**Space Uplink Protocol Specification**

The Space Uplink Protocol is designed to allow earth-based controllers to monitor and manage remote satellites. Due to the low bandwidth and high latency environments, connections are slow and sometimes delayed.

Each message to or from the remote device must consist of 4 bytes. All 4 bytes in the Space Uplink Protocol have unique bit signatures for easy detection. The format is as follows:

**00xxxxxx 01xxxxxx 10xxxxxx 11xxxxxx**

Packets which don’t follow this format will trigger the abort signal with the error code of 0o00001.

**Channels**

The channel (7bits) indicates what type of data is being communicated. Depending on the size of the data being returned, more than one Uplink packet will be sent. Packets will be padded with zeros in the least significant bits if needed.

|  |  |  |
| --- | --- | --- |
| **Channel (Octal)** | **Data Type** | **Description** |
| 0o000 | TLE Data | The TLE for the satellite |
| 0o001 | Name | The name of the satellite |
| 0o002 | Mass | The mass of the satellite (kg) |
| 0x003 | Time | Current time |
| 0o004-0o007 | UNUSED | UNUSED |
| 0o010 | Velocity | Current Velocity |
| 0o011 | Altitude | Current Altitude |
| 0o020 | ???? | ???? |
|  |  |  |
| 0o100 | Heartbeat | Heartbeat message channel (Usually \x7FFF) |
| 0o101 | Abort | Sending any data to this channel will trigger an immediate abort. |

**Abort Signals**

Abort signals are sent whenever the satellite detects any sort of anomaly. Abort signals can be sent for many different reasons, but they put the remote satellite in an unknown state. Abort messages are sent on the same channel that triggered the abort. Often the device is in read only mode. The abort bit is a single bit (a) that indicates the status.

**00axxxxx 01xxxxxx 10xxxxxx 11xxxxxx**

The abort bit is set to 0 at all other times. Normally a reconnection is required before the abort status will be cleared. An abort can be manually triggered by sending any data to the Abort Channel.

|  |  |  |
| --- | --- | --- |
| **Abort Code** | **Title** | **Description** |
| 0o00000 | SYSTEM ABORTED | Operation will not complete, abort mode is set. |
| 0o00001 | INVALID SIGNATURE | The byte signature is incorrect. |
| 0o00002 | INVALID SIZE | The packet size is incorrect. |
| 0o00003 | READ ONLY VALUE | This value cannot be changed |
| 0o00004 | CLIENT TIMEOUT | The client did not send data for too long |
| 0o00005 | UNRESPONSIVE CLIENT | The client did not respond to information requests. |
| 0o00006 | UNKNOWN I/O CHANNEL | Querying Unknown I/O Channel |

**Memory**

I/O channels directly map to the segment of memory that holds the value. You can get and set this memory by toggling the query bit when sending data to the remote device. The query bit (q) is a single bit that indicates whether the sender is requesting the memory or trying to set the memory on the given channel.

**00xqxxxx 01xxxxxx 10xxxxxx 11xxxxxx**

The Q bit is set to 1 for queries and set to 0 for write attempts.

Note: The system will abort if the write fails or if the memory is read only.

**Data Types**

|  |  |
| --- | --- |
| **Type** | **Size** |
| TLE Data | TEXT (???) |
| Name | TEXT (???) |
| Mass | FLOAT [kg] |
| Time | INT (4 bytes) |
| Velocity | FLOAT [km/s] |
| Altitude | FLOAT [km] |