Elijah Craig

This document explains how the IFJR and the IHU are communication down to the byte by byte level.

IFJR Interface

Detailed Description of the IFJR and IHU Interface

Revision: 1.0.2



Table of Contents

[1 Hardware Layer 2](#_Toc523164746)

[2 Software Layer 3](#_Toc523164747)

[2.1 Temperature Data Request 3](#_Toc523164748)

[2.1.1 Request 3](#_Toc523164749)

[2.1.2 Response 3](#_Toc523164750)

[2.2 Storage Capacity Data Request 3](#_Toc523164751)

[2.2.1 Request 3](#_Toc523164752)

[2.2.2 Response 4](#_Toc523164753)

[2.3 Reprogram Select Processor 4](#_Toc523164754)

[2.3.1 Command 4](#_Toc523164755)

[2.3.2 Response 4](#_Toc523164756)

[3 Example Communication 5](#_Toc523164757)

[3.1 Simple Data Request 5](#_Toc523164758)

[3.2 Simple Repeater Data Request 5](#_Toc523164759)

# 1 Hardware Layer

The hardware interface between the IFJR 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](https://en.wikipedia.org/wiki/I%C2%B2C) for details on how it works.

# 2 Software Layer

The In-Flight JTAG Reprogramming system, located at 8b address 0x1F, is a slave board to the IHU. The IFJR oversees the updating of select boards.

## 2.1 Temperature Data Request

### 2.1.1 Request

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 |
| 0x00 | 0x00: Request IFJR Temperature  0x01:  Request IFJR Storage Temperature |  |  |  |  |  |  |  |

### 2.1.2 Response

The IFJR responds with an 8b signed integer with 1°C/LSB.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 |
| 0x00 | Respective Temperature |  |  |  |  |  |  |  |

## 2.2 Storage Capacity Data Request

This command is used to determine the total capacity used for the IFJR specific SD card.

### 2.2.1 Request

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 |
| 0x00 | 0x02: Request Storage Used |  |  |  |  |  |  |  |

### 2.2.2 Response

The IFJR responds with a 64b unsigned integer representing the total bytes used.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 |
| 0x00 | Bytes Used | | | | | | | |

## 2.3 Reprogram Select Processor

This command assumes the processor binary has already been sent and exists in the IFJR’s SD card.

### 2.3.1 Command

This command requires ground control to specify a target processor, done by using a 8b unsigned integer. It also requires a binary version to be specified.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 |
| 0x00 | 0x03: Reprogram Command | 0x00: ADCS  0x01: IFJR  0x02: IHU  0x03: PMIC  0x04: Comms  0x05: Payload 1  0x06: Payload 2  0x07: Payload 3 | Major | Minor | Patch |

### 2.3.2 Response

The IFJR responds with a CISError code, an 8b unsigned integer, which is defined in the CubeSat1-Resources/Standard Operating Procedures/Code in section 6.4.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Byte Offset | 0x00 | 0x01 | 0x02 | 0x03 | 0x04 | 0x05 | 0x06 | 0x07 |
| 0x00 | Return Code |  |  |  |  |  |  |  |

# 3 Example Communication

## 3.1 Simple Data Request

IHU: [0x1F] 0x00 [IFJR write] IFJR Processor Temperature Request  
 IFJR collects the processors temperature  
IHU: [0x20] [IFJR read]  
IFJR: 0xBEEF 120

## 3.2 Simple Repeater Data Request

IHU: [0x1F] 0x01 [IFJR write] IFJR SD Card Temperature Request

IFJR collects SD Card temperature  
IHU: [0x1F] 0x00 [IFJR write] IFJR Processor Temperature Request  
 IFJR collects the processors temperature  
IHU: [0x20] [IFJR read]  
IFJR: 0xBFEC 120