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The ADCS & IHU Interface IHU Interface

Design and Rationale

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# Hardware Layer

The hardware interface between the PMIC and the IHU is I2C. It is a standard implementation of I2C with a clock wire and a data wire. See Wikipedia’s I2C article for details on how it works.

# Software Layer

The Attitude Determination Control System, located at 8b address 0xAC, is a slave board to the IHU.

## CubeSat1’s Orientation Data Request

This command is used when the IHU is building a telemetry packet. The latitude, with a needed minimum value of 648000, and longitude, with a needed minimum of 1296000, are 4B integers each. Latitude is measure from South (-90°) to North (90°) can be separated into 60 minutes, and each minute can be divided into 60 seconds. Longitude is East (-180°) to West (180°) with the subdivisions.

Roll, Pitch and Yaw, with a needed minimum of 64800, are represented by 2B values, which gives a 0.00555° precision for our possible 360° degrees for each direction of rotation.

|  |  |  |
| --- | --- | --- |
| Index | 0x00 | 0x01 |
| Function | 0x00: | 0x00: Latitude  0x01: Longitude  0x02: Roll  0x03: Pitch  0x04: Yaw |

## CubeSat1’s Power Data Request

This command is used by the IHU when building a telemetry packet and when the PMIC requests the voltages and currents of the ADCS. The temperature being represented with a 1B(8b) integer with 1°C/LSB, the PWM being represented by 1B(8b) from 0-255 and the current represented by a 16b value with 150µA/LSB.

|  |  |  |
| --- | --- | --- |
| Index | 0x00 | 0x01 |
| Function | 0x01: | 0x00: ADCS Temp  0x01: X PWM Out  0x02: Y PWM Out  0x03: Z PWM Out  0x04: X Current  0x05: Y Current  0x06: Z Current |

## Orientation Commands

These commands are to instruct the ADCS to spin, and maintain the direction of, some part of the satellite towards the object or location specified. The specifics will be specified later.

|  |  |  |
| --- | --- | --- |
| Index | 0x00 | 0x01 |
| Function | 0x02: Point | 0x00: Earth  0x01: Moon  0x02: XYZ |

# Example Cases:

IHU: [0xAC] 0x0202 (\_X, \_Y, \_Z) [ADCS Point \_X\_Y\_Z]

ADCS turns, returns time of completion.