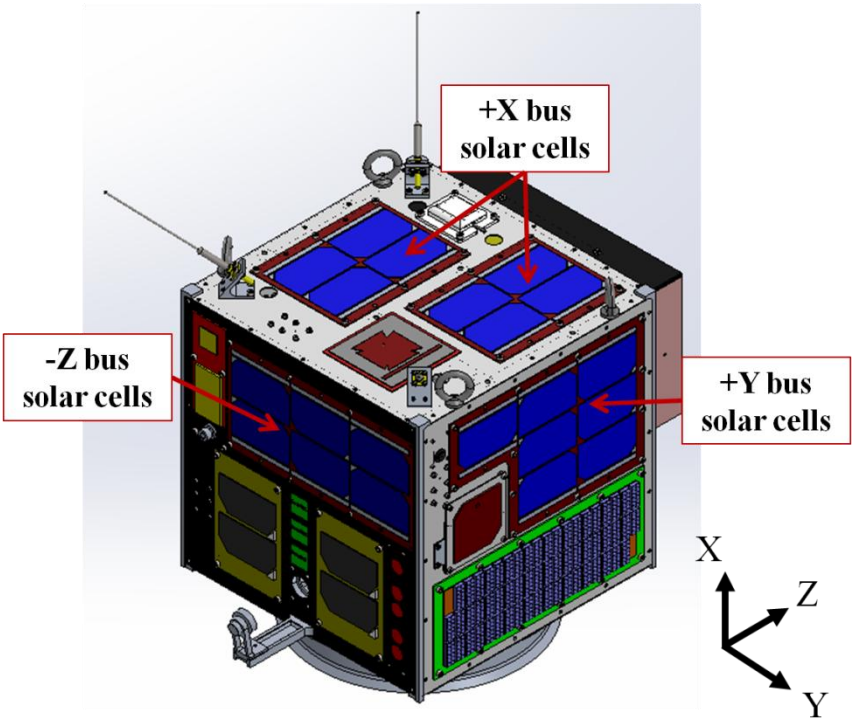


Figure 1 +X, +Y, and –Z bus solar cells position on HORYU-IV

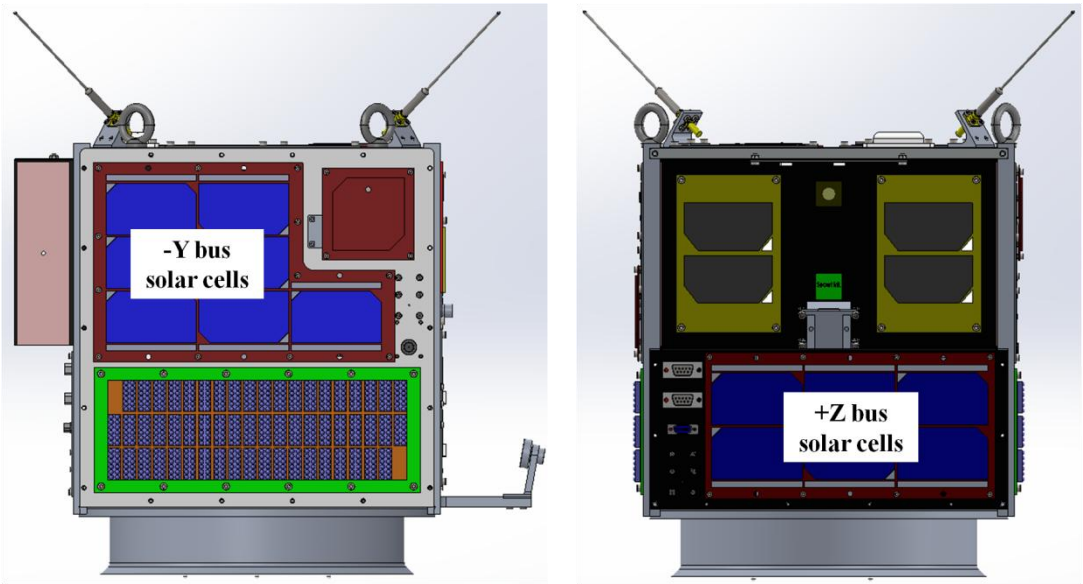


Figure 2 HORYU-IV bus solar cells in –Y and +Z direction

6. Real Time Housekeeping Data Format

Real time housekeeping data contain information on satellite condition. The real time housekeeping data format is presented in Table 4.

Table 4 Real time housekeeping data format

Data Number	Downlink Data (1 cell = 1 byte)
0	0xdd
1	0xdd
2	Page number 1
3	Page number 2
4	Hamming code ([2], [3])
5	0x52 Mode (Command[1])
6	CRC (50 bytes)
7	Hamming code ([5], [6])
8	Present day (at writing sensor data)
9	Present day (at writing sensor data)
10	Hamming code
11	Present hour (at writing sensor data)
12	Present min (at writing sensor data)
13	Hamming code
14	BATT1 temperature
15	BATT2 temperature
16	Hamming code
17	ANTENNA-S-BAND temperature
18	1200TX temperature
19	Hamming code
20	Board temperature
21	9600TX temperature
22	Hamming code
23	AVC-NZ temperature
24	AVC-PZ temperature
25	Hamming code
26	-XPANEL temperature
27	+XPANEL temperature
28	Hamming code
29	-YPANEL temperature
30	+YPANEL temperature
31	Hamming code

32	-ZPANEL temperature
33	+ZPANEL temperature
34	Hamming code
35	HOOD temperature
36	MIRROR temperature
37	Hamming code
38	5V-DCDC-VOLTAGE
39	5V-DCDC-CURRENT
40	Hamming code
41	3V-DCDC-VOLTAGE
42	3V-DCDC-CURRENT
43	Hamming code
44	BATT-VOLTAGE
45	BATT-CURRENT
46	Hamming code
47	CHARGE-CURRENT
48	X-PANEL-VOLTAGE
49	Hamming code
50	+Y-PANEL-VOLTAGE
51	-Y-PANEL-VOLTAGE
52	Hamming code
53	+Z-PANEL-VOLTAGE
54	-Z-PANEL-VOLTAGE
55	Hamming code
56	DCDC_TX_VOLTAGE
57	DCDC_TX_CURRENT
58	Hamming code
59	X-PANEL-CURRENT
60	+Y-PANEL-CURRENT
61	Hamming code
62	-Y-PANEL-CURRENT
63	+Z-PANEL-CURRENT
64	Hamming code
65	-Z-PANEL-CURRENT

66	PAST_MISSION [0]
67	Hamming code
68	PAST_MISSION [1]
69	PAST_MISSION [2]
70	Hamming code
71	PAST_MISSION [3]
72	PAST_MISSION [4]
73	Hamming code
74	GET_GPS_TIME
75	SW_AODS
76	Hamming code
77	Present day
78	Present day
79	Hamming code
80	Present hour
81	Present min
82	Hamming code
83	0xaa or 0xbb
84	0xaa or 0xbb
85	0xaa or 0xbb

7. HORYU-IV Abbreviations

AVC : Arc Vision Camera

CAM : Camera for Earth photography

DLP : Double Langmuir Probe

ELF : Electrons Emitting Film

HVSA : High Voltage Solar Array

OBO : On Board Oscilloscope

PEC : Photo-Electrons Current measurement

SNG : Digi-singer

VAT : Vacuum Arc Thruster

8. Additional Information

All the information in this document is HORYU-IV project's copyright. For further information about the document and HORYU-IV project, contact HORYU-IV team at: horyu4@langmuir.ele.kyutech.ac.jp.