|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bot Uplink Message**  **ALL Data Segments**  **Bit Map (Pt. 1)** | | | **Element Name** | **Range/Format** | **Description/Notes** |
| **Bytes 0-3 (32-bits) for BOTH std amd chg data** | **0-2**  (3 bits) | | *segid* | [ 0 - 7 ] | **Segment ID**  (identifies the segment type; 0=reserved, 1=status, 2=data, etc.; higher numbers reserved primarily for upload requests, alarms, etc.; ***guaranteed*** to be first field in segment) |
| **3-12**  (10 bits) | **3**  (1 bit) | *dp\_timestamp\_sgn* | [ 0 | 1 ] | **Data Product “Timestamp” Sign Bit**  (sign bit for the Data Product timestamp; 0=positive; 1=negative) |
| **4-12**  (9 bits) | *dp\_timestamp* | Unix Epoch Time  ***1 sec resolution*** | **Data Product “Timestamp”**  (time when Data Product collected; delta +/- 511 from Status Message ‘timestamp;’ must apply *dp\_timestamp\_sgn* above; cloud must anticipate 1-year rollover) |
| **13-18**  (6 bits) | | *dp\_node\_code* | [ 0 - 63 ] | **Data Product “Node Code”**  (equivalent to the SDK’s “Node Type ID;” integer value from a table lookup matching the 3-character “AAA” type identifier component of the *AAA\_N\_<meta|std|change>.json* Data Product file; value is table look-up) |
| **19-22**  (4 bits) | | *dp\_instance* | [ 0 - 15] | **Data Product “Instance”**  (equivalent to the SDK’s “instance;” an integer value matching the N-digit component of the *AAA\_N\_<meta|std|change>.json* Data Product file) |
| **23-29**  (7 bits) | | *dp\_index* | [ 0 - 127 ]  ***mod 128*** | **Data Product “Index”**  (a Bot-specific, sequential indexed count, incremented by 1, representing the number of uplink transmissions for this *dp\_type* and *dp\_instance* - both ‘std’ and ‘change’; cloud must anticipate a mod 128 rollover). |
| **30**  (1 bit) | | *data\_kind* | [ 0 | 1 ] | **Data “Kind” Flag**  (indicates whether this Data Product segment contains a “Standard” or a “Change’ component; if “0,” then ‘standard’ data info is included; if “1,” then ‘change’ data info is included) |
| **31**  (1 bit) | | *data\_change* | [ 0 | 1 ] | **Data “Change” Flag**  (if *data\_kind* above is “0,” this field has no meaning and should be ignored; if *data\_kind* above is “1,” a “0” in this field indicates “NC,” or “No Change” from previous reading, otherwise, a “1” in this field indicate a “change’ from the previous reading follows. |

Table 1: First 4 bytes (32-bits) for ALL Uplink Message "Data Segments."

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| --- | --- | --- | --- | --- | --- |
| **Bot Uplink Message**  **ALL Data Segments**  **Bit Map (Pt. 2)** | | | **Element Name** | **Range/Format** | **Description/Notes** |
| **Bytes 4-11 (64-bits)** | **0-11**  (12 bits) | | *status\_id* | [ 0 - 4095 ]  ***mod 2\*\*12*** | **Status Record ID**  (the ‘primary key’ or ‘rowid’ that uniquely identifies this Status Record in the ‘status’ Table of the Float’s embedded database; this built-in SQLite field can range from 0 - 264-1 on the Float; must anticipate rollover) |
| **12-27**  (16 bits) | | *heading* | [ 0 - 36,000 ]  ***centidegrees*** | **Heading**  (current reading; magnetic north; division by 100 will yield ‘heading’ in degrees as a float) |
| **26-31**  (6 bits) | **28**  (1 bit) | *pitch\_sign* | [ 0 | 1 ] | **Pitch Sign Bit**  (sign bit for the current pitch angle; 0=positive; 1=negative) |
| **29-33**  (5 bits) | *pitch* | [ 0 - 31 ] | **Pitch**  (current pitch angle; represented in degrees; must apply *pitch\_sign* above) |
| **32-37**  (6 bits) | **34**  (1 bit) | *roll\_sign* | [ 0 | 1 ] | **Roll Sign Bit**  (sign bit for the current roll angle; 0=positive; 1=negative) |
| **35-39**  (5 bits) | *roll* | [ 0 - 31 ] | **Roll**  (current roll angle; represented in degrees; must apply *roll\_sign* above) |
| **40-43**  (4 bits) | | *channels* | [ 0 - 15 ] | **Channels**  (data channels for this Data Product) |
| **44-47**  (4 bits) | | *dt* | [ 0 | 1| 2 | 3 ] | **Data Type**  (0=uint8; 1=int32; 2=float32 ; 3=Reserved, TBD) |
| **48-59**  (12 bits) | | *size* | [ 0 - 4095 ] | **Data Size**  (the total number of ‘standard’ or ‘change’ data products of ***dt*** Data Types) |
| **60-63**  (4 bits) | | *-* | - | **Reserved** |

Table 2: Next 8 bytes (64-bits) for ALL Uplink Message "Data Segments."

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bot Uplink Message STD Data Segment**  **Bit Map (Pt. 3)** | | **Element Name** | **Range/Format** | **Description/Notes** |
| **Bytes 12-15 (32-bits)** | **0-9**  (10 bits) | *samples* | [ 0 - 1023 ] | **Samples**  (number of ‘samples’ for this Data Product) |
| **10-20**  (11 bits) | *rows* | [ 0 - 2047 ] | **Rows**  (number of ‘rows’ in a ‘sample’ for this Data Product) |
| **21-31**  (11 bits) | *cols* | [ 0 - 2047 ] | **Columns**  (number of ‘columns’ in a ‘sample’ for this Data Product) |
|  | **0 🡪 n**  **(values repeat** *size* **times)** | *data* | byte array | **Data**  (a data stream of “***size\*1***” bytes when ***dt=0*** OR “***size\*4***” bytes when ***dt=1|2***; the stream starts at byte 16 in a ‘std’ Data Segment) |

Table 3: Bytes 12+ in Data Segment when "std" Data Product Information is included in the Segment.

TOTAL “FIXED” BYTES IN **std** DATA SEGMENT: 16 bytes (128 bits) - **0 bits unused**.

TOTAL “DATA” BYTES IN **std** DATA SEGMENT: *size* \*1 bytes (when *dt* = 0)

*size* \*4 bytes (when *dt* = 1|2)

TOTAL SIZE OF ‘STD’ DATA SEGMENT: Total FIXED Bytes + Total DATA Bytes

( 16 + *Calc Above* )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bot Uplink Msg Data Segment**  **Bit Map (chg)** | | **Element Name** | **Range/Format** | **Description/Notes** |
| **Bytes 12+** | **This block of data values repeats *size* times.** | *val\_1* | Based on ***dt*** | **Value 1**  (value of the 1st channel; either a uint8, int32, or float32, based on ***dt*** above) |
| *…* | Based on ***dt*** | **Value ?**  (value of an intermediate channel; either a uint8, int32, or float32, based on ***dt*** above) |
| *val\_n* | Based on ***dt*** | **Value N**  (value of the nth channel, where n is the total number of channels; either a uint8, int32, or float32, based on ***dt*** above) |

Table 4: Bit-packed Fields in ‘Data Segment when "change" Data Product Information is included in the Uplink Message.

**CHANGE DP INFO WILL ALL BE REVISED AFTER 5/1**

TOTAL “FIXED” BYTES IN **chg** DATA SEGMENT: 12 bytes (96 bits) - **0 bits unused**.

TOTAL “DATA” BYTES IN **chg** DATA SEGMENT: