Strelka Ground Station RF Protocol

# Preface:

This document outlines the radio protocol implemented using the LoRa modulation technique for communications between the Strelka device and the ground station.

# Packet Structure:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Identifier** | **Sender unique ID** | **Receiver unique ID** | **Payload** | **CRC32** |
| **Data type** | uint8\_t | uint32\_t | uint32\_t | uint8\_t | uint32\_t |
| **Length (bytes)** | 1 | 4 | 4 | variable | 4 |
| **Description** | Signify the packet type | Hardware ID of transmitting device | Hardware ID of receiving device | Fields containing fixed length payloads | 32-bit CRC checksum |

The unique ID of the Strelka can be obtained from the first 32 bits of the hardware ID contained in the STM32’s ROM. The ground station must know this ID so that it can choose which nodes it is speaking to.

The unique ID of the ground station is aways 0x00000000.

# Payload Fields:

## BAT\_VOL\_REQ

Request battery voltage.

Identifier: 0xXX

Payload:

*No payload fields.*

## BAT\_VOL\_RES

Battery voltage response.

Identifier: 0xXX

Payload:

|  |  |
| --- | --- |
| Name | Battery voltage |
| Value | - |
| Data type | float32\_t |
| Length (bytes) | 4 |

## CONTINUITY\_REQ

Request continuity.

Identifier: 0xXX

Payload:

*No payload fields.*

## CONTINUITY \_RES

Continuity response.

Payload:

|  |  |  |
| --- | --- | --- |
| Name | Drogue e-match state | Main e-match state |
| Value | *ematchState* | *ematchState* |
| Data type | uint8\_t | uint8\_t |
| Length (bytes) | 1 | 1 |

*ematchState*

|  |  |
| --- | --- |
| Value | Result |
| 0 | *OPEN\_CIRCUIT* |
| 1 | *SHORT\_CIRCUIT* |
| 2 | *GOOD* |
| 3 | *EMATCH\_ERROR* |

## FIRE\_DROGUE\_REQ

Fire drogue channel request.

Identifier: 0xXX

Payload:

*No payload fields.*

## FIRE\_DROGUE\_RES

Fire drogue channel response.

Identifier: 0xXX

Payload:

|  |  |
| --- | --- |
| Name | Fire drogue result |
| Value | 0 – success, 1 - error |
| Data type | uint8\_t |
| Length (bytes) | 1 |

## FIRE\_MAIN\_REQ

Fire main channel request.

Identifier: 0xXX

Payload:

*No payload fields.*

## FIRE\_MAIN\_RES

Fire main channel response.

Identifier: 0xXX

Payload:

|  |  |
| --- | --- |
| Name | Fire main result |
| Value | 0 – success, 1 - error |
| Data type | uint8\_t |
| Length (bytes) | 1 |

## GPS1\_STATE\_REQ

Request GPS 1 state.

## GPS1\_STATE\_RES

GPS 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | GPS good | Latitude | Longitude | Altitude | Satellites tracked |
| Value | 0 – error, 1 - good | *Decimal degrees* | *Decimal degrees* | *Units of ‘m’* | - |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t | uint8\_t |
| Length (bytes) | 1 | 4 | 4 | 4 | 1 |

## GPS2\_STATE\_REQ

Request GPS 2 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## GPS2\_STATE\_RES

GPS 2 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | GPS good | Latitude | Longitude | Altitude | Satellites tracked |
| Value | 0 – error, 1 - good | *Decimal degrees* | *Decimal degrees* | *Units of ‘m’* | - |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t | uint8\_t |
| Length (bytes) | 1 | 4 | 4 | 4 | 1 |

## ACCEL1\_STATE\_REQ

Request accelerometer 1 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## ACCEL1\_STATE\_RES

Accelerometer 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | acc good | accX | accY | accZ |
| Value | 0 – error, 1 - good | *Units of ‘g’* | *Units of ‘g’* | U*nits of ‘g’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## ACCEL2\_STATE\_REQ

Request accelerometer 2 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## ACCEL2\_STATE\_RES

Accelerometer 2 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | acc good | accX | accY | accZ |
| Value | 0 – error, 1 - good | *Units of ‘g’* | *Units of ‘g’* | U*nits of ‘g’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## GYRO1\_STATE\_REQ

Request gyroscope 1 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## GYRO1\_STATE\_RES

Gyroscope 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | gyro good | gyroX | gyroY | gyroZ |
| Value | 0 – error, 1 - good | *Units of ‘deg/s’* | *Units of ‘deg/s’* | *Units of ‘deg/s’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## GYRO2\_STATE\_REQ

Request gyroscope 2 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## GYRO2\_STATE\_RES

Gyroscope 2 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | gyro good | gyroX | gyroY | gyroZ |
| Value | 0 – error, 1 - good | *Units of ‘deg/s’* | *Units of ‘deg/s’* | *Units of ‘deg/s’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## MAG1\_STATE\_REQ

Request magnetometer 1 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## MAG1\_STATE\_RES

Magnetometer 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | mag good | magX | magY | magZ |
| Value | 0 – error, 1 - good | *Units of ‘uT’* | *Units of ‘uT’* | *Units of ‘uT’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## MAG2\_STATE\_REQ

Request magnetometer 2 state.

## MAG2\_STATE\_RES

Magnetometer 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | mag good | magX | magY | magZ |
| Value | 0 – error, 1 - good | *Units of ‘uT’* | *Units of ‘uT’* | *Units of ‘uT’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## BARO1\_STATE\_REQ

Request barometer 1 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## BARO1\_STATE\_RES

Barometer 1 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | baro good | Pressure | Temperature | Altitude |
| Value | 0 – error, 1 - good | *Units of ‘Pa’* | *Units of ‘deg C’* | *Units of ‘m’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## BARO2\_STATE\_REQ

Request barometer 2 state.

Identifier: 0xXX

Payload:

*No payload fields.*

## BARO2\_STATE\_RES

Barometer 2 state response.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | baro good | Pressure | Temperature | Altitude |
| Value | 0 – error, 1 - good | *Units of ‘Pa’* | *Units of ‘deg C’* | *Units of ‘m’* |
| Data type | uint8\_t | float32\_t | float32\_t | float32\_t |
| Length (bytes) | 1 | 4 | 4 | 4 |

## FLASH\_MEMORY\_STATE\_REQ

Request flash memory state.

Identifier: 0xXX

Payload:

*No payload fields.*

## FLASH\_MEMORY\_STATE\_RES

Flash memory state response.

Identifier: 0xXX

Payload:

|  |  |  |
| --- | --- | --- |
| Name | flash good | Write speed |
| Value | 0 – error, 1 - good | *Units of ‘Hz’* |
| Data type | uint8\_t | float32\_t |
| Length (bytes) | 1 | 4 |

## FLASH\_MEMORY\_CONFIG\_SET

## GPS\_TRACKING\_CONFIG\_REQ

Request GPS tracking configuration.

Identifier: 0xXX

Payload:

*No payload fields.*

## GPS\_TRACKING\_CONFIG\_RES

GPS tracking configuration response.

Identifier: 0xXX

Payload:

|  |  |  |
| --- | --- | --- |
| Name | gps good | Chirp frequency |
| Value | 0 – error, 1 - good | *Units of ‘Hz’* |
| Data type | uint8\_t | float32\_t |
| Length (bytes) | 1 | 4 |

## GPS\_TRACKING\_CONFIG\_SET

Set GPS tracking configuration.

Identifier: 0xXX

Payload:

|  |  |
| --- | --- |
| Name | Chirp frequency |
| Value | *Units of ‘Hz’* |
| Data type | float32\_t |
| Length (bytes) | 4 |

## GPS\_TRACKING\_PACKET

GPS tracking data packet.

Identifier: 0xXX

Payload:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Latitude | Longitude | Altitude | Satellites tracked |
| Value | *Decimal degrees* | *Decimal degrees* | *Units of ‘m’* | - |
| Data type | float32\_t | float32\_t | float32\_t | uint8\_t |
| Length (bytes) | 4 | 4 | 4 | 1 |