PUMATRONIX

ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2)

REAL-TIME MEASUREMENT OF SPEED AND DISTANCE

Product

Pumatronix Equipamentos Eletrônicos Ltda.

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Change History

Date	Revision	Content updated
14/03/2025	1.0.0	Initial edition

Overview

The continuous increase in population in urban areas implies major challenges for the public management of cities. Intelligent services using Information and Communication Technologies (ICTs) are becoming increasingly relevant in helping to monitor, control and make efficient and rapid decisions to solve the problems inherent in the large concentration of people, such as mobility and traffic safety, energy efficiency, public safety, supply control, among others.

The concept of Smart Cities is a global trend that classifies the strategic use of infrastructure and services based on the application of ICT solutions in urban planning and management, bringing results to society's social and economic needs. As such, the use of Information Technology allows cities to develop economically while at the same time increasing the quality of life of their inhabitants by generating efficiency in urban operations.

Examples of these technologies are Intelligent Transportation Systems (ITS), in which Pumatronix products such as the ITSDETECTOR 24L-3 radar are used. The device in this range can detect and track various vehicle information, in various lanes, in real time and periodically report vehicle speed, distance, angle and direction, with precise positioning and a high capture rate.

Figure 1 - ITSDETECTOR 24L-3 Radar

Summary

1. Introduction

HT-MTTR-3-485-C radar, also known as Multi-Lane Radar Velocimeter, can measure the distance, speed, driving direction of multiple vehicles in multi-lane in real time. It can capture certain vehicles, such as speeding vehicles and retrograde vehicles, by the way of triggering a camera.

This product was developed using military technologies and inherits advantages from the strong reliability of aerospace products. It has ultra-low power consumption and can operate in rain, snow, fog and other types of hostile climates.

Easy to install, this equipment enables various applications such as remote diagnostics, infringement detection, intelligent transportation assistance and other fields, with excellent performance and robustness in service.

The HT-MTTR-3-485-C currently includes radar ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2), used to monitor up to 3 tracks. The model adopts the FMCW radar system (Frequency modulated continuous wave radar). The distance and speed of the moving target are calculated by 2D-FFT (2D Fast Fourier Transform).

The model can operate in continuous output mode (Continuous Trace protocol) and single-point trigger mode (ST Capture – Multi Lane protocol).

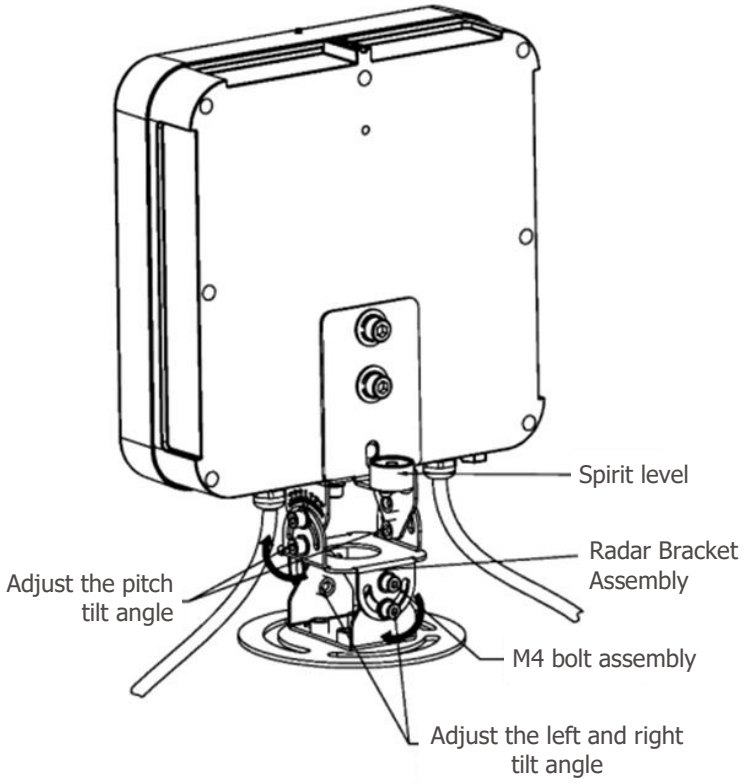

Figure 2 - ITSDETECTOR 24L-3 Radar and Bracket Assembly

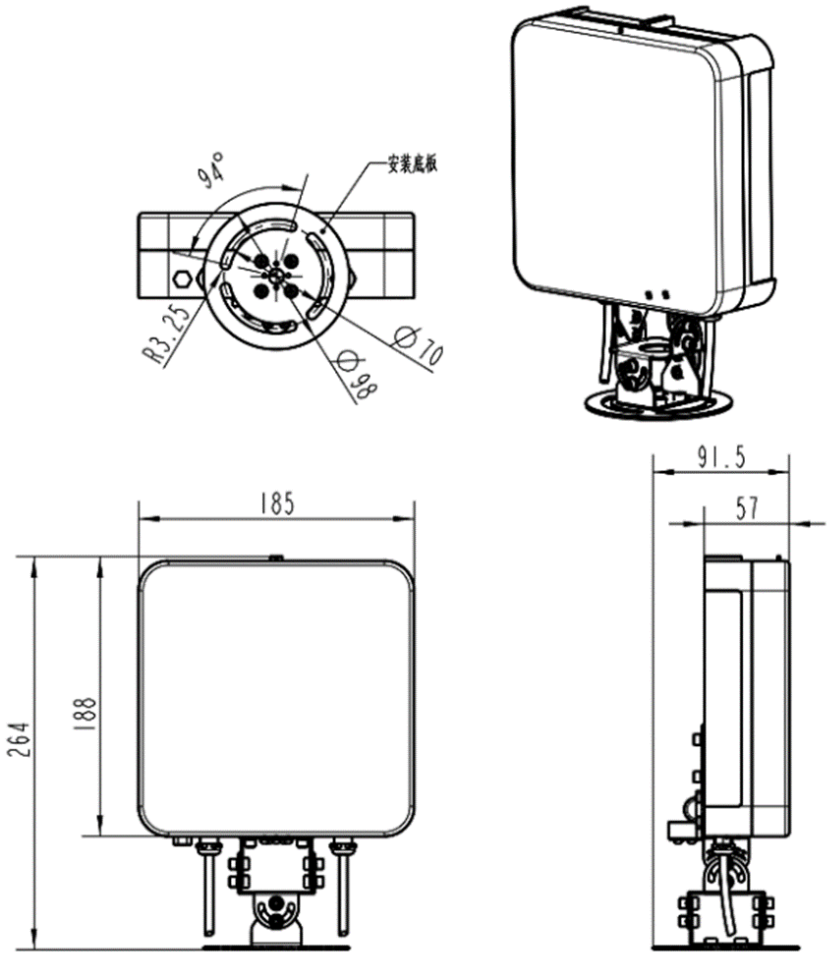

Figure 3 - Radar ITSDETECTOR 24L-3 dimensions

- Length: 189.5mm
- Width: 98mm (diâmetro do chassi)
- Height: 266mm

The radar has two external cables. One of which has two core wires used to connect to the power supply. The red core wire is connected to the positive pole of the power supply, and the blue core wire is connected to the ground wire of the power supply. The other one has three core wires, which adopts the RS485 standard and is used for data transmission. The red core wire is connected to RS485_ A. Green core wire connected to RS485_ B. The blue core wire is connected to the communication GND.

Mount the radar on the traffic crossbar with screws or clamps, like figure 3.

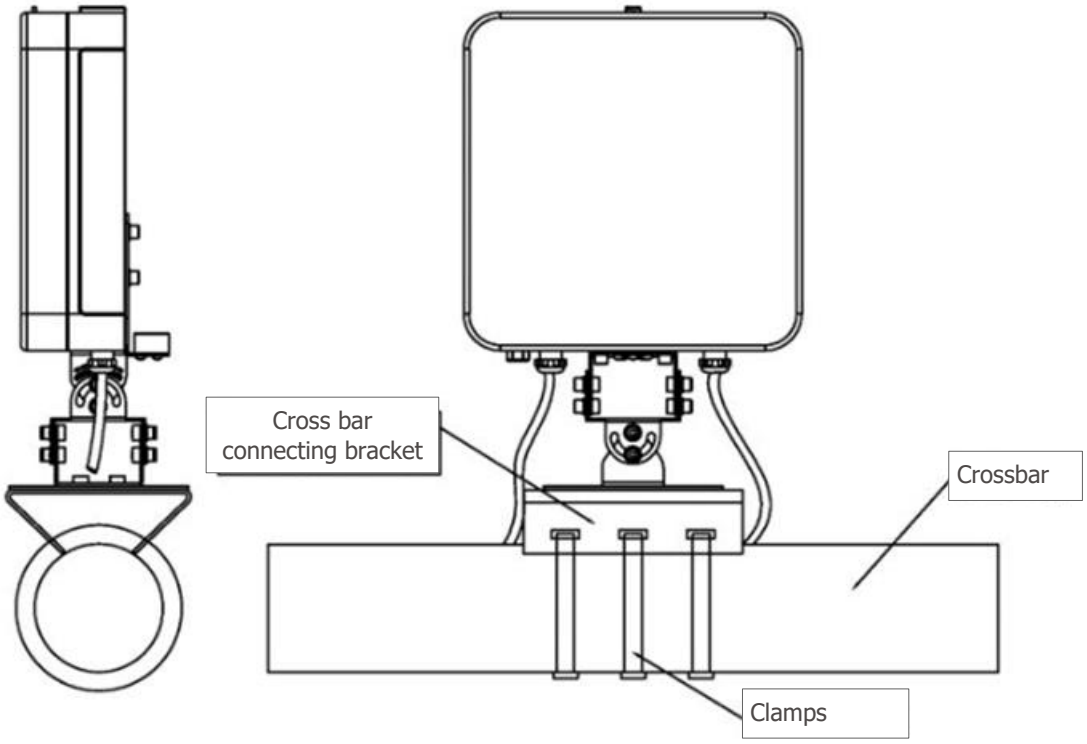

Figure 4 - Radar fixing with clamps

2. Technical Specifications

		ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2)
Operating Parameters	Frequency	24,150 GHz
	Speed range	2~300 km/h (bi-directional)
	Speed measurement error	± 2 km/h
	Distance range	0~40 meters
	Distance measurement error	± 0,325 meters
	Data update cycle	50 ms
	Horizontal beam width of the transmitting antenna	26.0°@6dB
	Vertical beam width of the transmitting antenna	18.0°@6dB
	Horizontal beam width of the receiving antenna	59.6°@6dB
	Vertical beam width of the receiving antenna	18.0°@6dB
	Vehicle capture rate	99%
	Redundant taking rate	< 1%
	Empty taking rate	< 1%

Power and Consumption	Power	DC 12V (With reverse polarity protection)
	Power consumption	≤ 3,5W
Communication Interface	Communication	RS485
Environmental Conditions	Temperature	-40°C a +85°C
	Humidity	0% a 90% @ RH (50°C)
	Atmospheric pressure	86 kPa a 106 kPa
Interior Protection Factor	Standard	IP67

3. Installation

The device ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2) monitors multiple lanes and can be installed on lane-side poles, gantries or semi-gantries, in the center of the set of lanes. For example, when using the HT-MTTR-3-485-C2 to cover three lanes, it needs to be mounted towards the center of the second lane. As shown in the figure:

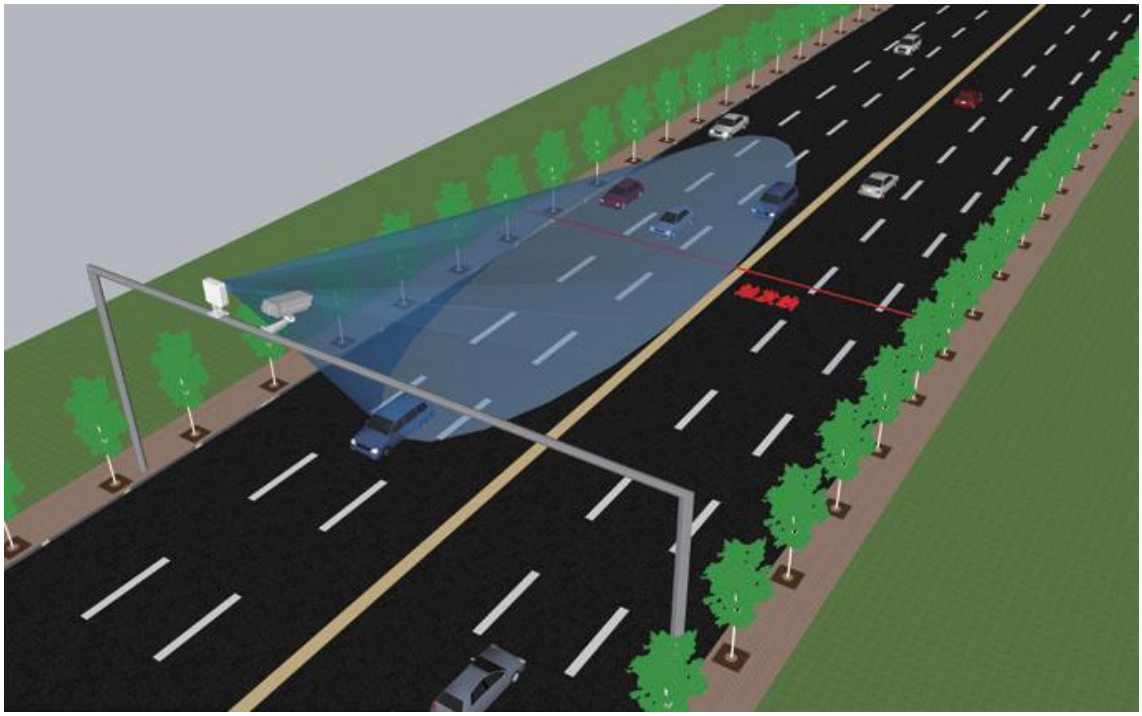

Figure 5 - Example of model installation ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2)

The pitch angle of radar mounting needs to be adjusted according to different installation heights. As shown in figure 5, the variable **α** is the pitch angle of radar.

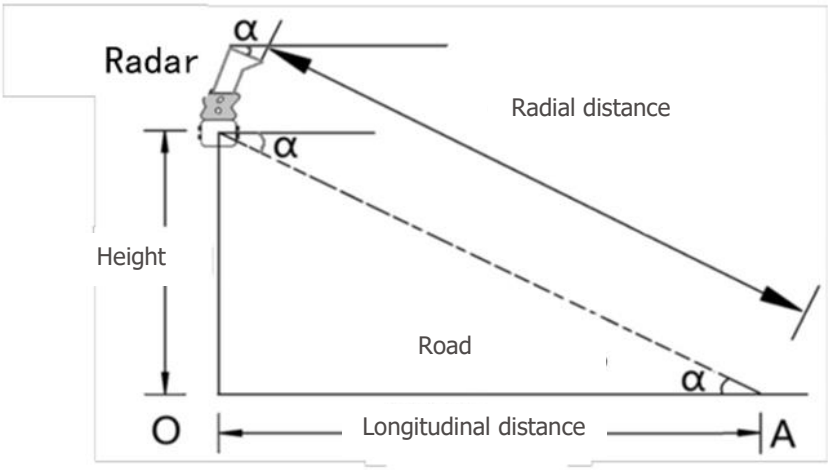

Figure 6 - Schematic diagram of radar adjusting pitch angle

The pitch angle **α** is adjusted according to the mounting height of the radar, as shown in table:

Installation height（Apart from the ground)	Pitch angle α
5 meters	14°
6 meters	15°
7 meters	15°
8 meters	16°
9 meters	16°

After the radar pitch angle is adjusted, the actual mounting height of radar is input, and then press the button of *WritePara* on the interface of radar host computer.

After radar mounted to the crossbar type or "Γ" bar, recommend adjustment radar profile according to the following steps:

1) Tighten the bottom screw to fix the radar on the bracket, adjust the gimbal of the radar, and put the bubble in the center of the level instrument to make the radar in the horizontal state (Figure 7), and record the pitch angle **γ** displayed by the side scale (Figure 8);

Figure 7 - Schematic diagram of horizontal state adjustment

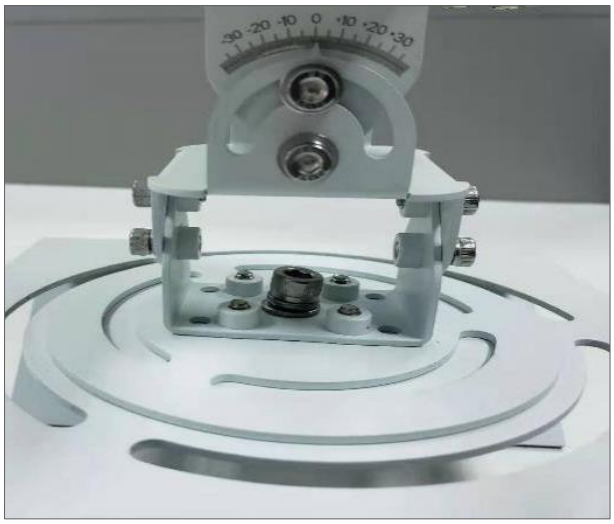

Figure 8 - Initial angle marking is 0°

2) According to the actual mounting height, find the angle **α** given in table 1, and the final pitch angle is (**γ** +**α**) on the side scale, with the tolerance of ±1°. For example, if the radar is mounted at 7 meters height, the initial pitch angle is 0°, and the radar pitch angle (**α+γ**) is 15° (Figure 9). In the actual mounting process, the initial angle is generally not equal to 0 degrees.

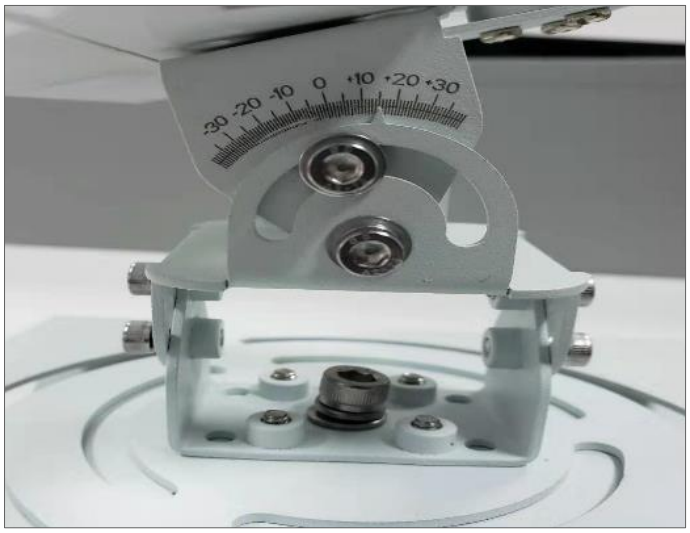

Figure 9 - Recording the angle of inclination

3) By horizontal rotation, aim at the center of the monitoring area (the center point of the target lane) according to the sight on the radar structure bracket (Figure 10).

Figure 10 – Horizontal rotation diagram

ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2) can be rotated horizontally, as shown in Figure 10, so that aim at the center of the monitoring area.

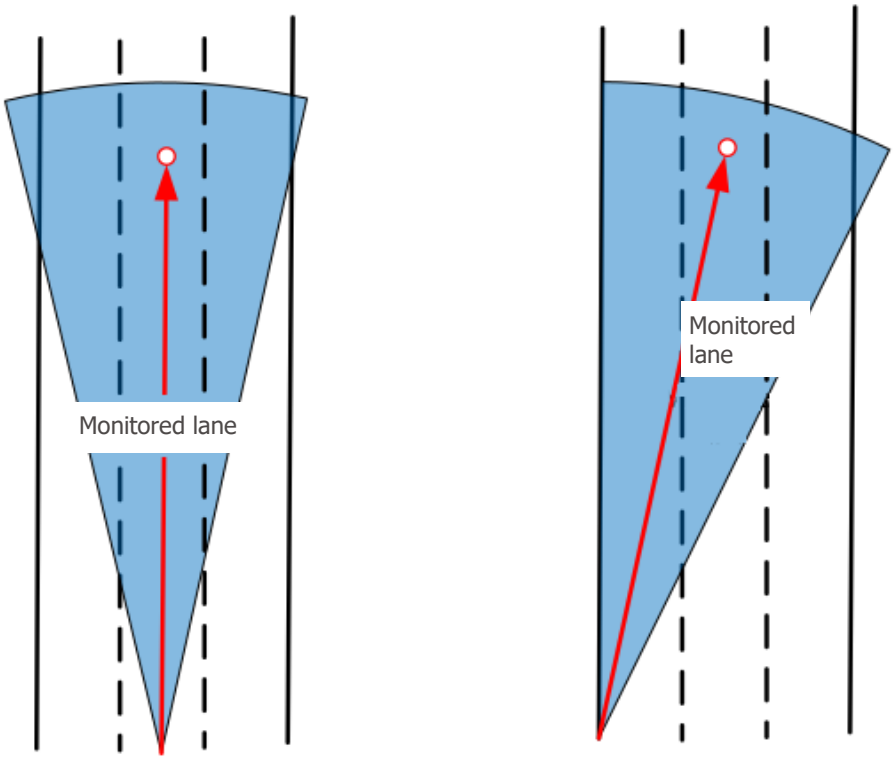

Figure 11 - Examples of rotation of the ITSDETECTOR 24L-3 (HT-MTTR-3-485-C2)

4. Debugging Method

4.1. System connection

After the radar is mounted according to the actual environment, connect the capture device according to the communication path, as shown in Figure:

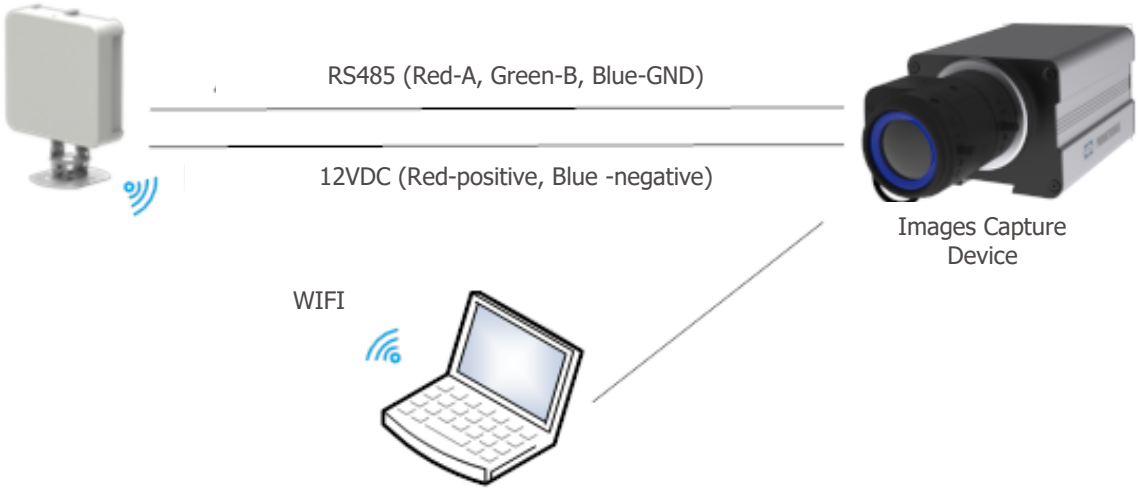

Figure 12 - Diagram of radar connection

The radar and the capture device are connected by a 485 line and a 12V power line, as shown in Figure 12. The radar is directly connected and debugged through WiFi the steps are as follows:

1) Connect the corresponding WIFI with a computer (WiFi Name: HT-MTTR-XX-XX-XX, WiFi Password: 12345678);
2) Open the HT-MTTR-3-485-C radar debugging host computer;
3) Select TCP / IP transparent transmission mode, the server IP is 192.168.1.1, the port number is 8899;
4) Click on *Connect* to network, the radar debugging host computer should display *Connected* radar status, as shown in figure:

Figure 13 - Connecting Radar

4.2. System Debugging

1) Set the mode to *Continuous trace*: Set the mode to *Continuous trace*, select *Continuous trace*, and press *Working mode setting*. *Working mode setting successfully* will be displayed in the information bar.

Figure 14 - Mode setting

2) Set Radar parameters: Estimate the horizontal coordinate d (left negative right positive) of the left edge of 1 lane relative to the radar (origin), and bind the width of 1 lane (generally 3.8m). For single lane

radar, the width of 2/3 lane is set to 0. Click the lane setting binding, the text box appears, the lane setting binding is successful, as shown in figure:

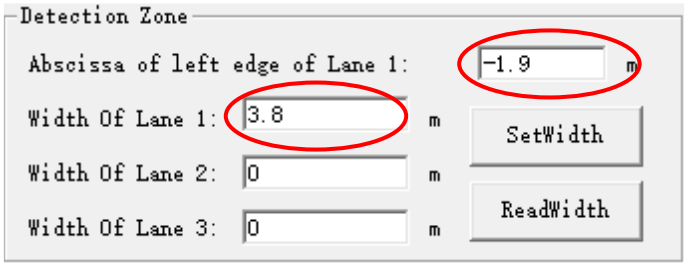

Figure 15 - Lane setting

If the radar is typically mounted, the *OffsetAngle* angle is set to 0 °; if the radar is mounted with deflection, the *OffsetAngle* angle (The radar is deflected to the left at a positive angle. The radar is deflected to the right at a negative angle.) is written, and then click *WritePara*, the text box appears *Parameter writting success*, as shown in figure:

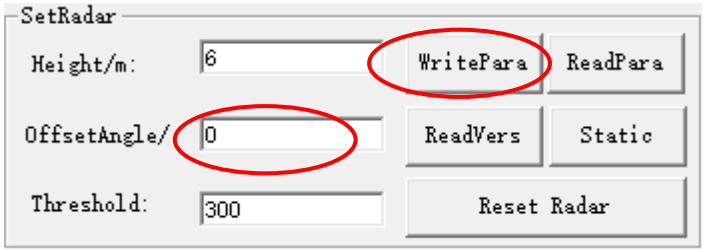

Figure 16 - Installation height and deflection angle settings

3) Observe vehicle lane: In the track display interface on the left side of the debugging host computer, observe whether the lane of the passing vehicle is upright (start tracking from 40 meters away, the tracking track is in the set lane), as shown in Figure 17. If the lane is too short, the pitch angle of the radar is too large, and the radar needs to be raised upward. Fine tune the "OffsetAngle" angle so that the target's track is parallel to the lane line

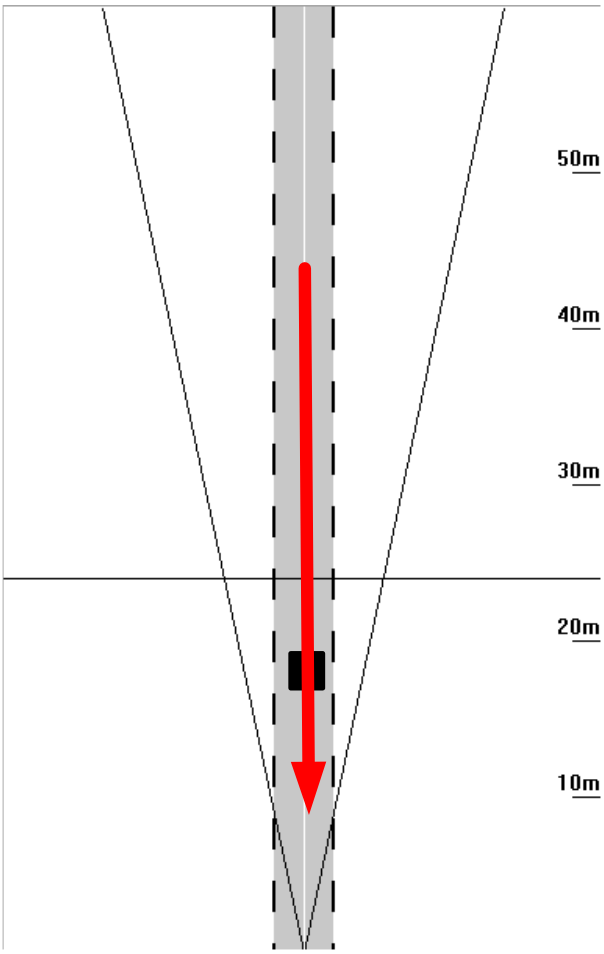

Figure 17 - Schematic diagram of vehicle track

4) Set the radar into the *Capture Mode*: The radar working mode is set to *Capture Mode*, as shown in Figure 18

Figure 18 - Capture Mode setting

Writting the radar snap position according to the actual requirements, click the *SetDistance*, and the text box appears that the writting is successful, as shown in figure:

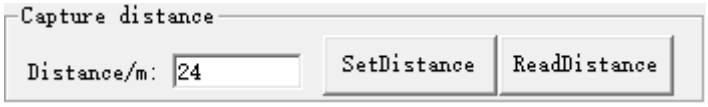

Figure 19 - Capture distance setting

The capture direction setting bar is shown in Figure 20. The drop-down list has three options: bidirectional, destination, and direction. The user selects the appropriate capture direction in the drop-down list, and then clicks the capture direction setting button to complete the setting of the capture direction. When the user needs to query the capture direction, click the capture direction query button to display the current capture direction in the drop-down list.

Figure 20 - Capture direction setting

5) Observe the capture effect: Every time a car passes, the capture information should be displayed in the lower text box area. If there are multiple captures of the big car, adjust the model recognition setting (the default value is 5.000) to reduce the threshold of the big car. The recommended value is 4.000/ 3.000/ 2.000, as shown in figure:

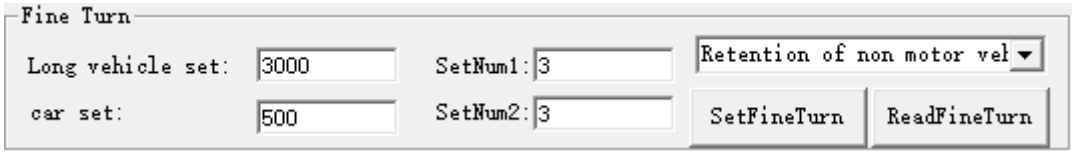

Figure 21 - Long vehicle setting

Then set the relevant parameters of the capture device, you can observe the captured images in the device.

5. General Warranty Conditions

Pumatronix ensures the product against any defect in material or manufacturing process for a period of 1 year from the date of issue of the invoice, provided that, at the discretion of its authorized technicians, it is found to be defective under normal conditions of use.

The replacement of defective parts and the execution of services resulting from this Warranty will only be carried out at Pumatronix Authorized Technical Assistance or a third party expressly indicated by Pumatronix, where the product must be delivered for repair.

This Warranty will only be valid if the product is accompanied by a *Maintenance Form* that has been duly completed and has not been erased and is accompanied by an Invoice.

5.1. Situations in which the Product loses its Warranty

1) Use of software/hardware not compatible with the specifications in the Manual;
2) Connecting the product to the mains outside the standards set out in the product manual and installations with excessive voltage variation;
3) Infiltration of liquids from opening/closing the product;
4) Damage caused by natural agents (electric shock, flooding, salt spray, excessive exposure to climatic variations, among other factors) or excessive exposure to heat (beyond the limits established in the Manual);
5) Use the product in environments subject to corrosive gases, excessive humidity and/or dust;
6) Show signs of tampering with security seals;
7) Show signs of opening and modification by the Customer in places of the product not authorized by Pumatronix;
8) Damage caused by accidents/falls/vandalism;
9) Display tampered and/or removed serial number;
10) Damage resulting from the Customer's transportation and packaging of the product in conditions incompatible with it;
11) Misuse and not in accordance with the Instruction Manual.

6. Privacy Policy

In compliance with the General Data Protection Law (LGPD) - Law No. 13709, dated August 14, 2018, this product has programmable functions for capturing and processing images that may infringe the LGPD when used in conjunction with other equipment to capture personal data.

The equipment does not collect, use or store personal information, whether sensitive or not, for its operation.

Pumatronix is not responsible for the purposes, use and handling of the images captured, and control of the information and ways of operating the product are the sole decision of the user or purchaser of the product.


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