ED5201

LoRaWAN GPS Cattle Collar Payload

V1.2.0

Document Revision Record

Version	Date	Description	
V1.0.0	2018-8-23	Preliminary version	Gavin
V1.1.0	2018-10-18	Add heartbeat upload	Gavin
V1.2.0	2019-8-22	Optimized ompression algorithm	Gavin

Introduction

The goal of this document is to detail the messages sent between GA5201 sensor and a LoRa Network server.

1. Sensor-To-Server Messages

1.1 Frame structure

Item	Header	UTC	Latitude	Longitude	Speed	Direction	Altitude	Msg type	Msg length	Data	CRC
Type	Uint8_t	Uint32_t	Uint32_t	Uint32_t	Uint8_t	Uint16_t	Uint16_t	Uint8_t	Uint8_t	Uint8_t*N	Uint8_t
Unit	-	S	degree*100000	degree*100000	Km/h	Degree	Meter	-	-	-	-
Byte	1	4	4	4	1	2	2	1	1	N	1

Characters sending order: high in the front, low in the back.

1.2 Payload description

1. Header

Head of frame, started with 0xAA.

2. UTC

Universal Time Coordinated, world standard time, such as: 1505285997(0x59B8D76D). The corresponding Beijing time is 2017/9/13 14:59:57.

http://tool.chinaz.com/Tools/unixtime.aspx

3. Latitude

The latitude value obtained by GPS is in ddd°mm.mmm’ format, need to convert into ddd.ddddd ° format, the hexadecimal obtained by multiplying 1000000 represents the protocol latitude value.

eg: ddd°mm.mmm’ format 2235.10896 convert into ddd.ddddd ° format is 22.585149.

22.585149*1000000=22585149，Convert to hexadecimal is 0x1589F3D

4. Longitude

The longitude value obtained by GPS is in ddd ° mm.mmm ’ format , need to convert into ddd.ddddd ° format , the hexadecimal obtained by multiplying 1000000 represents the protocol longitude value.

eg : ddd°mm.mmm’ format 11354.79188 convert into ddd.ddddd ° format is 113.913198 ，

113.913198*1000000=113913198，Convert to hexadecimal is 0x6CA2D6E

5. Speed

Express the speed in one byte, range 0---255; Unit: km/h.

6. Direction

Range: from 0 to 359. For example: 138 (0x8a).

7. Altitude

GPS altitude; Unit: m

8. Message Type

Reserved value for functional status representation.

9. Message Length

Record the data length, from 0x00 to 0xFF. If the data length is 0, the data is empty.

10. Data

Store the content of message type in bytes, the length is controlled by the message length.

11. CRC

The CRC value is the check code and is the sum of all bytes from UTC to RFU.

1.3 Command List

1. Alarm Message

Msg Typ	Msg Length	Data	
0x01	1	0x00	Default
		0x01	Reserved
		0x02	Low power alert
		0x04	Collar cut alarm
		0x08	Reserved

2. Sensor information

Msg Typ	Msg Length	Data
0x02	2	Uint16_t(Steps)
	4	Uint16_t(业务 ID)
	1	Uint8_t(Power present)

3. Heartbeat info

Msg Typ	Msg Length	Data
0x03	2	Uint16_t(Steps)
	4	Uint16_t(业务 ID)

2. Server-to- Sensor Message

2.1 Frame structure

Item	Header	Msg Typ	Msg Length	Data	CRC
Type	Uint8_t	Uint8_t	Uint8_t	Uint8_t * N	Uin8_t
Byte	1	1	1	N	1

2.2 Description

1. Header

Head downlink message, started with 0xBB.

2. Message Type

Indicate the function performed by this data frame. The analysis of the data needs to be performed according to the message type

3. Message Length

Record the data length, from 0x00 to 0xFF. If the data length is 0, the data is empty.

4. Data

Store the content of message type in bytes, the length is controlled by the message length.

5. CRC

The CRC value is the check code and is the sum of all bytes from UTC to RFU

2.3 Command list

1. **Set the reporting cycle**

Frame structure	Value	Msg Type	Unit	Remark
Msg type	0xB0	Uint8_t		
Msg Length	2	Uint8_t		
Data	Reporting cycle	Uint16_t	s	From 30 to 65535

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB0	Uint8_t		
Msg Length	3	Uint8_t		
Data	Operation	Uint16_t	s	
	Result	Uint8_t		success： 1 fail： 0

2. **Positioning mode（Adaptive positioning mode and fixed time positioning mode）**

Frame structure	Value	Type	Unit	Remark
Msg type	0xB1	Uint8_t		
Msg Length	1	Uint8_t		
Data	Positioning Mode	Uint8_t		0:Adaptive positioning mode 1:fixed time positioning mode

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB1	Uint8_t		
Msg Length	2	Uint8_t		
Data	Operation	Uint8_t		0: adaptive positioning mode1:fixed time positioning mode
	Result	Uint8_t		success： 1 fail： 0

3. Enable or disable removal alarm

Frame structure	Value	Type	Unit	Remark
Msg type	0xB2	Uint8_t		
Msg Length	1	Uint8_t		
Data	Removal alarm enabled or not	Uint8_t		0: disable 1:enable

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB2	Uint8_t		
Msg Length	2	Uint8_t		
Data	operation	Uint8_t		0:enable 1:enable
	Result	Uint8_t		success： 1 fail： 0

4. **Device parameter query command**

Frame structure	Value	Type	Unit	Remark
Msg type	0xB3	Uint8_t		
Msg Length	0	Uint8_t		
Data	NULL			

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB3	Uint8_t		
Msg Length	5	Uint8_t		
Data	Reporting cycle	Uint16_t	S	

	Positioning mode	Uint8_t		
	Removal alarm status	Uint8_t		
	Device status	Uint8_t		BIT0:GYRO、BIT1:GPS、BIT2: Ranging sensor Set to 1 as normal

5. Enable immediate positioning

Frame structure	Value	Type	Unit	Remark
Msg type	0xB4	Uint8_t		
Msg Length	0	Uint8_t		
Data	NULL			

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB4	Uint8_t		
Msg Length	1	Uint8_t		
Data	Result	Uint8_t		success： 1 fail： 0

6. Reset

Frame structure	Value	Type	Unit	Remark
Msg type	0xB5	Uint8_t		
Msg Length	0			
Data	NULL			

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB5	Uint8_t		
Msg Length	1	Uint8_t		
Data	Result	Uint8_t		success： 1 fail： 0

7. Set the time to enable positioning

Frame structure	Value	Type	Unit	Remark
Msg type	0xB6	Uint8_t		
Msg Length	2	Uint8_t		
Data	Time 1	Uint8_t	h	The time format should be 24-hour . Eg: 10PM， the data filled in is 22. the number of time 2 is greater than time 1.
	Time 2	Uint8_t	h	

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB6	Uint8_t		

Msg Length	3	Uint8_t		
Data	Operation	Uint8_t	h	Time 1
	Operation	Uint8_t	h	Time 2
	Result	Uint8_t		success： 1 fail： 0

8. Set the positioning interval from time 1 to time 2

Frame structure	Value	Type	Unit	Remark
Msg type	0xB7	Uint8_t		
Msg Length	1	Uint8_t		
Data	interval	Uint8_t	h	

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB7	Uint8_t		
Msg Length	2	Uint8_t		
Data	Operation	Uint8_t	h	
	Result	Uint8_t		success： 1 fail： 0

9. Set the positioning interval from time 2 to time 1

Frame structure	Value	Type	Unit	Remark
Msg type	0xB8	Uint8_t		
Msg Length	1	Uint8_t		
Data	interval	Uint8_t	h	

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB8	Uint8_t		
Msg Length	2	Uint8_t		
Data	Operation	Uint8_t	h	
	Result	Uint8_t		success： 1 fail： 0

10. Set the cumulative number of steps to enable GPS positioning

Frame structure	Value	Type	Unit	Remark
Msg type	0xB9	Uint8_t		
Msg Length	2	Uint8_t		
Data	Steps	Uint16_t	step	

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xB9	Uint8_t		
Msg Length	3	Uint8_t		
Data	Operation	Uint16_t	step	
	Result	Uint8_t		success： 1 fail： 0

11. Set the infrared detection interval

Frame structure	Value	Type	Unit	Remark
Msg type	0xBA	Uint8_t		
Msg Length	1	Uint8_t		
Data	interval	Uint8_t	min	

Device response message

Frame structure	Value	Type	Unit	Remark
Msg type	0xBA	Uint8_t		
Msg Length	2	Uint8_t		
Data	Operation	Uint8_t	Min	
	Result	Uint8_t		success： 1 fail： 0

Remark：The LoRa server recommends sending control commands using the comfirmed frame format.