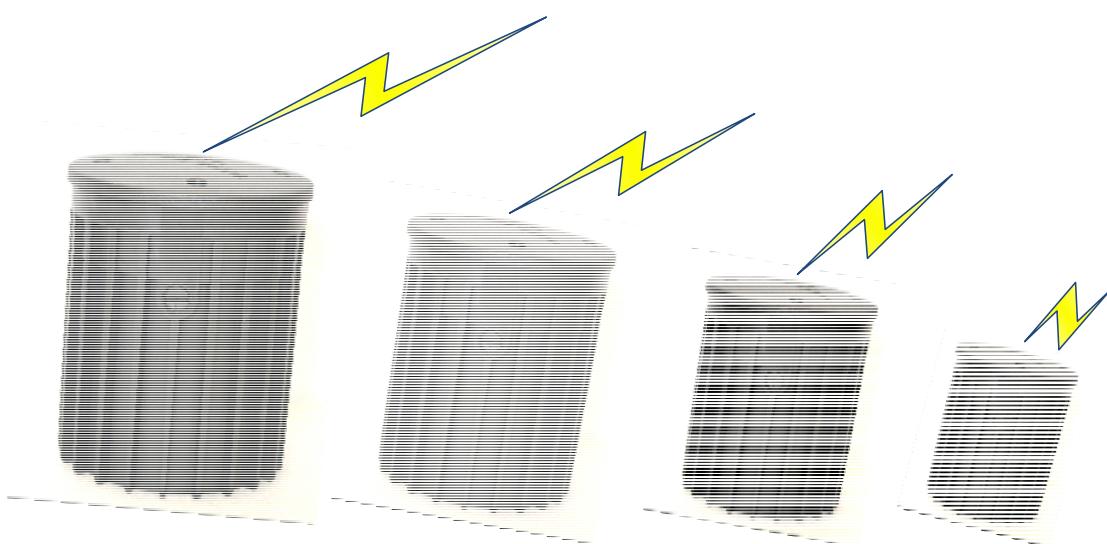


Operating manual for ITS vehicle detector



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1. Summarize

The product consists of ITS vehicle detector (below called detector), ITS signal receiver (below called receiver), Yagi antenna (below called antenna), and feeder line.

Detector (VDT-300/t) is a magnetic sensor that detects the impact of vehicles on the Earth's magnetic field by the digital magnetic sensor to judge the vehicle passage situation in the driveway. This device can accurately sense the vehicle information in the real time, and send the collected information to the supporting receiver (VDT-300/r) via Internet of Things. This process is to complete the front-end information collection and transmission of intelligent light control, and then the receive host transmits the related information to signal controller. The signal controller use the received traffic information to analyze the share of the current lane, and smart distributes the opening and closing time of the lights. (The installation picture as Figure1)

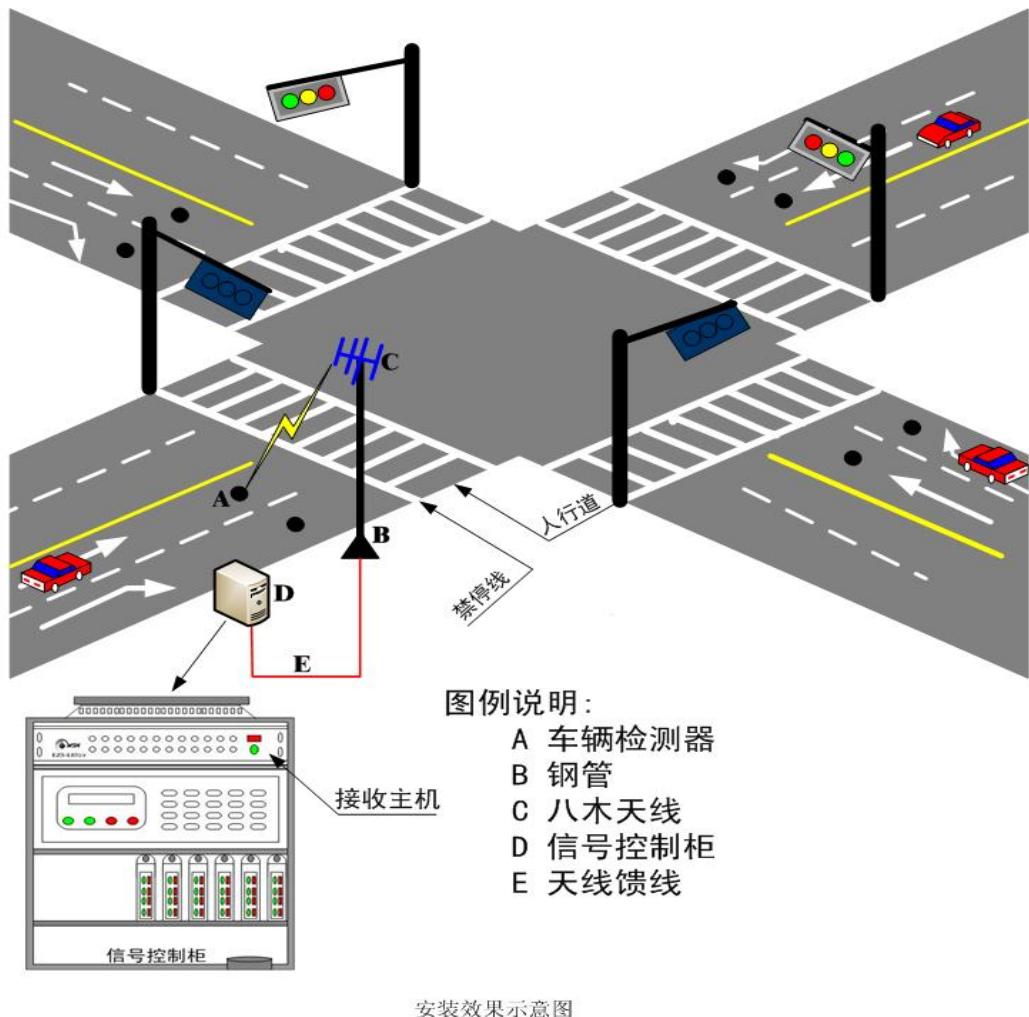


Figure1 Installation impression drawing

2. Product characteristics

- (1) This product is very small, so it will cause the minimal damage to the road.
- (2) The installation is simple and easy: there is wireless transmission, no power line and no data wire.
- (3) Self-adaption and self-learning ability is strong: Even if the road often passes large truck or bus to initiate the road flattened and deformation, it will not affect the detector to cause the big damage. By ten minutes self-adaption of equipment, the self-learning ability will normally operate again.
- (4) High detection precision: Whether high-speed driving or still ambling and even falling asleep, it can both accurately detect.
- (5) High environment adaptability: It can continue to work properly in all weather condition (wind, rain, snow and mist) and all day (day and night).
- (6) Unique algorithm, strong encryption, and strong interference immunity.
- (7) Stable and lasting: Low power consumption, and can work for 3-5 years (design by the daily flow of 10000 vehicles).
- (8) The setting is flexible and easy, and the detection range of 0 ~ 2m (radius) is adjustable.
- (9) It could detect trucks, trailers, buses and cars, but the bicycle and pedestrian cannot be detected.
- (10) It dynamically collects the vehicle traffic information of driveway in the real time.

3. ITS vehicle detector Specifications

- Model: VDT-300/t
- Work environment: -40~85°C, water-proof, protection level is IP67
- Product size: 96mm (diameter)×120mm (high)
- Power supply mode: 3.6V Li-SOCI2 batteries
- System working voltage: DC1.8V-3.6V
- Power consumption: stand-by work current is 10uA, and maximum current is 150mA
- Reporting period for test data: adjustable
- RF operation band: 434MHz±200KHz
- Reception sensitivity: base on 1.2kbps is 110dBm (1% packets error rate)
- Transmission speed: programmable data transfer rate, and highest speed is up to 500kbps
- Channel bandwidth: 200KHz
- Channel amount: 255 channels
- Transmitting power: programmable output power, and maximum power is up to +18dBm
- RF transmission distance: laid on the road, and more than 200m
- Antenna polarization way: vertical polarization
- Antenna gain: 0.5dBi
- Antenna standing-wave ratio (SWR): 2.0

4. Product outside drawing



Figure2 Detector outside drawing

4.1 Open detector

(1) The tools for open and close as the following figure:



Figure3 Flat screwdriver、scissor、703 adhesive

(2) Open: Use the flat screwdriver to unscrew the bolt (as Figure4), and see that there has a wire in the screw (as Figure5).



Figure5 wire in the screw

Figure4 Unscrew the bolt

Use scissor to cut off the wire (as Figure6), and then shorten one side of the wire. The both side cannot contact (as Figure7) and the detector will begin the work at the same time.



Figure6 Opened wire



Figure7 Cut wire

(3) Close: Coat the 703 adhesive to the screw hole wall (as Figure8), then cover the bolt and use the flat screwdriver to tighten the bolt (as Figure9).



Figure8 Coat adhesive



Figure9 The effect of tightening

4.2 Receiver



Figure10 Receiver's frontage



Figure11 Receiver's back



Figure12 Power adapter

Receiver's frontage (as Figure10): Status indicator, reset switch, and power switch.

Receiver's back (as Figure11): Power adapter, power interface, connection interface, serial communications, and antenna interface.

Comment: Can customize 1U standard chassis

Technical parameter:

- Model: VDT-300/r
- Work environment: -40~85°C
- Power supply mode: AC 220V (China)
- Product size: length is 190mm, width is 155mm, depth is 46mm (can customize 1U chassis)
- Data interface: IO interface, RS232
- Module: built-in GPS module (optional)
- RF band: 434MHz±200 KHz in ISM frequency range
- Reception sensitivity: base on 1.2kbps is 110dBm (1% packets error rate)
- Transmission distance: more than 300m
- Antenna: vertical polarization, gain 2.5dBi, standing-wave ratio (SWR) is 1.5

Product characteristics:

- (1) Wireless transmission with forward error correction function have strong interference immunity.
- (2) Low power consumption, easy installation and simple configuration.
- (3) The interface with signal controlled machine is agile, which has variety of information deictic function.
 - a. The signal receive host has 24-channel output, which can process the vehicle information of 24 driveway (extendible).
 - b. Export 12V high-low indication that corresponds to the presence of vehicles on the driveway.
 - c. Output signal pulse width is adjustable that meets the requirements of information capture for signal controller.
 - d. Support output function, and the output terminal of multiple lanes can be parallel outputted.
 - e. It has the error indication function. When the vehicle detector does not work or the wireless transmission interrupts, it could inform the signal controller in time to protect the normal operation of the signal controller.
 - f. It is equipped RS-232 serial port. When the 24-channel (extendible) analog signal outputs, it uses the digital signal way to synchronized output.

5. Installation guide

5.1 Install detector

Firstly, close the driveway that will be installed (the proper safety precautions with the traffic police). And then select an appropriate location (as Figure13 and Figure14) to drill a round hole that is slightly larger than 130mm depth and 108mm diameter (Standard aperture drill) (as Figure15).



Figure13 Drill holes



Figure14 Drill holes



Figure15 The drawing of drilling a hole

Secondly, mix thoroughly with a proportion of cement, sand and water, and then fill in the drilled hole. Put the working detector that has recorded the number of the driveway with the installed detector into the hole, and press it down firmly. If it is necessary, we can use a rubber hammer to gently tap the detector surface cover, and finally keep the detector surface cover and the ground in the same level.



Figure16 Installation

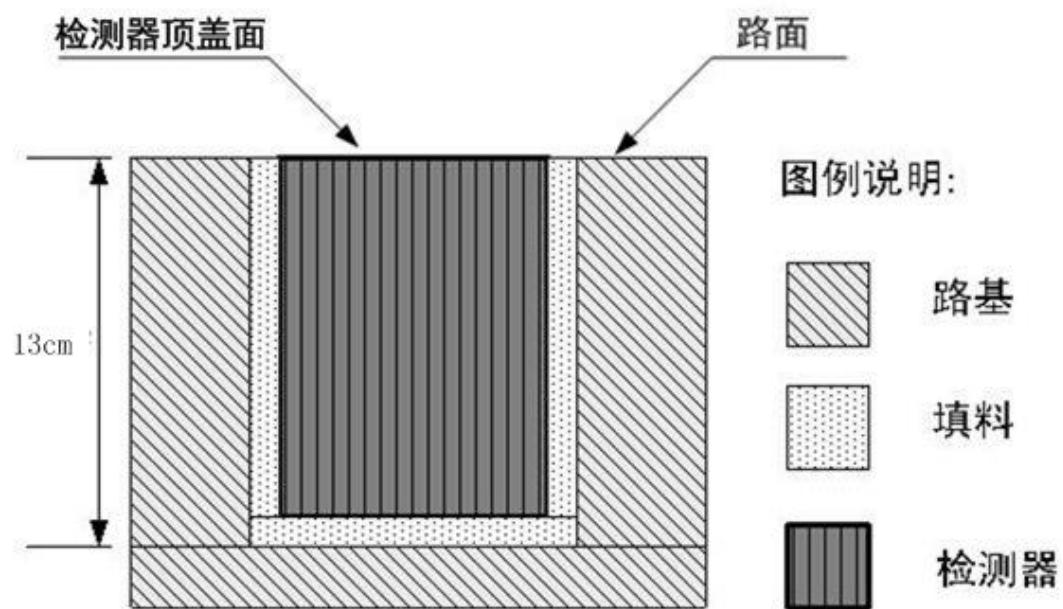


Figure17 Sketch map

Thirdly, the effect after the installation is shown in Figure18.



Figure18 The effect after installation

Finally, after the installation, clean the surface and evacuate to make the normal passage of vehicles.



5.2 Install antenna

Recommend establishing 5m-height steel, which is next to the signal control cabinet (as the Figure20 (B)). The antenna is mounted on the top tube (as the Figure20 (C)), and the feeder is connected to the receiver feeder port of the signal control cabinet. Adjust the antenna position, and aim the radiation direction at the installation position of detector. Please do the lightning protection.

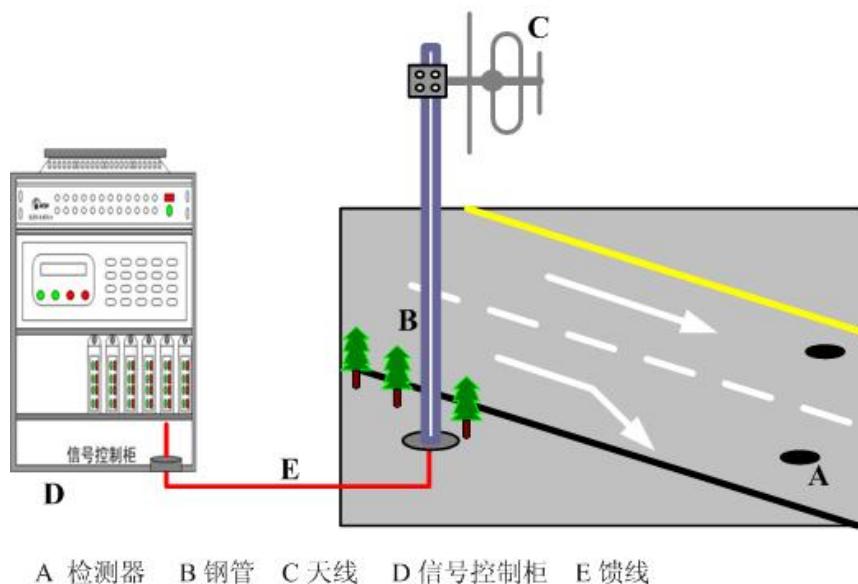


Figure20 The sketch map of antenna installation



Figure21 The effect of antenna installation

5.3 Install receiver

The receiver is installed in signal control cabinet (as Figure22), and connects the electrical power. No.1 to 24 of the LED should flash simultaneously, and the period is 2 seconds, in which 0.5 seconds is close state, 1.5 seconds is open state.

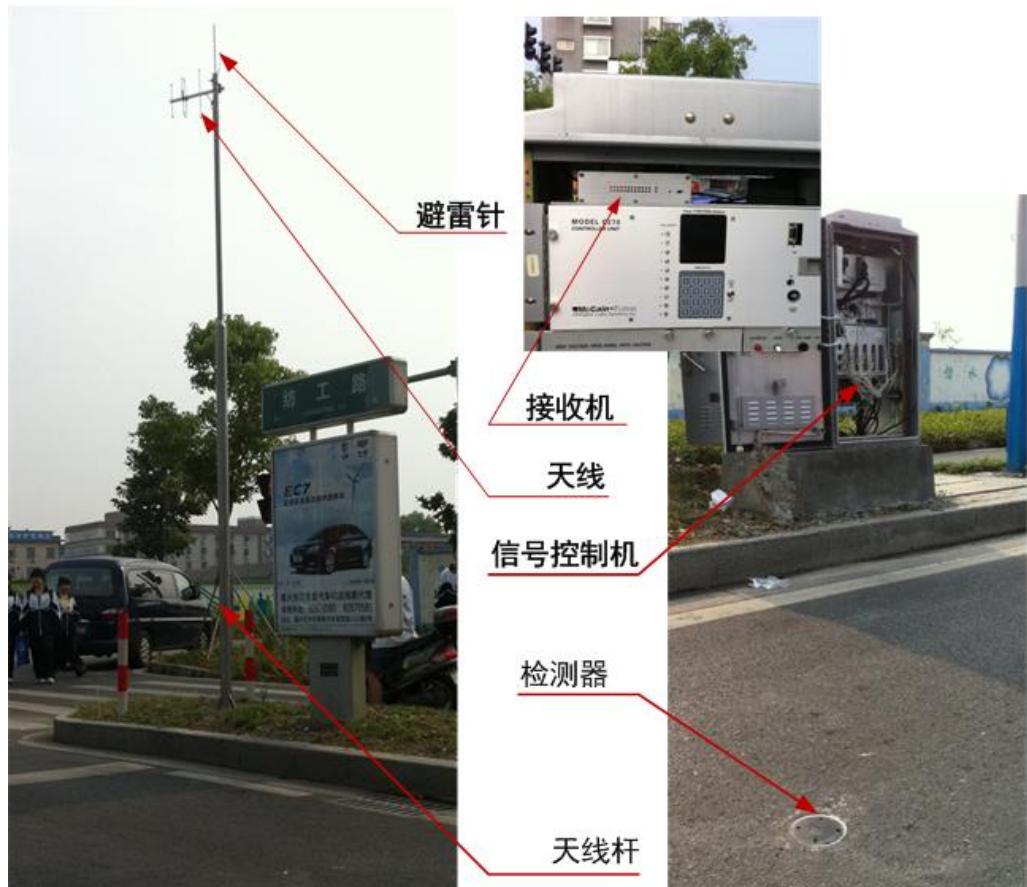


Figure22 Receiver position

The receiver starts within one minute, in which the indicator corresponding to the installed detector's number should be at the steadily open state. If the detector's number is No.1, the D1 indicator on the receiver is always light. The indicator corresponding to the uninstalled detector is at the flash state. Each receiver can access of 24 detectors (extendable).

6. Connection

The connection between the receiver and system is shown in Figure23.

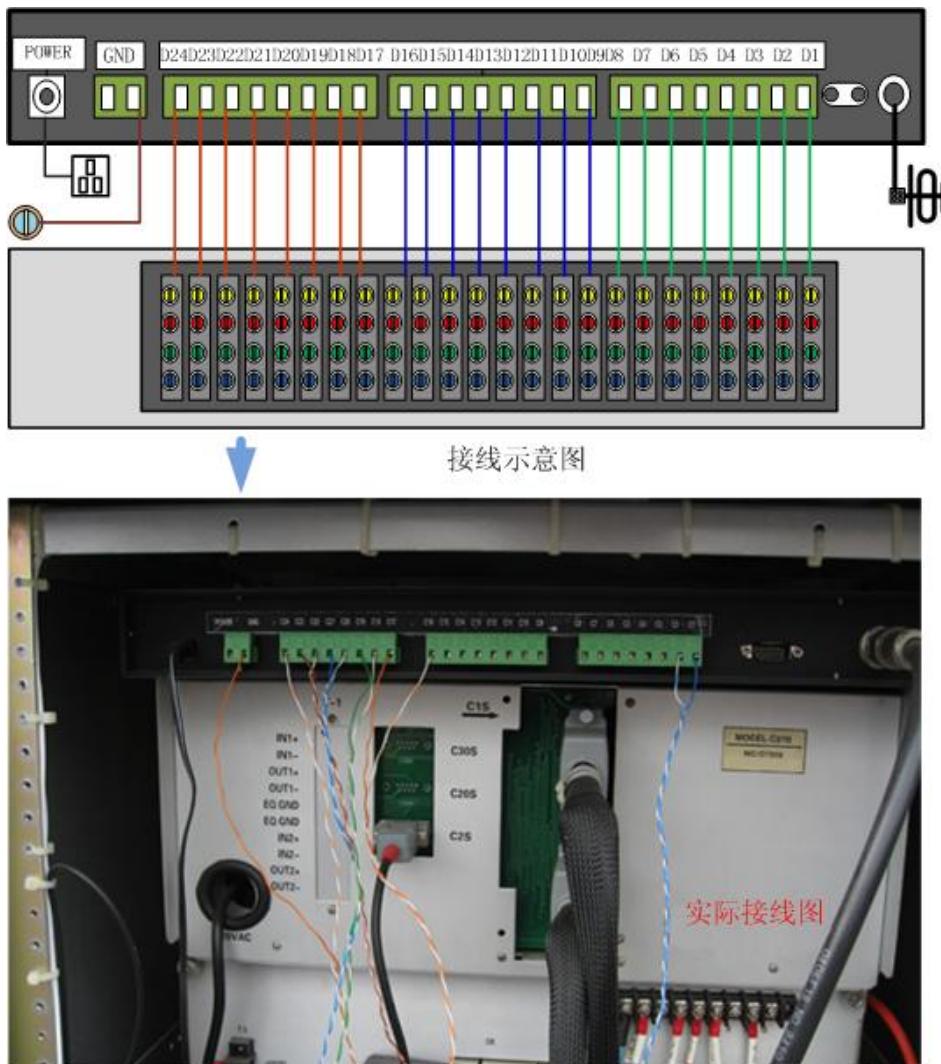


Figure23 The wiring diagram for the receiver and signal control machine

- (1) After completing the Yagi antenna setting, connect the feeder interface with the antenna interface that is on the back of the receiver.
- (2) The power adapter is inserted into the power adapter interface on the back of the receiver.
- (3) The serial port for communication is used to debug time and test the computer output data.

(4) The wiring terminal is used to output the road information to the signal controller.

There are 24 wiring terminals on the back of receiver, in which D1 to D24 interface are corresponding to 24 detectors, and GND and VCC are corresponding to ground and power. In the wiring time, it need to connect GND to the signal ground terminal, and then followed by the number to connect the detection signal output terminal to the signal input terminal that corresponds to the detector located driveway within signal controller. If the No.1 detector is laid in the east to west left turn lanes, it will connect the D1 interface to the signal input terminal that corresponds to the east to west left turn lanes within the signal machine.

7. Debug

After finishing all installation and layout for detectors, withdraw all roadblocks facilities and keep all driveway normal traffic. Observing the indicator that corresponds to the installed detector's number in the receiver and debugging it. The debugging work will include the following aspects.

7.1 Wireless transmission

Detector reports the road information to receiver through wireless network sensing. Therefore, the first thing is to check if the wireless transmission is normal.

We assume there already has installed and laid 12 vehicle detectors (numbered 01 to 12), the D1 to D12 indicators on the receiver should be in the steady light state (the detector is still in the adaptive background adjustment process) or present the flash process with the passing of vehicles (the adaptive background adjustment process is completed). The other D13 to D24 indicators should be flashing with the same frequency. This period is 2 seconds, in which 0.5 seconds is close state, 1.5 seconds is open state.

If it has occurred above periodic flashing between D1 and D12 indicators, it shows that the wireless transmission is blocked between the detector corresponding to this number and receiver. If appearing the case of transmission blocked, firstly check if this detector has been covered by the cement, and secondly check the antenna radiation angle to ensure that all detectors are within the scope of the antenna radiation.

7.2 Self-adaption background control

(1) Because the three-dimensional magnetic coefficients of earth every place are not the same, the detector has been filled adaptive background adjustment algorithm to ensure that the detector can be applied around the world. The configuration is without any artificial operation, and the detector can be done to adjust and learn the

adaptive background within 10 minutes after the layout. After that, it will normally work.

(2) Observing the D1 to D12 indicators, if the indicator is at steadily open state, it means that the detector corresponding to the number is still in the adaptive background adjustment process. If the indicator presents the flash process with the passing of vehicles, it shows that the detector corresponding to the number has finished the adaptive background adjustment and starts the normal work.

7.3 Signal output

There has the wiring terminal for signal output on the back of receiver. The test result is reported by the unit 1 to 24 terminal with 12V switch output: low electrical level is effective, it means there will output low electrical level (0V) when there has a car and output high electrical level (2V) when there does not have a car.

When the No.1 detector has detected a car, the D1 indicator in receiver frontage lights, and No.1 wiring terminal on the back of the receiver outputs low electrical level (0V). When the No.2 detector does not detect a car, the D2 indicator in receiver frontage is off, and No.2 wiring terminal on the back of the receiver outputs high electrical level (12V).

8. appendix

If this material is unclear, please contact us. Thanks!

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9. Warning

FCC STATEMENT

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
 - (1) This device may not cause harmful interference.
 - (2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- n Reorient or relocate the receiving antenna.
- n Increase the separation between the equipment and receiver.
- n Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- n Consult the dealer or an experienced radio/TV technician for help.