

DC400&_DC410 Smart Manhole Sensor Protocol_LoRaWAN

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V2.1

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Revision

V2.1 Modify the angle symbol and device status description; Modify the fire status bit as a reserved bit; Delete 0x04 data type and the command setting temperature threshold;

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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1 Special Notes

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2 Overview

DC400&DC410Smart Manhole Sensor_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	0-255byte	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	DC400, DC410

3.1.4 Report Data Type

Command	Type
0x01	Active reporting of information; 0x01 type data reported when status changed, like from move alarm or alarm canceled.
0x02	Periodic reporting data type; 0x02 type data reported at periodic reporting interval or when restart sensor.
0x03	Reply to the downlink command; 0x03 type data reported when restart sensor or after executing the down command;

3.1.5 Packet Size

The size of the packet, 1byte, in hex.

3.1.6 Payload

Payload1 format of Report data type 0x01, 0x024:

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	Reserved	Move 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 distance from sensor to liquid level or other object; 2bytes in hex, unit:mm; Note: For the DC400 sensor, because there is no height measure function, so the height is 0000 by default.	Report 060E means 1550mm
2	GPS selection	It indicates whether to upload latitude and longitude value; 1byte; it reports 0x00 or 0x01; 0x00 means without GPS information; 0x01 means carrying GPS information;	
3	Long	Longitude;	

		4byte, in hex, float single type (IEEE-754 standard); High in the front and low in the back;	
4	Lat	Latitude; 4byte, in hex, float single type (IEEE-754 standard); High in the front and low in the back;	
5	TEMP	Temperature value; 1byte,in hex,unit:°C;	Report 0x10 means 16°CReserved
6	Reserved	1byte; Default 0x01;	
7	Angle	The relative angle of inclination of the device; 1byte, in hex,unit:°;	Report 0115 means 21°
8-11	Full/Reserved/Move/power status	Full/fire/Move/power status; total 2byte; Full status: The upper four bits of the first byte are full status, 0x00:NOT full alarm, 0x10:full alarm; Note: For DC400 sensor, the full status is 0 always. Reserved: The lower four bits of the first byte is reserved,defalut 0xX0; Move status: The upper four bits of the second byte is move status,0x0X:NOT moved, 0x1X:move alarm; Power status: The lower four bits of the second byte is power status, 0xX0:battery normal, 0xX1:battery lower alarm.	Report 0x0010 means not full, move 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.

Payload2 farmat of Report data type0x03:

S/N	1	2	3	4	5
Payload	FW	Upload time	Detect Time	HThreshold	TThreshold
Size	2bytes	1byte	1byte	1byte	1byte
S/N	6	7	8	9	10
Payload	AThreshold	Move mode	UltraRange	Work mode	Reserved
Size	1byte	1byte	1byte	1byte	8bytes

Payload field definition:

S/N	Function	Description	Example
1	FW	Firmware version; 2bytes in hex; The upper eight digits are the major version number, and the lower eight digits are the minor version number.	0216means V2.22;
2	Upload time	Periodic reporting interval; 1byte,in hex, unit: hour;	18 means 24 hours;
3	Detect Time	Periodic detection interval; 1byte,in hex;Unit:min;	0A means 10min
4	HThreshold	Full alarm threshold; 1byte,in hex; Unit:cm;	1E menas 30cm;
5	TThreshold	Temperature alarm threshold; 1byte,in hex; Unit: °C;	4B means 75°C
6	AThreshold	Move(Angle)alarm threshold; 1byte,in hex; Unit: °;	1E means 30°
7	Move mode	Move function switch; 1byte; Content: 00 or 01; 00:close move detection function, 01:open move detection function;	
8	UltraRange	Ultrasonic range selection; 1byte; Content: 00 or 01; 00:2m version, 01:5m version; Note: there is no ultrasonic detection function for DC400 sensor, so please ingore it.	
9	Work mode	1byte; Content: 00 or 01; 00: the cycle detection is opened; 01:cycle detection is closed; Note:the work mode of DC400 sensor is 1 by default;	
10	Reserved	Reserved; 8bytes; Default 0x0000000000000000	

3.1.7 Reserved Filed

Reserved filed: 0x00,1byte.

3.1.8 Packet Tail

Packet tail: 0x81,1byte.

3.2 Example

For example1: the first data after power on,
800001021106A40016010000000010081

Description:

80: Packet header
00: Reserved, default 00
01: Device type, DC400&DC410
02: Data type 02
11: Frame size, total packet is 17 bytes
06A4: Height, 06A4 means 1700mm;
00: Donot carry gps inormation,so donot report longitude and latitude information;
16: Temperature, 16 means 22°C;
01: Reserved;
00: Angle value, 00 means 0°;
0000: full/Reserved/move/battery status, 0000 means not full, no move alarm, and battery normal;
0001: Frame count, this is the fist piece data after conneting power or restarting sensor;
00: Reserved, default 00;
81: Frame tail;

For example2: data with move alarm

800001011106A40000C0132001000020081

Description:

80: Packet header
00: Reserved, default 00
01: Device type, DC400&DC410
01: data type 01
11: Frame size, total packet is 17 bytes
06A4: Height, 06A4 means 1700mm
00: Donot carry gps inormation,so donot report longitude and latitude information;
0C: Temperature, 0C means 12°C
01: Reserved;
32: Angle value, 32 means the angle is 50°
0010: full/Reserved/move/battery status, 0010 means not full, moved alarm, and battery normal.
0002: frame count; 0002 means that is the second piece of data;
00: Reserved, default 00
81: Frame tail

For example3:

Upload data(data type 0x03):

80000103190302183C1E4B140101000000000000000081

Description:

80: packet head
00: Reserved; default 00
01: Device type, DC400&DC410
03: Report type,downlink confirmed

- 19: The packet size is 25 bytes
- 0302: The version of firmware v3.2
- 18: Upload time 24h
- 3C: Detection time 60min
- 1E: The height threshold 30cm
- 4B: The temperature threshold 75°C
- 14: Angle threshold 20°
- 01: The move function is opened
- 01: Ultrasonic range is 5meter
- 01: work mode of device; normal work mode;
- 00: work mode, 00 means turn cycle detection on;
- 0000000000000000: Reserved,default0;
- 00: Reserved, default 00
- 81: packet tail

4 Terminal Downlink Command

We can modify the DC400&DC410 sensor's configuration through the downlink command, such as the uplaod interval,threshold and so on.

The command type is ASCII.

Note: only when the sensor is woking and reporting , 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: 1byte,

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(only for DC410 sensor)
0x04	Setting angle(move) alarm threshold
0x05	Setting battery alarm value
0x08	Setting the cycle detection time(only for DC410 sensor)
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 80029999011881

4.2.2 0x02 Setting Full alarm threshold(only for DC410 sensor)

Function: Set full alarm threshold; *Only for DC410 sensor.*

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 01-255cm, unit:cm, in hex. The default is 30cm.

For example: set the full alarm threshold to 50cm,

The command is 80029999023281

4.2.3 0x04 Setting Move alarm threshold

Function: Set move 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 move alarm threshold to 30°,

The command is 80029999041E81

4.2.4 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 20%.

For example: set the battery alarm threshold to 20°,

The command is 80029999051481

4.2.5 0x08 Setting the cycle detection time (only for DC410 sensor)

Function: Set the cycle detection time. *Only for DC410 sensor.*

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 1-60min, unit:min, in hex. The default is 10min.

For example: set the detection time to 1min,

The command is 80029999080A81

4.2.6 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, 03/04 05/06/0E, 0B/0C, 0D,

02: Restart sensor;

03/04: ABP/OTAA mode; The active mode is OTAA by default.

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

For example: turn the echo of serial port on,

The command is 80029999090B81

4.3 Example

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

The command : 80029999010C81

Reply by serial port: UPLoadTime: 12 h

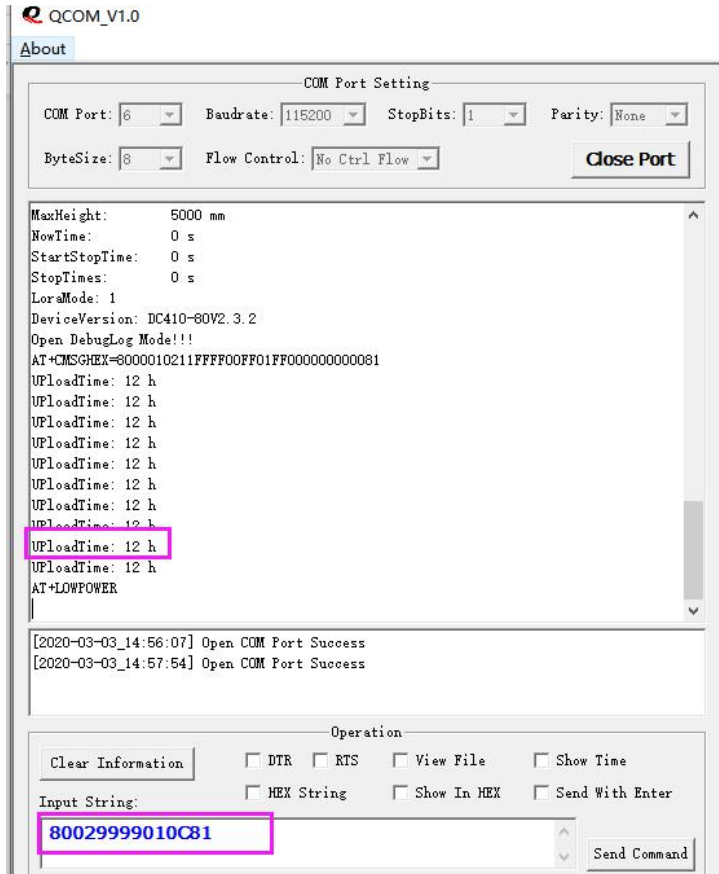


Figure1: change the upload time by serial port

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