

# TZ-TT18

## Temperature&humidity Transmitter

User Guide V2.2



## 1. Product overview

The temperature and humidity transmitter (hereafter referred as TT18) is with built-in temperature & humidity sensor and GSM module which needs to inset SIM card work.

There are three modes of TT18, turn on, turn off and flight modes. It only wakes up when it is time to send data or when the use operates it. Otherwise, it is in sleep status. So that it can be used for a longer time to bring you more convenience.

TT18 can collect the ambient temperature and humidity with high precision quickly and transmit them to the server through GPRS. It is widely used in cold chain logistics, medicine, transportation and other industries.

## 2. Specification

Specification	Details
Dimension	90mm*64mm*27mm
Battery	Built-in 3.7V/3000mAh Lithium battery
GSM antenna	Built-in
Flash memory	Can save 4320 GPRS data
Temperature precision	$\pm 0.3^{\circ}\text{C}$
Detect temperature range	$-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
Operating temperature range	$-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
Humidity precision	$\pm 3\%$
Detect humidity range	0~100%
Power consumption	Active mode(avg.) < 100mA Sleep mode(avg.) < 2mA
Humidity	Up to 75% non-condensing
GSM chip	SIMCOM GSM chip, 4 Frequency GSM 850/ 900/1800/1900mHz
LED	Device status/charge

## 3. Indicators and interface



Hardware	Function
A1. LED	Show the device's status (two colors led light ,Green+Red)
A2. LED	Charge status (single color led light ,Red)
B. USB Port	Configure or charge the machine
C. SIM card slot	Insert the SIM card
D. Button	Press on the button to start up the device or know the device's status

#### 4. Device mode

Device mode	Instructions
Boot mode	In shutdown mode, press and hold button for 5~8 seconds then loose or enter into the boot mode via setting 005 command via serial port ;In flight mode, need to hold down the button for 15 seconds to go into the boot mode
Shut down mode	Only can send 005 command to let the device go into shut down mode (in boot mode/flight mode. note: in flight mode, the 005 command only works by serial port setting)
Flight mode	Pressing the Button for 15s or set 005 command, the device will be in flight mode. In the flight mode, the device only save but not send data.( Note: In shut down mode,the 005 command only works by serial port setting)

## 5. Indicator light(LED light) status

**Note:** The A1 LED of the device will blink in red and green at the same time when insert the battery. If you'd like to know the device's status, please press the button 0.5 seconds and then loose. Then the LED will show to you the device in which status now and the LED only last 10s every time. When pressed the button after 0.5 seconds then loose, if the status of the LED lamp is quenched, means the device is in shutdown mode. There is priority of the device's status. The greater number, the higher priority. LED flashing as follows:

A1.Green+Red LED - indicating the device status		
Device led status	Explanation	Priority
Green and Red led each flash 0.1 seconds	Boot	
Green led on for 0.1 seconds and off for 0.1 seconds	Working properly	1
Red led on for 0.1 seconds and off for 0.1 seconds	Battery low voltage	2
Red led always on	There is a problem with the device(for example, no GPRS signal which result that the data could not be sent to the server)	3
Green led on for 1 seconds and off for 1 seconds	Flight mode	4
Off	Shut down	5

A2.Red LED - Power status	
Power status	Explanation
Red on	charging
Red off	With out charging or full charged

## 6. GPRS data format

TT18 GPRS data is in hex format.

The format of hex code:

**Format:** Start bits(2byte) + Packet length(2byte) + Protocol number(2byte) + Hardware type(2byte) + Firmware version(4byte) + IMEI(8byte) + RTC data time(6byte)+ LBS data length(2byte) + LAC(2byte) + CELLID(2byte) + MCC(2byte) + MNC(2byte) + Extension bits(A) + State data length(2byte) + Alarm type(1byte) + Terminal information(1byte) + GMS signal strength(1byte)

**+GSM state(1byte) +Battery voltage(2byte) + Temperature(2byte) + humidity(1byte) + Extension bits(B) + Extension bits(C) + packet index(2byte) + CRC(2byte) + Stop bits(2byte)**

The data of the device send to the server:

54 5A 00 2F 24 24 04 03 01 07 00 00 08 66 10 40 27 00 34 28 09 01 01 05 03 0D 00 08 25 33 78  
37 04 60 00 01 00 09 AA 00 17 37 01 95 09 DA 45 00 0A 57 0A 0D 0A

Here below is a table which informs more detailed information about the protocol.

Data block	Number of bytes	Data Content	Meaning
Start bits	2	'T' 'Z'	Tzone company identifier. This is the header of every packet
Packet length	2	Variable	The bytes length from the start at protocol number to the end at the CRC.
Protocol number	2	'\$\$'	Normal data
Hardware type	2	0x04 0x03	The hardware is TT18
Firmware version	4	Variable	0xFF 0xFF 0xFF 0xFF = 255.255.255.255
IMEI	8	Variable	BCD format, i.e. 0x08 0x66 0x10 0x40 0x27 0x00 0x34 0x28 = 866104027003428
RCT time date	6	Variable	The time and date when packet the data. The sequence is Year Month Day Hour Minute Second
LBS data length	2	Variable	GSM LBS's data length excludes LBS data length part. If the value is 0, there is no LBS data.
LAC	2	Variable	GSM's location area code 0x25 0x33 means LAC is 2533
CELL ID	2	Variable	GSM's serving CELL ID 0x78 0x37 means that CELL ID is 7837
MCC	2	Variable	Mobile Country Code, ignore the first digital, only 3 digital, 04 60 means that MCC is 460.
MNC	2	Variable	Mobile Network Code, 2 or 3 digital, if the first digital is 8 , MNC is 3 digital. If the first digital is 0, MNC is 2 digital. 87 56 means that MNC is 756. 00 56 means 56.
Extension bits	A=0		For future extending the protocol use, currently, has nothing, does not possess any byte
Status data length	2	Variable	The status data length excluding "Status data length" itself. If this part is 0, there is no status data.
Alarm type	1	Variable	The value of this part has four possibilities, Temperature/humidity included in all the GPRS data. 0xAA Interval GPRS data

			<b>0x10</b> Low battery Alarm <b>0xA0</b> Temperature/Humidity over threshold alarm <b>0xA1</b> Temperature/Humidity sensor abnormal alarm
<b>Terminal information</b>	<b>1</b>	<b>Variable</b>	<b>Bit 7 to bit 5</b> are reserved for future use. <b>Bit4:</b> <b>1</b> RTC time is abnormal <b>0</b> RTC time is normal <b>Bit3:</b> <b>1</b> The temperature/Humidity sensor is abnormal <b>0</b> The temperature/Humidity sensor is normal <b>Bit2:</b> <b>1</b> The temperature/Humidity is over threshold <b>0</b> The temperature/Humidity is normal <b>Bit1:</b> <b>1</b> The battery low voltage <b>0</b> The battery is normal <b>Bit0:</b> <b>1</b> The machine is charging <b>0</b> The machine is not charging
<b>GMS signal strength</b>	<b>1</b>	<b>Variable</b>	CSQ value , Hex code
<b>GSM status</b>	<b>1</b>	<b>Variable</b>	<b>Bit 7 to bit 6</b> are reserved for future use. <b>Bit 5:</b> <b>1</b> Internet connection is established <b>0</b> Internet connection is not established <b>Bit4:</b> <b>1</b> GPRS is registered successfully <b>0</b> GPRS is not registered <b>Bit3:</b> <b>1</b> The GSM is in roaming mode <b>0</b> The GSM is in home network mode <b>Bit2:</b> <b>1</b> GSM is registered successfully <b>0</b> GSM is not registered yet <b>Bit1:</b> <b>1</b> Detected SIM card <b>0</b> Not detected SIM card <b>Bit0:</b> <b>1</b> The GSM module is started <b>0</b> The GSM module is not started yet
<b>Battery voltage</b>	<b>2</b>	<b>0</b>	Unit:10mv, for example: 0195H=405(DEC), 405*10mV=4.05V.
<b>Temperature</b>	<b>2</b>	<b>0</b>	Unit:0.01℃, convert to binary first, mark in the highest bit , <b>1</b> -disconnect. <b>0</b> -connect. negative/positive mark <b>1</b> -the temperature is negative. <b>0</b> -the temperature is positive. Remaining is the temperature value, convert to HEX first , and multiply 0.01℃. for example:09 DA=25.22℃ , 49 DA= - 25.22℃ 80 00= not connect temperature/humidity sensor

humidity	1	0	Unit:100%, Hex code, for example: 45=69%, FF = not connect temperature /humidity sensor or no humidity
Extension bits	B=0		For future use, currently, this part has nothing, does not have any byte
Extension bits	C=0		For future use, currently, this part has nothing, does not have any byte
Packet index	2	Variable	The value range of this part is between 1 and 9999
CRC	2	Variable	The checked content is from the “protocol number” to the end at “CRC”, including “protocol number”, excluding “CRC”.
Stop bits	2	0x0D 0x0A	Indicate that this packet is finished

## 7. Use the GPRS function

Please through the following way to configure the machine :

1. The configuration software
2. SMS
3. The server (The machine must enable ACK function and you can set instructions before the server responses ACK. Otherwise the machine will be immediately into sleep. The machine is default that the ACK function is already open. Every time the machine sends GPRS data to the server, the server must respond @ACK,Packet index(Hex converted into decimal)# to the machine. Then the machine will continue to send next GPRS data to the server, please refer to the data protocol for packet index).

### For example:

when server get the data packet index is 23(HEX),conversion to decimal is 35.  
then the server need reply @ACK,35# to device .

### Notes:

1. The machine is already with default comments. Please insert a GPRS network SIM card to the device, then the unit will send data to our server automatically. (Please kindly refer to the common list below if you'd like to know the default settings)
2. If you want to change the configuration settings, please set it via SMS or use the same command via serial port tool.

### Step1: Set the APN (Access Point Name)

**Different network provider have the different APN at every country. If you don't know how to set the APN, please refer to the attachment.**

**Format: \*\$\$\$\$\$,011,APN, Username,Password#**

**Notes: The username and password could to be null.**

**For example: \*000000,011,cmnet,,#**

**Explication: The China Mobile's APN is "cmnet", and the username and password are empty.**

**After sending the command by SMS to device, it will reply to your mobile phone:**

**Receive: '011'OK**

**\*000000,011,cmnet,,#**

**If send the command by USB port to device, the serial port tool will show like below:**

**CMD bytes: 14**

**\*000000,011,cmnet,,#**

**ComdType:011(SETAPN)**

**APNnumber:cmnet**

**Username:**

**Password:**

**Step2: Set the server's IP & PORT**

**Format: \*\$\$\$\$\$,015,1,IP,PORT#**

**For example: \*000000,015,1,gateway.gotracking.net,18801#**

**gateway.gotracking.net is our server's domain name,18801 is the port.**

**If the client has his/her own server, please make sure that the IP and port is correct.**

**After you send the command of SMS to device, it will reply to your mobile phone**

**Receive: '015'OK**

**000000,015,1,gateway.gotracking.net,18801#**

**If you send the command by USB to device, the serial port tool will shows:**

**CMD bytes: 2B**

**\*000000,015,1,gateway.gotracking.net,18801#**



**ComdType:015(SETIPANDPORT)**

**Mode:01**

**IP/Domain Name:gateway.gotracking.net**

**Port:18801**

**Step3: Set GPRS time interval**

**Format: \*\$\$\$\$\$,018,X#**

**X: the time interval (unit is min),**

**For example:\*000000,018,1#**

**The device will send GPRS every1 minute and no times limit.**

**After you send the command of SMS to device, it will reply to your mobile phone:**

**Receive:'018'OK**

**\*000000,018,1#**

**If you send the command of USB to device, the serial port tool will shows:**

**CMD bytes: 0E**

**\*000000,018,1#**

**ComdType:018(SetGpreInternal)**

**Interval:1**

## 8. Command list

If you want to know more about the TT18 and configure it, you can refer to the command list.

**\$\$\$\$\$\$** is user's password, and initial password is **000000**

	SMS Instruction	Format	Note
1	Request a current machine information	*\$\$\$\$\$,000#	The machine will reply in the form of SMS(the data will contain IMEI、FW version、CCID、Temp、RH、CSQ、Battery、RTC)
2	Modify user password	*\$\$\$\$\$,001,@,@,@,@,@#	\$\$\$\$\$\$ is the old password @@@@@@ is the new password
3	Set the high/low temperature and humidity alarm function. When the TT18 is in high/low	*\$\$\$\$\$,003,A,B,C,D,X#	A=[-40~125],high-temperature threshold(unit:°C,default:125) B=[-40~125],low-temperature

	<p>temperature and humidity, TT18 will always send high/low temperature and humidity alarm GPRS data to the Preset Server.</p> <p>The machine will send data according to the time interval that you have set(003 has priority to 004 )</p>		<p>threshold(unit:°C,default:-40) A must be bigger than B If the temperatures exceed [A, B],it will send alarm data. C=[0~100],high-humidity threshold(unit:%,default:100) D=[0~100],low-humidity threshold(unit:%,default:0) C must be bigger than D If the humidity exceed [A,B],it will send alarm data X=[1,60], If the temperature or humidity value is over the threshold, the data reporting interval will be changed into X min (unit:min,default:1) <b>Note:</b>In order to ensure the consistency of temperature and humidity alarm, please set the alarm range of 003 instruction alarm to the same as the temperature and humidity platform in Tzone.</p>
4	<p>Set low power alarm When the TT18 voltage is lower than the preset value, TT18 will send one lower power alarm GPRS data to the Preset Server.</p> <p>The machine will send data according to the time interval that you have set(004 has priority to 018)</p>	*\$\$\$\$\$,004,X,Y#	<p>X is the low power alarm voltage, [360,430] unit:10mv(default:360) Y=[1~60] Y is the data reporting interval when the machine is under the low power voltage(unit:min, default:60, 0 is without sending data ) For example: *\$\$\$\$\$,004,380,10# When the battery voltage is lower than 3.8 V, the data reporting interval will be changed to every 10 minutes</p>
5	Set working model	*\$\$\$\$\$,005,X#	<p>X=0, Turn off (default); X=1, Turn on; X=3, Flight;</p>

6	Set RTC time	*\$\$\$\$\$,006,year,month,day,hour,minute,second#	Set the device RTC time . For example: *000000,006,16,01,11,10,46,30# Year:16 Month:1 Day:11 Hour:10 Minute:46 Second:30
7	Extend setting	*\$\$\$\$\$,008,ABCDEFG#	A=0, Disable machine information report function which get machine information SMS by Calling A=1, Enable machine information report function which get machine information SMS by Calling (default) B=0, Disable GPRS ACK function; B=1, Enable GPRS ACK Function(default); <b>Note:</b> The machine once every send GPRS data to the server, the server must respond @ACK,Packet index(Hex converted into decimal)# to the machine, then the machine will continue to send next GPRS data to the serve, please refer to the data protocol for packet index. C/D/E/FG=0
8	Set APN,Username,Password	*\$\$\$\$\$,011,APN,Username,Password#	APN : APN string (must < 28 chars) User name: Your username (must < 28 chars) Password: Your password (must < 28 chars) * If there is no username or password, please left it blank. For example: *000000,011,CMNET,,# (There is no username or password)
9	Set IP Address & port number	*\$\$\$\$\$,015,X,IP,PORT#	X=0 Using IP to connect the server X=1 Using DN to connect the server IP : xxx.xxx.xxx.xxx

			DN: (domain name) www.xxx.com PORT : [1,65535]
10	Set the data reporting intervals in turn on or flight mode	*\$\$\$\$\$,018,X#	X (3 Digital) [1,60] The data reporting interval (Unit: min,default:5)
11	Set the GPRS mode	*\$\$\$\$\$,019,X#	X=0, Use the UDP mode X=1, Use the TCP mode(default)
12	Set the temperature&humidity SMS alarm function	*\$\$\$\$\$,020,X,Y#	X=0, Disable this function(default) X=1, Enable this function Y, SMS number <b>Note:</b> The machine sends SMS alarm only when the temperature or humidity is over the threshold. Please set the 020 commend firstly. Then set the 003 command.
13	The machine only save the data in the memory instead of reporting the real-time data when the device is under bad condition <b>(over or under temperature/humidity or low power)</b>	*\$\$\$\$\$,021,A,B,C,D,E#	A=[-40~125],high-temperature threshold(unit:°C,default:125) B=[-40~125],low-temperature threshold(unit:°C,default:-40) A must be bigger than B If the temperature exceed [A, B], the temperature data will be saved only. C=[0~100],high-humidity threshold(unit:%,default:100) D=[0~100],low-humidity threshold(unit:%,default:0) C must be bigger than D If the humidity value exceed [A, B], the humidity data will be saved only. E=[350,430], low power threshold (unit:10mv,default:350)
14	The query command	*\$\$\$\$\$,040,X#	X: need to query the instructions
15	Clear data flash	*\$\$\$\$\$,500#	Clear history in the flash memory
16	Reboot time	*\$\$\$\$\$,600,X,Y#	X=0,Disable this function; X=[0,1440]/ Minutes,default:1440 Reboot time interval
17	Initialization	*\$\$\$\$\$,990,099#	All parameters will be changed to be factory default settings (Except the Password).
18	Reboot by SMS command	*\$\$\$\$\$,991#	TT18 will be reboot by this SMS

			command.
19	Read the machine records of Flash	*\$\$\$\$\$,999#	Through the USB configure cable, read the machine data records in the Flash memory on the computer. After reading, all data records will be empty.
20	Query all instructions	#DE	Only used to configure software
21	Query one instructions	#D5X	X: command, for example: #D5005. Only used to configure software

## 9. Instruction

With the battery in TT18, pressing the button for 5s, machine will be running. When TT18 completes initialization, it will go to sleep mode. Most of the time TT18 is in sleep mode, with only interval time data. Only when connected with serial port tool for configuration or the device is called / receives SMS command, will it wake up. After this, it goes into sleep mode again. Thus it can work for a longer time.

### Note:

1. Please don't connect the USB cable when the device is sending data to the server. Otherwise, the performance of sending data may be affected and the collected temperature by TT18 may be higher than the actual temperature.

2. Please set the RTC time when turn on the device. Otherwise the machine is the initial time. If the data is sent to our server, the RTC time will be auto updated when our server receives the data. If the data is sent to your own server, please change the device RTC time based on the below commend.

The server sends to device format:

UTC time:2016-08-02 01:19:48