TZ-TAG08B LoRaWAN

---User Guide

1 Overview

TZ-Tag08B LoRaWAN Wireless Temp & RH Sensor is a high quality product designed by Tzone Digital Technology Co., Ltd. Well overcome many shortcomings happened in similar products, with full consideration on tough environment and more. It have features includes long range (5km), small volume (106mm*57mm*33mm), long time using.Validated by many vital projects with stability and reliance features.the product send out data by LoRaWAN protocol.LoRaWAN Sensor can collect temp & humidity readings with preset interval and send out via LoRa communicating module, then LoRaWAN Gateway can translate raw data to temperature & humidity and battery voltage information.Real-time transmission and data storage functions can be implemented simultaneously. It is equipped with LCD, LED and buzzer,For more intuitive viewing of temperature and humidity data, RSSI signal strength, battery power sound and light alarm etc.,It could be widely used in temperature & humidity monitoring applications with our gateway products.

2 Applications

1.Walk-in and reach-in refrigerators

2.Agricultural greenhouses

3.Plants and workshops

4.Cold chain reefers and refrigerated trailers

5.Pharmacy warehouses and laboratories

3 Features

1. Use SENSIRION temperature and humidity, with reliable stability, large measure range and quick response.

2. Lora communication module use the new generated wireless chip SX1278 from American Semtech,with strong sending power,powerful penetrability and low attenuation,

3. The device can store 50000 recorded temperature and humidity data by using 32Mbit Flash.

4. The data collecting time could be set by customers from 1 minute to 1 hour and we suggest every 15mins in most occasion.

5. The tag has 3 working mode:normal working model,low voltage mode and temperature and humidity alarming mode. To better track the ambient temperature change, the data collecting time is different in each mode.

6. Built-in high performance li-socl2 battery, long time stand-by and stable performance. The electricity is less than 5uA when in the sleep mode,it is equipped with a super capacitor to effectively realize the full utilization of the battery, and solve the problem of battery instability at high and low temperatures.

7. Can set AppKey and AppEui.

8. The sensor can receive command from gateway,the parameters can be set.

9. All the data collected by the transmitter can be stored in memory, and can be read out through USB.

10. Using FDMA, TDMA and other technologies to avoid wireless conflict.

11. Ensure data is not lost with ACK.

12. When disconnect will automatically updates the sending interval to reduce power consumption.

13. The sensor can receive command from gateway,the parameters can be set.

14. With LCD display,the message(temperature/humidity data,RSSI signal strength,battery power etc.,)can be visually viewed.

15. The buzzer will alarming when the temperature/humidity exceed the limit.

4 Advantages of LoRaWAN over LoRa proprietary protocols

LoRaWAN is a set protocol standards mainly rely on MAC based on the LoRa physical layer transmission technology .With the standard, LoRaWAN has been a network technology. The technology contains LoRaWAN node, LoRaWAN gateway and LoRaWAN protocol ,data cloud platform. When using the LoRaWAN network products, there are two interface for user:One is a data interface between the underlying sensor and the LoRaWAN node, through which sensor data is passed to the network;the other is LoRaWAN protocol and data cloud platform and the user's application has a data interface between the network data transfer application.

LoRaWAN provides multi-channel access, frequency switching, adaptive rate, channel management, timing send and receive, node access authentication and data encryption, roaming and other features. In addition to the advantages of long distance transmission and low power consumption in the physical layer, the following advantages are obtained compared to the transmission method using only the physical layer of the LoRa:

1. Compatible. Different sensor nodes from different manufacturers can access the same LoRaWAN network, and the interface between the LoRaWAN protocol and the data cloud platform is unified. For application developers in terms of custom development without the development of all sensors, shorten the development cycle, reduce R & D costs, to deliver quickly.

2. Large network capacity. Through multi-channel access, frequency switching, adaptive rate LoRaWAN network relative to the physical layer based on the LoRa point-to-point or multi-point application of data capacity, access nodes can be more scalability. It is good for application developers to develop large-scale applications and continuous upgrade applications.

3. Good safety. LoRaWAN network design nodes access authentication, data encryption and other security mechanisms. These mechanisms, reviewed by industry experts and validated by multiple applications by various technology companies worldwide, are much more secure than ad hoc agreements with application developers. For the application of continuous security protection.

5 Specifications

Items	Features
Battery	Built-in 4000mAh /3.6V(not rechargeable)
Measure media	Ambient air
Accuracy of sensor	Humidity ±3%RH(20~80%),±4%(Other)
	Temp ±0.3°C(0~60°C),±0.3~±0.7°C(Other)
Working conditions	-30°C~+60°C； 0%RH ~ 85%RH(Non-condensed)
RF frequency	868/470MHz(optional)
Modulation	Lora

Communication protocol	LoRaWAN v1.02
Maxim range in open area	5km
Maxim Transmit power	20dbm(adjustable)
Memory Capacity	32Mbit (50000)
Transmit interval	1 min-1440mins(user definable)
Low voltage alarm	Yes(user definable)
Temperature and humidity alarm	Yes(user definable)
Stand-by Currents	<4uA
IP Level	IP54
Battery life	3 years (in 15mins interval)
N.W.	135g
Dimension	106mm*57mm*33mm

6 Working modes

Working modes	Working status
Normal mode	Lora sensor will collect temp and humidity readings as settings and send out via Lora module.
Low voltage mode	Device will send data each 30mins(default 30mins, adjustable) after enter low voltage mode,voltage lower than 2.5V(Default 2.5v,adjustable),and please change a new one a.s.a.p
Temp and humidity alarming mode	Device will collect and send out data in a shorter interval (default 5mins,adjustable) when ambient temp is higher than that set by customer,to make customer get the ambient temp readings conveniently.

P.S.:Priority:Temp alarming mode > Low voltage mode > Normal mode

7. Device status when sending data

The device will flash once when the device is sending a packet of data,and the LCD icon will be displayed.
LED bright status:
Green:normal.

Red:Something wrong with device,such as temperature/humidity exceed the limit,low voltage.
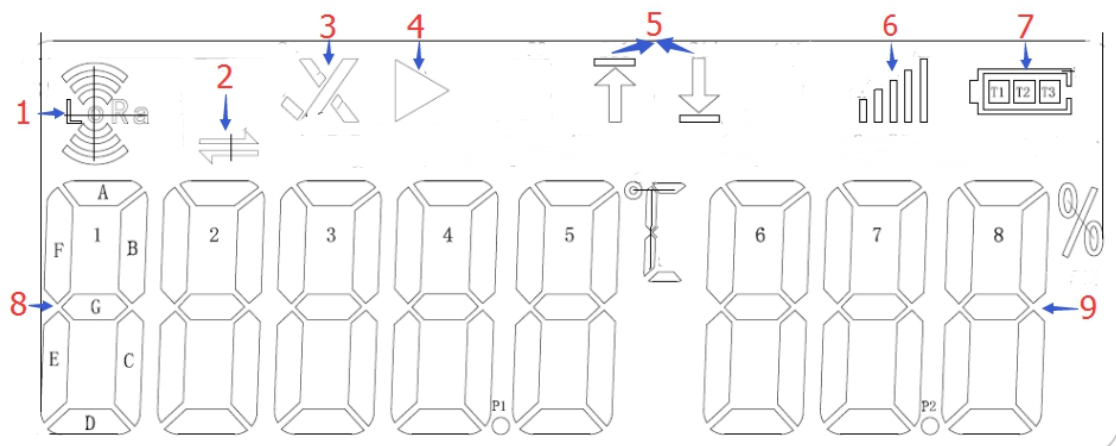LCD display please refer 9.LCD display indication

8. Function of Button

Mode	Operation	Device status	Indication
On	Keep button pressed for 3s	1.The green LED bright in 5s 2.LCD display turn on	The device starts sending data
Off	Keep button pressed for 3s	1.The red LED bright in 5s 2.LCD display turn off	The device stops sending data
Data send	Press shortly	LED bright one time	Only valid in boot mode LED flash status: abnormal(red),normal(green)
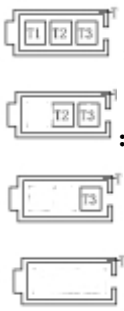
9. LCD Display Indication

Shutdown mode:the LCD is not display.
Boot mode:the LCD is display.
LCD will display LORA icon,Send icon,Temperature/Humidity alarm icon,Running status,Temperature icon,RSSI signal icon,Battery status,Temperature/Humidity information.

NO	Function	Indication
1	LORA icon	LORA Sensor
2	Send icon	The device will flash when sending data,and then off
3	Temperature/Humidity alarm icon	Normal：√　　Alarm：×
4	Running status	▷　Start running
5	Temperature/humidity icon	Upper limit：↑ Lower limit：↓ Upper Lower limit：↑↓
6	RSSI signal icon	：[-80,0]; ：[-100,-80]; ：[-115,-100]; ：[-125,-115]; ：[-138,-125]; The RSSI value is updated every time the gateway response after receiving the data, so the RSSI value is not displayed,if you don't turn on ACK or no response
7	Battery status	：[3.2,3.6]; ：[3.0,3.2]; ：[2.8,3.0]; ：[2.5,2.8];
8	Temperature	℃,℉ could available (configuration by 09 instruction)unit 0.1,sensor abnormal display ------
9	Humidity	unit0.1%,humidity reach 100% it display 100%，sensor abnormal display ------

10. Buzzer working mode

The buzzer will working when temperature/humidity exceed the limit ,the buzzer will ring and then stop.

Open instruction：1. 03 instruction

2. 36 instruction

How to close buzzer：

1.Temperature/humidity return to normal

2.Press button shortly；

3.Enter configuration mode；

4.Turn off；

5.The USB sends a close instruction

6.The gateway sends a close instruction

7.The buzzer working time has ended

PS:

1.After the buzzer works once, it needs to happen again after the temperature and humidity are abnormal (the temperature and humidity should return to normal and then abnormal).

2.The device is close buzzer function by default ,please open this function if you need.

3.The buzzer with high power consumption,it will reduce battery life, Please set this function according to your application

11. Command list

Note: After setting the command, must set #DS to take effect.

Command	Format	Note
Low voltage alarming function	*01,A,X,Y#	A:0 disable this function 1 enable this function (default) X:low voltage threshold ，[2000-3600],unit：1mV，default 2200 Y:transmit interval after low voltage alarming， [1-60],unit

		min,default 30
Set heartbeat package interval	*02,X#	X:[1-60],unit min，default 15
Set high Temp&RH alarming function	*03,A,X,Y,M,N,Z#	A:0 disable this function (default) 1 enable this function X:high temp threshold，[-40-125],unit：℃，default 100； Y:low temp threshold，[-40-125],unit：℃，default 0； M:high humidity threshold，[0-100],unit：%，default：100 N:low humidity threshold，[0-100],unit：%，default：0 Z:transmit interval after temp and humidity alarming，[1-60],unit min,default 5
Set the device time	*04,A,B,C,D,E,F#	A:year，[1976-2099],unit：yer B:month，[1-12],unit：month C:day，[1-31],unit：day D:hour，[0-24],unit：hour E:minute，[0-59],unit：minute F:second，[0-59],unit：second
Set up communication channel(868MHz)	*05,A,B,C,D#	A:The default access channel 1 Default:868100000Hz B:The default access channel 2 Default:868300000Hz C:The default access channel 1 Default:868500000Hz D:The default RX2 receiving channel:869525000Hz A、B、C、D[86300000-870000000] unit:Hz
Set up 8 continuous communication channel(470MHz)	*05,A1,A2,A3,A4,A5,A6,A7,A8,RX2#	A1-A8:The number of the channels [0-95]default:0,1,2,3,4,5,6,7 Corresponding to the TX

		frequency:470.3+A*0.2 Corresponding to the RX frequency :500.3+A*0.2 RX2: RX2 receiving frequency Default:505300000Hz unit:Hz
Set transmitting power	*06,A,B#	A:0 disable this function (default) 1 enable this function B:power value，[0,3]，default:0 0:20dbm 1:17dbm 2:14dbm 3:11dbm
Set the maximum data sending delay time	*07,X#	X: delay time, [0,300], unit: second, default: 180
Set the time interval for reading temperature and humidity	*08,X#	X:[0,65535],unit:second, default:0 0 indicates that temperature and humidity data are taken at irregular intervals, and temperature and humidity data are not obtained until the transmission intervall
Set APPEUI	*11,X#	X: APPEUI 16 digital, default：545A4C5208170101
Set APPKEY	*12,X#	X: APPKEY 32 digital; default：2B7E151628AED2A6ABF7158809CF4F3A
Set work mode	*35,X#	X=0,turn off(default) X=1,turn on
Set buzzer beep time	*36,X#	X:beep time [0,65535],Unit:second,0 means the buzzer is not working(default); 65535 means the buzzer will work until the temperature and humidity return to normal
Turn off the buzzer	*37,0#	
Set the sending protocol	*40,X#	X=0,Not included RTC time, humidity unit is %； X=1,Including RTC time,

		humidity unit is % (tag08 default); X=2,,Not included RTC time, humidity unit is 0.1%； X=3,Including RTC time, humidity unit is 0.1% (tag08B default);
Set the removal margin of temperature/humidity alarm	*41,X,Y#	X:Temperature value,[0,120],default:0, unit:°C Y:Humidity,value,[0,100],defa ult:0, unit:%
Set the temperature and humidity calibration value	*42,A,X,Y#	A=0, Disable calibration; (default) A=1, Enable calibration; X:Temperature calibration value; If the calibration value is added to the temperature, it begins with +; If the calibration value is reduction to the temperature, it begins with -; Can support to one decimal point, unit: °C Y:Humidity calibration value; If the calibration value is added to the humidity, it begins with +; If the calibration value is reduction to the humidity, it begins with -; Can support to one decimal point, unit: %
Save command	#DS	
Search single command	#D5X	X:command
Search all commands	#DE	
Quit configuration	#DQ	
Into firmware upgrade mode	#DU	
Query current temperature and humidity	#DT	
Print the stored readings	#DP	Automatically delete log data after reading

Delete all the stored readings	#DA	
Query current time	#DB	
Query Device EUI	#DC	
Query firmware version	#DV	
Default setting	#DO	
Reboot device	#DR	

12. LED indications

1. LED light will turn on when LoRaWAN Sensor send a reading out; LED light will turn off when it finished. It means the LoRaWAN gateway received the reading if Led light flash twice in a few minutes.

2. LED light will keep on in configure mode until configuration ends.

3. LED light will on when you push Button quickly, and LoRaWAN Sensor will send out a readings, LED light will turn off when finished.

13. How to use the device

The sensor is in OTA mode, please register the device in the sever of LoRaWAN after getting it.DEVEUI can be seen in the label of the sensor,APPEUI is 545A4C5208170101,and APPKEY is 2B 7E151628AED2A6ABF7158809CF4F3A, also can be set by yourself,The sensor needs to be configured with the same APPKEY and APPEUU (commands 11 and 12) as on the server.It can be normally used when the sensor successfully connect to the Internet. Please use 04 command to set RTC time if customer need the correct stored history readings.

The factory setting of the sensor is off mode by default,Please refer to the button function after you get it,press and hold the button for 3s to start up,and the sensor will automatically send data to the gateway,The data transmission interval is 15 minutes by default, if you want to send data quickly,please press the button shortly.TZ-Tag08B is a data sender,which should work with LoRaWAN Gateway.If the sensor is successfully connected to the network, it can be used normally.

If you want configure parameters , Please open the upper cover of device,and insert our configure line,at this time the green LED is bright which indicating the device has entered the configuration mode.For detailed configuration instructions and configuration methods,please refer to"TAG08B" Configure Software Manual.

14. Data format

1. **New version data protocol (suitable for V4.0 and later)**

   Start+State + battery voltage + Temperature+Humidity+RTC

time

- Start：1 byte，0x10 (Humidity unit is%) or 0x12 (default,Humidity unit is0.1%)
- TAG status：1 byte (convert to binary)

bit7: Battery voltage status, 1-low Voltage, 0- Voltage normal；

bit6: Temperature status,1- Temperature more than set high and low temperature threshold, 0- Temp normal;

bit5:The key status,1-Press button,0-don't have press button;

bit4:Whether an ACK reply is required,1-need,0-neen't;

bit3:Whether RTC time is included,1-contains,0-ontains,doesn't contains;

bit2-bit0: reserved;

- Battery voltage: 1 byte, unit:10mv, this value=actual value-150,

For example:0xce means 3.56v(convert to decimal).

- Temperature:2 byte, convert to binary, the first bit of temperature means normal/abnormal(0-normal,1-abnormal); the second bit of temperature means positive(+)/negative(-) (0-positive,1-negative) ; after the third bit of temperature means real temperature, unit:0.1℃(convert to decimal);

   For example: 01 64 means +35.6℃, 41 64 means -35.6℃, 80 00 means abnormal;

- Humidity: 1 byte, unit: %, FF means abnormal

   2 byte, unit: 0.1%, FF means abnormal

   (Based on 40 instructions, the default is 2byte, unit is 0.1%)

- RTC time:6 byte, format is year+month+day+hour+minute+seconds,this data

is optional, set by command 40;

2. Old version data protocol (suitable before V4.0)

State + battery voltage + Temperature+Humidity

- TAG status：1 byte (convert to binary)

bit7: Battery voltage status, 1-low Voltage, 0- Voltage normal；

bit6: Temperature status,1- Temperature more than set high and low temperature threshold, 0- Temp normal.

bit5:The key status,1-Press button,0-don't have press button

bit4-bit0: reserved;

- Battery voltage: 1 byte, unit:10mv, this value=actual value-150,

For example:0xce means 3.56v(convert to decimal).

- Temperature:2 byte, convert to binary, the first bit of temperature means normal/abnormal(0-normal,1-abnormal); the second bit of temperature means positive(+)/negative(-) (0-positive,1-negative) ; after the third bit of temperature means real temperature, unit:0.1°C(convert to decimal);

    For example: 01 64 means +35.6°C, 41 64 means -35.6°C, 80 00 means abnormal;

- Humidity: 1 byte, unit: %, FF means abnormal

15. LORAWAN Gateway downward command

LORAWAN Gateway downward command

Start+ downward command +command content+Check code

Start:0xF0;

downward command:1 byte;

Command content:X byte;

Check code:1 byte, the previous data sum

Please refer to the following table for the specific format. If there is no special indication, the following table adopts hex format, MSB First.

Command	Command function	downward command	Note
1	Low voltage alarming function	F0 01 A X Y CHECKSUM	A:0 disable this function 　1 enable this function X:low voltage threshold, [2000-3600],unit：1mV,2 byte

			Y:transmit interval after low voltage alarming，[1-1440],unit min,2 byte
2	Set heartbeat package interval	F0 02 X CHECKSUM	X:[1-1440],unit min,2byte
3	Set high Temp alarming function	F0 03 A X Y M N Z CHECKSUM	A:0 disable this function 1 enable this function X:high temp threshold，[-40-125],unit：℃，2 byte； Y:low temp threshold，[-40-125],unit：℃，2 byte； M:high humidity threshold，[0-100],unit：%，2 byte； N:low humidity threshold，[0-100],unit：%，2 byte； Z:transmit interval after temp alarming，[1-60],unit min,2 byte；
4	Set the device time	F0 04 Y M D H M S CHECKSUM	A:year,unit:yer,1 byte B:month,unit:month,1 byte C:day,unit:day,1 byte D:hour],unit:hour,1 byte E:minute,unit:minute,1 byte F:second,unit:second,1 byte
5	Set up communication channel(868MHz)	F0 05 A1 A2 A3 A4 A5 A6 A7 A8 RX2 CHECKSUM	A:The default access channel 1 B:The default access channel 2 C:The default access channel 1 D:The default RX2 receiving A、B、C、D[86300000-870000000] 4 byte,unit:Hz
5	Set up 8 continuous communication channel(470MHz)	F0 05 A B C D CHECKSUM	A1-A8:The number of the channels [0-95], 1 byte Corresponding to the TX frequency:470.3+A*0.2 Corresponding to the RX frequency :500.3+A*0.2 RX2: RX2 receiving frequency 4 byte,unit:Hz

6	Set transmitting power	F0 06 A B CHECKSUM	A:0 disable this function 1 enable this function B:power value，[0,3], 0:20dbm 1:17dbm 2:14dbm 3:11dbm
7	Set the maximum data sending delay time	F0 07 X CHECKSUM	X: delay time, [0,300], unit: second, 2 byte
8	Set the time interval for reading temperature and humidity	F0 08 X CHECKSUM	X:[0,65535],unit:second, default:0 0 indicates that temperature and humidity data are taken at irregular intervals, and temperature and humidity data are not obtained until the transmission interval
11	Set APPEUI	F0 0B X CHECKSUM	X:8byte
12	Set APPKEY	F0 0C X CHECKSUM	X:16byte
40	Set LORA data protocol	F0 28 X CHECKSUM	X=0,Not included RTC time, humidity unit is %； X=1,Including RTC time, humidity unit is % (tag08 default); X=2,,Not included RTC time, humidity unit is 0.1%； X=3,Including RTC time, humidity unit is 0.1% (tag08B default);
41	Set the removal margin of temperature/humidity alarm	F0 29 X Y CHECKSUM	X:Temperature value,[0,120],default:0, unit:℃ Y:Humidity,value,[0,100],default:0, unit:%
253	Search command	F0 FD X CHECKSUM	X:The command to query,1byte
255	Restart the LORA module	F0 FF 00 CHECKSUM	After setting the LoRa parameters (such as command 05,11,12), send this command to restart the LoRa module

Reply to the LORAWAN Gateway downward command

Start+ downward command +command content+Check code
Start:0x30;
downward command:1 byte;
Command content:X byte;
Implementation results:
If the command is set, then 1 byte, 0x00 means successful setting, 0x05 means no command, 0x08 means wrong parameter;
If it is query command, it is the query command+the query result+the contents of the command
Command content: if the query result is 0x05 or 0x08, there is no such data
Check code:1 byte, the previous data sum

16. Notes when using

1. Please keep away from mental objects and don't put into metal sealed small space.

2.Please keep away from water and corrosive chemicals.

3. Please tell us your application and configuration requests, we will try to configure it well before delivery and guide you how to install properly.