

**FIXED-ANGLE SPEED-MEASURING
RADAR**

PRODUCT MANUAL

(V12.0.0)

***HIK*VISION**

2020.1

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1 General Description

Fixed-angle Speed-measuring Radar measures the speed and distance of an approaching or receding target in the direct lane and provides snapshot for traffic management with a trigger bit set. The narrow beam antenna meets the international requirements for speed enforcement radar systems. This module enables an easy integration as there are no settings required. It can be widely applied to gantry, tunnel, three-dimensional crossing bridges and other traffic environments.



Figure1 Fixed-angle Speed-measuring Radar product

Features:

- High performance radar works in 24GHz ISM Band;
- Special microstrip antenna design effectively avoids interference from adjacent channel target;
- Accurate speed and distance measurement for multiple targets;
- High dynamic speed measurement range with very high capture rate($\geq 99\%$);
- Add WiFi to set parameters simply and fast;

- Advanced DSP technology, highly accurate speed measurement & very low false alarm rate;
- Simple installation and convenient in maintenance;
- Sensor performance unaffected by harsh weather conditions.

2 Product Function

Fixed-angle Speed-measuring Radar adopts advanced microwave and high accuracy positioning technology, which is suitable for real-time velocity measurement and fixed-point snapshot. Combined advanced signal processing technology, distance detection for multiple targets can be achieved. All these designs enable vehicles with different speeds or sizes can be triggered snapping at fixed-spot locations. Snapshot images are shown in Figure 2 and Figure 3.



Figure 2 Snapshot image

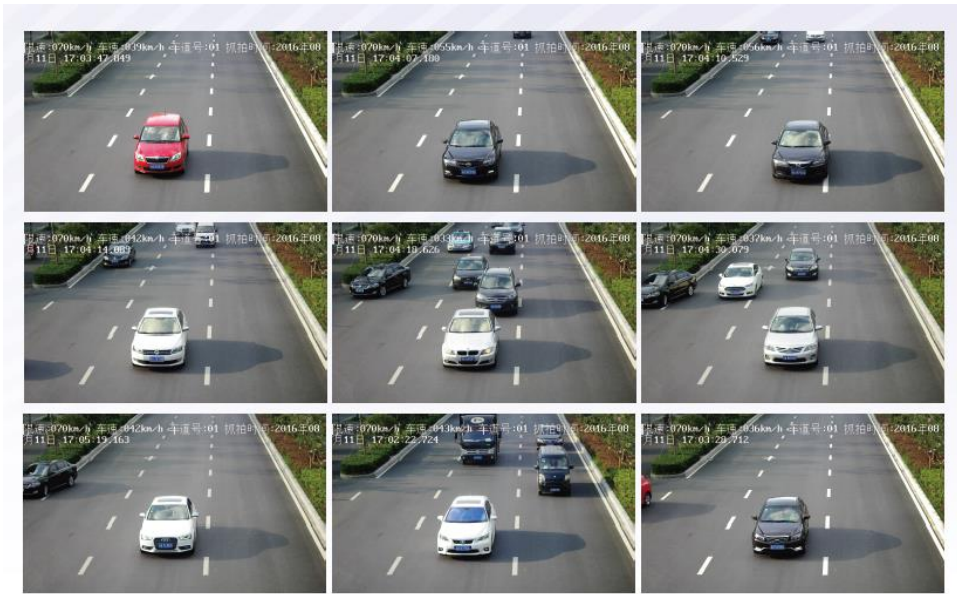


Figure 3 Snapshot images at fix-spot

Compared with the previous versions, the structure and function are upgrade in this version. The wire harness interface is placed inside of the radar, the connector is canceled, which effectively prevent the negative impact caused by connecting-disconnecting the wire harness frequently. Meanwhile a WiFi function is added to this radar, parameters can be set through it, which is more convenient for debugging.

3 Specifications

Frequency Range	24GHz
Modulating Type	CW
FOV	6°×6°
Velocity Mesurement	10 km/h ~250 km/h
Velocity Accuracy	1km/h
Capture Distance	18 m ~28m

Capture Rate		$\geq 99\%$
Triggering accuracy		$\leq \pm 0.5\text{m}$
Data rate		37Hz
Measurement Error	$< 100\text{km/h}$	-0.5~0 km/h
	$\geq 100\text{km/h}$	-1~0 km/h
Voltage Range		9 V ~12V DC
Current Range		$< 0.3\text{A}$
Power Dissip.		$< 2\text{W}$
Temp. Range		$-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$

4 Installation Instruction

4.1 Bracket Installation

Bracket can connect, fix, adjust angle of the radar. The installation result is shown as Figures 4 and 5.:

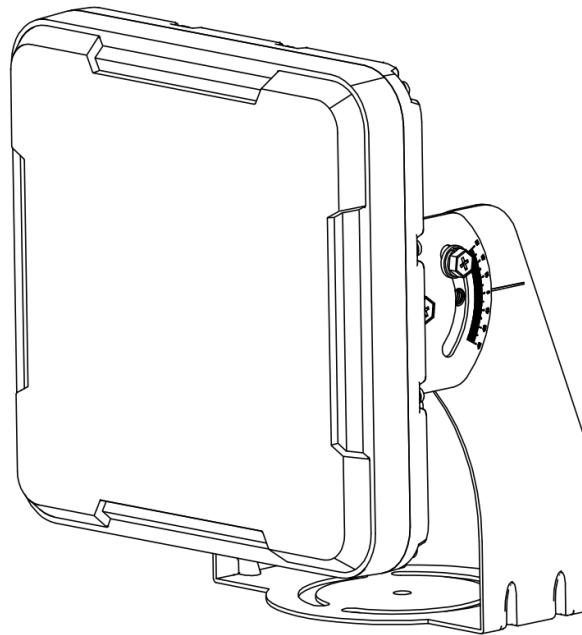


Figure 4 bracket installed-front side

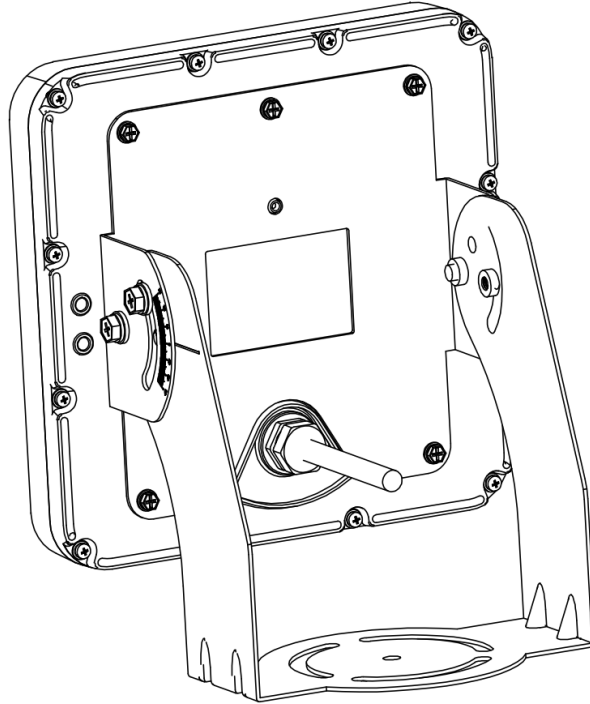


Figure 5 bracket installed-back side

4.2 Hardware Installation

(1) The radar is usually mounted on the gantry, L-bar, etc. fixed on the top of the driveway. Radar detection direction is aligned with the snapshot position which is in the middle of the driveway.

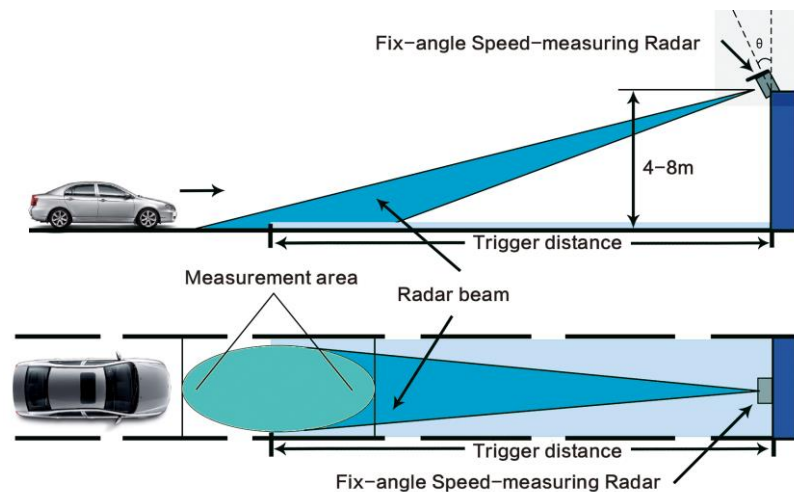


Figure 6 installation diagram

(2) Adjust the installation height, Elevation Angle, triggering distance, etc. as required.

Typical installation: height 6m, elevation angle 11°, triggering distance 28m.

In installation progress auxiliary tools, such as digital protractors, hand-held slope meters, laser-assisted pitch regulators, etc. can be used to increase the installation efficiency.

The radar is also applicable to multiple lanes.

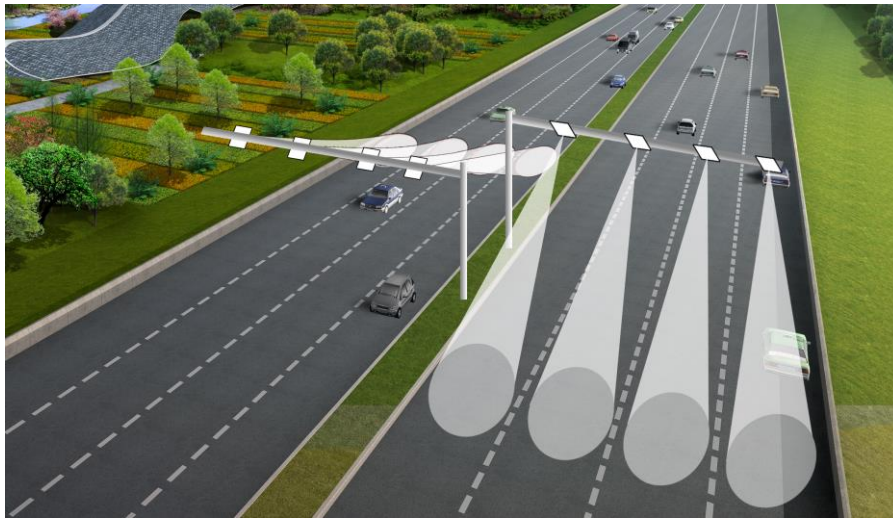


Figure 7 Fixed-angle Speed-measuring Radar used in multiple lanes(installation diagram)

4.3 Communication Connection

Name	Corresponding Interface
+12V (Red Line)	radar power positive, voltage 12V, high quality power supply is recommended
GND (Black Line)	earth wire of radar power
A+/TX (Green Line)	RS485-A port (positive), RS232-TX port
B-/RX (Blue Line)	RS485-B port (negative), RS232 -RX port

SGND (Brown Line)	earth wire of radar signal, RS485-GND or RS232-GND port
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Notes:

1. It is recommended that SGND should be connected when connecting the radar to serial line, so as to avoid bit errors.
2. Either RS485 or RS232 communication port, please contact manufacturer for advance selection.

5 Communication Protocol**5.1 Protocol Description**

The radar data communication adopts RS485 or RS232, baud rate 9600bps, data bits 8 bits, stop bits 1, no checkout bits.

5.2 Protocol Message

The radar sends the speed packet in the form of single byte (the unit is km/h), For example, the speed data received is 0x32, that is the speed of the target is 50km/h.

6 Software Usage

The following chapter includes the installation and management steps of the software. For specific instructions, please refer to the Fixed-angle Speed-measuring Radar debugging software manual(V2.3)

6.1 Software Installation

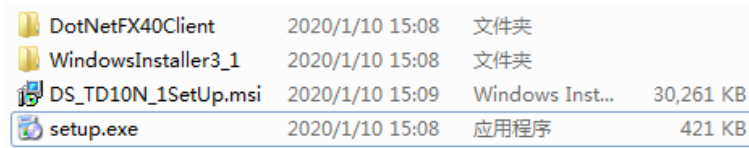


Figure 8 documents list of unzip package

Unzip the package and run "setup.exe", then follow the prompts to complete the installation. After installation, the "Fixed-angle Speed-measuring Radar debugging software shortcut" will be generated on the desktop, as shown in Figure 9.



Figure 9 Fixed-angle Speed-measuring Radar shortcut

6.2 Software Interface

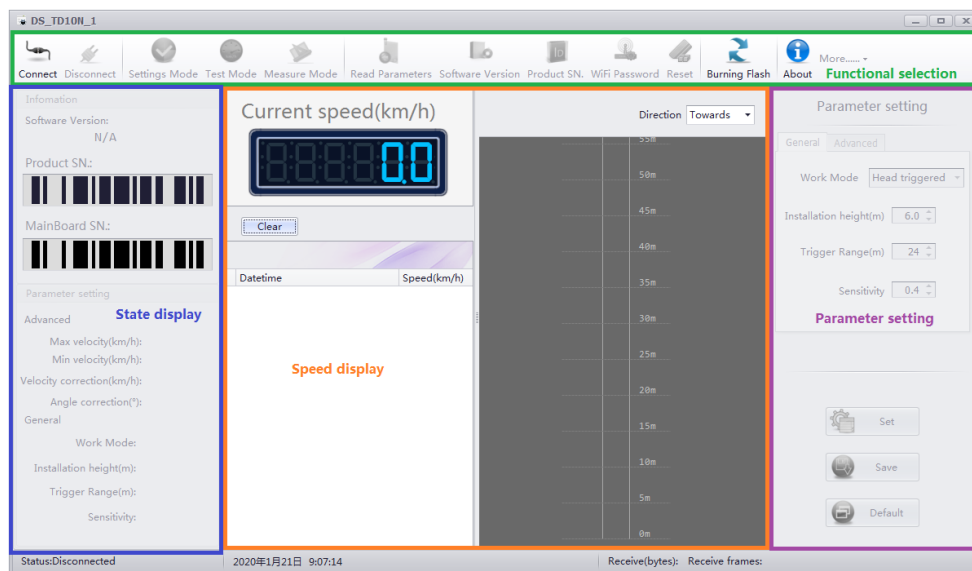


Figure 10 software interface

The software interface would be divided into four parts: "function selection zone", "status display zone", "speed display zone", "parameter setting zone".

"Function selection zone" carries a number of functional selections, including device connection/disconnection, setting state, speed state, measurement mode, software reset, parameter readback, software version query, product sequence number query, etc.

"State display zone" shows current state of the radar, including working mode, installation brightness, trigger distance, sensitivity, speed limit, speed correction, etc.

"Speed display zone" displays the current measurement speed, speed recording and animation display.

"Parameter settings zone " carries "parameter settings", "parameter preservation", "restore factory settings" , etc. The radar parameters can be set in this state, including work mode, installation height, trigger distance, sensitivity, speed limit, speed accuracy correction, etc.

6.3 Device Connection

There are two ways to connect the radar and device: WiFi and serial port, which can be chosen in the "device connect" interface of "function selection zone", as shown in Figure 11.

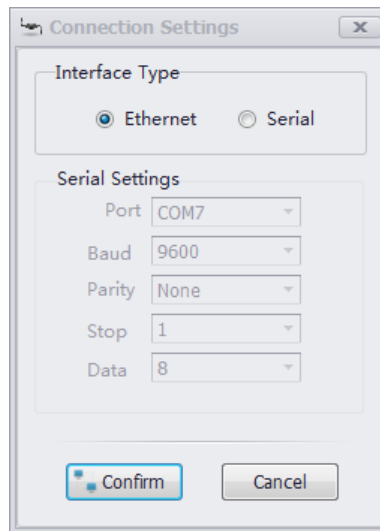


Figure 11 device connection

If the Internet mode is selected. Then click the WiFi name of the radar (naming rules is "HIK+SN") to complete the connection, as shown in Figure 12.



Figure 12 WiFi connection diagram

If the Serial mode is selected. The software can automatically identify all available ports, and users can choose the corresponding ports according to the radar (the specific port number can be seen in device manager).

If no special customization, our radar baud rate is 9600bps, data bits 8 bits, stop bits 1 bits, no parity bits. After setting up, click "connect" to connect the radar. The successful connection interface is shown as Figure 13.

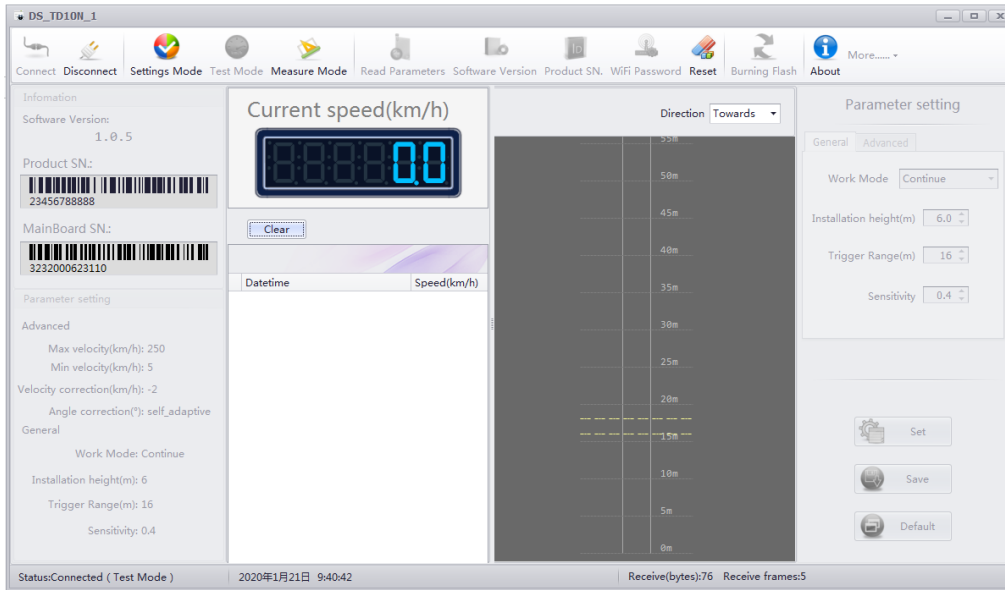


Figure13 connection success

6.4 State Display

After the successful connection, the "state display zone" will show the current state of the radar, including software version, product sequence number, serial number of the main board, radar parameters and so on, as shown in Figure 14.

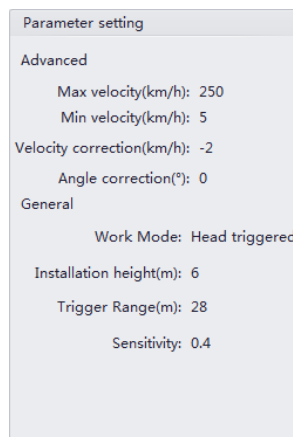


Figure14 radar parameters

6.5 Speed Measurement State

After the successful connection, it is assumed to be the state of speed measurement. When a vehicle passes the certain position, the speed display area will display the current speed and record the data, as shown in Figure 15.

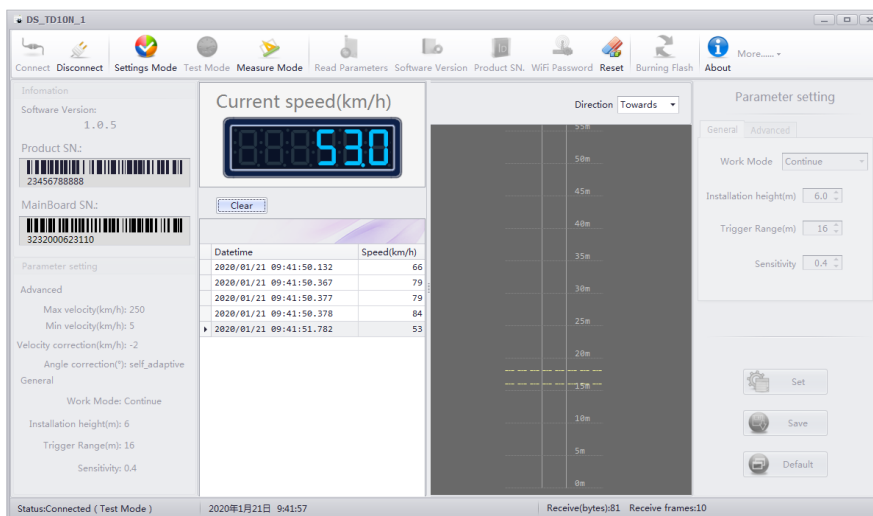


Figure15 speed measurement state

6.6 Parameter Setting

Click the "state set" in "function selection zone", and the parameters setting is activated while speed detection function is closed.

Parameter setting

General Advanced

Work Mode Head triggered

Installation height(m) 6.0

Trigger Range(m) 28

Sensitivity 0.4

Set

Save

Default

Figure16 parameter setting

- Working mode refers to triggering mode including: front triggering mode, rear triggering mode, bi-direction triggering mode and continuous triggering mode.

1. Front triggering mode: measure moving vehicles straight coming, data delivery one time of each vehicle , no data delivery without vehicles.

2. Rear triggering mode: measure moving vehicles straight going, data delivery one time of each vehicle , no data delivery without vehicles.

3. Bi-direction triggering mode: front triggering for moving vehicles

straight coming, rear triggering for moving vehicles straight going, no data delivery without vehicles.

4. Continuous triggering mode: deliver data when vehicles enter the detection area, no data delivery without vehicles.

- Triggerring distance: The horizontal distance of the radar to the photographing position.
- Installation height: the actual installation height of the radar.
- Sensitivity: the sensitivity of the target detection. The greater the value is, the lower sensitive the radar gets, 0.2~0.6 is recommended
- Upper limit / lower limit: the highest and minimum speed values of measurement required.
- Speed accuracy correction: it is necessary to correct the speed detected by radar on some occasions.

The following steps can be proceeded when the parameter values are set.

- Parameter setting: current parameters will be operating after clicking this option, while lost when power off. Please choose "parameter save" to save the current settings.
- parameter save: save the current parameters and the radar will run according them after restarted.
- Restore factory settings: restore factory default parameters.

All options in "parameter setting zone" are valid in the active state. You can get back to measure speed by choosing "speed measuring state" in

"function selection zone".

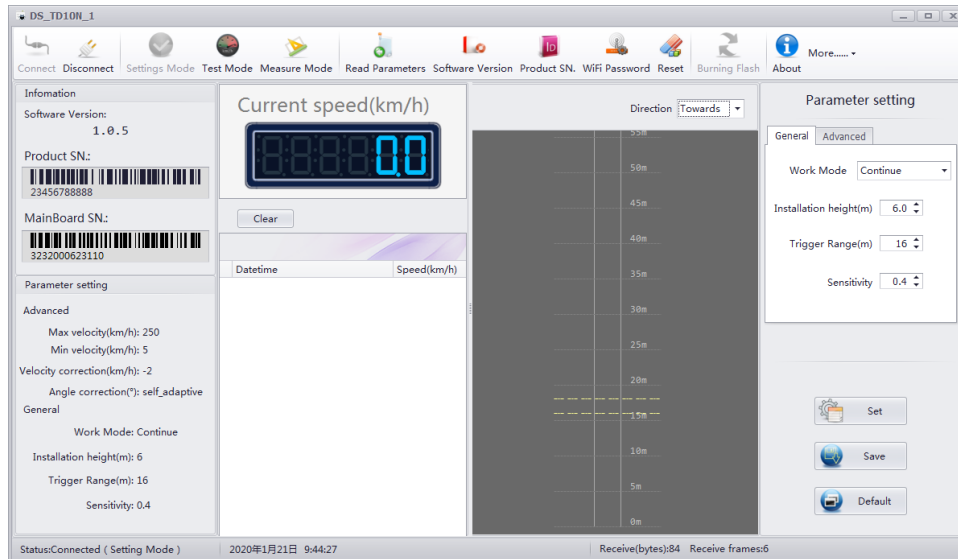


Figure17 parameter setting zone in activate state

6.7 Measurement Mode

The measurement mode is special for the Measurement Institute, which requires the software version is 1.0.0 or above. In this mode, the radar can report the speed of the target in the measured area in real time. The speed can be viewed directly by the debug software, and also can be caught by the camera.

If no speed is measured, please withdraw from the measurement mode, and enter the setting state. Change the working mode to the head trigger, reduce the sensitivity value, and then enter the measurement mode again after the storage.

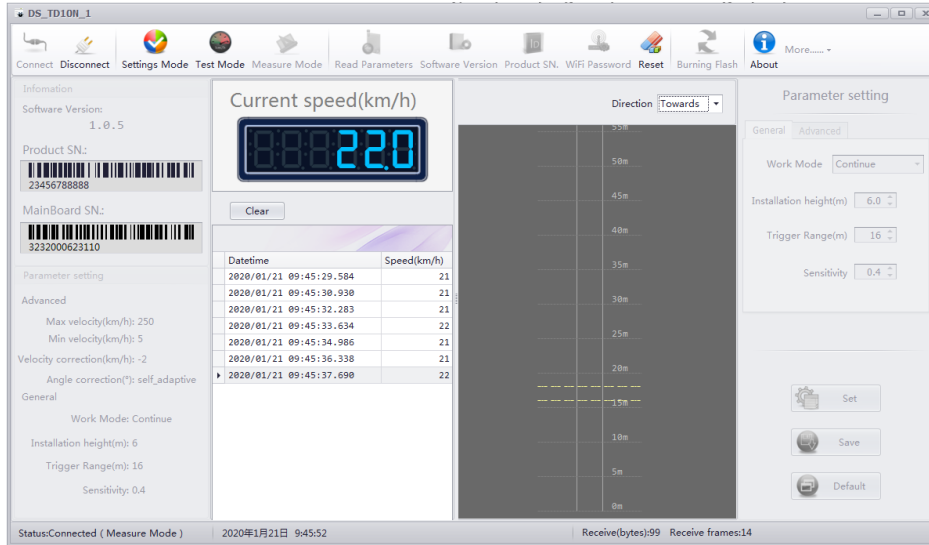



Figure18 measurement mode

6.8 Program Upgrade

Before upgrading the radar program, it is necessary to disconnect the device or restart the software. Click "program upgrade" in "function selection zone" , and set the corresponding serial port parameters in the pop-up "connection setting": baud rate 9600, data bit 8, stop bit 1, no checkout bit. Then click "connect" to enter the program upgrade interface.

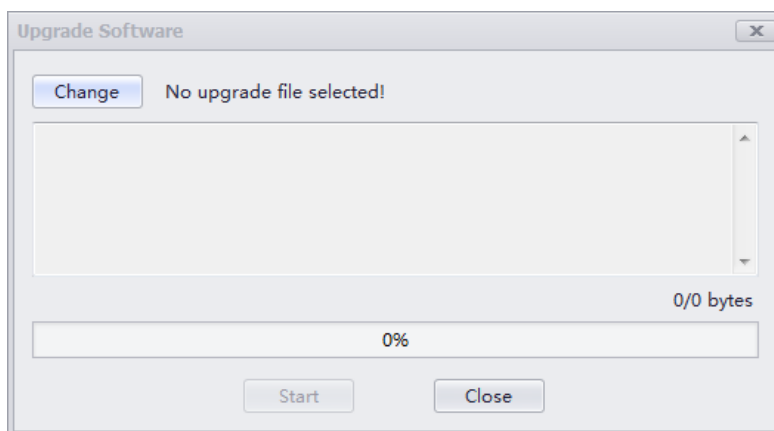


Figure19 program upgrade interface

Click "change" , select the appropriate upgrade file, and then click start to upgrade. When the progress bar shows 100%, the prompt box will show "program writing is successful" , as shown in Figure 20.

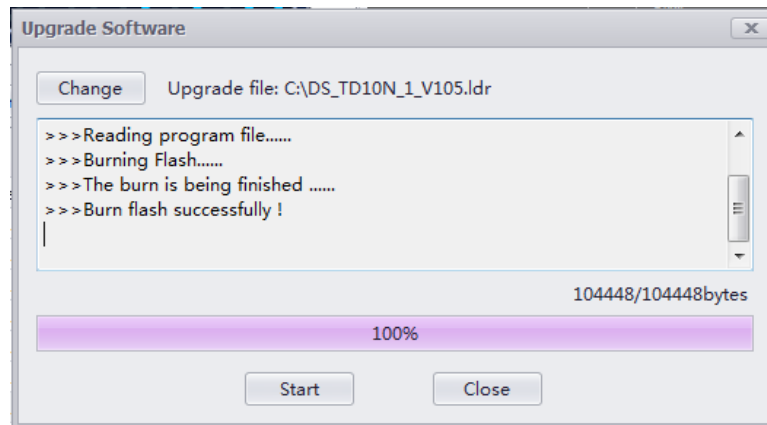


Figure20 program upgrade finished

The radar will automatically restart and run the new program.

(Note: this function is available in the software version of 1.0.0 and above. The previous versions are upgraded by cold boot.

7 Radar Status Indicator light

There are two indicator light in Fixed-angle Speed-measuring Radar: red one is power box status indicator light, green one is signal indicator light.

Red light: it will light when the power on, and flash when WiFi is connected (when radar communicates via WiFi, RS485 will not receive commands).

Green light: it will blink 5 times when the radar starts to enter the working state, which indicates that the normal start of radar is completed.

It will light up 200ms when the radar captures the vehicle's reporting speed.

8 Maintenance and Common Fault diagnosis

8.1 Use Cautions

- Supply voltage should be suitable, not too high;
- No shelters in the front of radar;
- Do not plug the serial port when it is still hot;
- No pounding or dropping;

8.2 Common Fault diagnosis

- Debugging software cannot be connected;
 1. Verify the power connections to the radar (check that the green light is on)
 2. Check the serial port is connected firm or not, and whether the sequence is correct.
 3. If the RS485/RS232 converter is used, check the converter is working normally or not.
- Speed measurement is invalid;
 1. Check the illuminate location is accurate or not.
 2. Check the serial port is connected right or not, and readback the parameters by software to check the parameter setting is appropriate

or not.

3. Reduce sensitivity and test again.

4. Check there is strong electromagnetic interference nearby or not.

● Speed can be detected without car;

1. Check the radar is aimed at the target lane or not.

2. Check there is strong electromagnetic interference nearby or not.

3. Reduce sensitivity and test again.

