

# **TBS-201 Wireless Vehicle Detector**

## **User Manual**





## Content

1. Overview .....	1
2. Product Model .....	1
3. Key Features.....	1
4. Main Function.....	1
5. Application Scenarios .....	2
6. Production Specification.....	2
7. Structure Size.....	3
8. Working Principle.....	4
8.1. Working Principle.....	4
8.2. Wireless Communication Working Principle .....	5

9. Installation .....	5
9.1. Installation requirements.....	5
9.2. Installation Steps .....	5
10. WeChat Applet Introduction.....	8
10.1. Add WeChat Applet .....	8
10.2. Enable Bluetooth connection .....	9
11. Notes.....	10

## 1. Overview

TBS-201 wireless vehicle detector is a wireless geomagnetic sensor integrated with LoRa and microwave technology. Using effective dual-mode joint algorithm, the detector realize precise parking spot detecting function and can be widely used in intelligent traffic, smart community, smart parking and other applications.

TBS-201, LoRa gateway and smart parking application management platform form smart parking management system, which works as a whole smart parking solution. TBS-201 is compatible with LoRaWAN protocol , can communicate with gateway which compatible with LoRaWAN protocol.

The data collected by the detector and transferred to application platform can be explained, detailed information please refer to < TBS-201 application protocol>.

## 2. Product Model

TBS-201: Wireless vehicle detector (dual mode, with geomagnetic and microwave sensor)

## 3. Key Features

- High detection precision, adjustable detection threshold
- Build-in intelligent procession, Automatic drift compensation, stable and reliable performance
- Long wireless transmission distance
- Transmission parameters can be set optionally
- Parameters can be configured via Bluetooth
- Low power consumption, long battery life
- Compact size, easy to install

## 4. Main Function

- Report parking state timely
- Low power alarm
- Detector failure alarm
- Report working states regularly
- Support reset and calibration automatically or manually

## 5. Application Scenarios

- Industrial parks
- On road parking space
- Commercial parking slot
- Other public parking slot

Note: The strong magnetic field or the field where magnetic varies greatly are not suitable for the detector use.

## 6. Production Specification

### Basic Specification

Working Frequency	AU915, AS923
Communication Standard	LoRaWAN™, Class A
Transmitting Power	Maximum 20dBm
Receiving Sensitivity	-135 dBm ( SF12,125KHz)
Detection Rate	>99%
Bluetooth Calibration	Auto calibration after device wake-up via Bluetooth
Downlink Configuration	Calibration, detection threshold, heartbeat interval
Uplink Alarm	Low power alarm, failure alarm
Software Upgrade	Wireless upgrade
Power Supply	Build-in battery, 3.6V, 38000mAh
Power Switch	Strong magnetic switch
Battery Life	>10 yrs, in typical working state <sup>[1]</sup>
Bearing Weight	>10 tonnes
IP Grade	IP68
Working Temperature	-40°C~85°C
Storage Temperature	-50°C~85°C
Working Humidity	10%~95%
Environment Requirement	There are no ferromagnetic materials, no strong magnetic

	field nearby. no Metal shield cover the detector.
Size	Φ: 130mm, H: 87mm
Weight	800g

Note[1]: Typical working state means the device report information every 12 hours, there are 5 times for vehicles come in and go out to a parking space a day.

#### Microwave Antenna Specification (TBS-201 only)

Item	Receiving antenna	Transmitting antenna
Vertical 3dB main lobe width	38°	38°
Horizontal 3dB main lobe width	38°	38°
Minor lobe level	≥15dB	≥15dB

## 7. Structure Size

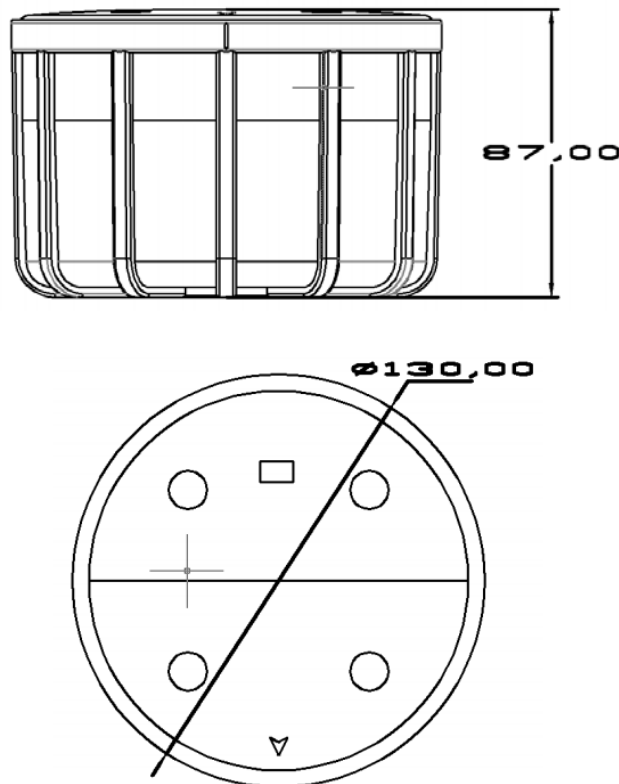


Figure 1. TBS-201 dimensions

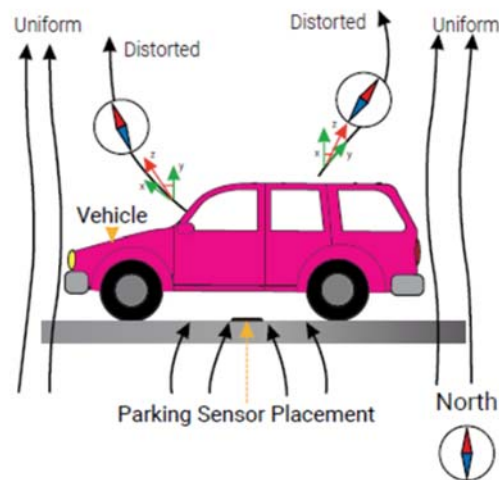
## 8. Working Principle

### 8.1. Working Principle

The frame and shell of a car are made of ferromagnetic material (various types of steel), which make disturbance to surrounding magnetic field. According to this characteristic, the parking sensor determines whether there is a car in the parking space by sensing the magnetic field change. With build-in dual-sensors (geomagnetic sensor and microwave sensor), powerful signal analysis and processing algorithm, the detector offers enhanced information, especially acquire complementary and optimization to the reverse sensitivity characteristics of chassis with different height.

Compared with traditional device with single sensor, TBS-201 can greatly improve the detection accuracy and reduce information loss. The detection mechanism is show as below.

- 1) Geomagnetic sensor detects the magnetic field lines which distorted by ferrous metal of the vehicle, magnetic field strength obtained as the vehicle presence and movement with the magnetic sensor.



- 2) Microwave Radar module emits wireless modulation wave and receives the reflective signals to determine if the parking spot is occupied and vacant



## 8.2. Wireless Communication Working Principle

With build-in wireless transmission module, TBS-201 can communicate with LoRaWAN gateway and smart parking application server located in cloud or in local.

Vehicle detector, LoRaWAN gateway, application server and smart parking application (APP) composite of the Smart Parking system. Shown as figure 2.

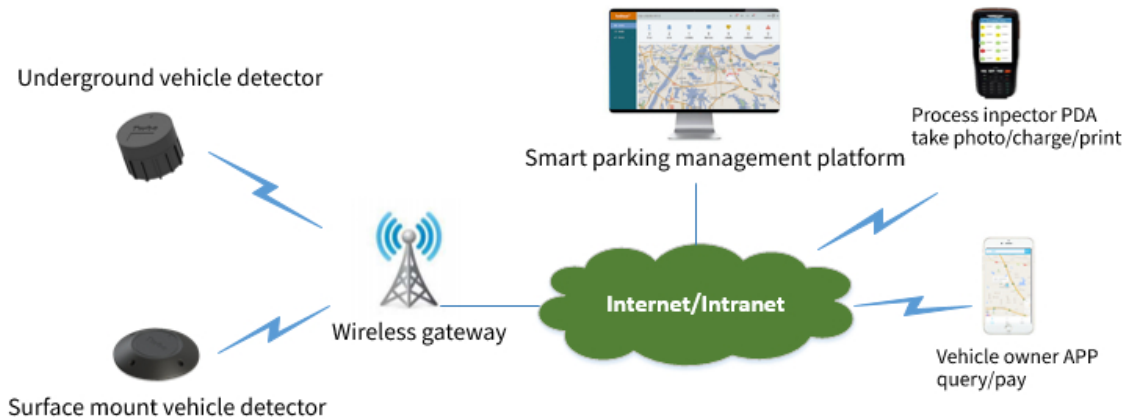


Figure 2. Smart Parking System

## 9. Installation

### 9.1. Installation requirements

1. Please try to install in the daytime and finish the installation as soon as possible.
2. Please pay attention to road safety and wear orange or other color clothes.
3. Tool:
  - a. Ruler: Measure the installation position and the hole depth.
  - b. Marking pen: mark the installation position.
  - c. Drill: Drill holes on the ground at the installation position.
  - d. Cleaning brush: clear sundries in holes.
  - e. Scoop: mixing cement, marble glue and curing agent.

### 9.2. Installation Steps

1. Product Check

Take out the product and make sure appearance is not damaged. Check if the label pastes tight on the product and label information (include the DevEUI and other parameters which used to device registration) is clear. As shown in figure 3.





Figure 3. Product appearance and label

Note: To restart or calibrate TBS-201, place the magnet in the groove at the top of the device and stay for 1~5 seconds, then move away.

## 2. Drill hole

### a. Mark the installation position

According to the design of parking space, select the installation position and mark the position, provide a code for the parking space. Usually the device is installed in the middle of the parking space. Shown as figure 4.

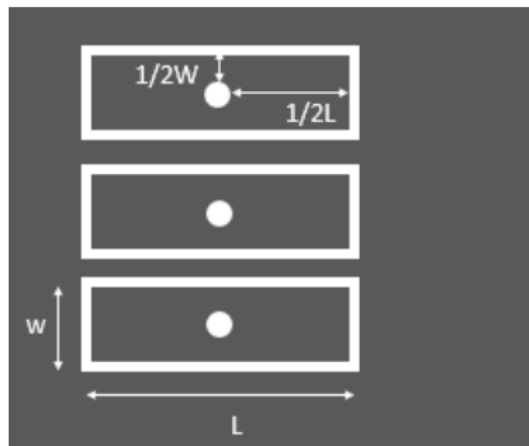


Figure 4. TBS-201 installation position

### b. Drill a hole

Drill a hole at the marked position, pay attention to measure the hole depth so that TBS-201 surface will be placed a bit lower low road surface. Shown as figure 5.



Figure 5. drill a hole

- c. Clear the sundries and fill the hole with cement

Clear the sundries in the hole, put water, quick dry cement to the hole and stir evenly.

- d. Place device.

Put the device into the hole, compact the cement, make sure the device surface is aligned to or a bit lower than the road surface, finally remove the extra cement.

Note:

- Make sure cement do not cover the TBS-201 surface and the spiral slit. the spiral slit is shown as the figure 6. Once the spiral slit is sealed with cement, the device will be hard to remove for device maintenance or replacement.



Figure 6. the spiral slit is marked in red circle

- Keep device is placed in horizontal position, cement is compacted tightly to avoid the device cause inclination or subsidence once tires rolling over the device.

- Make sure the triangle mark on the device surface point to the direction of vehicle leaving or entering. The triangle mark is shown as figure 7.



Figure 7. Triangle mark located on the device surface

## 10. WeChat Applet Introduction

The Applet is designed to finish the registration to LoRaWAN network and wake up the device via Blue-tooth.

### 10.1. Add WeChat Applet

There are two ways to add Wechat Applet.

1. Scan code.

Open Wechat, scan following code, then enter the applet. The code is shown as figure 8. then select “Geomagnetic vehicle detector”.



Figure 8. Scan code

2. Search in WeChat
  - Search “ 快捷设备安装” in WeChat.



## 10.2. Enable Bluetooth connection

- a. Turn on phone's Blue-tooth.
- b. Place the magnet stripe in the groove at the top of the device and stay for 1~5 seconds, then move away. The groove is shown as figure 9.



Figure 9. groove in the device surface

- c. Click "Connected device" in applet. If success, the device basic information will be displayed in applet. As shown in figure 10.

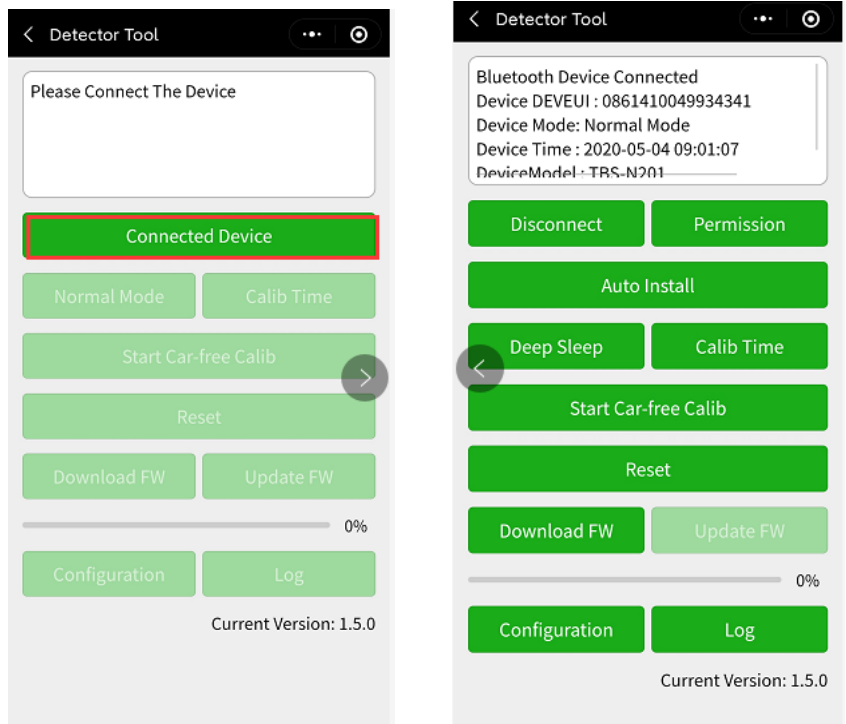


Figure 10. applet page

- d. Select “Auto Install”, the device will be wakened up and perform the calibration automatically, the system time will be synchronized. as shown in figure 11.

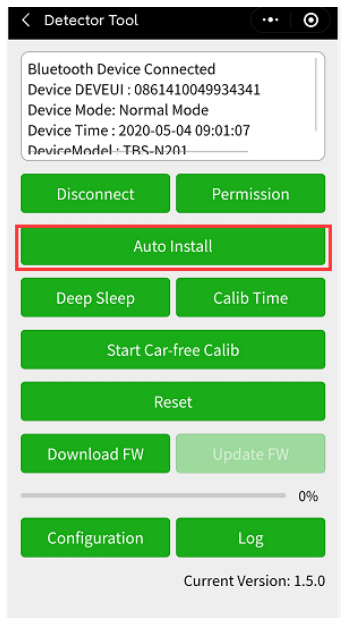


Figure 11. Auto install

## 11. Notes

1. Battery life: The battery life refers to the service life under normal conditions. When the device is used in poor LoRa network ( $SNR \leq -12$ ), the device function will be affected and the battery life will be shortened.

Normal conditions mean the device can work normally in most time. The wireless communication is stable.

2. During the calibration, make sure there is no vehicle and other metal material within 1 meter around the device. or calibration will make error.
3. When the server sends calibration command to device, make sure there is no vehicle in the parking space or calibration will make error.
4. When the device work abnormally, the device can be reset through calibration command. If this method doesn't work, please try to do manual calibration. (refers to chapter 9.2)
5. For manual calibration, if device cannot connect by Bluetooth, please try to change a magnetic stripe.
6. Re-calibration is needed once the device is moved during detecting.
7. Make sure the triangle mark on the device surface point to the direction of vehicle leaving or entering.
8. When command to modify parameter is sent to device from server, while the device is in dormant state and cannot receive the command until waiting for the detector sending state. Detailed information please refer to < TBS-201 application protocol>.
9. iPhone is recommended to be used. The device can be connected and operated through applet via Bluetooth. Because there are many android phones, some of phones may have compatibility problem.