

DF702&DF703 Waste Bin Sensor Protocol_LoRaWAN

Confidential

V2.8

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Revision

- V2.8** Update uplink format. Add example, and delete command 0x0E;
- V2.6** Add the example of payload with gps information;
- V2.5** Modify the size of framecount;
- V2.4** Modify the uplink data format; Add downlink confirmed data format; Add command 0x0E; Add type of GPS data;
- V2.3** Add downlink command which can be used to select active mode OTAA/ABP and configure max height;
- V2.0** Add latest terminal uplink data format and downlink command;
- V1.1** Change the downlink command;
- V1.0** Initial version;

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Index

1 Special Notes.....	4
2 Overview.....	4
3 Terminal Upload Data Format.....	4
3.1 Field Definition.....	4
3.1.1 Packet Header.....	4
3.1.2 Forced Bit.....	4
3.1.3 Device Type.....	4
3.1.4 Report Data Type.....	5
3.1.5 Packet Size.....	5
3.1.6 Payload.....	5
3.1.7 Reserved Filed.....	7
3.1.8 Packet Tail.....	7
3.2 Example.....	7
4 Terminal Downlink Command.....	9
4.1 Terminal Downlink Command Format.....	10
4.2 Detailed Command.....	10
4.2.1 0x01 Setting Cycle Upload interval.....	10
4.2.2 0x02 Setting Full alarm threshold.....	11
4.2.3 0x03 Setting Fire alarm threshold.....	11
4.2.4 0x04 Setting Fall alarm threshold.....	11
4.2.5 0x05 Setting Battery alarm threshold.....	12
4.2.6 0x08 Setting the cycle detection time.....	12
4.2.7 0x09 Switch function setting.....	12
4.3 Example.....	13

1 Special Notes

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2 Overview

DF702&DF703_LoRaWAN sensor uses the LoRaWAN transmission protocol. This document defines its uplink data format protocol and downlink format.

3 Terminal Upload Data Format

Field	Packet head	Forced bit	Device type	Report data type	Packet size	Payload	Reserved	Packet tail
Instruction	Packet head	Forced bit	Device type	Active reporting or answering	Packet length	Data content	Reserved	Packet tail
Size	1byte	1byte	1byte	1byte	1byte	0-255 byte	1byte	1byte

3.1 Field Definition

3.1.1 Packet Header

Packet head: 0x80; length: 1byte.

3.1.2 Forced Bit

Forced bit: 0x00; length: 1byte

3.1.3 Device Type

Command	Device type
0X01	DF702&DF703

3.1.4 Report Data Type

Command	Type
0x01	Active reporting of information; Report the data when have status changed, such as changes from full to empty or from fall alarm to not fall alarm, etc.
0x02	Heartbeat data type; Report 0x02 type data when restart or at upload interval.
0x03	Reply to the downlink command; Report this data when restart or the downlink command is executed successfully.

3.1.5 Packet Size

The size of the total packet,in hex. For example, report 0x11 means 17bytes.

3.1.6 Payload

Payload data format1 (Abnormal reporting data type 0x01 ,heartbeat data type 0x02):

S/N	1	2	3	4	5	6
Payload	Height	GPS selection	Long	Lat	TEMP	Reserved
Size	2bytes	1bytes	4bytes	4bytes	1byte	1byte
S/N	7	8	9	10	11	12
Payload	Angle	Full status	Fire status	Fall status	Power status	Frame count
Size	1bytes	0.5byte	0.5byte	0.5byte	0.5byte	2byte

Payload field definition:

S/N	Function	Description	Example
1	Height	The height from sensor to garbage or the measured object; 2bytes, in hex; Unit: mm;	Report 0x060E means 1550mm
2	GPS selection	It indicates whether the data contains latitude and longitude information; 1bytes; Content: 0x00 or 0x01; 0x00 mean no GPS information; 0x01 means report GPS information.	
3	Long	Longitude; 4bytes, in hex, float single type(IEEE-754standard);	Report CD03E942 means 116.507423°
4	Lat	Latitude; 4bytes, in hex, float single type(IEEE-754standard);	Report EF272042 means 40.038998°

5	TEMP	Temperature; 1bytes; in hex, unit:°C	Report 0x10 means 16°C
6	Reserved	Reserved; 1byte;	
7	Angle	The relative angle of inclination of the device; 1byte, in hex, unit:° ;	Report 0x10 means 16°
8-11	Full/ Fire/ Fall/ power status	Full/Reserved/Fall/power status; Total 2byte; <i>Full status:</i> The upper four bits of the first byte are full status, 0x0X: NOT full alarm, 0x1X: full alarm; <i>Fire status:</i> The upper four bits of the first byte are fire status, 0xX0: NOT fire alarm, 0xX1: fire alarm; <i>Fall status:</i> The upper four bits of the second byte are fall status, 0x0X:NOT fall, 0x1X:fall alarm; <i>Power status:</i> The lower four bits of the second byte are power status, 0xX0: battery normal, 0xX1: battery lower alarm.	Report 0x0010 means not full, not fire alarm fall alarm, and battery normal.
12	Frame count	Frame counter, Number of packets reported after power-on; 2bytes; in hex;	Report 000A means the tenth data after power-on

Payload data format2(Confirmation reply for downlink commands format data type 0x03):

NO.	1	2	3	4	5
Function	FW	CycleTime	DetectTime	HThreshold	TThreshold
Size	2byte	1byte	1byte	1byte	1byte
NO.	6	7	8	9	10
Function	AThreshold	Fall mode	Ultra Range	Work mode	Reserved
Size	1byte	1byte	1byte	1byte	8byte

Payload field definition:

S/N	Function	Description	Example
1	FW	The firmware version number; 2byte, in hex; The upper eight bits means the major version number,the lower eight	Report 0216 means V2.22;

		bits means small version number;	
2	CycleTime	Periodic reporting interval; 1byte, in hex; Unit: hour;	Report 18 means 24hours;
3	DetectTime	Periodic detection interval; 1byte,in hex; Unit:min;	Report 0A means 10min;
4	HThreshold	Full(height) alarm threshold; 1byte, in hex; Unit: cm;	Report 1E menas 30cm;
5	TThreshold	Temperature alarm threshold; Reserved; 1byte,in hex; Unit: °C;	Report 4B means 75°C
6	AThreshold	Fall(Angle)alarm threshold; 1byte,in hex; Unit: °;	Report 1E means 30°
7	Fall mode	Fall function switch; 1byte; Content is 0x00 or 0x01; 0x00:close fall function, 0x01:open fall function;	
8	Ultra Range	Ultrasonic range selection; 1byte; Content is 00,01 or 02; 00:112k, 01:75K, 02:40K version;	
9	Work mode	1byte; Content is 00, 01 or 02; 00: normal work mode;the cycle detection is opened; 01:cycle detection is closed; 02: demo mode; Sensor will report the data at detection interval.	
10	Reserved	8byte,default 0;	

3.1.7 Reserved Filed

Reserved filed;Default 0x00,1byte.

3.1.8 Packet Tail

Packet tail; Default 0x81,1byte.

3.2 Example

For example1: Data type 0x01

800001011107D000190000000000010081

Description:

80: Packet header

00: Reserved, default 00

01: Device type, DF702&DF703

01: Data type, Active reporting of information
11: Packet size, 17bytes
07D0: Height, 2000mm
00: Dono carry gps inormation
19: Temperature, 25°C
0000: Reserved and angle value, angle is 0
0000: Trash bin is empty, no fire, no fall, and battery normal
0001: Frame count, this is the fist piece data after power on
00: Reserved, default 00
81: Packet tail

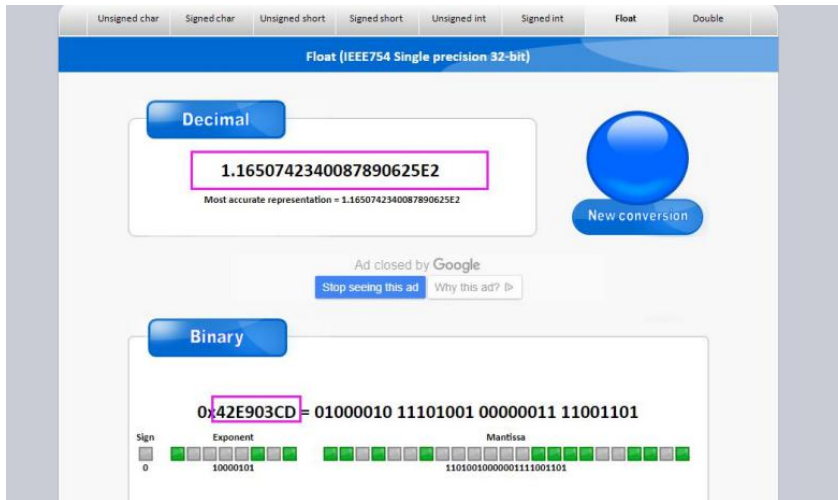
For example2: upload data with GPS information

800001021907D001CD03E942EF27204219000000000010081

Description:

80: Packet header
00: Reserved, default 00
01: Device type, DF702&DF703
02: Active reporting of information
19: Packet size, 25bytes
07D0: Height, 2000mm
01: Carry gps inormation
CD03E942: longitude, 116.507423; Calculation: first change CD03E942 to 42E903CD, then change it to decimal, will get 116.507423.
EF272042: latitude, 40.038998;The calculation method is the same as above;
19: Temperature, 25°C
0000: Reservedand angle value, angle is 0
0000: Trash bin is empty, no fire, no fall, and battery normal
0001: Frame count, this is the fist piece data after conneting power
00: Reserved, default 00
81: Packet tail

Note: For the method of parsing latitude and longitude, you can refer to the online tool: http://www.binaryconvert.com/convert_float.html ,as following picture,



For example3: download confirmed information. Data type 0x03

8000010319010418011E4B1E00000000000000000000000081

Description:

- 80: Packet header
- 00: Reserved, default 00
- 01: Device type, DF702&DF703
- 03: Download confirmed information
- 19: Packet size, 25bytes
- 0104: firmware version, V1.4
- 18: cycle upload interval, 24h
- 01: cycle detection interval, 1 min
- 1E: Full alarm threshold, 30cm
- 4B: Fire alarm threshold, 75°C
- 1E: fall alarm threshold, 30°
- 00: Turn fall function off
- 00: Ultrasonic range 112k
- 00: Work mode 0, normal work mode
- 0000000000000000: Reserved
- 00: Reserved, default 00
- 81: Packet tail

4 Terminal Downlink Command

We can modify the DF702&DF703 waste bin sensor’s configuration through the downlink command, such as the uplaod interval,threshold and so on.

The command type: ASCII.

Command Direction: From PC to waste bin sensor through serial port.

Note: only when the sensor is woking , it can receive and excute the command. If sensor is in sleep mode, it cannot receive command.

4.1 Terminal Downlink Command Format

Field	Packet head	Command type	Payload			Packet tail
Instruction	Packet head	The function of commands	Header	Command code	Content	Packet tail

Field Definition:

Packet Header: 0x80; length:1byte.

Command Type:

Command type	Instruction
0x02	Configure device parameters through the downlink

Payload:

1 Header:0x9999

2 Command code:

Command code	Function
0x01	Setting cycle upload time interval
0x02	Setting Full alarm threshold
0x03	Setting Fire alarm threshold
0x04	Setting angle(fall) alarm threshold
0x05	Setting battery alarm threshold
0x08	Setting the cycle detection time
0x09	Switch function setting

3 Content: please refer to part4.2

Packet Tail: 0x81,1byte.

4.2 Detailed Command

4.2.1 0x01 Setting Cycle Upload interval

Function: Set data cycle upload time interval;

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	01	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 01-168, unit: h (hours) in hex. The default is 24 hours.

For example: set the upload time to 24hours,

The command is 80029999**0118**81

4.2.2 0x02 Setting Full alarm threshold

Function: Set full alarm threshold.

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	02	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 15-255cm, unit:cm, in hex. The default is 30cm.

For example: set the full alarm threshold to 30cm,

The command is 80029999**021E**81

4.2.3 0x03 Setting Fire alarm threshold

Function: Set fire alarm threshold.

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	03	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 1-255, unit:°C, in hex. The default is 75°C.

For example: set the full alarm threshold to 75°C,

The command is 80029999**034B**81

4.2.4 0x04 Setting Fall alarm threshold

Function: Set fall alarm threshold

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	04	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 15-90, unit:°, in hex. The default is 20°.

For example: set the fall alarm threshold to 30°,

The command is 80029999**041E**81

4.2.5 0x05 Setting Battery alarm threshold

Function: Set battery alarm threshold;

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	05	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 5-99, unit: %, in hex. The default is 30%.

For example: set the battery alarm threshold to 30°,

The command is 80029999**051E**81

4.2.6 0x08 Setting the cycle detection time

Function: Set the cycle detection time.

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	08	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be in the range of 1-60, unit:min, in hex. The default is 10min.

For example: set the detection time to 10min,

The command is 80029999**080A**81

4.2.7 0x09 Switch function setting

Function: Switch function setting

Format:

Field	Packet head	Command type	Payload			Packet tail
Instruction	80	02	9999	09	Content	81
Size	1byte	1byte	2byte	1byte	1byte	1byte

The content can be 02, 0B/0C, 0A/09, 00/01, 05/06/0E,

02: Restart sensor;

0B/0C: open/close echo function of the serial port;

0A/09: open/close fall function;

00/01: close/open GPS function;

03/04: ABP/OTAA mode;

05/06/0E: set the work mode 0/1/2; work mode 0: normal work mode; Work mode 1: close the detection function; Work mode 2: demo mode, waste bin sensor will report the data at cycle detection time when use demo mode.

For example1: turn the echo of serial port on,

The command is 80029999090B81

For example2: open fall function,

The command is 80029999090A81

For example3: set the work mode1,

The command is 80029999090681

4.3 Example

For example1: change the cycle upload time to 12h,

The command : 80029999010C81

Reply by serial port: UPLoadTime: 12 h

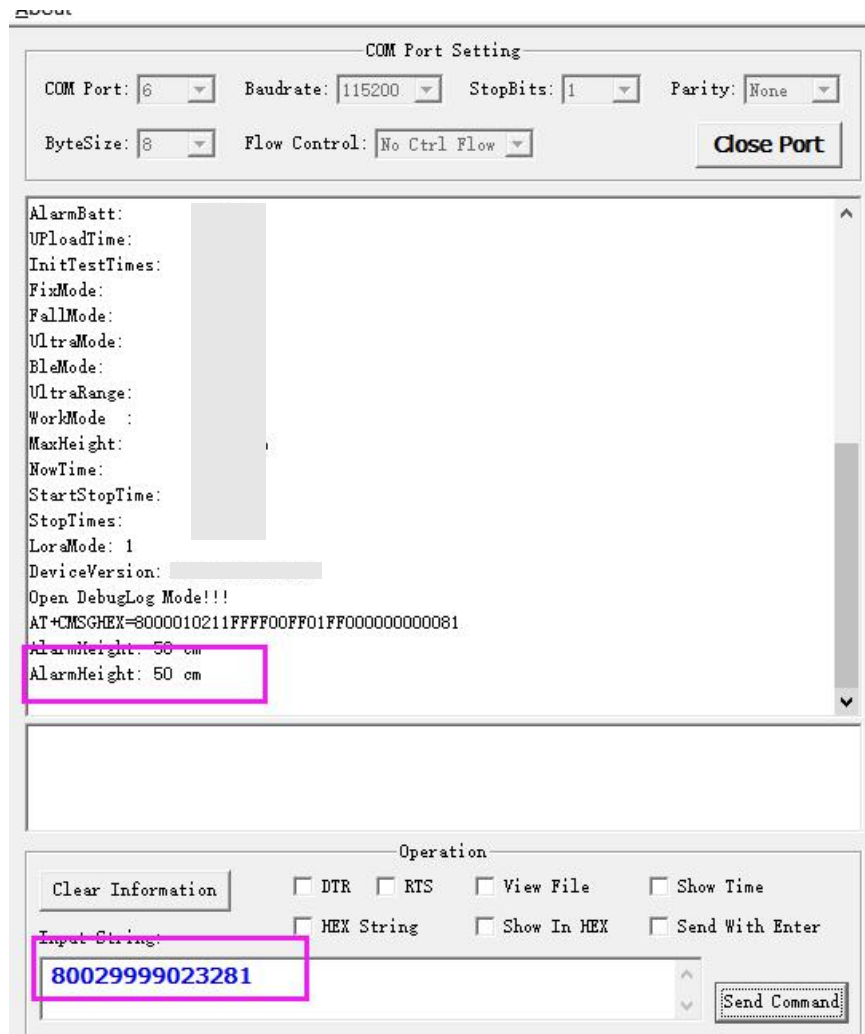


Figure2: change the full alarm threshold by serial port

Note: Regarding the detailed steps to modify the configuration by serial port, please refer to the configuration manual.