

TBS-223 Wireless Vehicle Detector

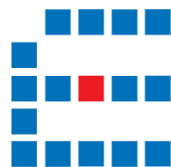
Application Protocol



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1. Overview

This document describes the definition and composition of TBS-223 protocol. The protocol is the agreement that TBS-223 and server complied. Device will not response to any data other than this protocol.

RFU: Reserved for Future use

Encrypted field value

1: 00 no need encryption

2: AR (according to the registration result)

2. Communication Mode

TBS-223 detector adopts LoRaWAN protocol to communication with server.

3. Data Type

Date type	Description
BIT	bit
BYTE	Unsigned single byte, int (8 bit)
WORD	Unsigned double bytes, int (16 bit)
DWORD	Unsigned four bytes, int (32bit)
BYTE[n]	N bytes
BCD[n]	8421 code N bytes

4. Payload Structure

Header	Protocol version	Time	Frame number	Length	Command ID	Encryption	Message body	CRC	End
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Payload Description:

Name	Number of Bytes	Description
Header	1	Header value: 7E
Protocol Version	1	Protocol Version
Time	4	Reserved
Frame Number	2	Frame count

Length	2	Length of message body
Command ID	1	Attribute of current frame, 01: uplink message 07: downlink message
Encryption	1	If the message body is encrypted
Message Body	N (variable)	Message body
CRC	2	CRC value: 0000
End	1	End value: 7E

5. Payload type

There are three types of payload data.

- 1) Sensor Parameters message
- 2) Sensor Status message
- 3) Downlink configuration message.

5.1. Sensor Parameters Message

After successful registration, the device will send parameters information. The data structure of the information is as follows.

Command ID	Encryption	Message body
0x01	0x00	Message body of parameters information

The total length of Sensor parameters message is 32 bytes.

Sensor parameters in Message Body

Description of message body is as follows.

Type	Message length	Value																									
0x03	01	1 byte	Device type:0x85																								
0x05	01	1 byte	Software and hardware version <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Hardware</th> <th colspan="4">Software</th> </tr> <tr> <th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th> </tr> </thead> <tbody> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </tbody> </table>	Hardware				Software				7	6	5	4	3	2	1	0								
Hardware				Software																							
7	6	5	4	3	2	1	0																				
0x06	03	3 bytes	Heartbeat interval, step 30s, maximum 24h, 12h by default where (N+1) *30sec																								
0x37	01	1 byte	Detection mode 01: single mode, geomagnetic sensor 02: single mode, microwave sensor																								

			03: Joint mode: Geomagnetic and microwave sensor
0x22	01	1 byte	Sensitivity (1-7 level); Default: 04

5.2. Sensor Status Message

The data structure is as follows. The total length of state message is 43 bytes.

Command ID	Encryption	Message body (Tag value)
0x01	00	Message body of status message

Description of message body is as follows.

Type	Message Length	Value																									
0x02	01	1 byte	<u>Detector report type:</u> 0x00: heartbeat report 0x0B: unoccupied report 0x0C: occupied report 0x0D: strong magnetic disturbance report 0x0E: low battery alarm report 0x0F: sensor failure report (IC information can be read) 0x10: sensor damaged report (IC information cannot be read)																								
0x23	03	3 bytes	Parking space information, at the 7th bit in first byte. Other two bytes reserved <table border="1" style="margin-left: 20px;"> <tr> <td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>1: vehicle</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>0: no vehicle</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td> </tr> </table>	7	6	5	4	3	2	1	0	1: vehicle								0: no vehicle	x	x	x	x	x	x	x
7	6	5	4	3	2	1	0																				
1: vehicle																											
0: no vehicle	x	x	x	x	x	x	x																				
0x29	02	2 bytes	Battery Voltage 0-3600mV in decimal																								
0x25	06	6 bytes	The magnetic value XYZ																								
0x32	01	1 byte	Occupancy information 01: vehicle 00: no vehicle																								
0x0B	01	1 byte	Temperature °C in decimal																								
0x35	01	1 byte	Humidity %RH in decimal																								

5.3. Downlink Configuration Message

When sending downlink command, the below command prefix is fixed.

Please send downlink command to Fport 1

Header	Protocol version	Reserved	Frame
1 byte	1 byte	4 bytes	2 bytes
7E	10	00000000	0001

After the above prefix, then add up the command body, if multiple command is being sent, then add the length of message body, so if two 3 bytes command, then it will be 0006

Length of message body	Command ID	Encryption	Message body	CRC	End
2 bytes	1 byte	1 byte	N (varies)	2 bytes	1 byte
0003	07	00	220107	0000	7E

The data structure is as follows. The total length of message is 18 -43 bytes.

Command ID	Encryption	Message body (Tag value)
0x07	00	Message body for setting

Description of Parameters list is as follows.

Type	Message Length	Value	
0x0C	01	1 byte	Restart Device command; 01 Restart
0x06	03	3 bytes	Change Heartbeat interval command, where (N+1) *30sec
0x26	01	1 byte	<u>Initiate sensor calibration;</u> 00: calibration when no vehicle 01: calibration when occupied
0x22	01	1 byte	Detection sensitivity (01-07 level)
0x27	01	1 byte	Time synchronization mode 01: synchronize immediately once receives the message
0x28	01	1 byte	01: Request to report the current setting

5.4. Acknowledge Message

The device will response the correct downlink command once accepted the message sent from server.

The data structure is set as follow which has a fix prefix with Frame number

Header	Protocol version	Reserved	Frame number
1 byte	1 byte	4 bytes	2 bytes

And the command body is the same as the downlink command only the instruction changed into 01

Length of message body	Command ID	Encryption	Message body	CRC	End
2 bytes	1 byte	1 byte	N (varies)	2 bytes	1 byte

Command ID	Encryption	Message body
0x01	00	Message body for accepted setting

Command instruction will be activated once after the acknowledgement message received.

Invalid command

If the device response the below command, it mean the command is invalid and not being accepted.

Type	Message Length	Value	
0x18	01	1 byte	01: Invalid command

6. Data Sending Sequence and Frame Structure Analysis

6.1. Data Sending Sequence

- 1st message is device parameters message
- 2nd message is no vehicle message or the current status message
- 3rd or others will be Heartbeat or parking state message

6.2. Frame Structure Analysis

Example 1: device parameters message

7E1160404F2F000000110100030185050102060300059F37010322010400007E

Data	Description
7E	Head
11	Protocol version 1.0
60404F2F	Time UTC = 4 March 2021 03:08:31
0000	Frame no
0011	Length of message body
01	Command ID
00	Encryption
030183	03: device type
050102	05: software/hardware version
060300059F	06: heartbeat interval i.e 00059F = 1439 >>(1439+1)*30 sec =12h
370103	37: detection mode 03 = joint mode
220104	22: sensitivity
0000	CRC
7E	End

Example 2: status message

7E1160419A430009001D010002010C2303CC018B29020DDA2506ECE6FDF31EAA3201010B011435013200007E

Data	Description
7E	Head
11	Protocol version 1.0

60419A43	Time UTC = 5 March 2021 02:41:07
0009	Frame no
001D	Length of message body
01	Command ID
00	Encryption
02010C	02: detector state; 0C = occupied report
2303CC018B	23: parking space information, (For internal used)
29020DDA	29: battery Voltage: value 0D DA(hex) = 3546 (dec) = 3.546V
2506ECE6FDF31EAA	25: magnetic value XYZ (For internal use)
320101	32: occupied status; value 01 = Vehicle occupied
0B0114	0B: Temperature °C in decimal; value 14(hex) = 20°C
350132	35: Humidity %RH in decimal, value 32(hex) = 50%
0000	CRC
7E	End