



Traffic Flow Monitoring Radar

User Manual

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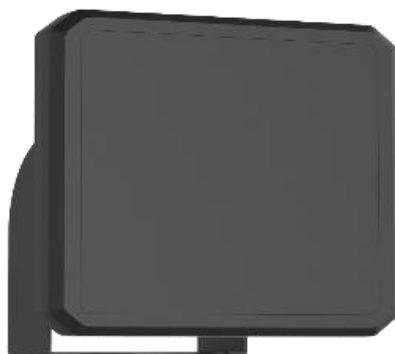
Symbol	Description
 NOTE	Provides additional information to emphasize or supplement important points of the main text.
 WARNING	Indicates a potentially hazardous situation, which if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
 DANGER	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

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Chapter 1 Product Introduction

1.1 Shape



1.2 Port Introduction

Cable Color	Name	Cable Color	Name
Red	DC 24+	Green	RS-485+
Black	DC 24-	Blue	RS-485-
		Brown	GND

Data communicates with other devices via Ethernet.

Chapter 2 Installation

The radar is recommended to be installed on the 6-meter high gantry, L-shaped rod, column, etc., and formal installation is recommended. If it cannot be installed at the positions above, the road side installation can also be considered. When installing on the road side, you need to adjust the horizontal detection angle.

There should be no big blocking items in front of the radar, such as road sign, metal mesh, advertising board, etc. The radar performance may be degraded because of the blocking radar beams.

Installation:

Fix the radar and its bracket at the designated firm position of the pillar arm. The radar installation should be oriented towards the detection area. It requires to tilt down 1 to 2 degrees when installing radar.

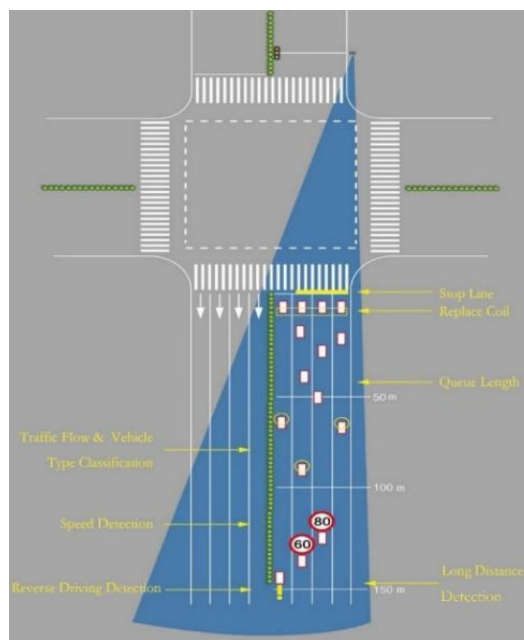


Figure 1 Installation



- The radar should be fixed firmly on the bracket, and the material of the bracket should be strong and durable enough to prevent vibration in case of degrading the performance.
- Ladders or aerial ladder truck shall be used during installation. The operation shall follow the safety operation requirements. The worker should be familiar with the power equipment, radar device operation and can work at the high altitude.
- When working at the heavy traffic road, the workers should wear safety reflective jackets, safety helmets, and set warning signs as the safety requirements asked.



WARNING

- The radar supply voltage is 24 VDC. It will cause damage when connecting to 220 VAC power, and the manufacturer doesn't have any responsibility for such operation.
- If there is any damage about the cable when opening the package, please stop the installation and DO NOT try to repair it by yourself. Please contact the seller and confirm the damage with them.
- Installation operation should comply with company safety regulations or local safety policies.

Chapter 2 Debugging Software

2.1 Overview

This software is a debugging software for traffic flow monitoring radar. It is used to set radar parameters, debug the radar, and troubleshooting.

2.2 Installation Instruction

Software: This software is suitable for running under Windows 7 system and above. NET Framework 4.0 or later (included in the installation package) and Windows 7 64-bit version is recommended.

Hardware: The minimum configuration, 2.0 GHz CPU frequency, 2 GB memory, and 1 GB video memory. Independent graphics card is recommended for better display effect.

2.3 Install Software

Run the setup.exe. If the computer does not installed with NET Framework, the software will install NET Framework first. Then install the debug software by following the installation wizard. After selecting the installation path, the wizard will install the software automatically.

Click "finish" when the installation is completed. The software will create a shortcut named "FCWRadarTestingSoftware.exe" on the desktop. Double click it, and run the software.

2.4 Software Function Introduction

Fix the radar and turn it on. Connect the PC via Ethernet. Open the debugging software. The initial interface is shown as Figure 2. The software interface is divided into the software function bar area, radar parameter setting area, information display area, and radar status area.

Click "connect", and then input IP address of the radar. The default IP address is 203.0.113.64. The PC should be in the same network segment with that of the radar. Set port (5000 and 9001 respectively as shown in Figure 3), and click OK.

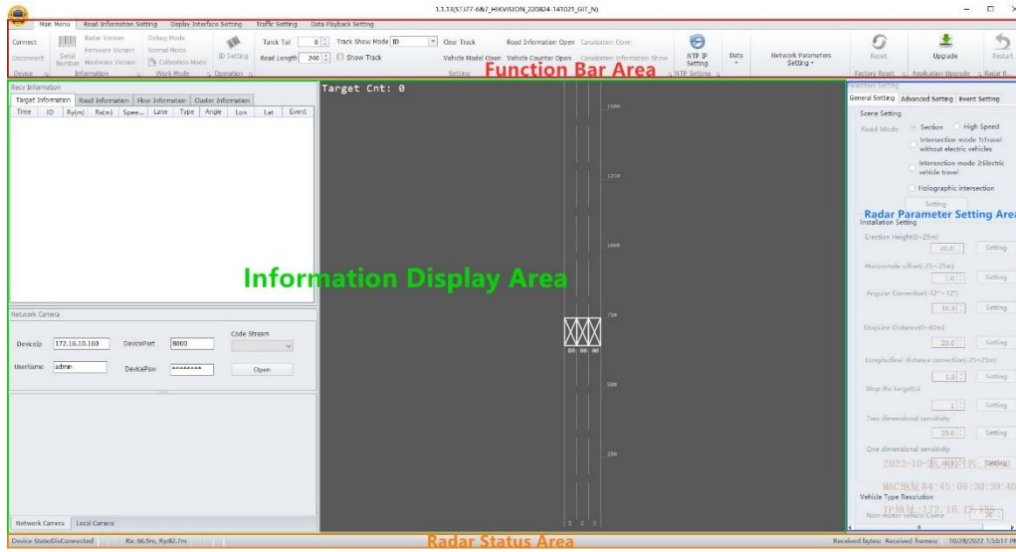


Figure 2 Debugging Software

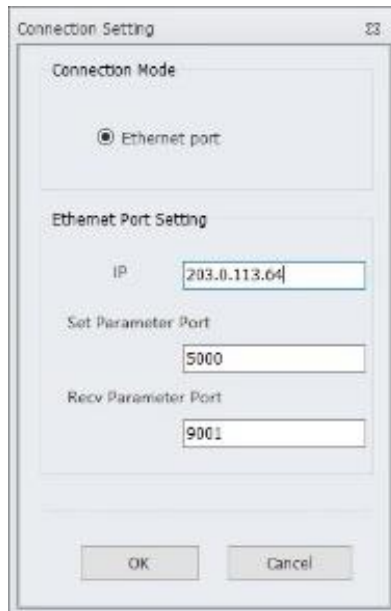


Figure 3 Connection Settings Menu

2.4.1 Function Bar Area

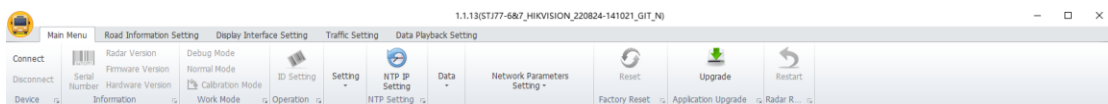


Figure 4 Function Bar Area

The function bar is divided into five parts: Main Menu, Road Information Setting, Display interface Setting, Traffic Setting, and Data Playback Setting.

2.4.1.1 Main Menu Bar

- **Device connection:** The radar communicates with the debugging software through the Ethernet port. Click device connection, set the target IP address, click OK, and wait for the device connection.
- **Disconnect the device:** Disconnect the communication connection between the host computer and the radar.
- **Product serial No. and software version:** Information such as radar SN (product serial No.) and software version can be viewed at the bottom of the interface.
- **Debugging mode:** The gray icon indicates that the radar is in debugging mode. In this status, the radar displays all targets detected within the entire beam range.
- **Normal mode:** The gray icon indicates that the radar is in normal mode.
- **ID setting:** When two or more radars are set up in the same direction or in the same area, if the last digit of product SN is same, it shall be changed to a different digit to avoid the interference.
- **Track trailing:** Track trailing can realize the linearization of target motion trajectory. By changing this value, the length of track trailing displayed by the target can be changed.
- **Road length:** Appropriate lane length can be defined according to the actual road environment requirements, and the maximum length can be set up to 1200 meters.
- **Display trajectory:** After the radar detects the vehicle target, it can track the vehicle target sustainably and effectively until the target is out of the radar detection range. Track display can observe the vehicle in the lane more intuitively. If this option is selected, the target motion trajectory will be displayed. If this option is not selected, it will not be displayed.
- **Clear track:** When there are more targets detected, more tracks displayed on the debugging software interface will affect the tester's judgment of vehicle motion. At this time, the current trajectory can be cleared and only the vehicle driving situation can be observed.
- **Vehicle type:** Large, medium, and small vehicle types. Default status: ON.

- **Road information:** Click and the road information dialog box appears, showing the road queue length.
- **Vehicles number statistics:** Click the number of vehicles statistics, you can display and count the number of vehicles in each lane.
- **Enable/Disable channelization setting:** Enable road channelization setting, which is used to set road channelization at intersections.
- **Channelized road information display:** Channelized setting on state. Click this button to display or hide the channelized setting data.
- **Data preservation:** This function can save the vehicle data information monitored by the radar in real time, so that the user can read back the data, and provide the user with an effective basis for the smooth operation of the road. If yes, the playback data will be saved for later selection. In addition, if the camera is enabled, the debugging software will hover over the interface of the camera to save playback pictures, but the local camera does not need to do this operation.

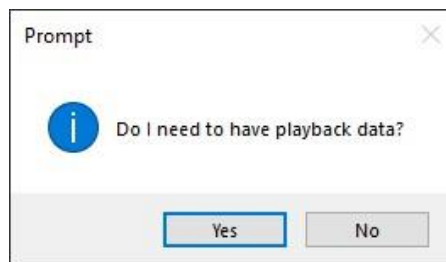


Figure 5 Playback Data Prompt

- **Stop recording:** This function can stop recording data. Click and you will be reminded the path where the data is saved.
- **Network parameters setting:** After you click Open, you need to enter the password to change the network parameters. The password is 123++321. After the change is successful, radar connection needs to be made with a new IP address. (The new network parameters take effect only after the radar is restarted after the network parameters are modified.)

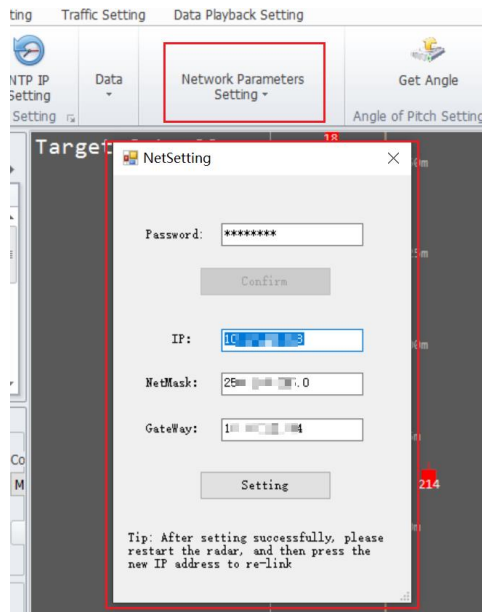


Figure 6 Network Parameters Setting

- **Restore Default Settings:** The radar parameters are restored to the default settings.
- **Program upgrade:** Update radar program via Ethernet port.
- **Radar restart:** The radar can be restarted.

2.4.1.2 Road Information Setting Bar

You can set the number of lanes, vehicle driving direction, and other parameters, as shown in the figure below:

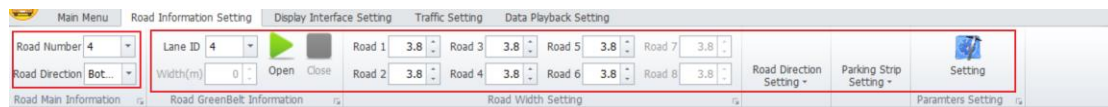


Figure 7 Road Information Setting Bar

On this interface, you can set road main information, road median strip, road width, and road direction. After setting, click “Set” to confirm the setting.

2.4.1.3 Display Interface Setting Bar

You can set the display effect of radar beam and lane, as shown below.

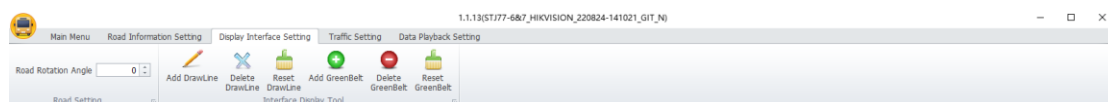


Figure 8 Display Interface Setting Bar

- **Add lines:** You can add curvature or cross lane lines according to the real road conditions by using the mouse to click 2 points on the position in the software.

- **Delete lines:** You can delete extra lane lines according to the real road conditions. You can operate by the mouse to click 2 points at the position.
- **Reset:** Restore the lane lines displayed initially.
- **Add median strip:** You can add median strip according to the real road by the mouse to click 4 points in the desired position.
- **Remove median strip:** According to the real road to clear the median strip settings by the mouse to click 4 points in the desired position.
- **Reset median strip:** Restore the initial setting of the median strip.

2.4.1.4 Traffic Setting bar

You can open and close the virtual coil function, and make statistics on road vehicles as shown in the figure below.



Figure 9 Traffic Setting bar

Click "Turn On Virtual Loop Detector Setting Interface" button to turn on the virtual loop detector setting interface (set loop detector type, coordinates, length and other information). The "Receive information" bar automatically switches to the traffic information interface. Set cycle time (unit: s), and click "Start Statistics" for road traffic statistics.

2.4.1.5 Data Playback Settings Bar

You can realize the saved data playback function, as shown in the following figure.

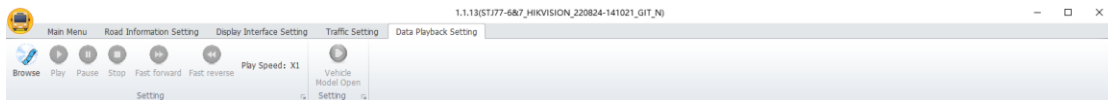


Figure 10 Data Playback Settings Bar

This bar is used when the radar is disconnected. File is selected in folder which name is the date instead of the PlayBackData folder. For example:

D:\\Data\\20210521-180603\\PlayBackData. You just need to choose folder 20210521-180603 instead of sub-folder PlayBackData.

2.4.2 Information Display Area

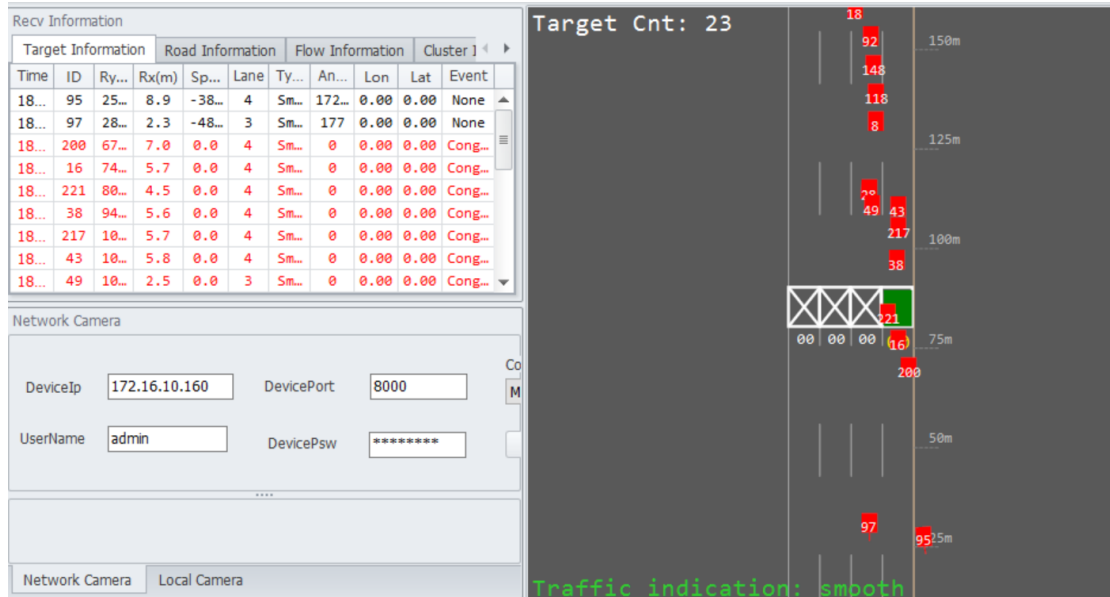


Figure 11 Information Display Window

Information Display Window can help user to record and observe the driving conditions and information of target vehicles in real time. The display window mainly includes target information, camera, road information, flow information, and road condition model.

The target information window displays the information of the target vehicle detected by the radar in real time, including the vehicle number, distance, lateral distance, speed, lane number, and event information, which can help user to analyze real-time monitoring data.

Camera connects to mainstream USB cameras and Hikvision cameras. After the Camera is successfully connected, the user can cooperate with the lane 2D/3D model according to the real-time video picture to help the user set up and debug the radar.

2.4.3 Radar Status Area

This area is located below the debugging software interface, and user can check the radar connection status, product SN, software version, and other information in the "radar status area".

2.4.4 Radar Parameter Setting Area

Radar debugging includes Common Settings, Advanced Settings, and Event Settings, as shown below.

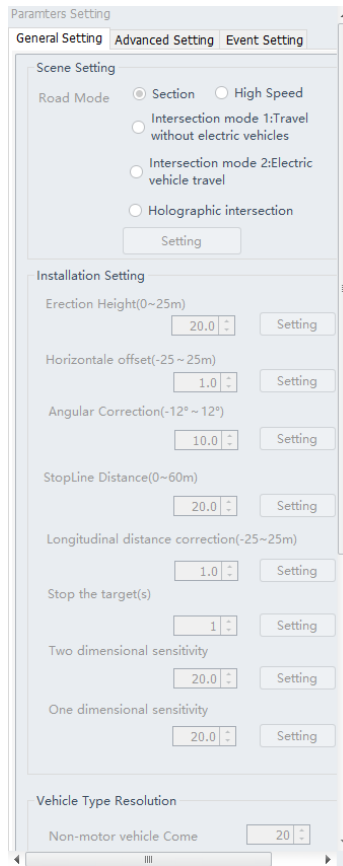


Figure 12 Parameter Setting Area

2.4.4.1 Common Setting

The user can set the radar scene type, installation parameters, sensitivity, and vehicle type classification according to the real installation environment of the radar.

2.4.4.1.1 Scene Setting

You can choose main road type and intersection type.

Section: Usually does not include a road intersection.

High Speed: Select this mode when the radar is operating at high speed.

Intersection mode 1: Applicable to intersections with non-motor vehicle.

Intersection mode 2: Applicable to the intersection without non-motor vehicle.

Holographic intersection: It is suitable for the target monitoring under the intersection.

2.4.4.1.2 Installation Setting

In this option, the user can set the installation height, horizontal offset, angle correction, lower limit of blind area, Y-distance correction, stop target, and other information according to the real installation environment of the radar.

- **Erection Height:** The vertical height of the radar center from the ground.
- **Horizontal Offset:** Correct the X-position offset of the radar with respect to the center of the total road width. “-” to the left and “+” to the right.
- **Angular Correction:** The adjustment range is $\pm 12^\circ$, and correct lateral angle deviation caused by radar installation angle deviation same as the horizontal deviation correction. Left is “-” and right is “+”.
- **Stop line Distance:** Set the radar's straight-line distance from the stop line.
- **Longitudinal distance correction:** Correct the target distance error in Y direction.
- **Stop the target:** Set the retention time of the stop target. The unit is second. If the value is 0, the stop target will remain until it starts to move.
- **Two dimensional sensitivity:** The ability of the radar to recognize the target velocity. The higher the value, the lower the sensitivity, and the lower the target detection rate. On the contrary, the smaller the value, the higher the sensitivity, the higher the target detection rate, and the increase of false alarm. The user can set it reasonably according to the real road conditions, and the recommended value of sensitivity is 4.
- **One dimensional sensitivity:** The ability of the radar to recognize the target distance. The higher the value, the lower the sensitivity, and the lower the target detection rate. On the contrary, the smaller the value, the higher the sensitivity, the higher the target detection rate, and the increase of false alarm. The user can set it reasonably according to the real road conditions, and the recommended value of sensitivity is 4.

2.4.4.1.3 Vehicle Type Resolution:

Non-motor vehicle Come, Non-motor vehicle Go, Non-motor vehicle Limit Come, Non-motor vehicle Limit Go:

The values of these four parameters are set as the sensitivity threshold. The smaller the value, the greater the possibility of identification as a non-motor vehicle, and the larger the value, the greater the possibility of identification as a non-motor vehicle.

Middle vehicle come, Large vehicle come, Middle vehicle go, Large vehicle go:

The values of the four parameters are set to the length of the vehicle in meters as shown in Figure 13. It means that a motor vehicle larger than 6 meters and smaller than 9 meters is judged as a middle vehicle, while a motor vehicle larger than 9 meters is judged as a large vehicle.

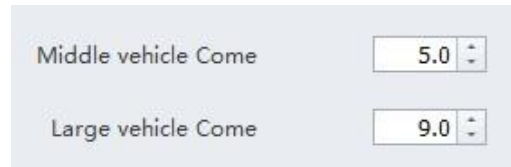


Figure 13 Vehicle Length

2.4.4.2 Advanced Setting Bar

This window is mainly used for automatic angle correction of radar in debugging mode and advanced sensitivity setting in special scenes.

By observing the CFAR point in the circular chart of the point cloud, it can determine whether there is interference source in the radar beam range. If there is no target in the field of vision, but there are more CFAR points concentrated all the time, it can be adjusted by the "sensitivity setting" of 4 different distance ranges in the "advanced sensitivity setting".

If the target trajectory is inconsistent with the real trajectory, click the "Automatic Angle Correction" button to correct the angle to make them match with each other.

After debugging the radar, click the button of "Common Settings" on the left of "Advanced Settings" to return to the standard interface, and then click the button of "Normal Mode" to switch the radar to the normal working state.

2.4.4.3 Event Setting

In this window, you can set parameters such as High Speed Threshold, Slow Speed Threshold, and Queue Length Event.

At present, the event detection supported by the radar includes regular parking, congestion parking, vehicle overspeed, slow vehicle, opposite direction, etc. The event detection results are displayed in the "event detection -- target information" in the information display area.

The queue length and information of different lanes can be selected by setting the queue length upper limit of the corresponding lane in Queue Length event.

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The screenshot displays the 'Event Setting' tab of the radar monitoring software. It is divided into four main sections:

- Target Track:** A vertical list of radar returns with their respective range values in meters (e.g., 285m, 280m, 275m, etc.).
- Target Information:** A table titled 'Radar Target' containing the following data:

Num	Ry	Rx	Vy	Vx	Angle	SNR	LostN...
10	19.0	-3.3	-9.3	1.4	1.0	0	0
305	107.	2.5	0.0	0.0	2.0	2	10
299	108.	6.0	0.0	0.0	3.0	1	244
284	111.	2.4	0.0	0.0	2.0	2	13
264	128.	3.0	0.0	0.0	2.0	2	29
374	135.	3.0	0.0	0.0	2.0	2	115
335	135.	3.0	0.0	0.0	2.0	2	196
404	143.	2.9	0.0	0.0	2.0	2	125
92	150.	2.5	0.0	0.0	2.0	2	173
274	157.	0.6	0.0	0.0	2.0	2	121
352	163.	1.6	0.0	0.0	2.0	2	131
226	169.	2.1	0.0	0.0	2.0	2	184
67	176.	3.0	0.0	0.0	2.0	2	173
161	185.	0.6	0.0	0.0	2.0	2	147
162	192.	0.6	0.0	0.0	2.0	2	147
163	199.	0.6	0.0	0.0	2.0	2	147
164	205.	0.6	0.0	0.0	2.0	2	147
- Radar Display:** A circular radar plot with a grid, showing several blue dots representing detected targets.
- Event Setting Panel:** A configuration area on the right with the following settings:
 - Overspeed Threshold(km/h): 120
 - Slow Down(km/h): 10
 - Parking Information: Lane 1-8 Queue Length, all set to 15.

At the bottom of the interface, there are controls for 'Track Tail' (set to 100), 'RoadLen' (set to 240), and a 'Draw Time: 2.0033 ms ~ 499.2 FPS' indicator.

Figure 14 Event Setting

Chapter 3 FAQ


3.1 Failed to connect to the radar.

- Check whether the IP addresses of PC and radar are in same network segment.
- Check status of power supply and the operating status of radar device.
- Check the cable connection of radar is reliable or not.

3.2 No vehicle target displayed after debugging.

- Check whether CFAR information in point cloud chart is good in “Advanced Setting - Status Bar”.
- Check radar parameters. Adjust radar elevation angle and horizontal offset to make radar beam cover the target road lane.
- Check the radar working status. Check whether the value of received bytes and frames are changed in “Radar Status Bar” of the debugging software.

3.3 Firmware upgrade operation description

- Before upgrading the radar firmware, disconnect the debugging software from the radar. Click , the radar connection setting interface pops up. Enter the radar IP address, and set the parameter port to 5000 by default (generally not modified).

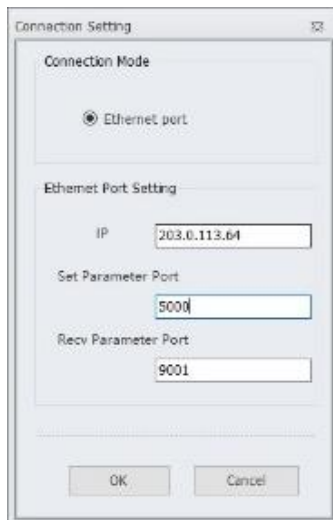


Figure 15 Radar Connection

- Click OK to open the upgrade window. Click Browse to import the firmware file. Click Start Upgrade. Wait until the upgrade is completed, and the radar will automatically restart after the upgrade is completed.

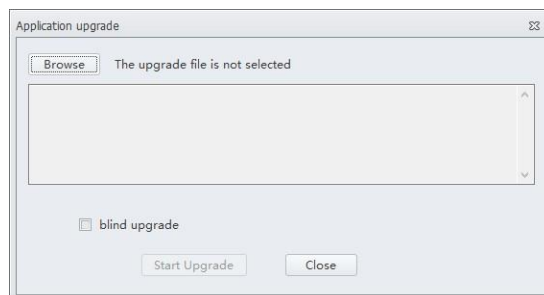


Figure 16 Upgrade



See Far, Go Further