AD Plus
Installation Guide

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V1.6	

Revision History

Date	Revision	Modification Description	Author
April 16, 2021	V 1.0	First draft of AD Plus solution	
May 10, 2021	V 1.1	Modification of format and content	
June 17,2021	V 1.2	Modification of the device image	
September 23, 2021	V1.3	Supplementary precautions for inertial navigation installation Supplementary precautions for the installation of glass-mounted and countertop-mounted CA29M	
October 27, 2021	V1.4	Modification of ADAS calibration and DMS installation precautions	
December 24, 2021	V1.5	Added BSD calibration	
April 1, 2022	V1.6	Modification of ADAS/DSC/DMS calibration	Zhouhao/Wangxiaoyong

Table of Contents

Foreword

This *AD Plus Installation Guide* is hereby prepared to better guide engineering personnel to install AD Plus and its accessories properly and quickly, and to improve installation efficiency.

This document mainly includes the following parts: foreword, system overview, preparation for installation, introduction to installation, and acceptance and cleaning.

This document is applicable to installation engineering personnel.

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Important Instructions

1. Before installation, please park the vehicle on the horizontal ground and shut down the engine (do not park the vehicle on a ramp or an inclined road).
2. Please read the section of packing list carefully and check carefully at the time of unpacking.
3. Please read the section of tool list carefully and provide installation tools before product installation.
4. Before installation, please observe the vehicle environment and follow the principles below:
    a. The installation position and wiring of the product shall neither affect the driver's view nor affect the adjustment of the rearview mirror and sun visor;
    b. The camera lens for monitoring the road condition ahead of the vehicle must be within the working range of the windshield wiper;
    c. The installation position of the camera for monitoring the driver in the vehicle shall comply with local regulations;
    d. The installation position shall be convenient for the replacement and maintenance of Micro SD card and SIM card.
5. The appropriate installation position shall be selected according to the vehicle environment, and this document is for reference only.
6. The appropriate power supply connection method shall be selected according to the vehicle environment. **If discrete wire connectors are adopted, connection to the power supply and all signal cables of vehicle is required, and shall be carried out by specialized personnel, as it may be dangerous for non-specialized personnel to operate the power system of the vehicle without authorization.** This document is for reference only.
7. In case of any problem in the installation for special vehicles, please contact the product supplier in time for support.
8. Veyes App is required to debug and configure AD Plus during installation.
9. Please scan the QR code below, or search and download the Veyes APP in the App Store. After the download is completed, connect the APP to AD Plus for related operations according to the prompt on the interface of the APP.

IOS (Apple Store)

Foreign Android (Google Store)

1. System Overview

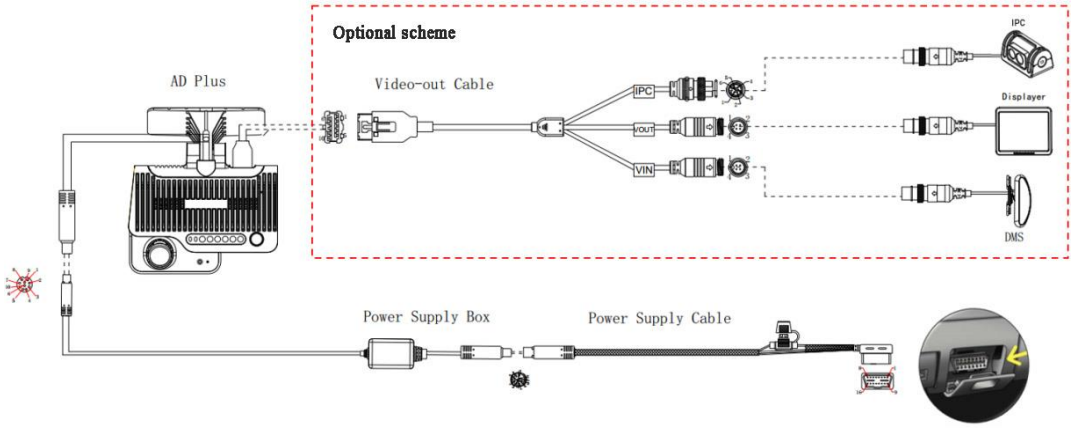
1.1 Product Overview

AD Plus is a dual-camera integrated intelligent Digital Video Recorder (DVR) designed for driving monitoring and safety risk control, with advantages of simple installation, comprehensive functions and low price.

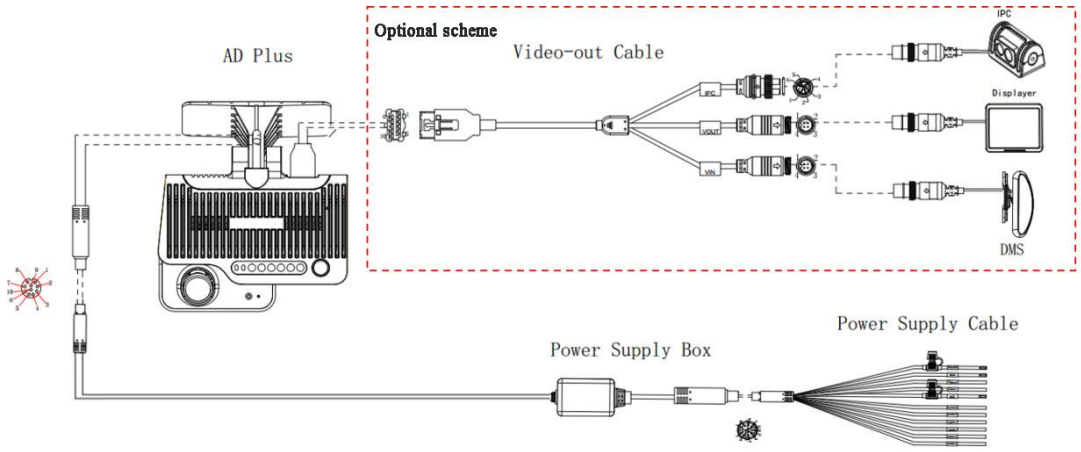
The deep learning technology is adopted for the intelligent algorithm of AD Plus. AD Plus has the features of advanced driver-assistance system (ADAS) and intelligent cockpit, and can effectively identify the hazards such as front collision, close car-following and lane departure, as well as intelligently identify unsafe driving behaviors of driver such as use of mobile phone and seat belt unfastened during driving. With DMS camera or BSD camera, the product can further implement the function of driver status monitoring or blind spot pedestrian detection. With intelligent auxiliary functions, the product can identify potential risks in real time and remind drivers to avoid them in time in case of any driving safety risks, thus effectively reducing accident risks.

The product is suitable for most weather conditions such as day and night, rain and snow, and can be installed on buses, taxis, ordinary passenger cars, passenger vehicles, freight vehicles, dangerous goods transport vehicles, school buses, muck trucks, sanitation vehicles and other vehicles.

1.2 Schematic Diagram of System Connection-Power Supply through OBD



1.3 Schematic Diagram of System Connection-Power Supply through Discrete Wire



2. Preparation for Installation

2.1 Technical Requirements for Installation

Relevant personnel shall be familiar with the functions, applications and the overall composition principle of the product.

Relevant personnel shall understand the electrical circuits and structure of motor vehicles, and common installation methods of in-vehicle equipment.

2.2 Understanding of Installation Environment

Before equipment installation, relevant personnel shall have a clear understanding of the vehicle model concerned, the installation positions of the main unit and auxiliary cameras of the DVR, the type and length of cables required for each vehicle model, and the list of common auxiliary materials, so as to ensure successful completion of equipment installation and commissioning.

2.3 Confirmation of Vehicle Conditions and Vehicle-related Electrical Information

Confirmation of vehicle information is the basic precondition of successful installation and also the guarantee of division of responsibilities to avoid any damage to the vehicle. For each component, proceeding to next step is only allowed after clear confirmation, and each operation shall be confirmed by the person in charge of the vehicle and the installation personnel.

(1) Check the appearance and interior trims of the vehicle for any damage.

(2) Check whether the vehicle can ignite normally.

(3) Check whether the vehicle power supply system is in good condition.

*Note: Confirmation of the above information is crucial. Installation can only be carried out after the above information is considered normal through confirmation.

2.4 Power Supply Connection of Vehicle

AD Plus has two power supply connection modes:

1. Quick plug-in type power supply connection through OBD interface: This mode is suitable for quick installation by users themselves. For details of this power supply mode, please refer to the accompanying *AD Plus Product Manual* in the AD Plus packing box. It will not be detailed here.

2. Power supply connection through discrete wire: This mode requires operation by specialized installation personnel. The following mainly describes the mode

of connection to the vehicle power supply according to the power cable requirements of the product.

(1) Required tool: multimeter.

(2) Selection of power supply connection position

When the vehicle is shut down, use a test pencil to detect whether the circuit is live. If it is live, it is judged as a constant power supply, and then measure the voltage.

When the vehicle is shut down and is in ACC position or ignition state, use a test pencil to detect whether the circuit is live. If it is electrically neutral in shutdown state, and is live in ACC position or ignition state, it is judged as an ACC power cable, and then measure the voltage.

(3) Voltage measurement of power supply connection

Constant power supply: When the vehicle is shut down, use a multimeter to measure whether the voltage of the constant power supply cable is about 24V. If the voltage of multiple cables is about 24V in shutdown state, select the cable with higher current as the constant power supply connection cable.

ACC:When the vehicle is in ACC position or ignition state, use a multimeter to measure whether the voltage is about 24V. If the voltage is 0 in shutdown state and about 24V in ACC position or ignition state, select the cable as the ACC power supply connection cable.

*Note: During power supply connection, first conduct measurement at the positive and negative terminals of the power supply with a multimeter, to avoid wrong connection.

2.5 Connection of Necessary Signal Cables

Where required, the following signal cables must also be connected to enable the intelligent assisted driving functions of AD Plus:

(1) Vehicle speed pulse cable or CAN data cable - to obtain accurate vehicle speed data;

(2) Left and right steering signal cables - to obtain left and right steering information of vehicle;

(3) Brake signal cable - to obtain vehicle braking information.

Please consult the maintenance engineer of the vehicle discipline for specific position of vehicle speed pulse cable/CAN data cable. Generally, the left and right steering signal cables and the brake signal cable are arranged on the fuse board below the steering wheel or below the front passenger dashboard, and measurement for these cables can be conducted using a multimeter.

*Note: If the measured signal is a pulse signal, the source of left steering/right steering/brake signal shall be set as pulse on the setting interface of the main unit; if the measured signal is a continuous high or low level signal, the source of left steering/right steering/brake signal shall be set as level on the setting interface of the main unit.

3. Preparation of List of Installation Materials and Tools

3.1 Inspection as per Packing List

After unpacking the product, please confirm whether the DVR is intact and whether the accessories are complete.

3.2 Preparation of Installation Tools

Before installation, the following installation accessories and tools shall be made available.

List of Installation Tools and Accessories				
S/N	**Picture**	**Name of Tool**	**Purpose**	**Qty.**
1		Torsion drill	Tighten screws	1 pcs
2		**Common screwdriver socket**	**Tighten screws; optional**	**1 pcs**
3		**Crow plate**	**Pry up the vehicle panel**	**1 pcs**
4		**Ties**	**Bundle cables**	**Several**
5		**Dry cleaning cloth**	**Clean the countertop**	**1 pcs**

List of Installation Tools and Accessories				
S/N	**Picture**	**Name of Tool**	**Purpose**	**Qty.**
6		**Smartphone/pad**	**Install the EasyCheck App for video preview and parameter configuration**	**1 pcs**
7		**Steel tape**	**Measure the installation height of the forward-facing ADAS camera lens and assist the installation in other scenarios**	**1 pcs**
8		**Mark pen**	**Mark lines for main unit installation**	**1 pcs**
9		**Cutting nippers**	**Cut and strip wires**	**1 pcs**
10		Insulated rubber tape	Wrap wire ends	1 pcs
11		Scissors	Cut insulated rubber tape or wire clip	1 pcs
12		USB flash disk	Standby	1 pcs
13		Multimeter	Locate vehicle power supply Measure the conduction of harness Measure pulse signal	1 pcs
14		3M adhesive tape	Fix DMS camera	1 pcs
15		Three-legged ladder	Easy to install the BSD camera	1 pcs
16		Waterproof sealant	Waterproofing the backfill after punching	1 pcs
17		Waterproof tape	Waterproof protection for outdoor wire connectors	1 pcs

The following installation tools are also required for the installation of DMS camera if required:

DMS Camera Installation Tools				
S/N	**Picture**	**Name of Tool**	**Purpose**	**Qty.**
1		PH2 cross screwdriver	1.Adjust and fix the DMS camera lens at certain angle (generally included in the DMS camera packaging) 2. Tighten the lens screws; for ADAS calibration	1pcs
2		3.5mm*25mm self-tapping screw	Fix camera; standard (generally included in the DMS camera packaging)	4pcs

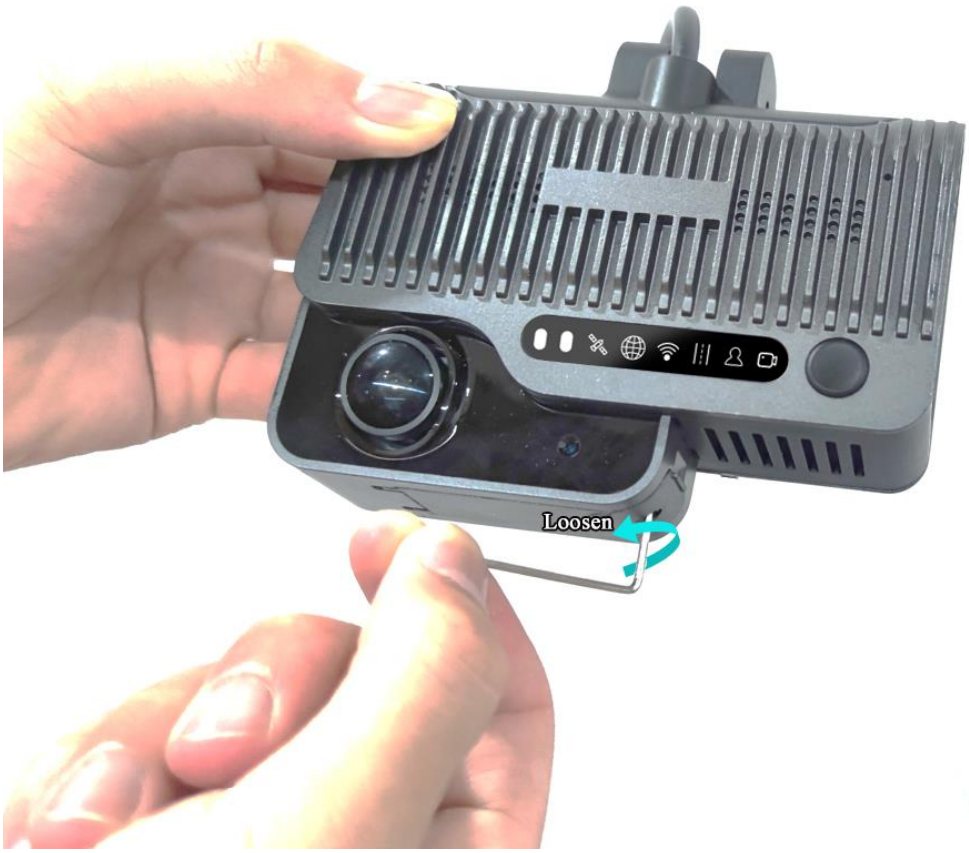
3.3 Preparation of SIM Card and Micro SD Memory Card

To ensure normal online communication and data storage of the equipment, please prepare a supporting Micro SIM card and a Micro SD memory card that meets the quality requirements before installation.

4. Installation of AD Plus

4.1 Installation of SIM Card and Memory Card

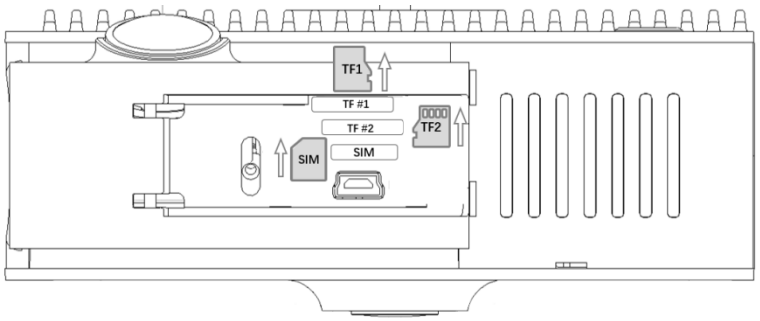
Take out the main unit (without powering on), and turn the card slot panel at the bottom of the main unit counterclockwise with the L-shaped socket head wrench in the package to open the panel.



Install SIM card and Micro SD card as shown in the figure below (pay attention to

the insertion direction of the cards).

If you feel smooth and flexible during installation, and hear a clear sound of "Da" when pushing in the cards completely, it indicates that the cards are installed in the correct direction; if there is obvious friction resistance during installation, it indicates that the installation direction is wrong. Take out the cards in time to avoid any damage to the cards and the card holder.



*Note:

(1) Do not touch the surface of the metal contact of the SIM card with hands when taking and installing the card, for fear of contaminating the SIM card by dust and sweat stain.

(2) Before installing SIM card, please check the surface of the metal contact of the SIM card for any dirt (such as dust, fingerprints and water stains). If any, clean the surface with a piece of non-woven fabric or rubber.

(3) In Micro SD card slot 1, Micro SD card shall be pushed in with the metal strip side down; in Micro SD card slot 2, Micro SD card shall be pushed in with the metal strip side up.

After installation of SIM card and Micro SD card, fasten the card slot panel.

4.2 Selection of DVR Installation Area

Requirements for installation area of AD Plus:

(1) The DVR must be installed in the middle of the front windshield. It is generally installed in the rearview mirror area above the centerline of the front windshield. A deviation less than 5 cm on the left and right sides is allowed for the installation position if it is not feasible to install the device in the middle as required (The deviation of the DVR relative to the centerline of the front windshield shall be calculated with the centerline of the front camera lens).

(2) When conditions permit, the height of the DSC camera lens shall not exceed the height of the driver's eyes, and the installation position shall be as low as possible provided that the driver's view is not obstructed. The linear distance from the position of the DSC camera lens to the driver's face shall not be more than 116cm.

(3) The external camera lens of the DVR must be within the working range of the left and right wipers (to ensure that the external camera lens screen is clean and free from stains)

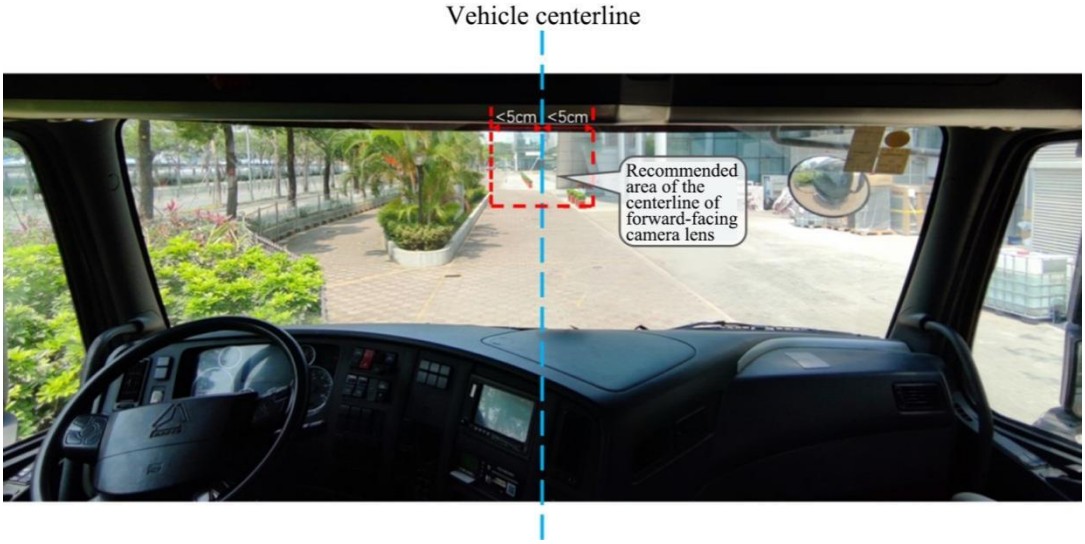
(4) The preferred vertical distance from the external camera lens of the DVR to the ground is in the range of 130cm-240cm

(5) Avoid installing other electronic devices around the DVR as far as possible, including ETC, intelligent rearview mirrors, electronic tags; otherwise, they

may affect the positioning signal of the device.

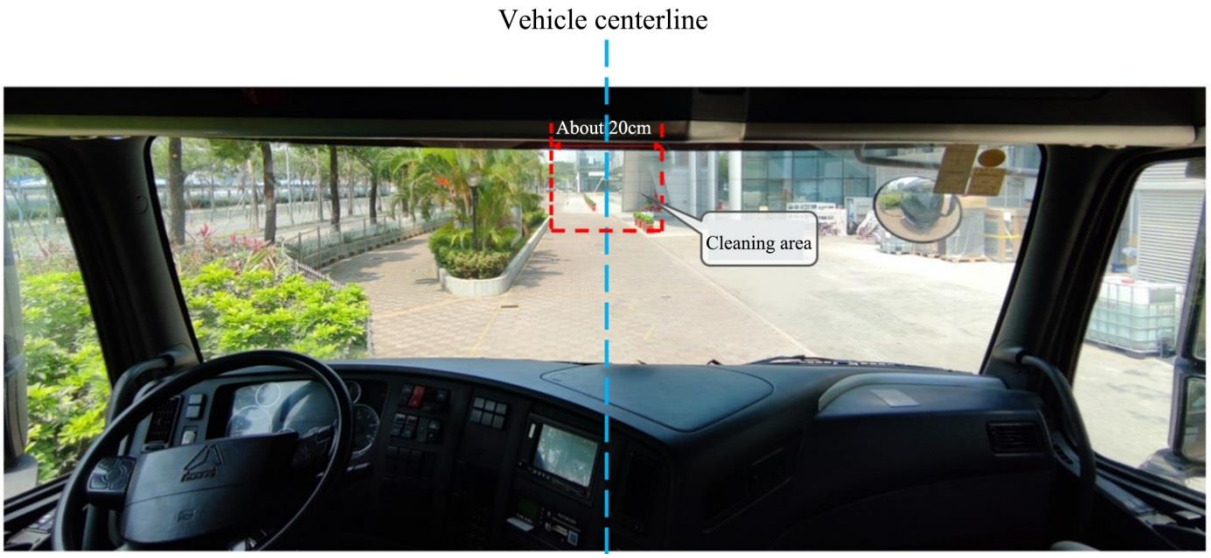
The installation position shall be determined in such a way that the DVR will not hinder the driver from viewing the front blind spot reflector, and there is no obstruction (such as interior rearview mirror or glass coating) within the field of view in front of and around the internal and external cameras lens.

The installation area is generally selected as shown in the figure below:



4.3 Installation of DVR Bracket

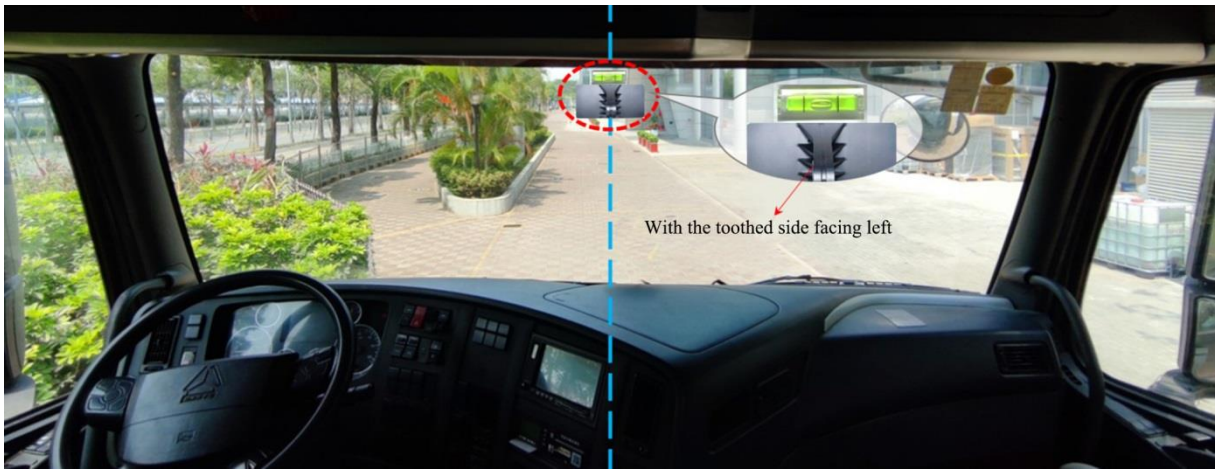
Clean the interior and exterior of the glass in the target installation area with alcohol cotton to ensure that no dirt on the glass in this area will affect the angle of view of the external camera lens, and ensure the glass is dry.



Park the vehicle on the horizontal ground, and then stick the level horizontally above the target area (adjust the inclination angle of the level to center the bubble).

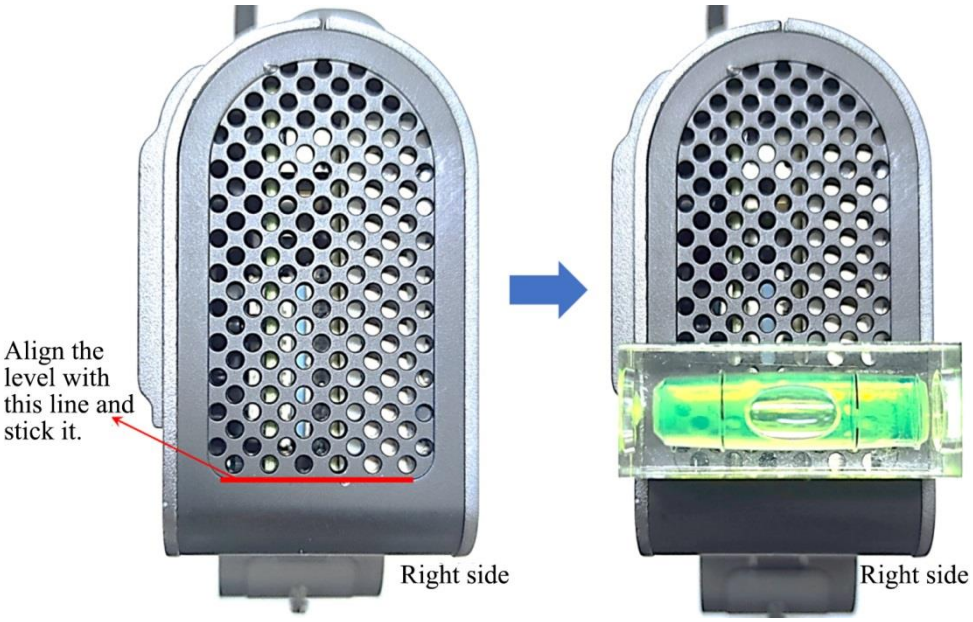
Stick the bracket with the connection of the bracket facing down (with the toothed side facing left).

Tear off the 3M adhesive film on the bracket to stick the bracket horizontally on the front windshield with the level as reference, and then press the bracket for 10s to ensure no bubbles between the bracket and the glass.



4.4 Installation of DVR

After fixing the bracket horizontally, remove the level, align it and stick on the right side of the main unit in the area as shown in the figure below:



Connect the DVR to the bracket with the front side facing inward (with the teeth on the left side of the bracket engaged with those on the left inner side of the DVR), and tighten the bracket stud clockwise with a PH2 cross screwdriver (before tightening, first adjust the DVR to be vertical).

4.5 Adjustment and Fixation of DVR

Adjust the DVR back and forth to center the bubble in the level (indicating that the DVR is vertical at this moment).

Fasten the bracket stud to ensure that the angle of the DVR will not be changed easily. Remove the level, and fix the DVR.

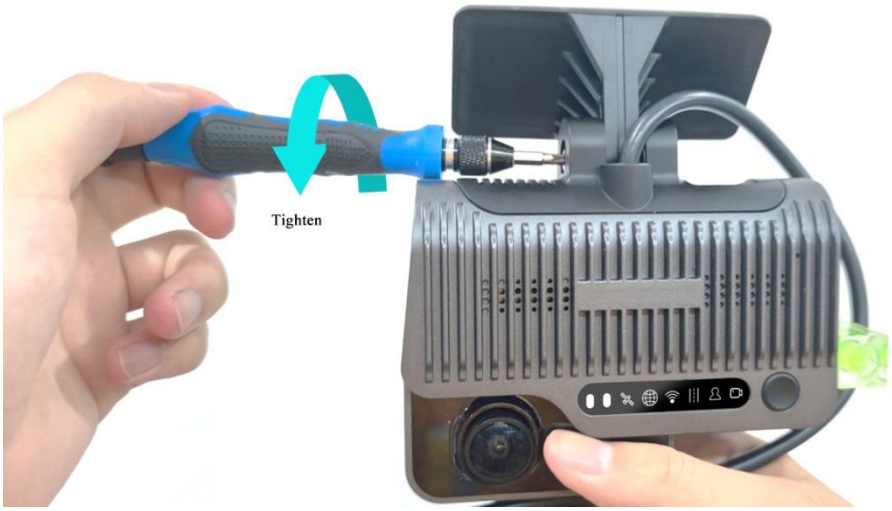
* Notes:

Make sure that the connection between the bracket and the main unit is fastened (the device is rigidly connected with the vehicle), so that the main unit will not shake easily. Otherwise, the GPS positioning will be inaccurate.

Only after the main unit is firmly connected with the vehicle can the device be powered on.

If the device is fixed and installed after power-on, it shall be powered on again before being tested or used.

The GPS module built in ADPlus is an inertial navigation module, and the above requirements can ensure the normal operation of inertial navigation products.

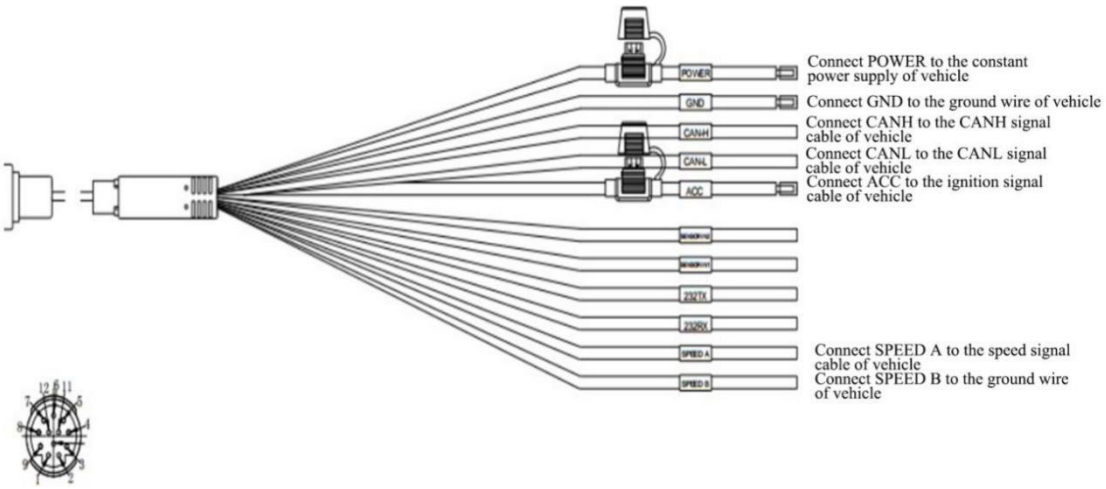


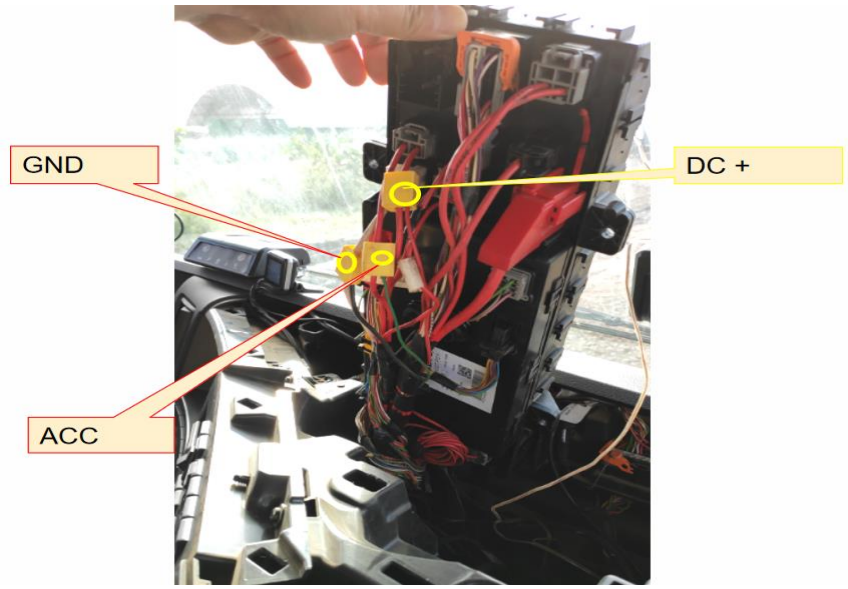
4.6 Power Supply Connection, Connection of Signal Cables and Wiring

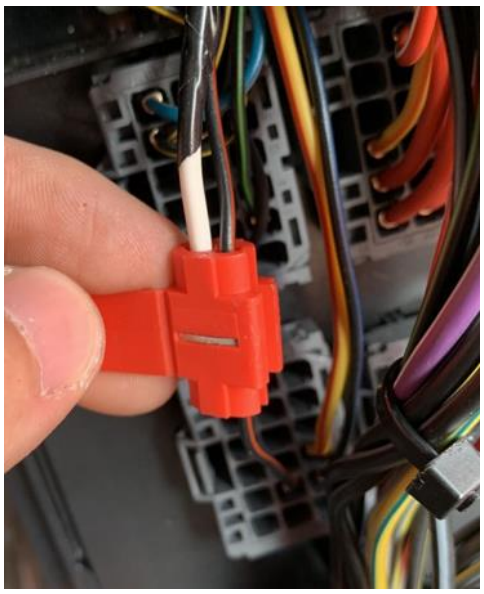
4.6.1 Power Supply Connection

(1) If the mode of quick power supply connection through OBD interface is adopted, locate the OBD interface of the vehicle and directly connect with the interface.

(2) If the mode of power supply connection through discrete wire is adopted, according to the definition of power discrete wire, connect POWER/ACC/GND with the power cable of the vehicle, respectively.







*Note:

The power cable shall be connected using "special stripping-free connection terminal" where possible (no stripping is required, so as to avoid the risk of electric leakage), and the connection shall be wrapped with insulated rubber tape to avoid electric leakage/short circuit.

If there is no special stripping-free connection terminal, stripped wires can also be used for connection. In this case, the connection process must conform to the standard specifications. After the connection is completed, the connection shall be wrapped with insulated rubber tape to avoid electric leakage/short circuit.

4.6.2 Connection of Signal Cables (Pulse or CAN/Left/Right Steering Signal/Reversing)

1. Vehicle speed pulse or CAN (one out of two)

   (1) Consult the maintenance engineer of the vehicle discipline to locate the vehicle speed pulse cable. In the power supply cable of AD Plus:

   Connect "SPEED A" to the vehicle speed pulse cable;

   Connect "SPEED B" to the vehicle ground wire.

   After the connection is completed, log in to the Veyes APP to connect the AD Plus. Enter the configuration interface, and set the speed source of the equipment as "Pulse". At the same time, drive the vehicle for a short distance at the installation site to test the accuracy of vehicle speed pulse data.

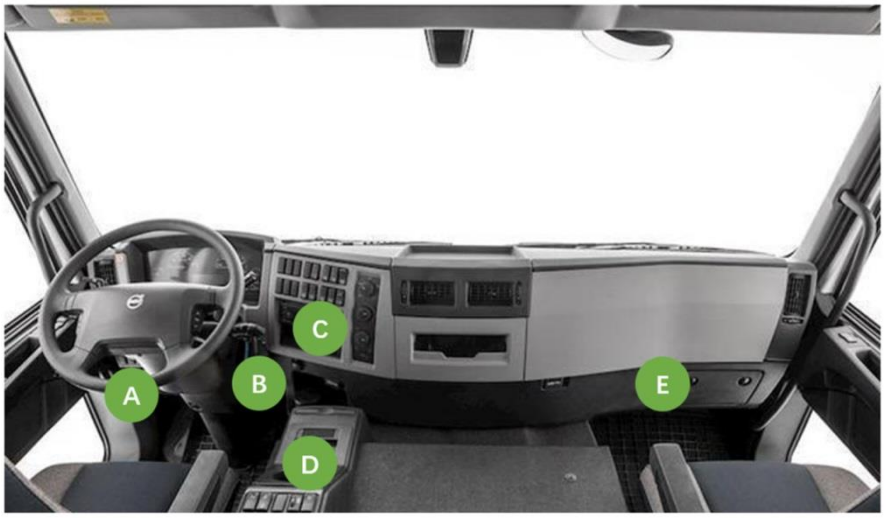
   *Note:

   To avoid interference with vehicle speed pulse by other electrical signals of the vehicle, a ground wire must be connected here.

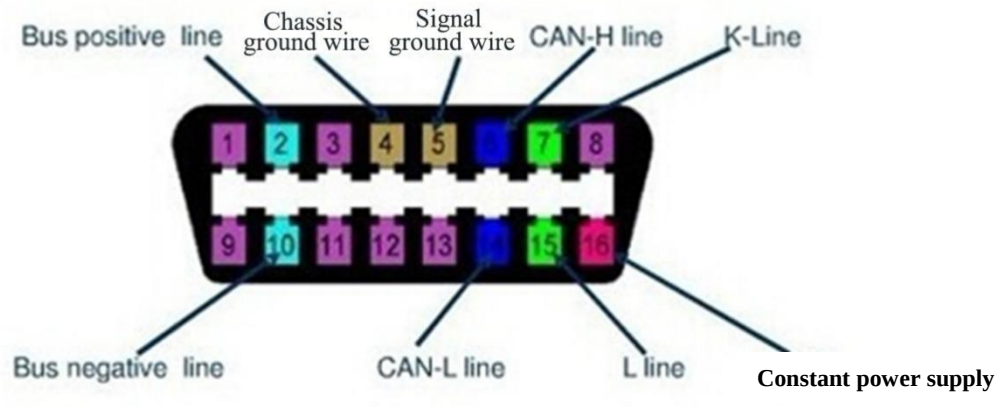
(2) Consult the maintenance engineer of the vehicle discipline to locate the OBD interface of the vehicle. Generally, the position of the OBD interface of the vehicle is as shown in the figure below. Locate CAN-H and CAN-L cables of the vehicle behind the OBD interface. Take the standard 16PIN inverted trapezoidal OBD interface as an example, CAN-H and CAN-L cables generally correspond to pins 6 and 14, respectively. (The cable sequence varies with the shape of OBD interface. The example here is only for illustration.)

After the connection is completed, log in to the Veyes APP to connect the AD Plus. Enter the configuration interface, set the CAN model and baud rate of the equipment, and set the speed source as "OBD". At the same time, drive the vehicle for a short distance at the installation site to test the accuracy of vehicle speed pulse data.

General Position of OBD Interface of Each Vehicle Model



Pin Definition of OBD Interface of Vehicle



2. Left steering/right steering/reversing signal

After locating the fuse board below the steering wheel or the front passenger dashboard, measure the cable corresponding to left steering/right steering/reversing signal according to the tips on the cover back of the fuse board or using a multimeter.

For the standard discrete wire, there are only two IO signal cables, so only connection to the left and right steering signals respectively is required.

For some customized discrete wires, there are eight IO signal cables, so the left steering, right steering and reversing signal cables need to be connected.

*Note:

If the measured signal is a pulse signal, the source of left steering/right steering/brake signal shall be set as pulse on the setting interface of the main unit; if the measured signal is a continuous high or low level signal, the source of left steering/right steering/brake signal shall be set as level on the setting interface of the

main unit.

4.6.3 Wiring

Upon the completion of connection of main cables according to the schematic diagram of system connection, as well as power supply connection and connection of signal cables, arrange these cables using a crow plate according to the diagram below and conceal them in the interior trim panel or the panel of the dashboard (i.e. concealed wiring).

If DMS camera or BSD camera (optional) is required, the wire length of DMS camera and BSD camera can be reserved for wiring at the above-mentioned position.

(1) If the mode of power supply connection through OBD interface or discrete wire is adopted, the wiring mode is as follows:

Since ADPlus has a power supply box with built-in turning-on/off control strategy, it is necessary to fix the power supply box at a certain position on the vehicle. Attention should be paid to the following items when the fixing position is selected:

1. Close to OBD interface or power ports of discrete wire
2. Horizontal surface mounting
3. Not interfered with other components
4. Away from vibrating and jittering positions, such as trumps and motors
5. Hidden positions preferred

Since different vehicle models have different OBD interface positions, the corresponding wiring and the fixed position of the power supply box vary. Here, we recommend two installation positions for the power supply box. You can also fix the power box in other positions according to the actual vehicle model.

Fixed position 1 of power supply box:

Remove the side trim in the driving seat area, tear 3M cellophane wrapping the power supply box and fix it on the left or right side-trim, please see below:

Fixed position 2 of power supply box:

The power supply box will be fixed on the right side-trim in the driving seat area through open wiring. We do not suggest install it on the left side-trim through open wiring, since it might interfere with the car door. When the fixed position is selected, tear 3M cellophane wrapping the power box and fix it on the right side-trim of in the driving seat area. Please see below:

5. Calibration of AD Plus

5.1 ADAS Calibration

5.1.1 Connection with APP

Start the vehicle and wait for the power status light of the DVR to turn on. The DVR is working normally and the WiFi is in AP mode if the power status light is green and normally on and the WiFi status light is red (and not flashing).

Log in to VeyesAPP with mobile phone / Pad within 3min after the main unit is powered on. Before connecting the device with the EasyCheck App, please turn on the mobile phone WiFi and GPS.

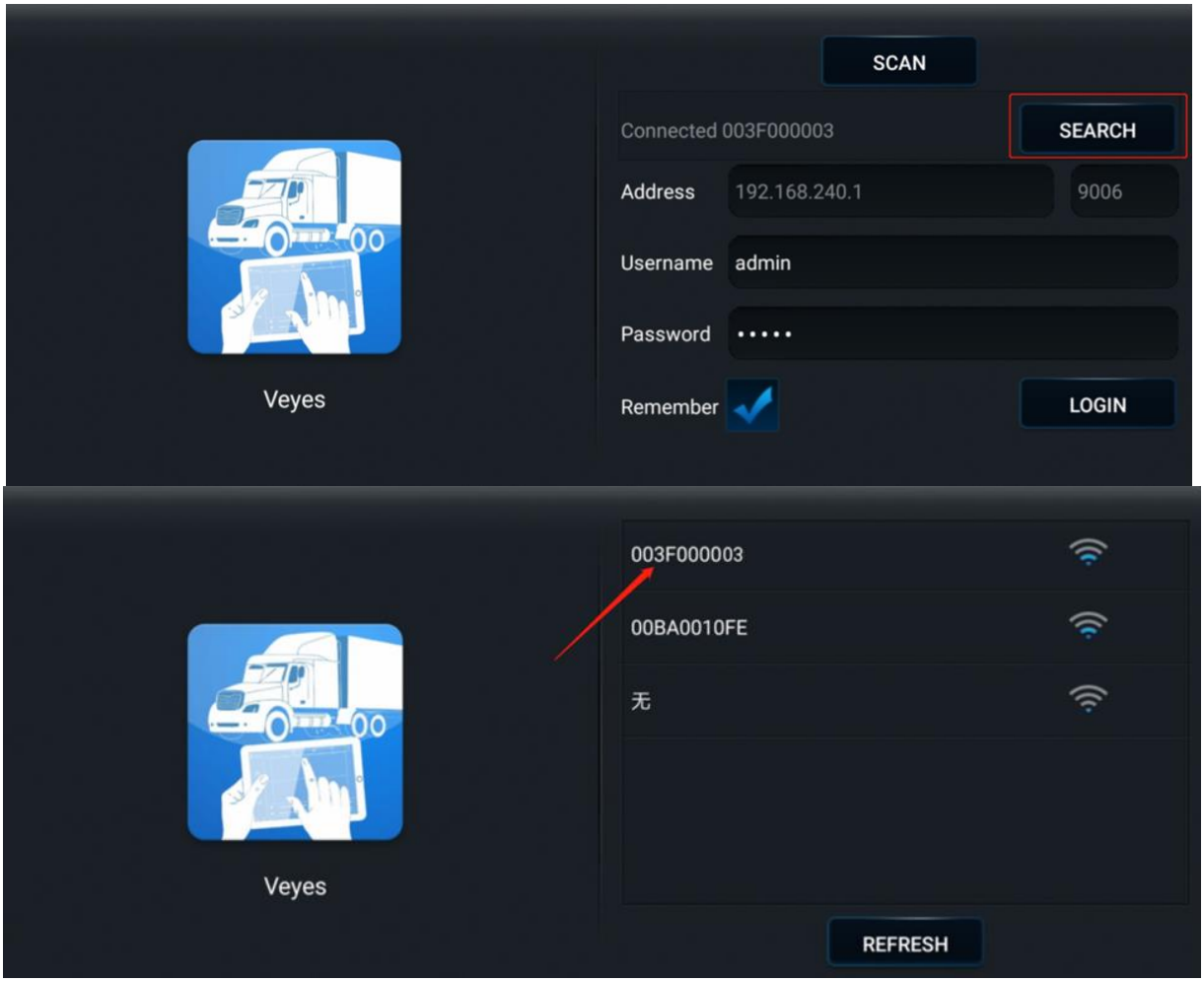
The ADPlus will remain in AP mode for 3 minutes after it is powered on. At this time, you can operate the EasyCheck App on your mobile phone, and click the [Search] to enter the WiFi hotspot search interface. When logging in for the first time, the name of WiFi hotspot is named by ADplus encryption chip number (generally, ST-xxxxxxxxxx by default). If the license plate number is modified, the hotspot name is the license plate number. Search for WIFI hotspots named by ADPlus encryption chip number or entered license plate number to enter the login

interface.

*Note:

Within 3 min after startup, the DVR will automatically enable the WIFI transmission mode for debugging and connection with APP. If no connection is established with any APP within 2 min, the Wi-Fi hotspot of the DVR will be OFF.

In the login interface, enter the corresponding user name and password and click Login to enter the operation interface. The default username/password is admin/admin.

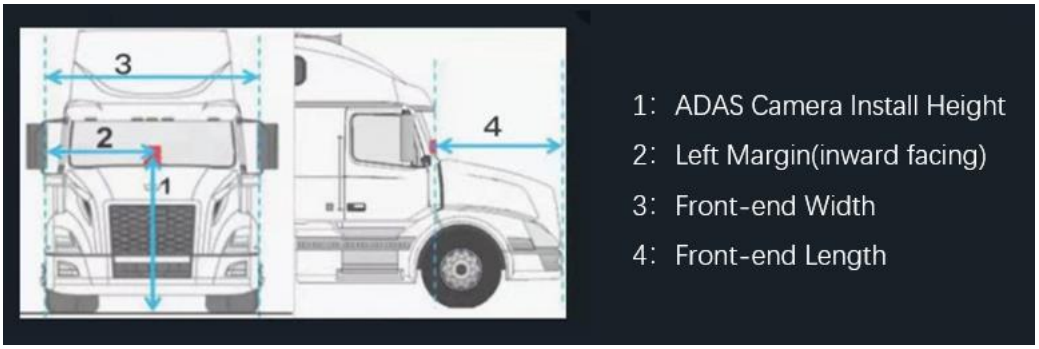


Click the [Login] to enter the operation interface.

5.1.2 Installation Parameters Measurement of the ADAS Camera Lens

Measure the vertical height (accurate to cm/inch) from the ground to the AD Plus front camera lens with a box staff or tape and take it as the ADAS camera lens installation height. Measure the horizontal distance from the ADPlus front camera lens to the outermost edge of the left tire (when viewed outside the vehicle and facing the left side of the vehicle head) and take it as the left margin of the ADAS camera lens. Measure the width of the vehicle head (the distance between the outermost edges of the tires on both sides) and the length of the vehicle head (the horizontal distance from the ADAS camera lens to the license plate). Refer to the figure below for the example of distance measurement.

Note: When the vertical height from the ground to the AD Plus front camera lens is measured, read the height value after making sure that the box staff or tape is perpendicular to the ground.

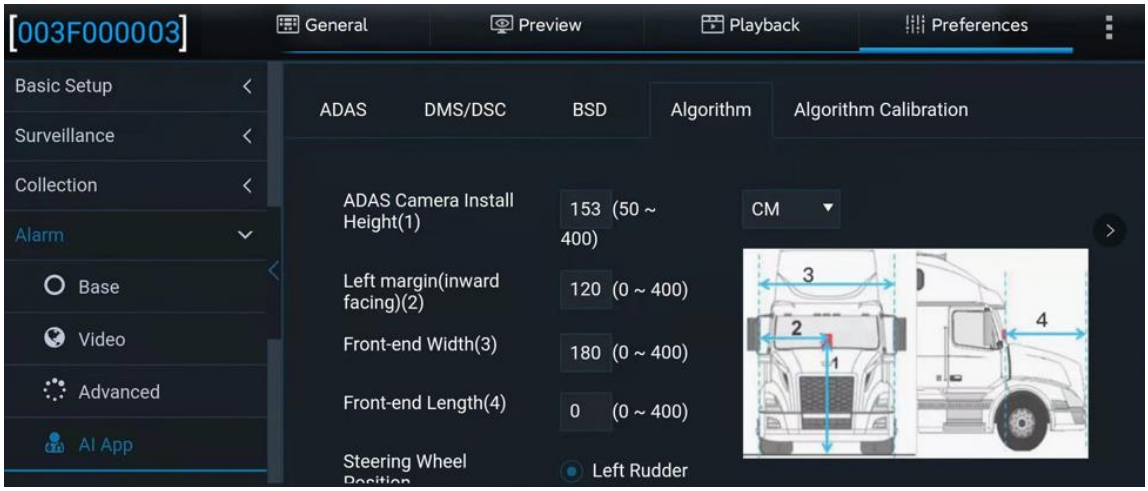


5.1.3 Calibration of ADAS Camera Lens

5.1.3.1 Calibration Parameter settings

After entering the Veyes operation interface, click [Preferences]> [Alarm]> [AI App]> [Algorithm], as shown in the figure below:

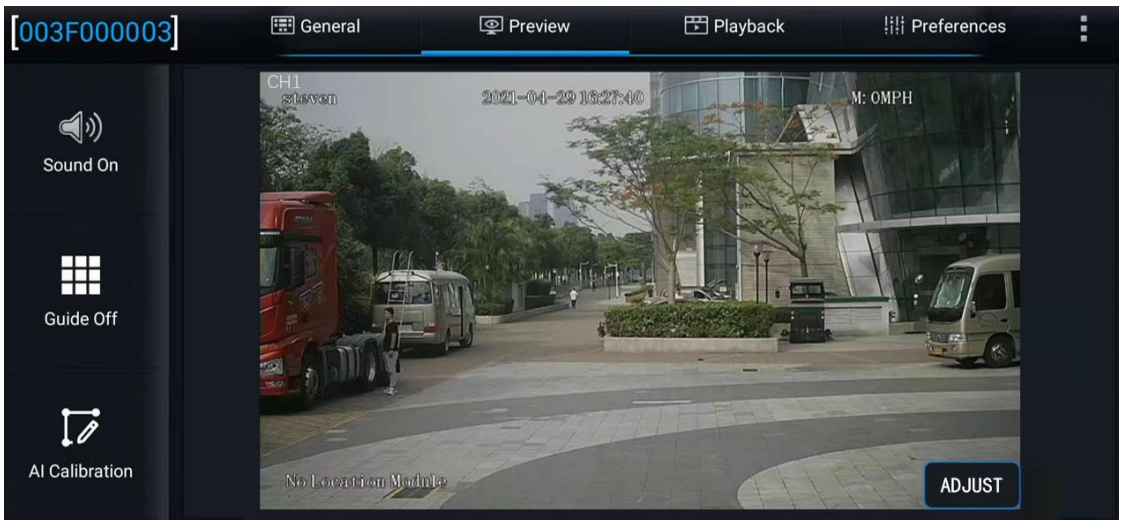
The ADAS calibration height can be in centimeters or inches. In the parameter input boxes, fill in the ADAS camera lens installation height, the left margin of the ADAS camera lens, and the width and the length of the vehicle head read in the previous step, respectively. Click [Save] after filling in the parameters. This automatic calibration method is recommended.



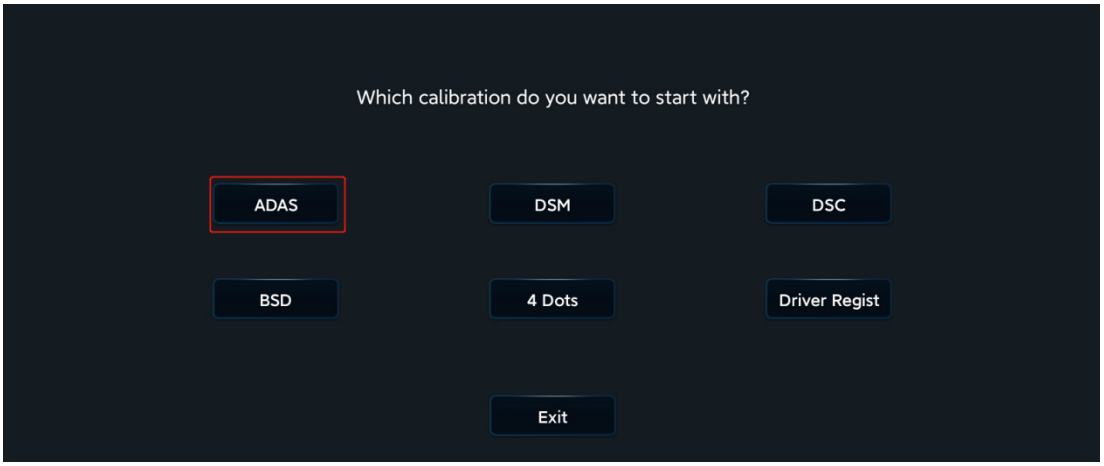
5.1.3.2 Automatic calibration

For Manual calibration in other devices, there are 2 methods available—the long-distance calibration method and the short-distance calibration method. However, since ADPlus is capable of automatic calibration, it is only required to enter the relevant parameters manually in the manual calibration process, and it is not necessary to perform the long-distance and short-distance calibration procedures completely. The operation steps are as follows:

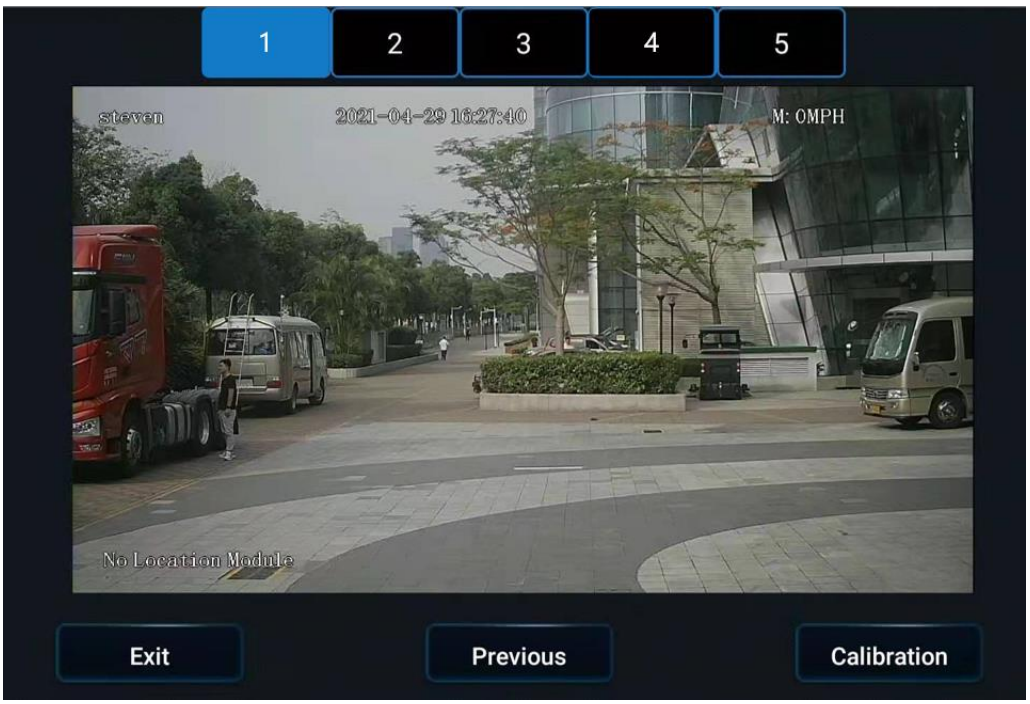
1. On the homepage, click [Preview] to enter the preview interface and click [AI Calibration] at the lower left corner of the screen to enter the calibration selection



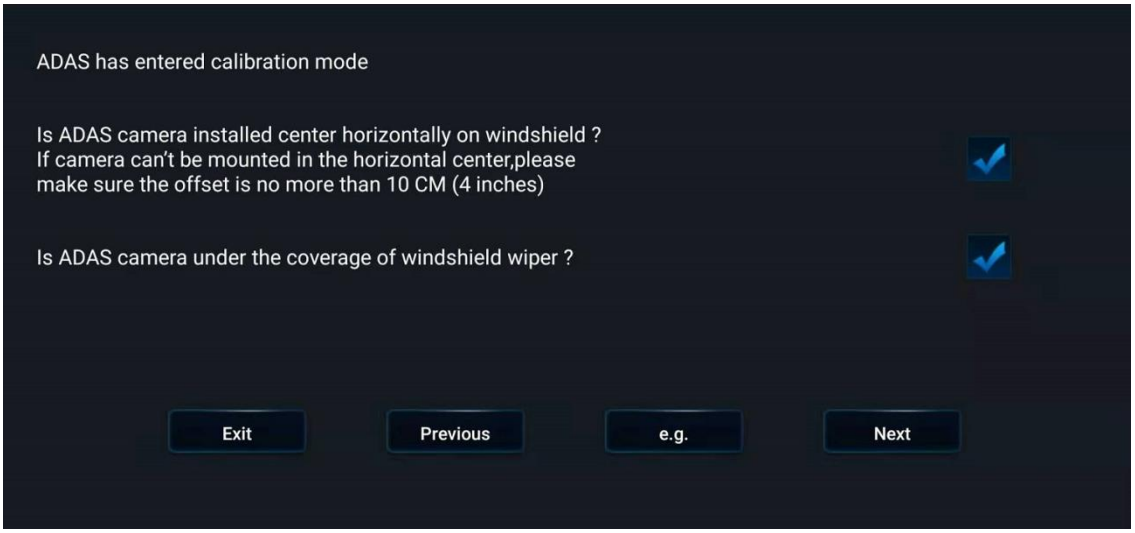
Enter the real-time preview interface, double click the ADAS channel screen to enter the main stream; click the "AI Calibration" button at the lower left corner of the screen to enter the AI calibration selection interface to perform ADAS calibration



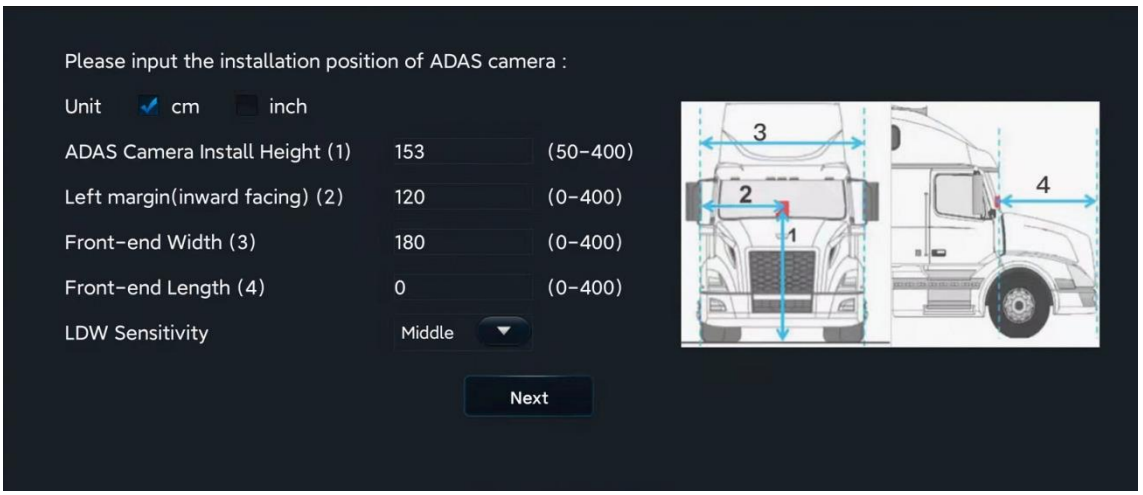
2. Select the calibration channel. ADAS cameras are all installed on Channel 1, so select Channel 1. Then, click "Calibration" at the lower right corner of the screen to enter the calibration process



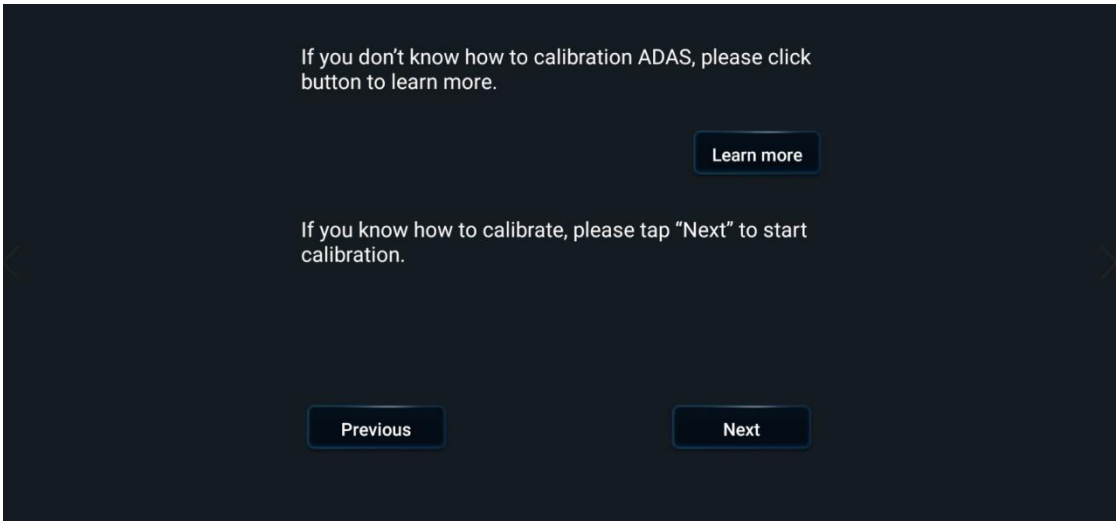
3. Confirm that the ADAS is installed at a proper position of the front windshield and within the working range of the wipers, and then click [Next]



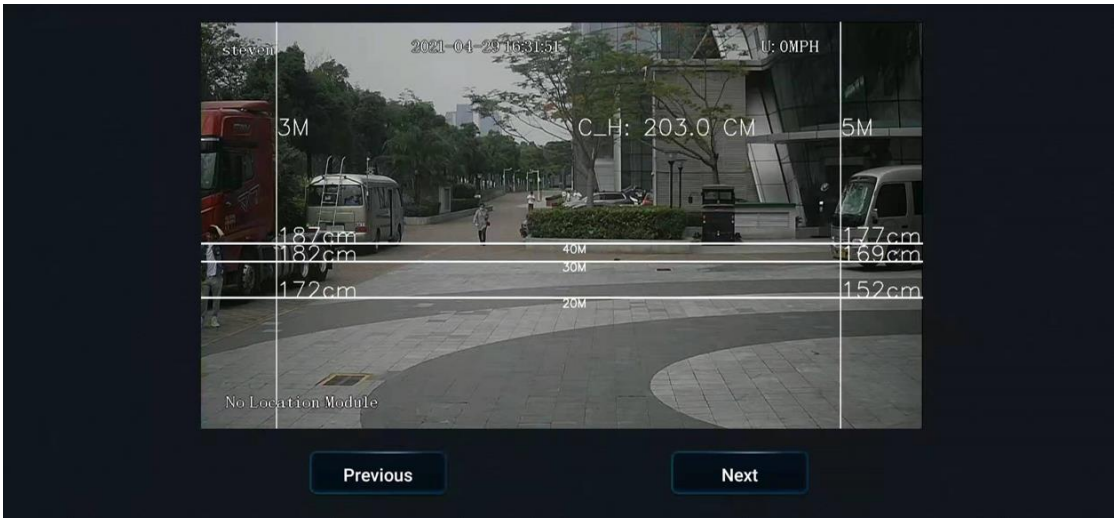
4. In the parameter input boxes, fill in the installation height and left margin of ADAS camera lens, front end width, and front end length as specified in 5.1.2 respectively. For the measurement, please refer to the example on the right. The serial number of ach parameter corresponds to that of the legend, as shown in the figure below.



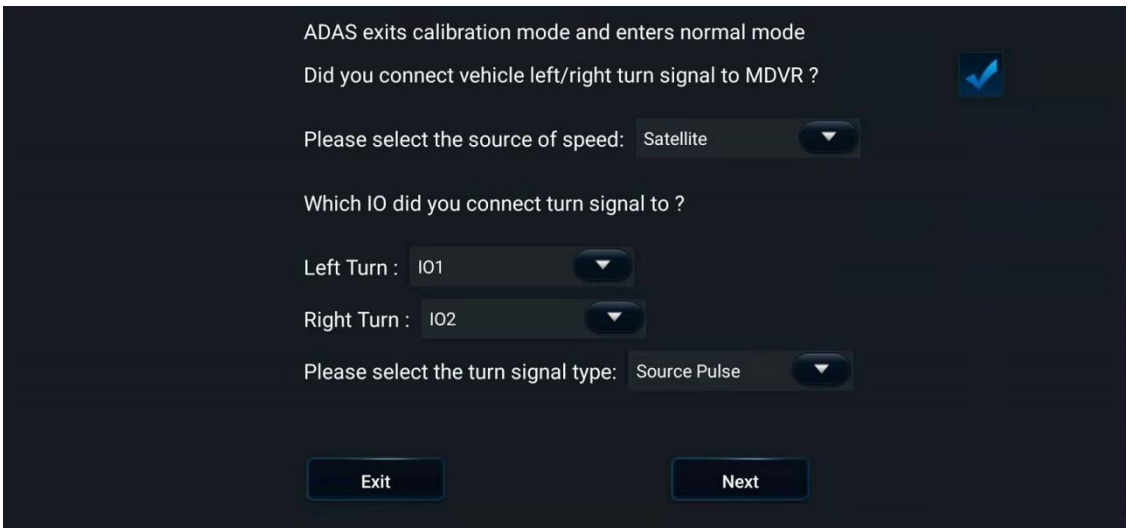
Click [Next] to enter the interface as shown below.

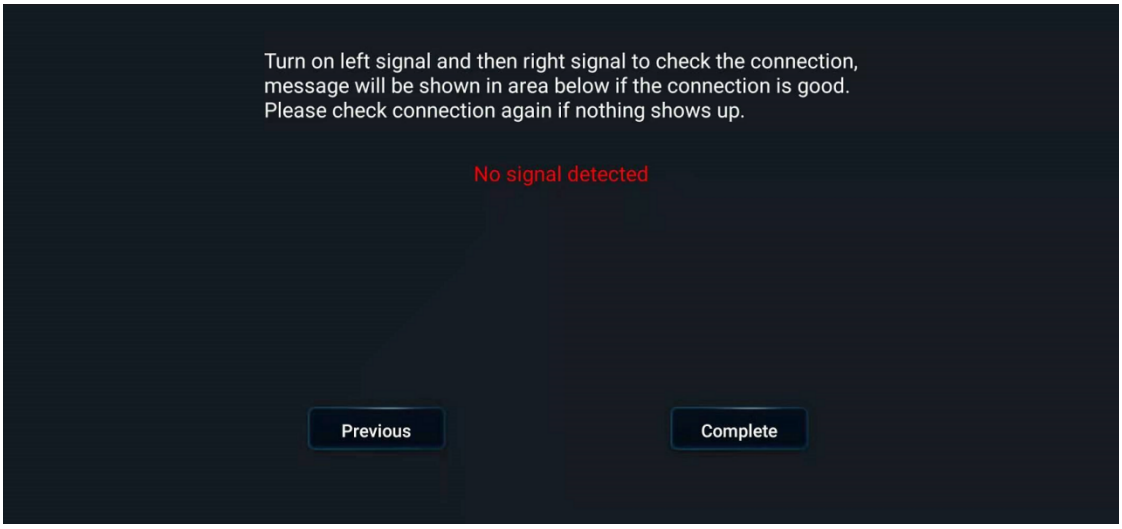


5. Click [Next] to enter the interface as shown below. Since ADPlus is capable of automatic calibration, it is only required to click [Next] directly without adjusting the device in this interface.



6. Enter the interface below, select the source of speed according to the actual installation conditions, set the left and right steering signal parameters, and then click Next. Check whether the left and right steering signals are valid according to prompts in the next interface that appears. After checking, click [Finish] to exit the calibration interface.





7. Return to the real-time preview interface of the ADAS channel (by double clicking the ADAS channel to enter the main stream), and check and confirm that there is no calibration line superimposed on the screen at this time, a condition suggesting the normal operation of the ADAS channel.

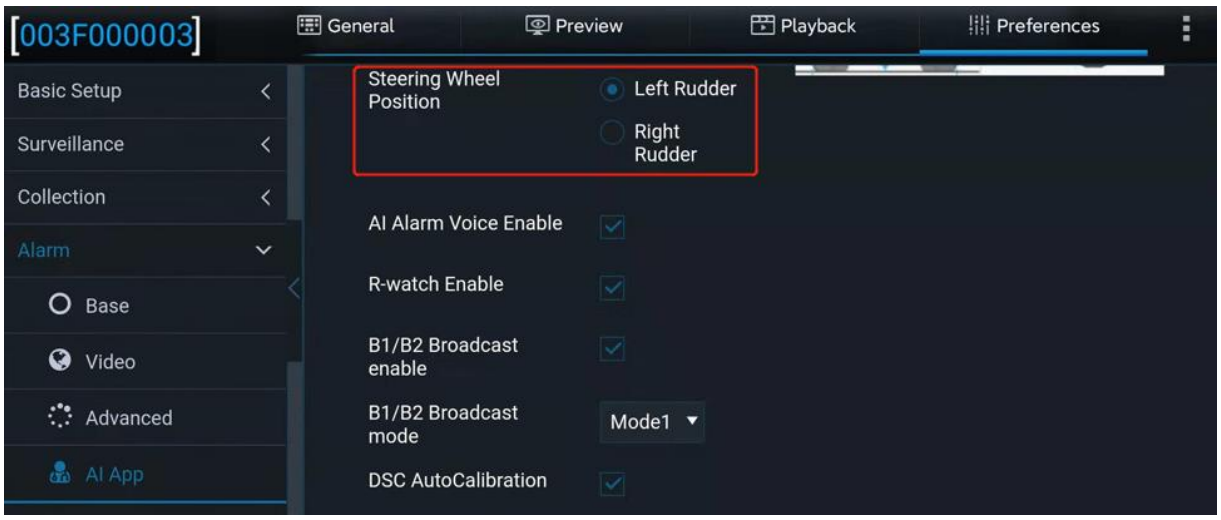
At this point, the calibration operations of the ADPlus from the preview interface are completed.

5.2 DSC Calibration

5.2.1 Left and Right Rudder Setting

In the Veyes operation interface, click [Preferences]> [Alarm]> [AI App]> [Algorithm], as shown in the figure below:

Select left rudder or right rudder at [Steering Wheel Position]. The vehicle is a left rudder one if the driver's seat faces forward and the steering wheel is on the left side of the cab and a right rudder one if the steering wheel is on the right side of the cab.



5.2.2 Cab Camera Angle Adjustment

In the operation interface of Veyes, click [Preview] to enter the preview interface, double click Channel 2 to zoom in and view the cab screen.

Open the card slot panel at the bottom of the DVR and adjust the angle of the cab camera lens with an L-shaped Allen wrench at the adjustment hole of the cab camera lens angle.

Adjust the cab camera lens to meet the following conditions:

1) The center of the cab shall be in the middle of the screen
2) The cab screen shall be level
3) The vehicle steering wheel shall be shown at the left/right corner of the screen

The cab screen of an internal camera lens properly adjusted is as follows:

6. Installation and Calibration of Optional Components

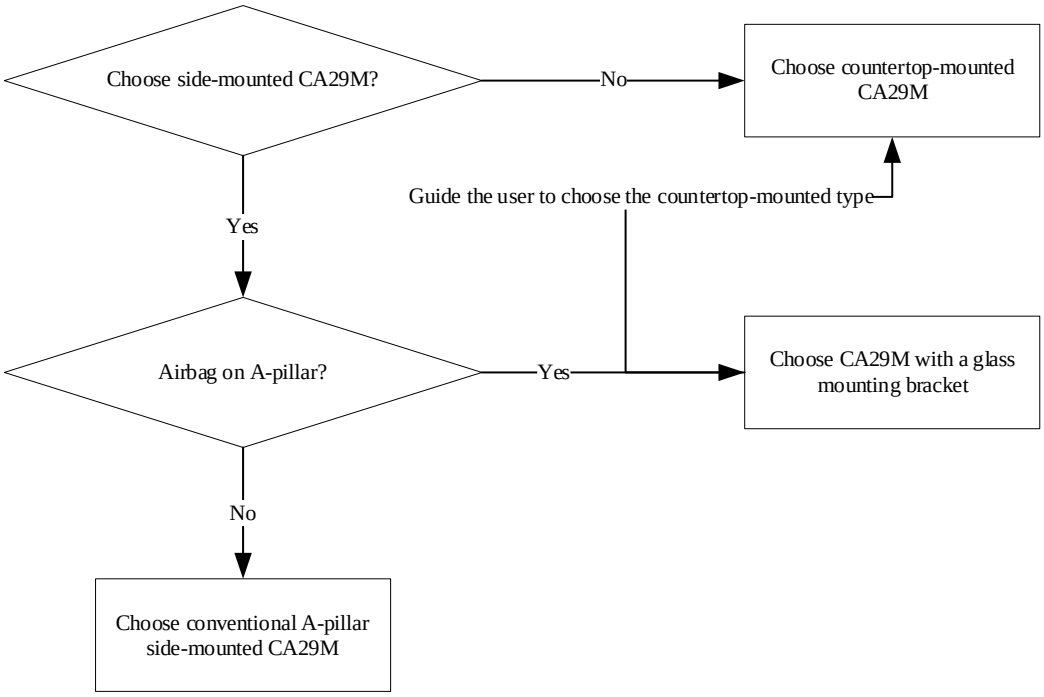
6.1 DMS Camera

For different usage scenarios, three types of DMS cameras connected externally to ADPlus can be selected at present: A-pillar side mounted CA29M, A-pillar side glass mounted CA29M, and countertop mounted CA29M.

The three cameras are as follows:

A-pillar side mounted CA29M (Focal length: 3mm& 4mm)	**A-pillar side glass mounted CA29M (Focal length: 3mm& 4mm)**	**Countertop mounted CA29M (Focal length: 4mm)**
		

Generally, customers can choose A-pillar side mounted CA29M or countertop-mounted CA29M according to the actual situation. However, since some vehicles have airbags on the A-pillar, there will be hidden dangers if the camera is fixed on the A-pillar. In this case, CA29M with glass mounting bracket can be chosen and fixed next to the A-pillar. Or the front-end personnel can guide the customer to choose countertop mounted CA29M.



6.1.1 Requirements for Installation Position

1. If the A-pillar camera (CA29M, the recommended model under normal circumstances) is selected, the DMS camera shall be installed on the driver side A pillar, with the camera side facing the driver's face.
2. Distance from the DMS camera lens to the driver's face (the above three CA29M cameras):

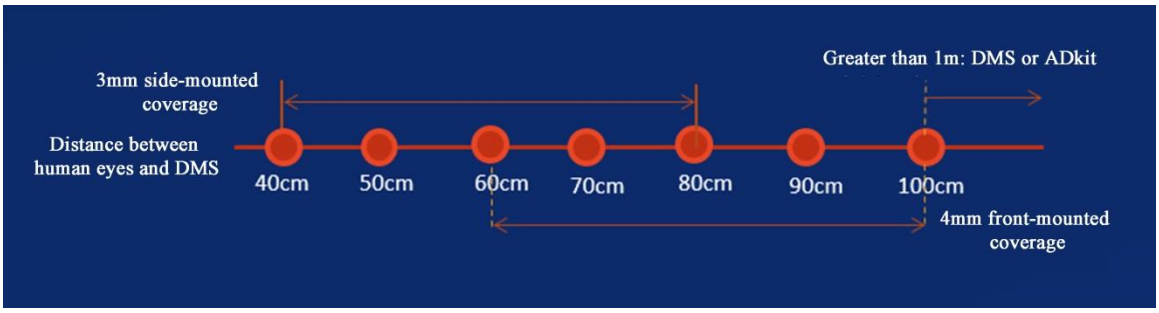
   3 mm camera lens: It is suitable for scenarios where the distance from the camera lens to the driver's face is 40~80cm, and the recommended installation distance is 50~70 cm;

   4mm camera lens: It is suitable for scenarios where the distance from the camera lens to the driver's face is 70~100 cm, and the recommended installation distance is 70~90 cm.

3. **The height of the above three DMS cameras after installation must be lower than that of the driver's face, and the camera lens must have a low angle of view.** In principle, the closer the DMS camera is to the instrument panel, the larger the low angle of view will be, which is favorable. However, the DMS camera can be installed at a higher position, so that it won't be obstructed by the steering wheel.

   For large trucks, the recommended installation height range of the DMS camera lens on the A-pillar or the front windshield is from the highest point of the steering wheel to 10 cm above the highest point of the steering wheel.

Different cameras have different "camera and driver distance" coverage, and the coverage is described as follows:



For cameras larger than 100 cm, DMS or ADkit is recommended.

6.1.2 Requirements for Installation Angle

Auxiliary adjustment through real-time preview screen after the equipment is powered on:

1. Adjust the angle of the DMS camera up and down, and left and right, to ensure that the driver's face appears in the middle of the video screen and the lower edge of the screen is below the driver's chest.
2. Make sure that the fill light of the DMS camera faces toward the driver's face (the fill light shall not face toward the seat belt; otherwise, it will lead to overexposure of video).
3. Make sure that there is no other object (such as steering wheel) in the DMS video screen that will block the driver's face and the seat belt features.
4. Make sure that there is no other object (for example, the steering wheel) in the DMS video screen that will obstruct the driver's face and the seat belt features.

6.1.3 Requirements for Installation Details

1. If A-pillar installation (3mm lens, crescent CA29M, with side mounting bracket) or A-pillar side glass mounting bracket installation (3mm lens, crescent CA29M, with glass mounting bracket) is adopted, the labeling surface of DMS camera must face toward the A-pillar (with the arc side facing toward the driver).
2. In the event of installation on countertop (4mm lens, crescent CA29M, with vertical mounting bracket), the labeling surface of the DMS camera must face downward (with the arc side facing upward).
3. After angle adjustment and calibration, the protective film on the DMS camera must be removed, and the DMS camera must be locked with a socket head wrench to avoid shaking.

Installation on left A-pillar: with the arc side facing toward the cabin and the wire end at the bottom

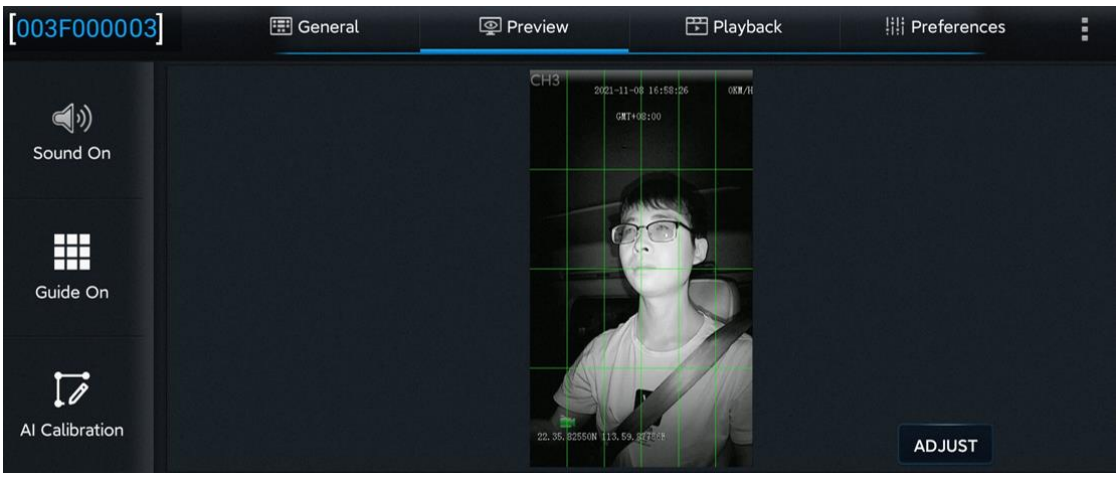
Installation on a countertop: with the arc side up

Installation on right A-pillar: with the arc side facing toward the cabin and the wire end at the top

6.1.4 Installation Steps

6.1.4.1 Installation steps of A-pillar CA29M camera

1. Energize the device, connect the device through the APP, and enter the real-time preview screen. After that, check whether the driver is upright in the screen when the device is installed at the target position and the camera label faces the direction of the A-pillar (with the arc surface facing the driver).



2. If the screen is upright, there is no need to set the installation type of the DMS camera, and go directly to step 3;

If the driver is upside down or skewed on the screen, select the channel corresponding to the DMS camera (the Channel 3) by clicking [Preferences]> [Surveillance]> [Camera Setup], and modify the rotation angle, mirroring, and flipping parameters on the right side of the screen to adjust the DMS channel screen. Generally speaking, the installation angle parameter should be set to 0 for countertop-mounted CA29M. If the screen of external 3mm A-pillar side-mounted CA29M is skewed, the installation angle parameter needs to be modified from 0 to -90° or +90°.

*Note: Do not activate Mirroring or Flipping, please make sure that Mirroring and Flipping settings are both No.

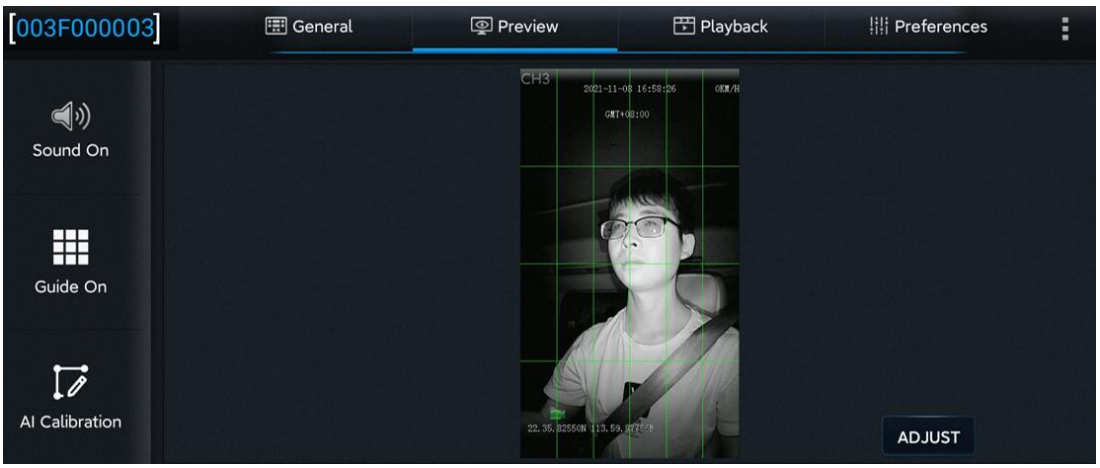
3. After the appropriate installation position meeting the above requirements for installation details is determined through the DMS camera screen, first tighten the upper screw of the DMS camera mount (with the lower screw of the mount not tightened temporarily, so as to adjust the angle of the camera up and down).

4. Adjust the left and right angle joints of the DMS camera through the hexagon socket screws, so as to adjust the angle of the DMS camera left and right.

5. After adjusting the angle of the DMS camera up and down/left and right, make sure that the driver sits according to normal driving habits and posture, to meet the following conditions:

   (1) Make sure that the driver's face appears in the middle of the video screen, and the lower edge of the screen is below the driver's chest.

   (2) Make sure that the fill light of the DMS camera faces toward the driver's face (the fill light shall not face toward the seat belt; otherwise, it will lead to overexposure of video).



(3) Make sure that there is no other object (such as steering wheel) in the DMS video screen that will block the driver's face and the seat belt features.

(4) Make sure that there is no other object (for example, the steering wheel) in the DMS video screen that will obstruct the driver's face and the seat belt features.

6. Tighten the lower screw of the DMS camera mount and the screws at the left and right angle joints to ensure that the camera will not shake up and down or left and right.

6.1.4.2 Installation steps of glass mounted CA29M camera

If the vehicle has an airbag on the A-pillar, and the A-pillar side mounted CA29M camera could not be mounted on the A-pillar, CA29M camera with glass mounting bracket can be chosen. The specific installation process is as follows:

1. Power on the device first; then, connect with the device through the APP, enter the real-time preview screen, and on the premise that the 3M tape on the base of the glass mounted CA29M camera is not torn off, roughly determine the camera installation position which shall meet the following requirements:

(1) The glass mounting bracket shall not be too far away from the A-pillar, otherwise it will obstruct the driver's view; the bracket base should be mounted parallel to the A-pillar.

(2) The installation position must ensure that the camera viewing angle is the upward viewing angle.

(3) After the glass-mounted camera is installed, the upper part of the driver's body (above the chest) can be displayed on the camera screen. It shall be ensured that the seat belt features and face features can be seen, and the driver's face appears in the middle of the screen.

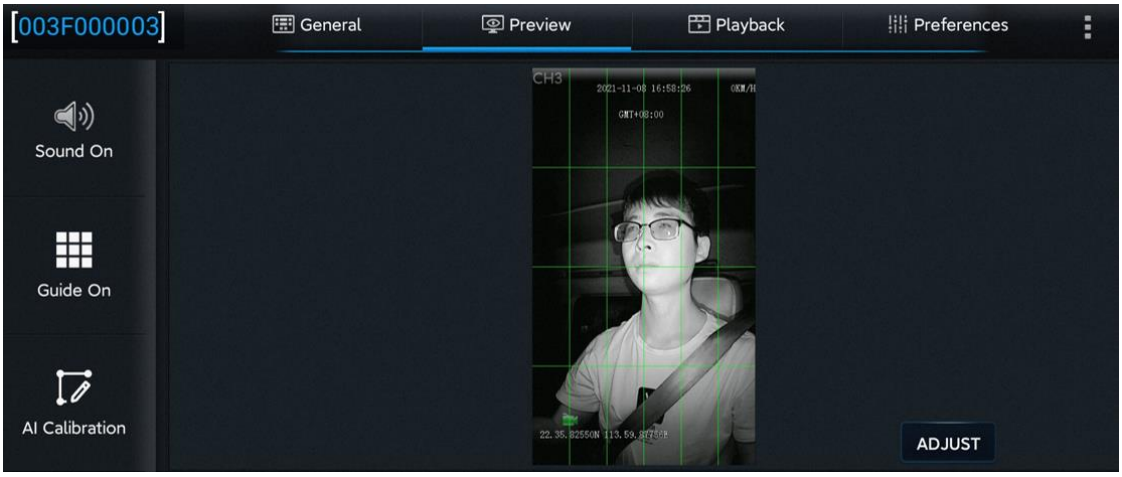
2. After determining the approximate position, adjust the label surface of the CA29M camera to face the A-pillar (with the curved surface facing the driver); then, tear off the 3M tape on the bracket base, and attach the bracket to the windshield in the direction parallel to the A-pillar.

* Note: When mounting, make the notched side of the bracket face upward, to facilitate camera angle adjustment after mounting. As shown in the following figure.

3. After attaching the base on the glass, adjust the spherical hinge by pushing the CA29M camera to ensure that the following requirements can be met according to the normal driving habits and sitting posture of the driver:

(1) Make sure the DMS camera has a low angle of view.

(2) Make sure that the driver's face appears in the middle of the video screen, the driver's face and body are vertical on the video screen, and the lower edge of the screen is below the driver's chest.



(3) Make sure that the fill light of the DMS camera illuminates the driver's face (fill light illuminating the seat belt is not allowed; otherwise, it will lead to overexposure of video).

(4) Make sure that there is no other object (for example, the steering wheel)

in the DMS video screen that will obstruct the driver's face and the seat belt features.

4. Tighten the screws on the right side of DMS camera bracket to ensure that the camera will not shake.

6.1.4.3 Installation Requirements for CA29M Camera Vertically Mounted on Countertop

If the DMS camera is a countertop-mounted CA29M, the CA29M camera needs to be fixed above the instrument panel. The specific installation method is as follows:

1. Power on the device first; then, connect with the device through the APP, enter the real-time preview screen, and preliminarily determine the camera installation location which shall meet the following requirements:
   (1) The desktop is flat and the camera can be fixed easily.
   (2) The driver's face on the DMS screen is not obstructed by the steering wheel, and the upper part of the driver's body (above the chest) can be displayed on the screen. It shall be ensured that the seat belt features and face features can be seen, and the driver's face appears in the middle of the screen.
   (3) DMS camera should be fixed in the middle of instrument panel. If this is not possible, the camera can be installed with rightward or leftward deflection, but the maximum deflection angle shall not exceed 30°.
2. After the installation position is determined, fix the DMS camera bracket on the instrument panel with self-tapping screws.
3. After the base is fixed, adjust the angle of DMS camera lens to ensure that the following requirements can be met according to the normal driving habits and sitting posture of the driver:
   (1) Make sure that the driver's face appears in the middle of the video screen, the driver's face and body are vertical on the video screen, and the lower edge of the screen is below the driver's chest.
   (2) Make sure that the fill light of the DMS camera illuminates the driver's face (fill light illuminating the seat belt is not allowed; otherwise, it will lead to overexposure of video).
   (3) Make sure that there is no other object (for example, the steering wheel) in the DMS video screen that will obstruct the driver's face and the seat belt features.
4. Tighten the screws of DMS camera bracket to ensure that the camera will not shake.

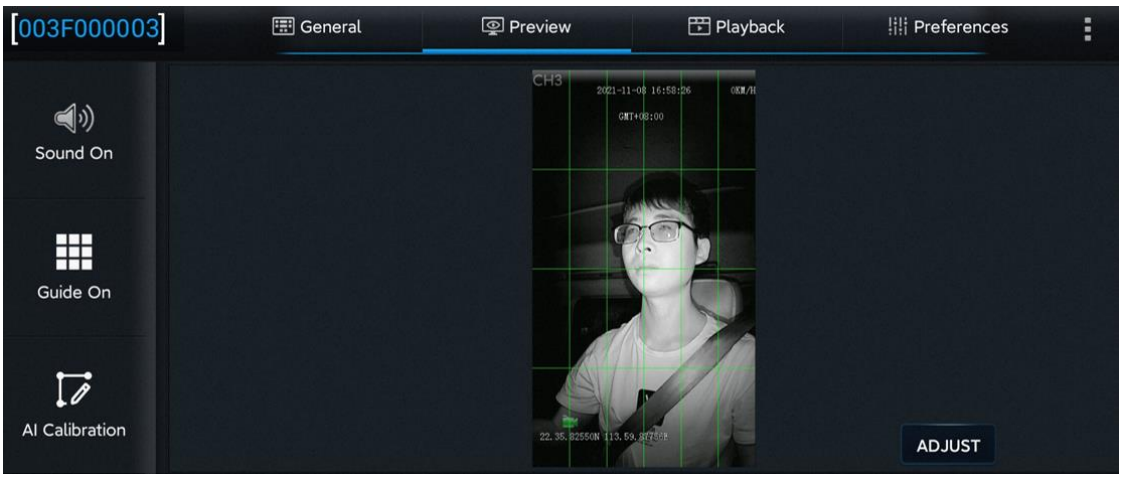
6.1.5 Calibration Requirements

Log in to the Veyes APP.

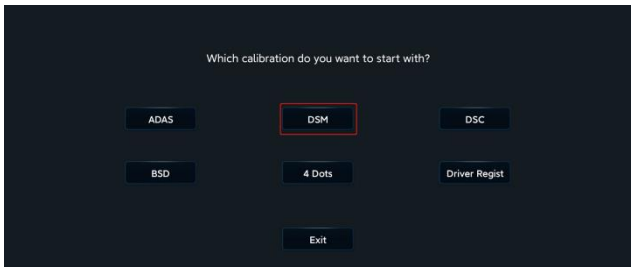
1. Click Preview on the homepage to enter the preview interface.

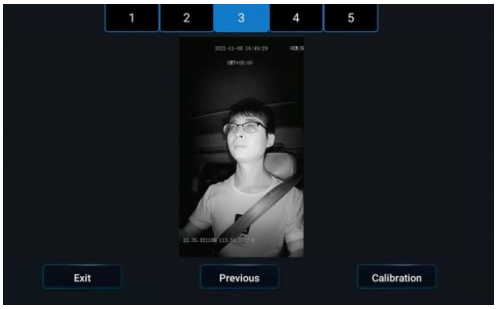
Double-click the driver channel to enter the main-stream full screen.

2. Click AI Calibration for calibration selection.

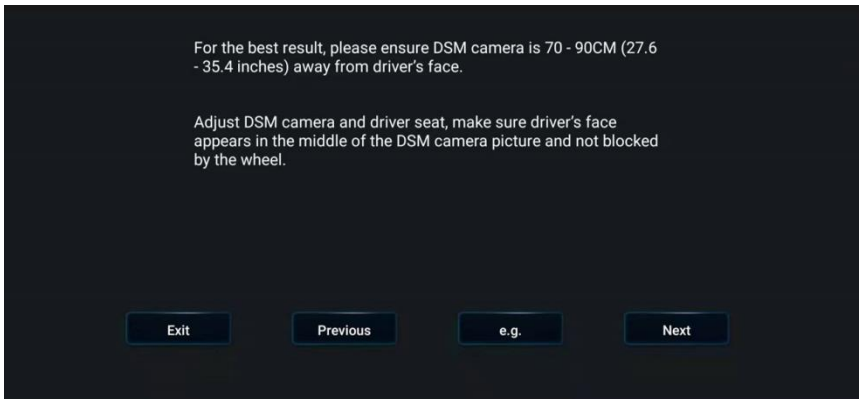


3. **Select DMS for calibration.**
4. **Select the corresponding channel of the DMS camera (select Channel 3 here).**
5. **Click Calibration to move on to the next step.**





6. **Confirm the prompts - click Next to move on to the next step.**

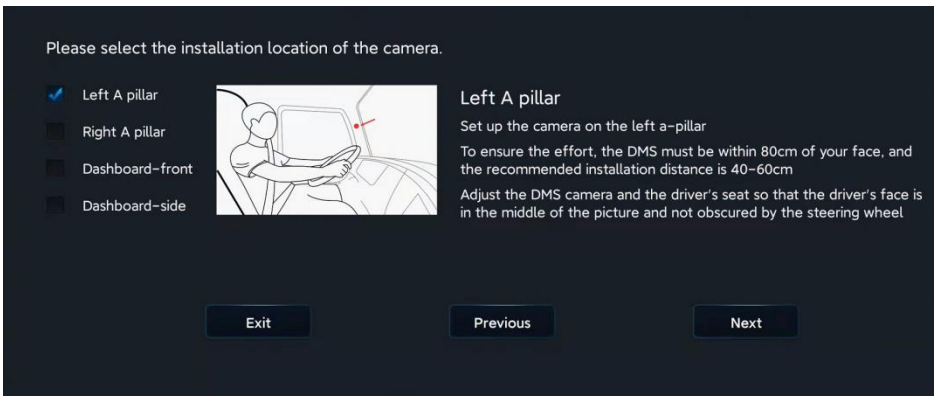


7. **Installation Location of DMS Camera**

The left A-pillar, the right A-pillar, the front side of the countertop, and the lateral side of the countertop are available. If you have any questions, please click each option in turn, and refer to the legend and description on the right.

After selecting the corresponding installation method, the software automatically associates the calibration method with the installation method, not requiring any manual operation (for installation on the left A-pillar, the right A-pillar, and the lateral side of the countertop, the lateral side calibration is applied, and for the installation on the front side of the countertop, the front side calibration is applied).

(This step is very important, and the selected installation method must be consistent with the actual installation method)



*Note:

Before clicking Next to start formal calibration, the driver shall sit in the normal driving posture and look straight ahead.

8. Click Next to move on to the next step for automatic face calibration.

During calibration, make sure that the driver sits still according to normal driving habits and posture and looks straight ahead.

In the process of side calibration, the intelligent algorithm will automatically learn the driver's head deflection angle and the positions of feature data of the driver's face. If the driver moves his head during the calibration, the calibration will restart automatically.

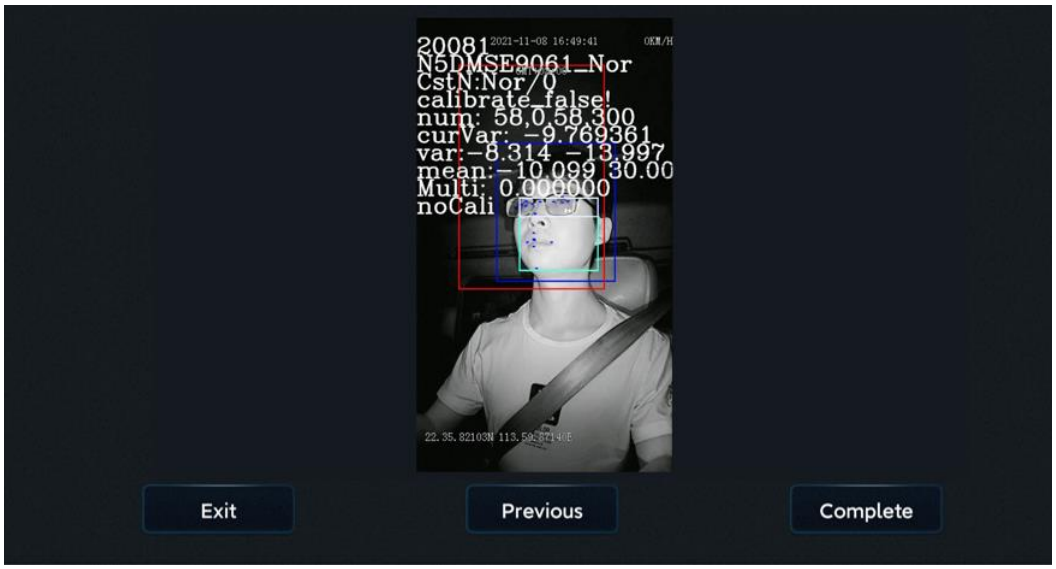
*Note:

For installation on the left A-pillar, the right A-pillar, and the lateral side of the countertop, the human face and the camera must form a certain angle to complete the calibration.

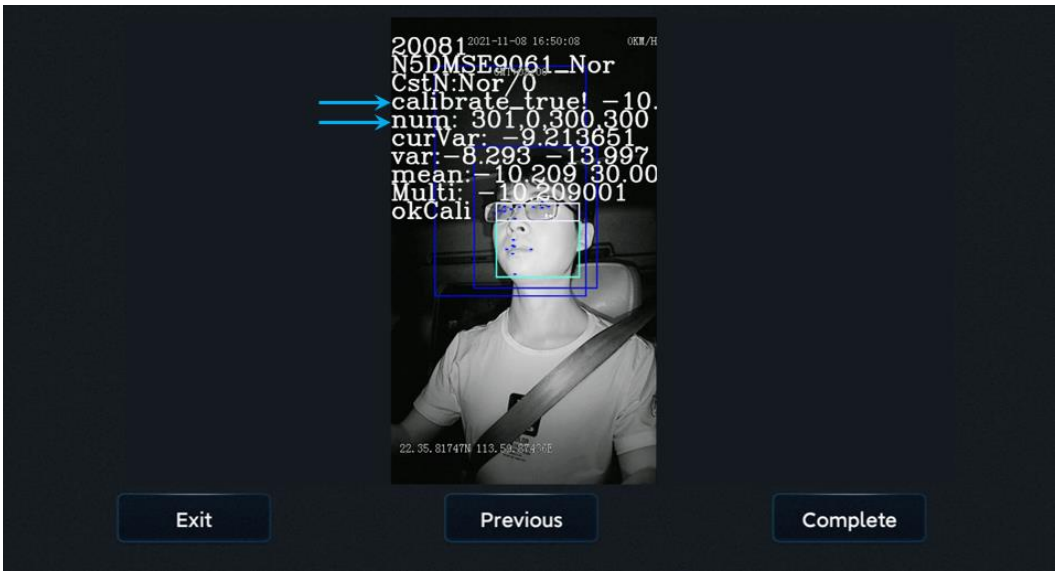
For installation on the front side of the countertop, the human face must be in front of the camera to complete the calibration.

The driver sits still and waits for the equipment to be calibrated automatically. When the value of NUM reaches 301 in the mode of side installation and side calibration (51 in the mode of front installation and front calibration), the calibration frame turns from red to blue, and then the calibration ends.

Calibration is ongoing:



Calibration is completed:



Click Finish to complete the calibration and exit the calibration mode.

6.2 BSD Installation and Calibration

6.2.1 Top View Camera Installation and Calibration

For installation of top view cameras, namely the front-top view camera, right-top view camera and left-top view camera, large wide-angle cameras are adopted and installed near the front end. The cameras, through the top view angle, capture pictures of blind spots on vehicle sides, and the AI intelligent algorithm is used to determine whether there is a pedestrian in the blind spot.

The principles and steps of installation and calibration are the same for left and right top view cameras.

The camera used is MiniC24-MA, and the camera installation effect refers to the following figure.

[Installation position]

The camera shall be installed on the upper part of the front end, and the coverage shall be 4m long on both the left and right sides, and 3m wide counting from the line from the installation position vertically to the ground point. The specific installation position shall be comprehensively considered according to the width of the A-pillar of the actual vehicle, the height of the driver's seat, the vehicle type, the rearview mirror condition, etc. For selecting the installation location, pay attention to the following points:

1. The left and right sides of the installation position shall not be blocked by any bulge.
2. The rearview mirrors, carriages, etc., cannot block BSD, otherwise, the camera shall have a bracket customized, or the installation position changed.
3. The installation height shall be 210-400 cm, preferably 270-300 cm.
4. The installation location shall be finally determined based on the driver's location and figure, which shall be selected as appropriate subject to the realization of full coverage.

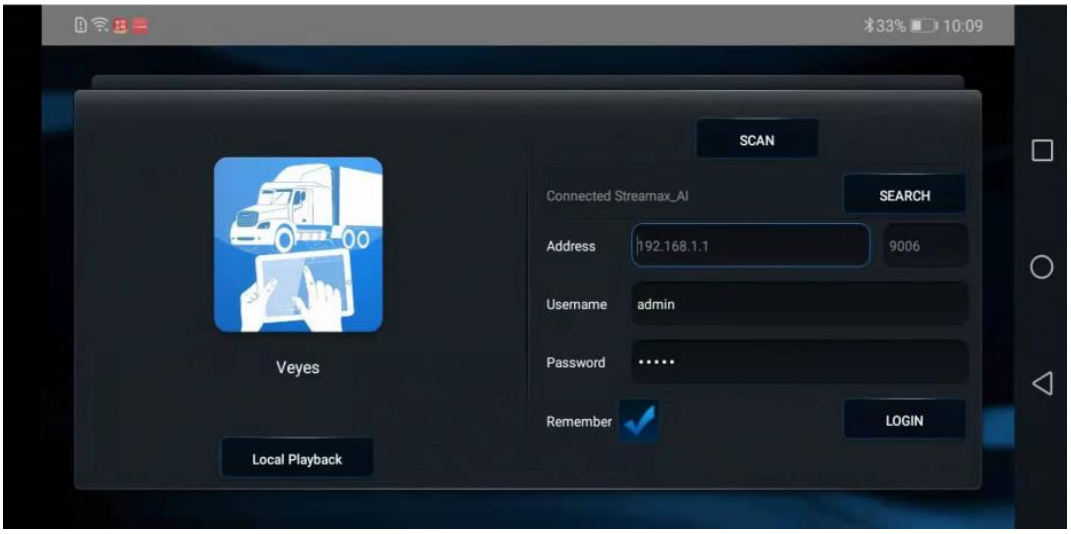
[Imaging Adjustment]

1. Rotate the ball head of the camera to adjust the screen. It is required that the installed imaging image shall cover the pedestrian-detection area, and the area must be located in the center of the image.
2. The lower center of the image must show a little vehicle body to ensure coverage to the limit of the blind spot.
3. The lower edge of the image should not show too much of the vehicle body,

otherwise, the image may be overexposed to the car body at night due to infrared reflection.

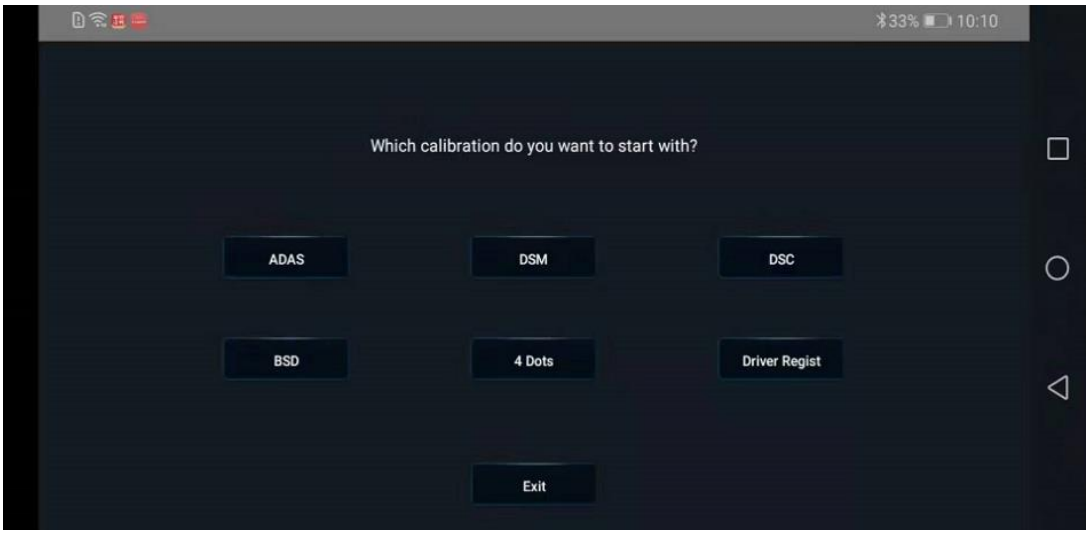
[Calibration Debugging]

Step 1: Connect the mobile phone to the device hotspot, enter EasyCheck App, input the user name and password, and click **Login**.

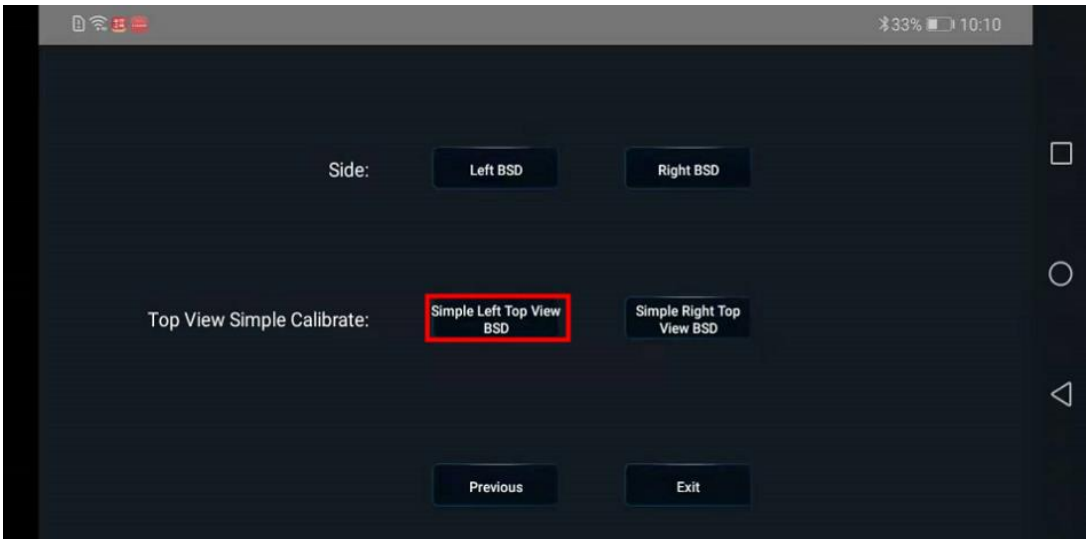


Step 2: Choose **Preview - AI Calibration**.

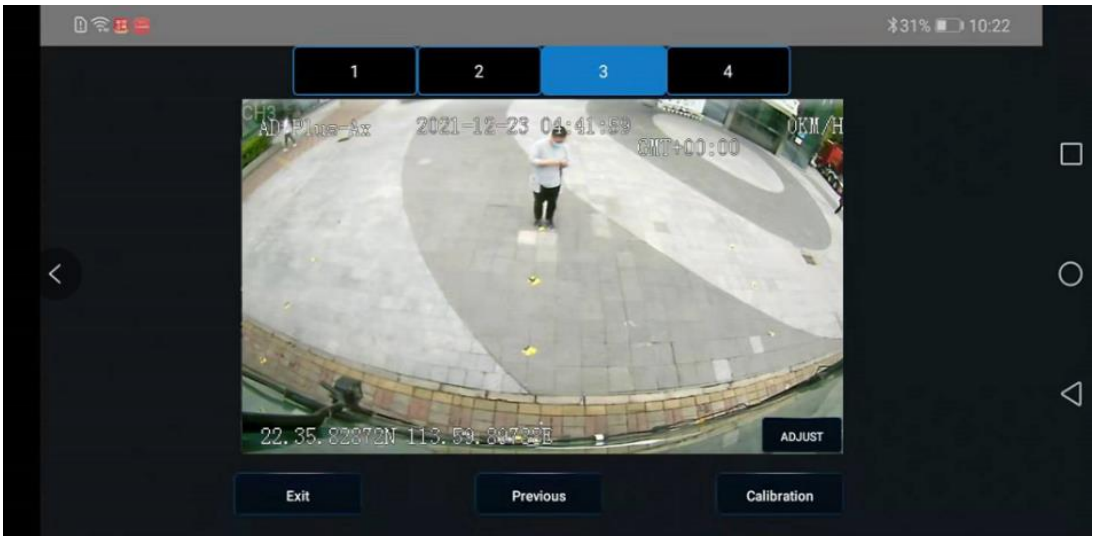
Step 3: Choose **BSD**.



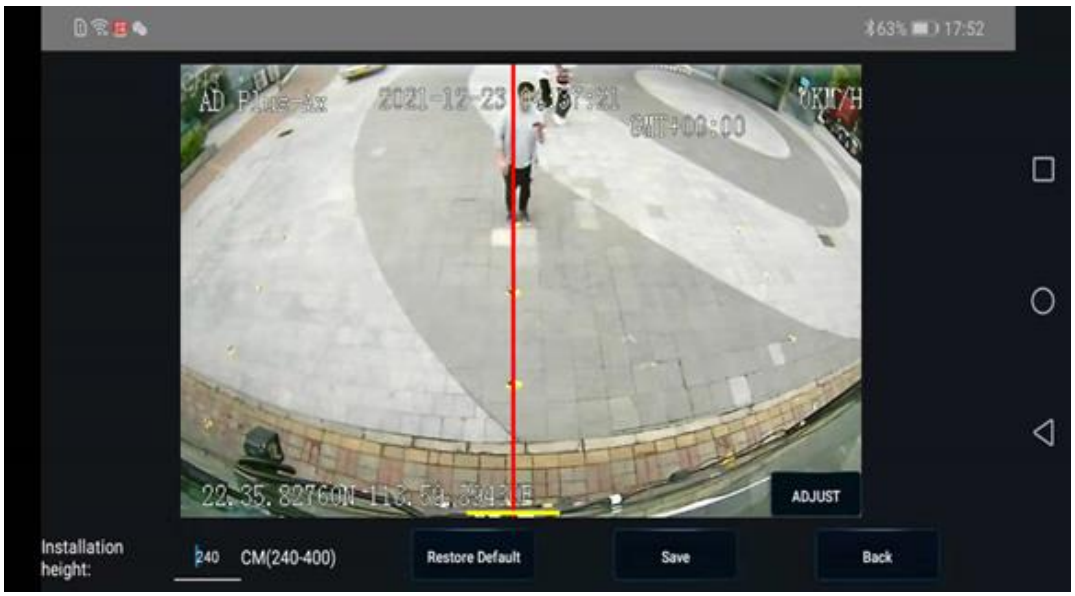
Step 4: Choose **Simple Left Top View BSD**.



Step 5: Choose the channel to connect the camera.



Step 7: Put the yellow line close to the side edge of the vehicle body, and input the installation height.



6.2.2 Calibration for lateral side installation

Later side installation means installation on the right side and left side. The principles and steps for their installation and calibration are the same. It is to introduce the left-side installation here.

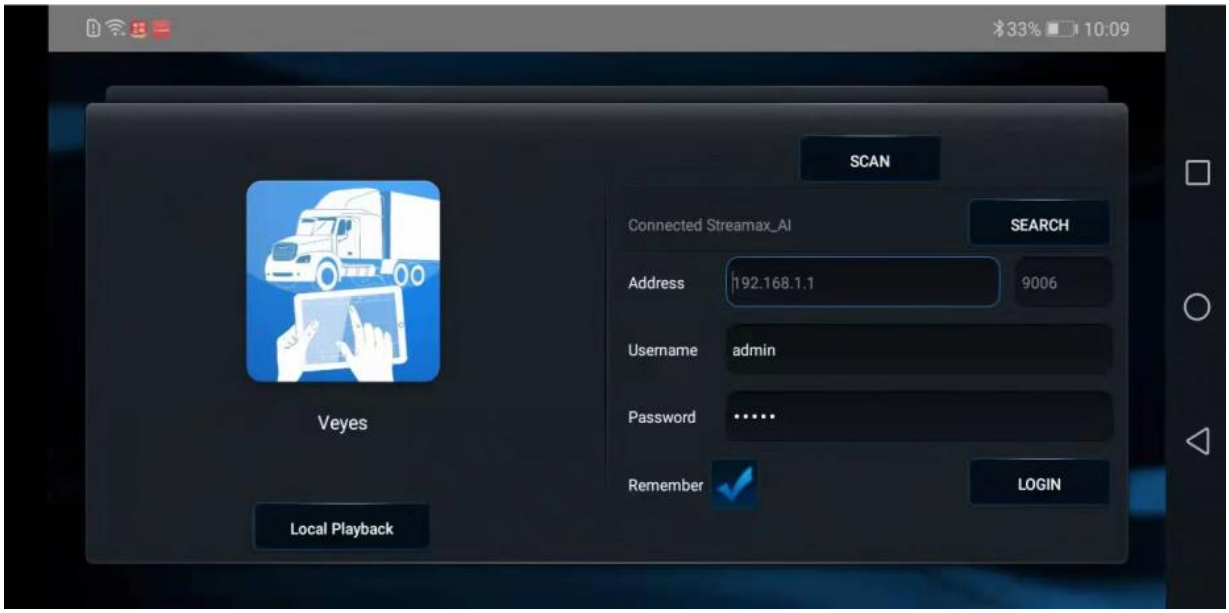
The camera is CA24S, and the installation position is shown in the figure.

The installation height of BSD shall be 100 - 250 cm, and the distance from BSD to the front end shall be 100 - 2,000 cm.

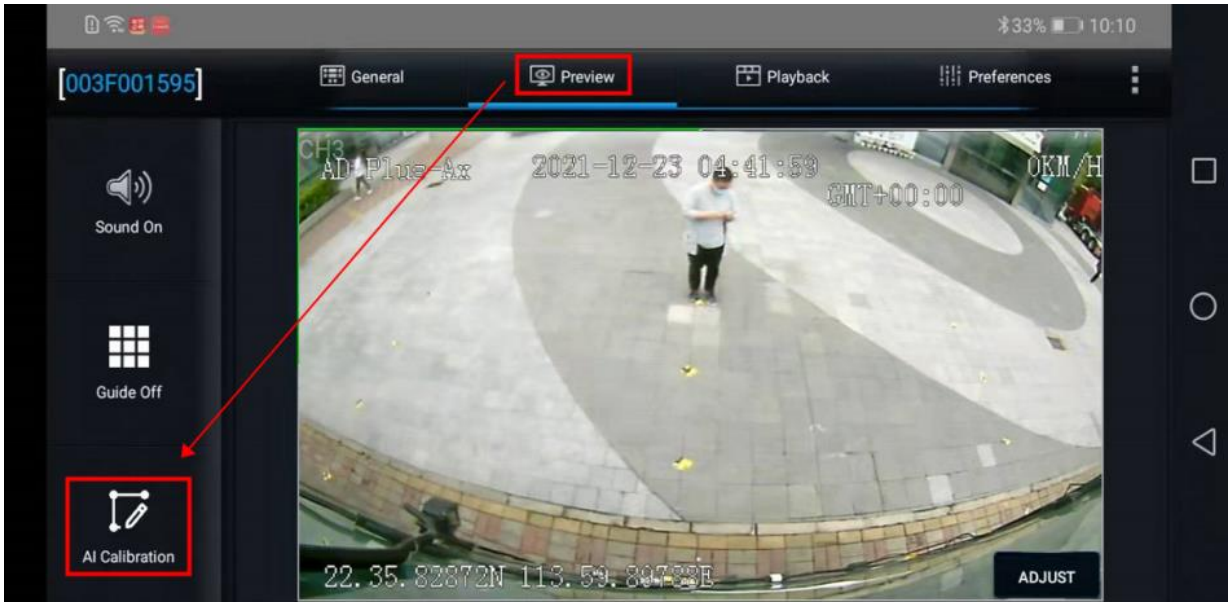
The optimal installation height for lateral side installation of BSD is 195±15 cm.

Start calibration:

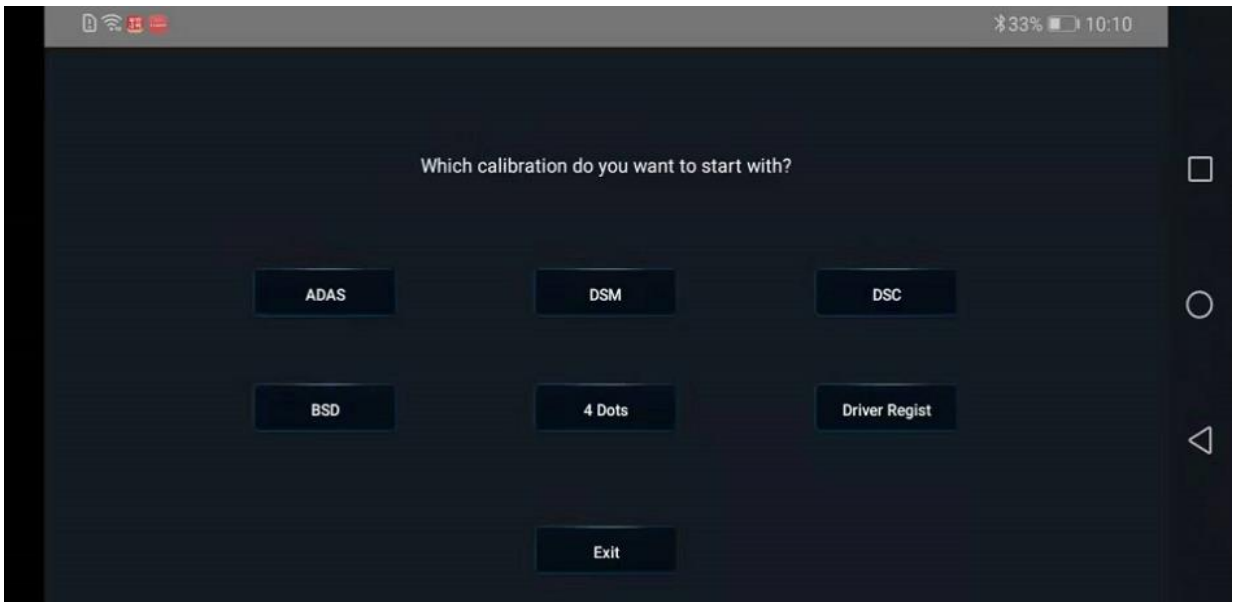
Step 1: Connect the mobile phone to the device hotspot, enter EasyCheck App, input the user name and password, and click **Login**.



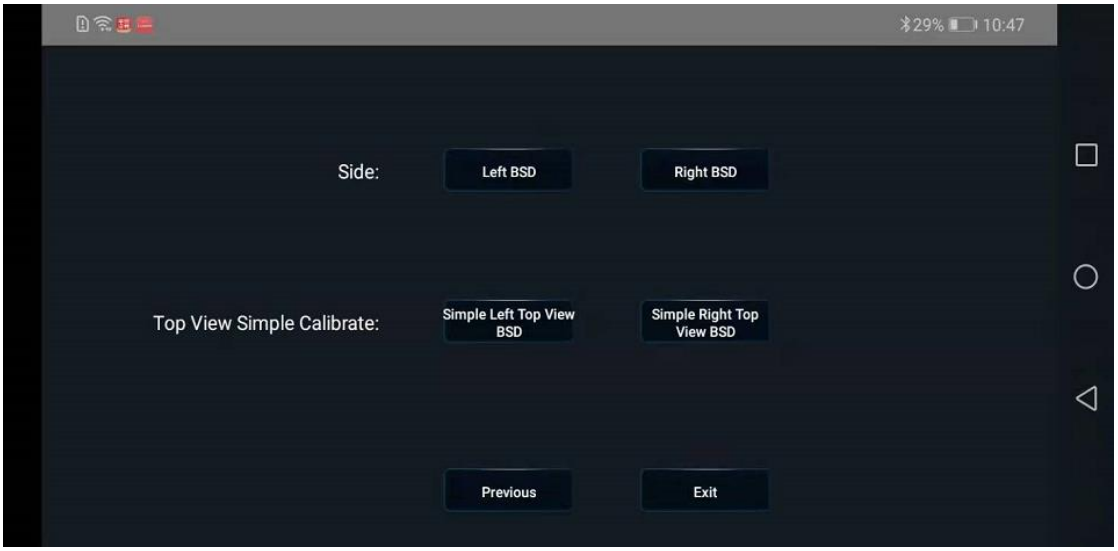
Step 2: After logging into EasyCheck App, choose **Preview - AI Calibration**.



Step 3: Choose **BSD**

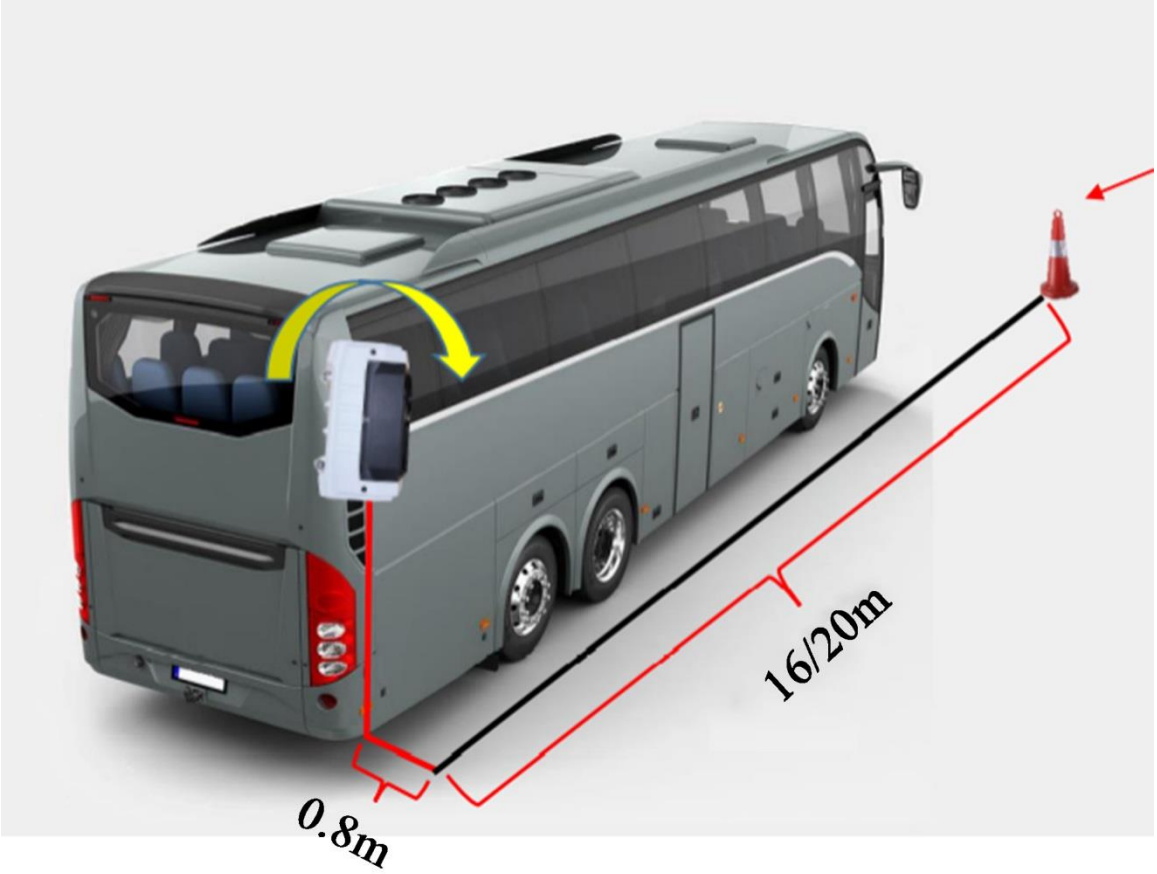


Step 4: Choose **Left Top View Blind Area**

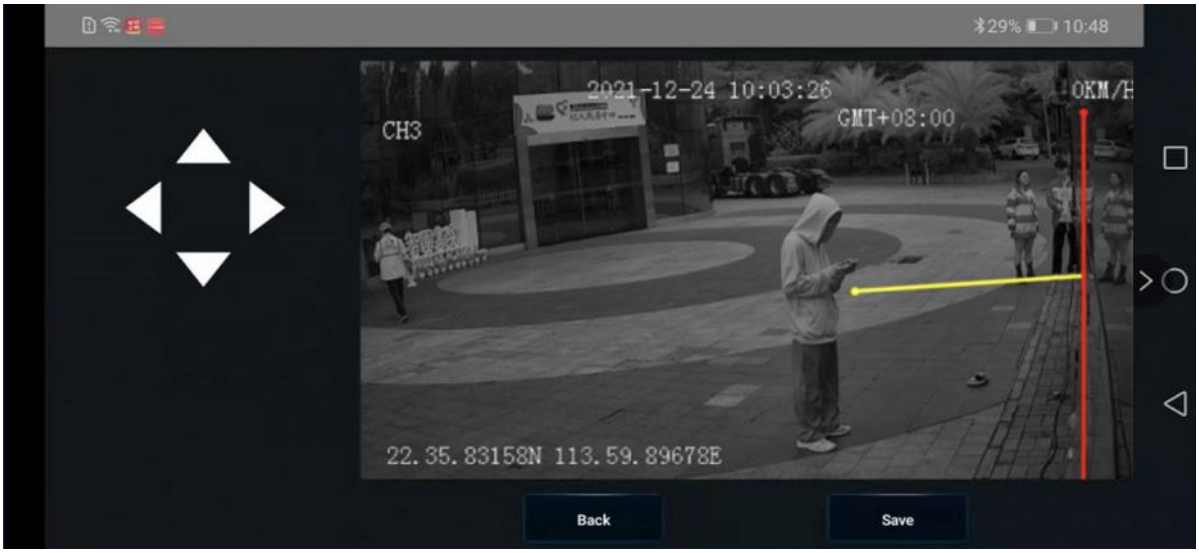


Step 5: Choose the channel to connect the camera.

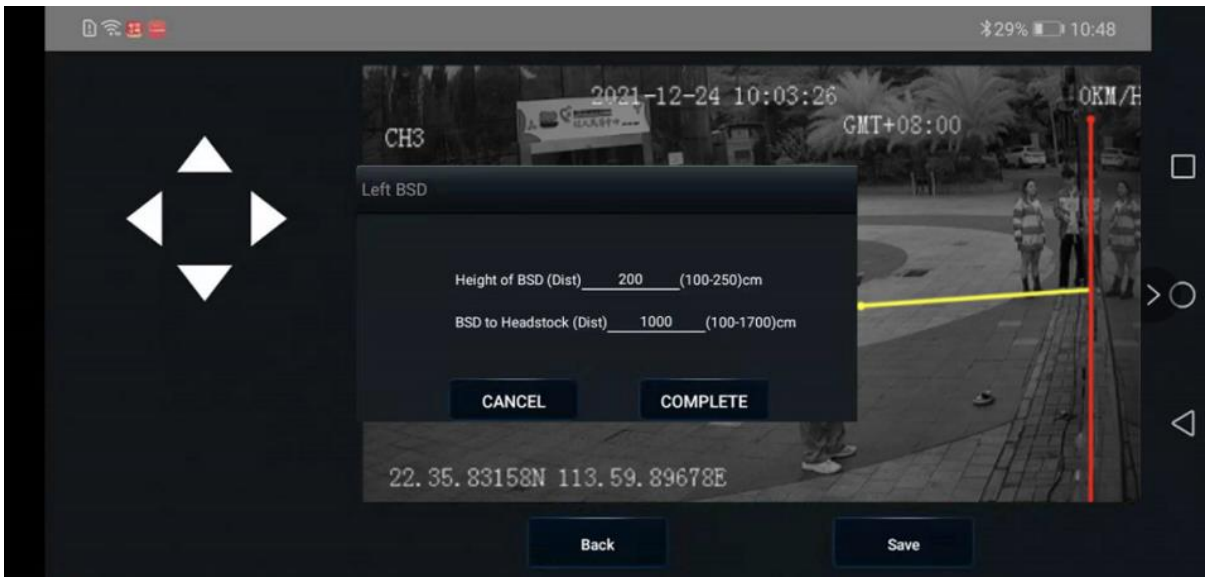
Step 6: Place the traffic cone at a location within the range of 2-3m longitudinally distanced from the front end and 0.8m laterally distanced from the front end **(the specific location shall be determined based on the actual car situation; taking the average height of drivers, it is suggested to sit into the vehicle to check the size of the blind spot, and calibrate the blind spot on the viewing angle into the screen, which shall prevail).**



Make the red line stick to the left edge of the vehicle body, and the yellow line stick to the lower edge of the traffic cone (it is the bottom of one's feet here); then, click **Save** after the adjustment.



Now, the screen shows the installation height of the BSD camera, and the distance from the BSD camera to the front end.

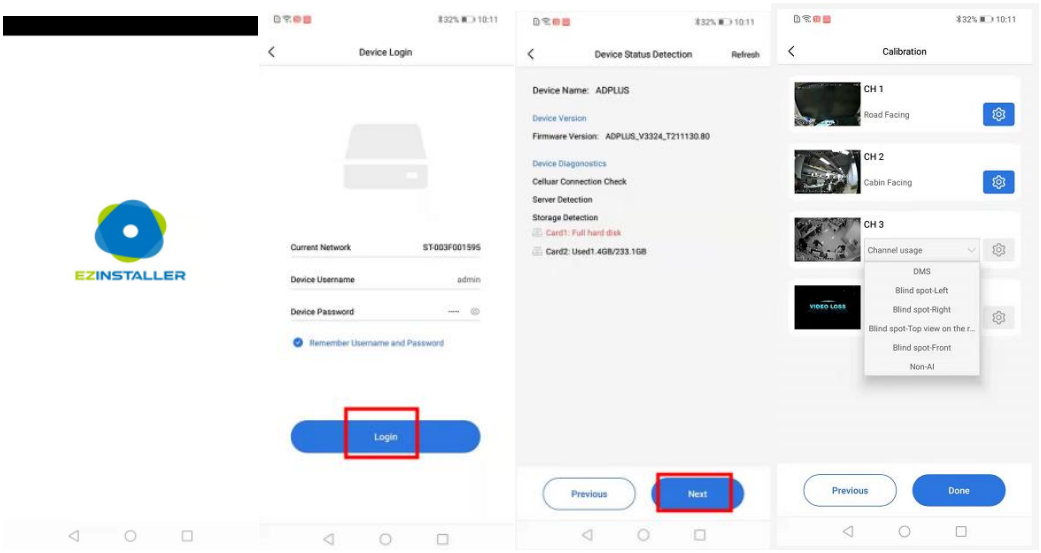


Input the accurate installation height and the distance from the camera to the front end, and click **Finish**.

6.2.3 Calibration of Blind Spot in Front Top View

Step 1: Connect the mobile phone to the device hotspot, enter ezinstall, input the user name and password, and click **Login**.

Step 2: Choose **Next**, then the screen shows the channel; select **AI alarm type** = Blind spot front, and choose the setting button to start calibration.



Step 5: Draw the blind spot area into a rectangle by moving four points **(the drawn area shall cover all the blind spots in front of the vehicle).**

Click **Save** to complete the calibration.

6.2.4 Principle of Actual Vehicle Routing

1. If the front end shall not be perforated, it is suggested to install the camera on the cargo box or the connector.
2. If the vehicle is equipped with a self-unloading carriage, and the camera must be installed on the carriage, the blind spot of the top view should be routed from the trail to the front end.
3. The side-mounted BSD is not applicable to trailers, and the routing to the trailer is not practicable.

7. Acceptance and Cleaning

7.1 Cleaning

Clean up the installation site, collect and take away tools and waste separately, and put the original articles in the vehicle to their original place, and then the installation work ends.

7.2 Installation Acceptance

1. Conduct acceptance for the installation details and parameter setup item by item according to the acceptance list provided by the customer.
   (1) Focus on inspection of parameter setup, and save screenshots.
   (2) Focus on inspection of video images, and capture and save videos.
2. Take pictures of all the equipment and the center console after installation.
   (1) Take pictures of the installation positions of all items.
   (2) Take a picture of the rendering inside the cabin after installation.