



# **VIA Mobile360 M500 AI Safety System User Manual**

## Overview

Mobile360 M500 is a smart on-board The AI Safety System monitoring device specially designed for industrial vehicles, such as stackers, forklifts and other engineering equipment. It can detect the dangerous state of the work area in real time and provide warnings to improve the safety of the operation of engineering vehicles. An indispensable security system in the era of smart industry.

The AI Safety System monitoring function mainly uses three independent monitors, combined with deep learning calculations to complete machine vision recognition. Two of the ultra-wide-angle monitors with supplemental light design are installed on the front and rear of the forklift. They can provide safety detection even in poorly lit environments and assist operators in seeing blind spots near the vehicle during work. In addition, a monitor equipped with infrared supplement light can detect the fatigue of the operator at the same time, and can correctly identify the status of the personnel under various light conditions. If equipped with basic vehicle accessories such as display screen, speed sensor, seat belt, etc., it can analyze the status inside and outside the vehicle and the operator, and can send out visual and sound alarm reminders in time. The screen display can help the operator see the visual blind angle reduces the occurrence of industrial safety accidents and improves the working safety of forklifts.

M500 power supply adopts wide-voltage design, which can cover most of the different types of forklifts on the market. Because the

working environment of this kind of engineering vehicles is often harsh, such as high temperature, high humidity and a large amount of dust, etc., the main body, connector Including peripheral equipment, IP67 protection specifications are used to ensure that the system can operate normally in harsh environments.

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## 1. Specifications

| Item                   | Description                       |
|------------------------|-----------------------------------|
| Memory                 | 1GB memory                        |
| Storage                | 512MB ROM                         |
| Audio                  | Power 2W / 4 OHM External speaker |
| Wireless Communication | WIFI 802.11a/b/g/n/ac             |
|                        | 4G LTE                            |
|                        | GPS/Beidou                        |
|                        | BT 5.0                            |
| Power                  | DC9-36V                           |
| Operating System       | Embedded Linux                    |
| Dimensions             | 178mm x 164mm x 52.8mm            |

## 2. Accessories

| Item                                  | Description                                    |
|---------------------------------------|--|
| Front Camera<br>(Aviation connector)  | Lens 6G ,F2.3, D:190° V:110.8° H:180°,<br>WALH |
|                                       | Fill light White LED AHD@720P                  |
|                                       | Waterproof Rating IP67                         |
| Rear Camera<br>(Aviation connector)   | Lens 6G ,F2.3, D:190° V:110.8° H:180°,<br>WALH |
|                                       | Fill light White LED AHD@720P                  |
|                                       | Waterproof Rating IP67                         |
| Inside Camera<br>(Aviation connector) | Lens 6G ,F2.3, D:68° V:33° H:59°               |
|                                       | Fill light IR LED AHD@720P                     |
|                                       | Waterproof Rating IP67                         |

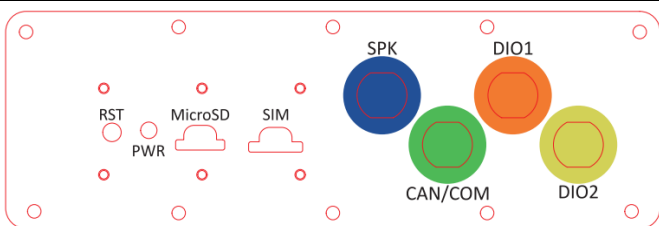
|                                     |   |
|-------------------------------------|---|
| Speaker<br>(Aviation connector)     | 2W/4 OHM Mono speaker   |
| Power Cable<br>(Aviation connector) | Red (9-36V)<br>Black (GND)<br>Yellow (IGN/ACC)  |
| Fuse                                | Connect 12V and IGN/ACC to the fuse box<br>for use                                    |
| Antenna (SMA CONN)                  | 4G Antenna (MAIN + DIV)<br>3in1 Antenna (WIFI/BT/GPS)                                 |
| LCD Display<br>(Aviation connector) | 7-inch LCD display, aviation connector  |
| PCIe connector                      | 4G LTE module   |
| Data DIO wiring                     | Including vehicle speed sensor connector<br>and seat belt sensor connector (Optional) |
| SD Card                             | 32G TF card   |

### 3. Operating Temp

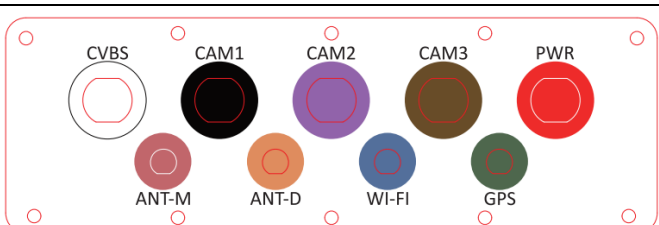
| Item                            | Description |
|---------------------------------|-------------|
| Host Operating Temp             | -20°C~+70°C |
| Front Camera<br>Operating Temp  | -40°C~+85°C |
| Rear Camera<br>Operating Temp   | -40°C~+85°C |
| Inside Camera<br>Operating Temp | -40°C~+85°C |

## 4. Appearance Description

### 4.1 Front Panel

|   |   |                                 |
|---|---|---------------------------------|
|  | 1 | Reset Key                       |
|   | 2 | Power LED                       |
|   | 3 | Micro SD Slot                   |
|   | 4 | Micro SIM Slot                  |
|   | 5 | SPK                             |
|   | 6 | DIO1<br>(Reserved Expansion)    |
|   | 7 | CAN/COM (Reserved<br>Expansion) |
|   | 8 | DIO2<br>(Reserved Expansion)    |

### 4.2 Back Panel

|   |   |                   |
|---|---|-------------------|
|  | 1 | Display Connector |
|   | 2 | Inside Camera     |
|   | 3 | Rear Camera       |
|   | 4 | Front Camera      |
|   | 5 | Power Connector   |
|   | 6 | 4G Main Antenna   |
|   | 7 | 4G DIV Antenna    |
|   | 8 | WIFI/BT Antenna   |
|   | 9 | GPS/BD Antenna    |



## 5. Installation Instructions

### 5.1 Host Installation

According to the suggestion, the main unit of M500 can be installed on the bottom of the forklift driver's seat and fixed on the bottom of the seat with the mainframe bracket (Schematic); when the bottom space of the driver's seat is insufficient, it can be installed on the forklift roof, and the mainframe can be fixed with the roof bracket (Schematic) ), and confirm the length of the camera wiring, power wiring, power cord, and display (Optional) wiring.



## 5.2 Installation Mobile APP

Install Mobile360 WorkX software on the phone, the phone system requirements: Android 5.0 and above.

## 5.3 Power Instructions

1. Find the fuse box
  2. Determine the location of the 12V power supply through the meter
  3. Use the meter to confirm the IGN/ACC power supply position, match the appropriate fuse connector to the power cord
  4. Install the 12V and IGN/ACC fuse connector to the fuse box
  5. Connect the ground wire to the car body
  6. Connect the power cord to the M500 machine (PWR interface 12V (red), ACC (yellow), GND (black))
  7. Connect the IGN/ACC cable to the M500 machine (PWR interface ACC (yellow))
  8. Start the forklift and make sure that the M500 is turned on normally
  9. Arrange and store the extra wires in a suitable location
- (Schematic)



## 5.4 Camera Installation Instructions

1. Install the front camera at the front of the forklift, match it with a suitable bracket or fix it on the body
2. The base is fixed but the camera angle is adjusted to about 60 degrees and the angle is not fixed
3. Install the rear camera at the rear of the forklift, match it with a suitable bracket or fix it on the body
4. The base is fixed but the camera angle is first adjusted to about 45 degrees and the angle is not fixed
5. Install the built-in camera on the special bracket, with the camera facing the driver's seat
6. Fix the base, the elevation angle is not fixed
7. Connect the inside camera to the CAM1 interface
8. Connect the rear camera to the CAM2 interface
9. Connect the front camera to the CAM3 interface
10. Arrange and store the extra wires in a suitable location

(Schematic)



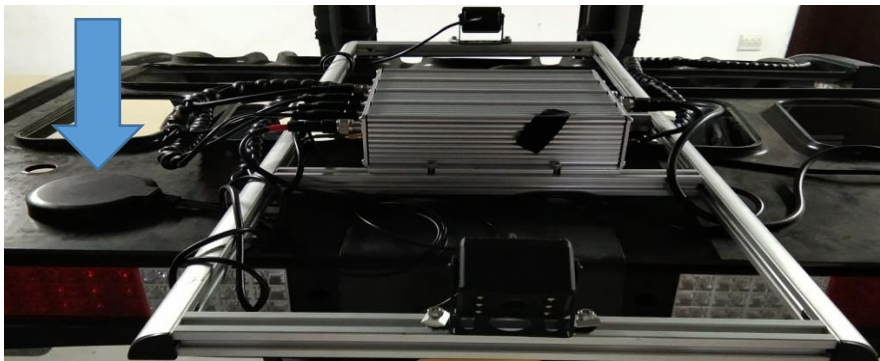
## 5.5 Speaker Installation Instructions

After fixing the speaker, connect the cable to the SPK interface of the M500, and arrange and store the extra wires in a suitable position (Schematic).



## 5.6 Antenna Installation Instructions

Connect the 4G & 3-in-1 antenna to the rear panel of the M500 and fix it on the forklift truck (Schematic).



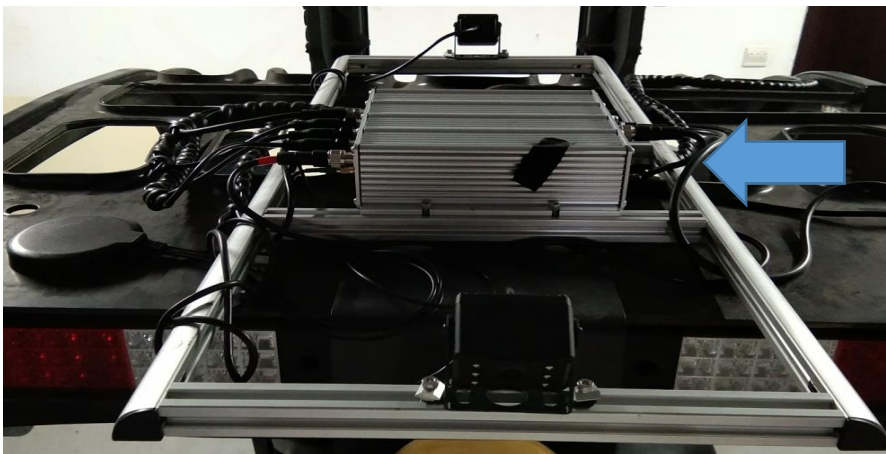


## 5.7 Bracket Installation Instructions

1. The monitor bracket is fixed on the right front pillar of the forklift through a customized lock plate, and is used to install monitors, cameras, speakers and other equipment (Schematic).



2. The roof bracket is used to fix the front and rear DMOD cameras, and can be used to fix the M500 mainframe when the bottom space of the driver's seat is insufficient (Schematic).



## 5.8 LCD Display Installation Instructions

Install the display screen on the inside camera/display fixing bracket, and connect the wiring to the CVBS interface, organize and store the extra wires in a suitable location (Schematic).



## 6. Start Using M500

The M500 will be in the working state about 1 minute after the forklift is powered on, and will enter the shutdown state about 20 seconds after the forklift is turned off. When a dangerous state is detected, the system will sound a warning sound. M500 must be set through the mobile APP.

### 6.1 LED Indicator Status Description

| LED   | Flashing frequency | Description              |
|---|--------------------|--------------------------|
| Power LED   | On                 | System startup           |
|   | Off                | System shutdown or sleep |
|   | 4Hz                | Firmware/MCU upgrade     |
|   | 1Hz                | Power On/Off             |
| 1Hz=1 flash per second / 4Hz=4 flashes per second |                    |                          |

## 6.2 Warning Description

| Item                           | Warning range                                     | Prompt method   |
|--------------------------------|---|---|
| Pedestrian collision avoidance | Pedestrians appear in the marked danger zone      | Speaker: The "di" sound keeps clicking until the person is out of the area<br>Display: Red pedestrian warning             |
|                                | Pedestrians appear in the demarcated warning zone | Speaker: Repeated "note the front (rear) side" after the breakpoint for 0.5 seconds<br>Display: Orange pedestrian warning |
|                                | Pedestrians appear in the designated safe area    | Speaker: No warning<br>Display: Green pedestrian warning  |
| Driver behavior                | Fatigue driving/yawning                           | Speaker: Repeated "Please Drive Safely" and breakpoint 0.5 second warning tone<br>Display: Red warning                    |
|                                | Dozing  | Speaker: Repeated "Please Drive Safely" and breakpoint 0.5 second warning tone<br>Display: Red warning                    |
|                                | Smoking   | Speaker: 0.5 second warning sound after repeating "no smoking"<br>Display: Red warning                                    |
|                                | Phoning   | Speaker: 0.5 second warning tone after repeating "do not call"<br>Display: Red warning                                    |
|                                | Block camera                                      | Speaker: Repeated "camera abnormality" after the breakpoint 0.5 second warning sound<br>Display: Gray                     |
|                                | Driver have left                                  | Loudspeaker: Repeat "driver have left" for 0.5 seconds<br>Display: Gray   |
| Seat belt (Optional)           | Seat belt disconnect warning                      | As long as the DMS can recognize the face, it will start the detection<br>When a seat belt break is detected              |

|                             |                                |  |
|-----------------------------|--------------------------------|--|
|                             |                                | Speaker: Repeated "Please fasten your seat belt" and break point 0.5 second warning tone<br>Display: Shows the seat belt icon  |
|                             | No warning on seat belt buckle | As long as the DMS can recognize the face, it will start the detection<br>Detect when the seat belt is buckled<br>Speaker: no warning<br>Display screen: shows the seat belt |
| Speeding Warning (Optional) | Speed detection                | Set speed limit alarm  |

## 6.3 Calibration Method Description

The calibration of M500 needs to be connected through the mobile phone APP. The connection method is through the M500 WIFI. After the connection is successful, enter the APP to operate the M500. The camera screen will prompt the user whether the current camera has been calibrated successfully. If it has been set, you can click the camera to view the viewing screen. If you need to re-calibrate, you can click the calibration button to calibrate the camera again.

### 6.3.1 Online Way

1. Wait for M500 to finish booting
2. Turn on the mobile WIFI and search for the terminal device (the default name is VIA\_ M500\_XXX) (Figure 1)
3. The default password is: 12345678
4. If the mobile APP is not connected to the terminal device, a connected icon will appear (Figure 2)
5. When the mobile phone APP is connected to the terminal device, the camera calibration screen will appear (Figure 3/ Figure 3)
6. The device interface supports switching to connect to other WIFI (only supported by Android APK) (Figure



2)

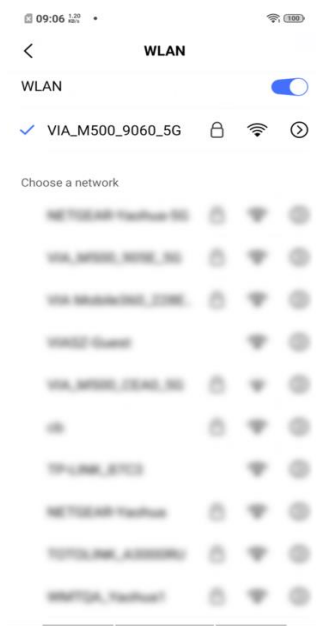


Figure 1



Figure 2

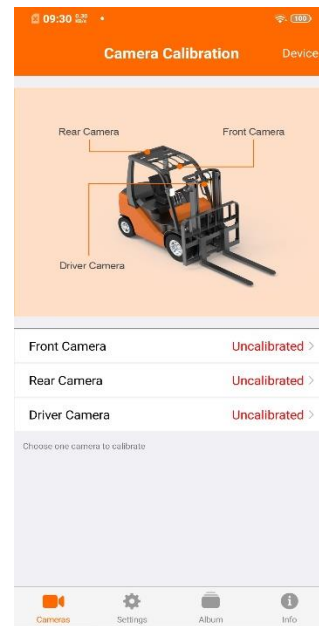


Figure 3

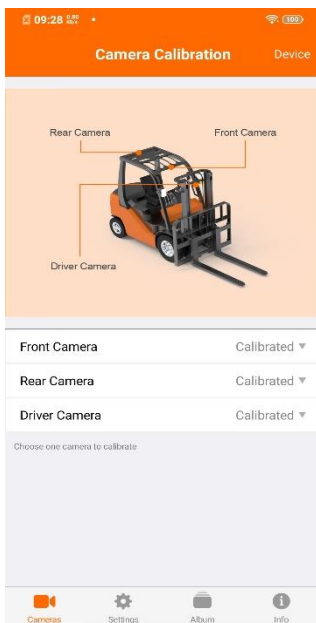


Figure 4

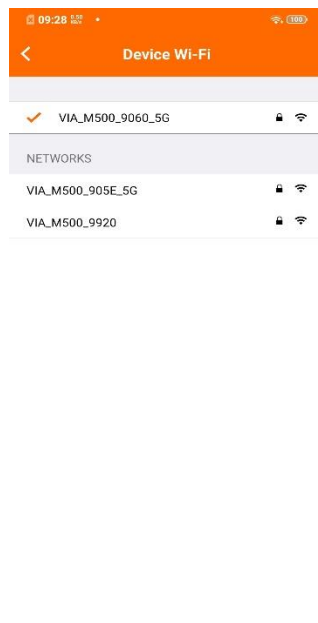


Figure 5

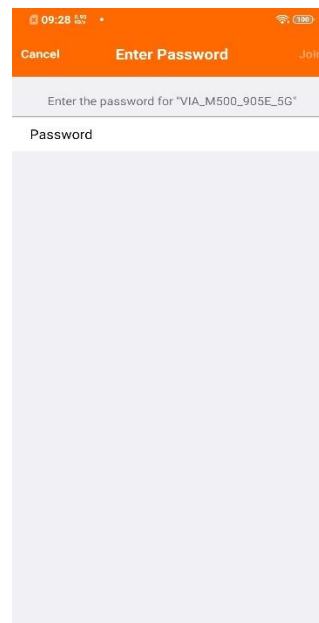


Figure 6










### 6.3.2 Front And Rear Camera Security Zone Calibration

The camera equipped with M500 can monitor a distance of about 6 meters and can alert the area according to the size of the forklift.

The current suggestion is that within 2 meters is a danger zone, within 3 meters is a warning zone, and 3 meters away is a safe zone, but customers can set the safety zone, warning zone, and danger zone according to their needs. When a person is detected, the warning will be followed.

#### 6.3.2.1 Express Calibration

The Express Calibration is to allow customers to quickly set the area range, so it is in accordance with the recommended distance (2 meters is a dangerous zone, 3 meters is a warning zone, and 3 meters is a safe zone).

- 1) Select the camera through the mobile APP  
(  Figure 3) , and select the Express Calibration mode (Figure  )
- 2) Select the installation height of the camera (Figure  )
- 3) Set the distance of the first area (Figure  )
- 4) he distance of the second zone can be set (Figure  )
- 5) Take out the M500 accessory box, place the calibration mark on item 3 above and place it at the set position, view the camera image through the mobile phone APP, and adjust the camera to align the middle calibration mark with the box in the middle of the screen (Figure  ,and click OK After the position, click the confirmation symbol on the upper right to complete the setting (Figure  )
- 6) Can be recalibrated (Figure  )
- 7) After calibration, live preview can be performed (Figure  )

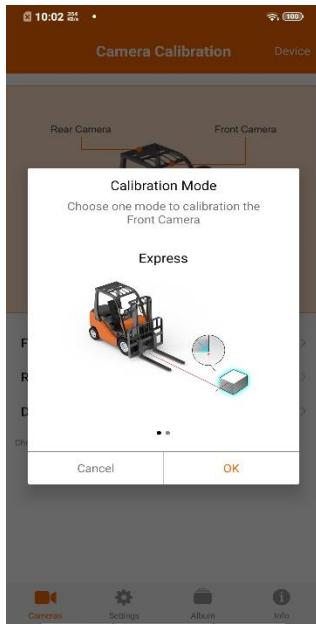


Figure 7

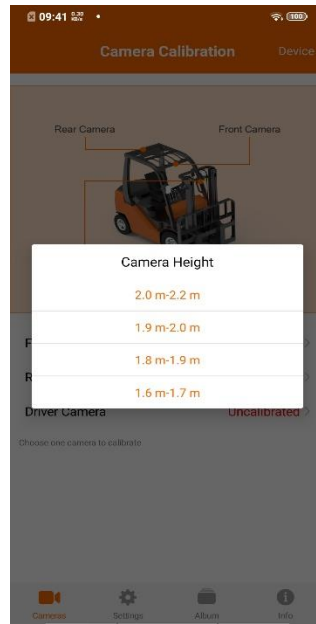


Figure 8

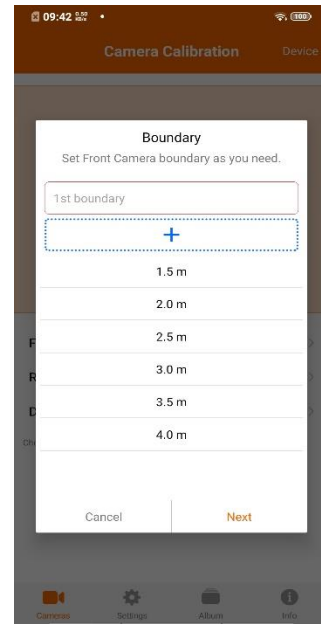


Figure 9

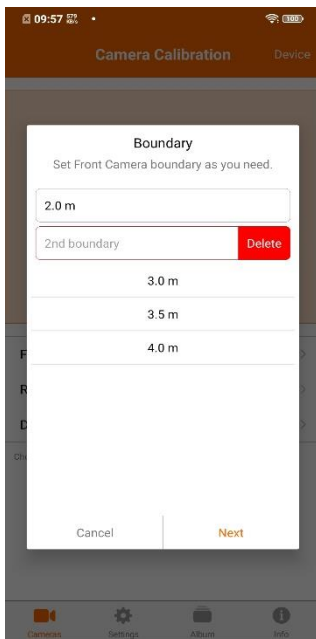


Figure 10

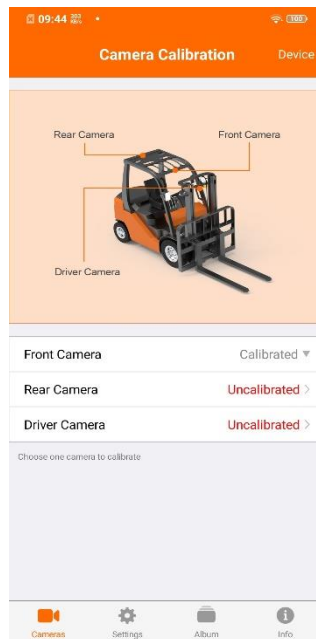


Figure 11

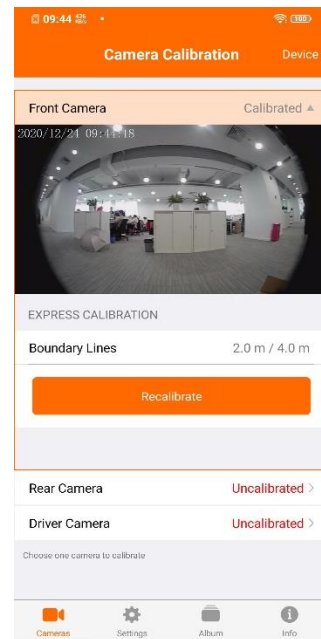


Figure 12

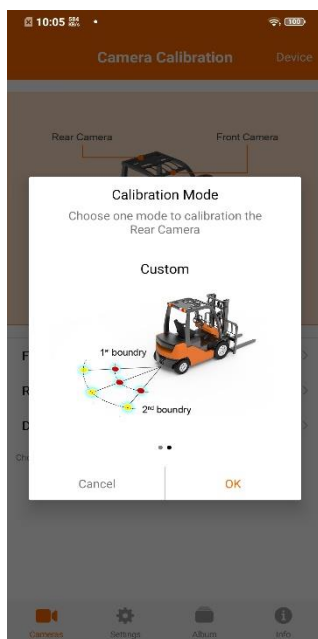


Figure 13

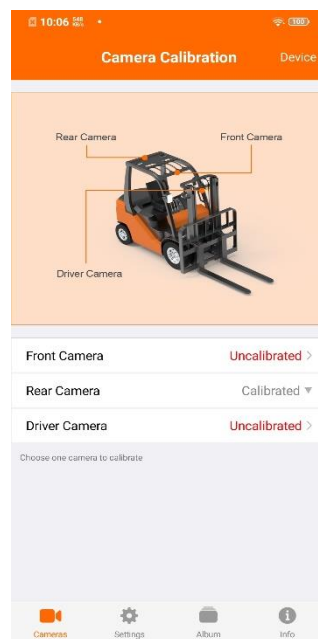
### 6.3.2.2 Custom Calibration

When the Express Calibration cannot meet customer needs, the customer can redefine the detection range with Custom Calibration. Before calibration, the dangerous area and warning area must be clearly defined.

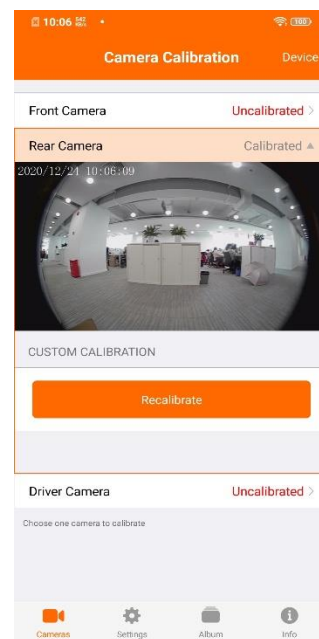
- 1) Select the camera through the mobile phone APP (Figure 3), and select the custom calibration mode (圖示 4)
- 2) And put three calibration positions in the two defined ranges
- 3) Left (L), middle (M), right (R), and correspond to the six points on the mobile APP to the defined node (圖示 7), and then complete the calibration operation (Figure
- 4) Can be recalibrated (Figure
- 5) After calibration, live preview can be performed (Figure



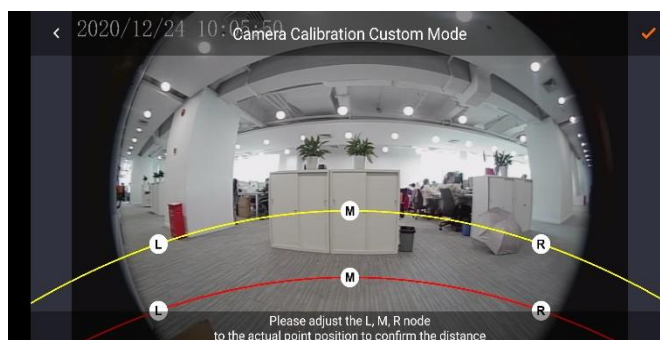
圖示 4



圖示 5



圖示 6



圖示 7

### 6.3.3 Driver Camera Calibration

The inside camera is preset through the mobile APP, and the face is within the set range. When the setting is completed, it will follow (6.2 Warning Tips) as a warning, and it can also be recalibrated (Figure 8).

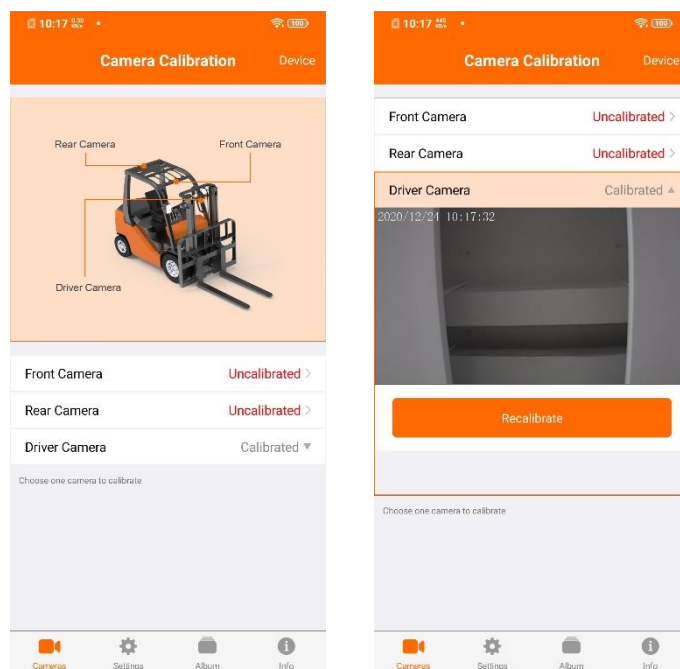
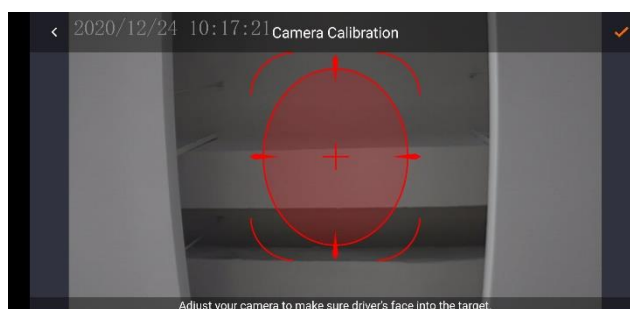


Figure 8

### 6.3.4 Seat Belt Settings

When the seat belt is detected, the connection status is displayed (Figure 9; when the seat belt is not detected, the unconnected status is displayed (Figure 10; when the seat belt hardware is not detected, the seat belt status is not displayed (Figure 11.

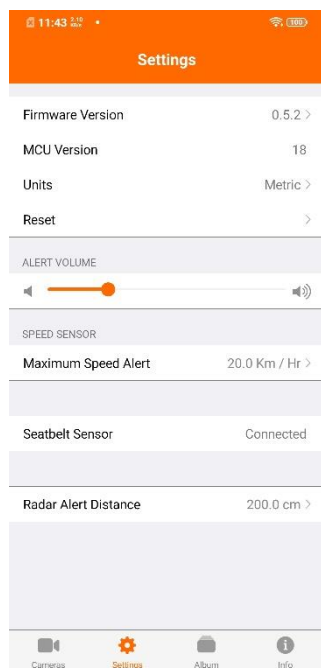


Figure 9

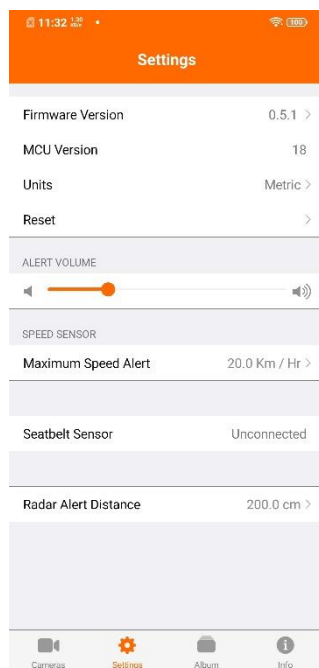


Figure 10

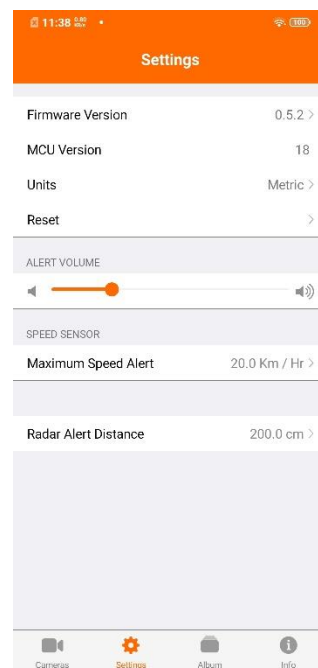


Figure 11

## 6.3.5 System Setting

In the system settings, you can query software version, unit, restore factory settings, adjust volume, set maximum speed, tire dimension, radar alarm distance, etc. (Figure .

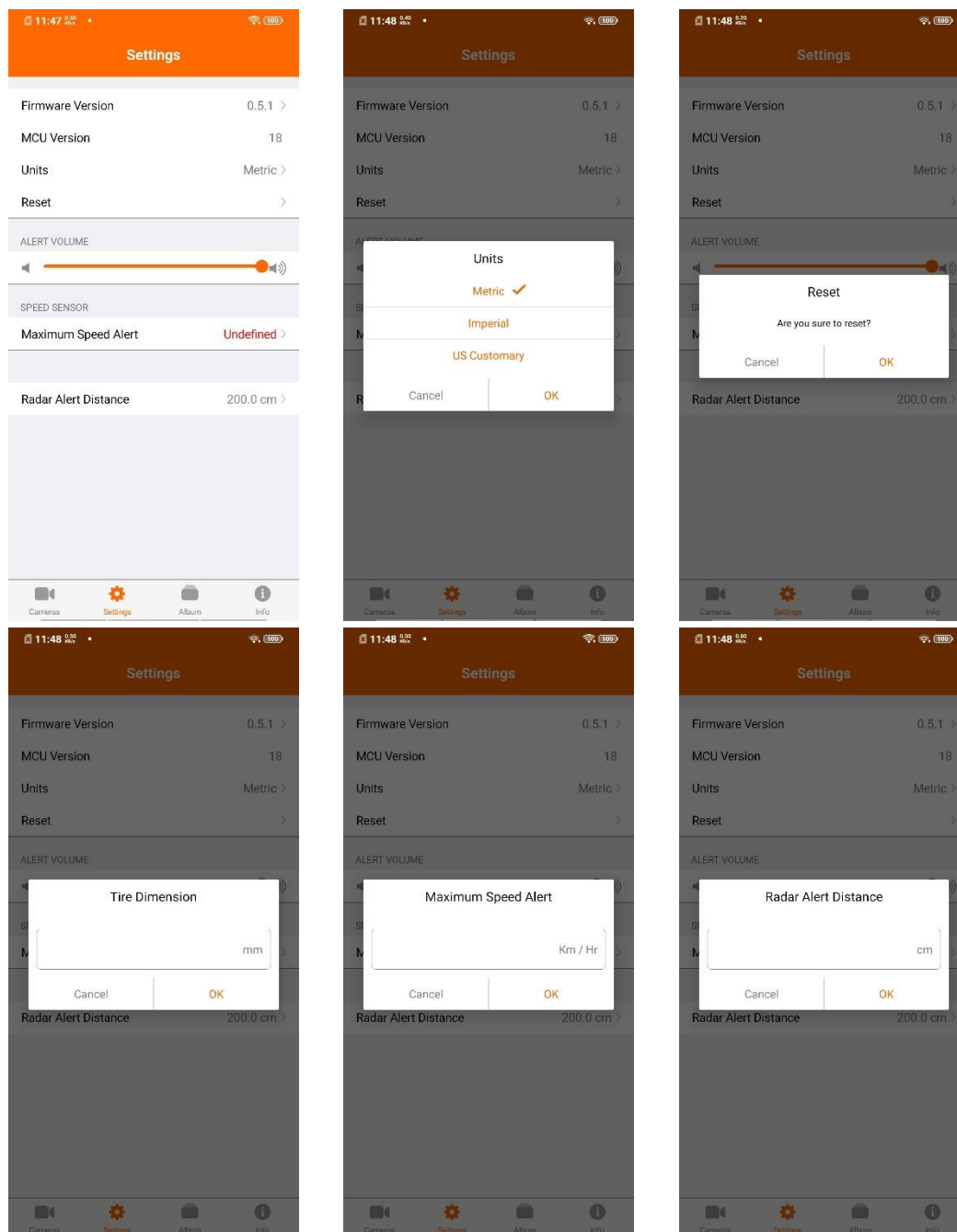


Figure 12

### 6.3.6 Album

The video files in the playback device can be previewed in the album (Figure , and the video files can also be downloaded and saved to the mobile phone for preview playback (Figure .

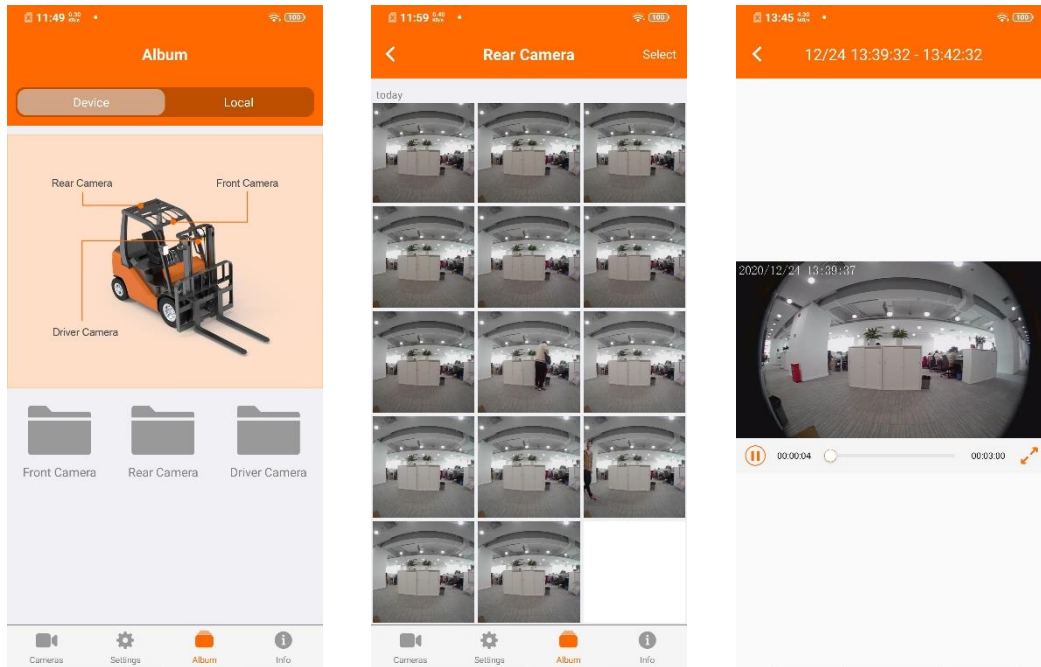


Figure 13

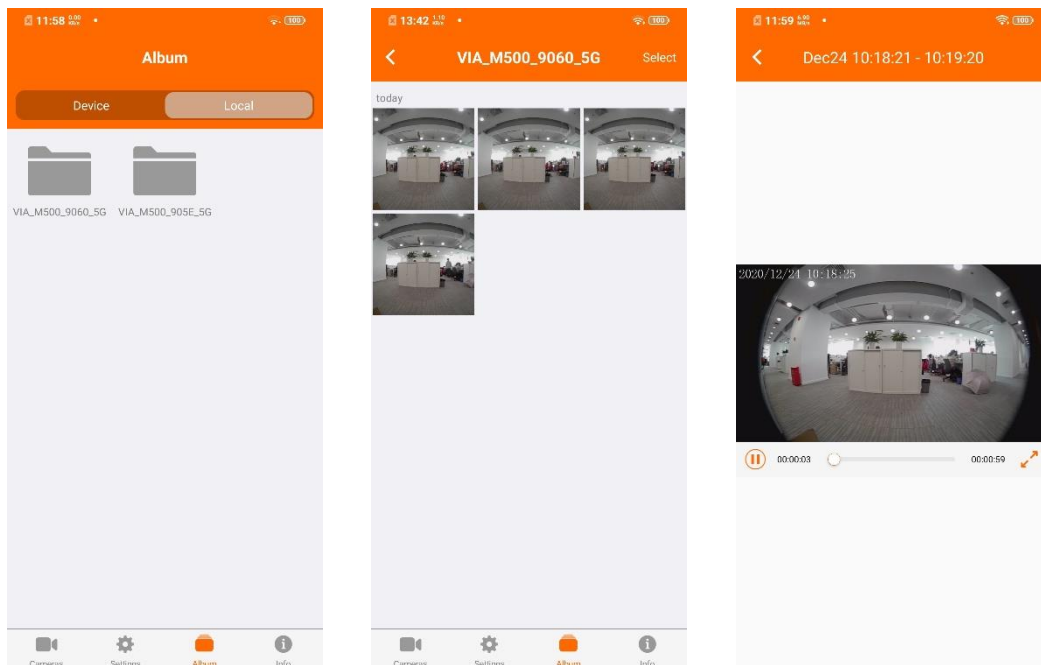


Figure 14



### 6.3.7 System Information

Display APK software version information and software privacy policy (Figure .

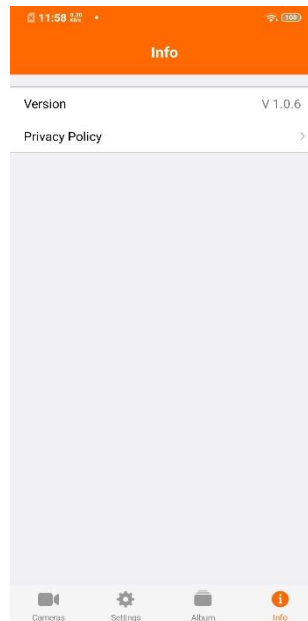


Figure 15

### 6.3.8 System Upgrade

The phone connects to the terminal WiFi, starts the APK, and when a version update is detected, an upgrade prompt message will pop up (Figure ; in the system settings, when there is a version update, there will also be an update prompt message (Figure .

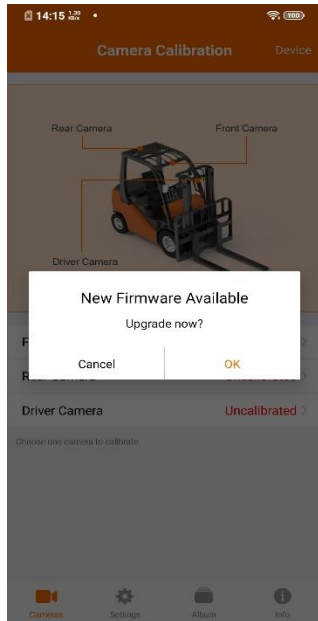


Figure 16

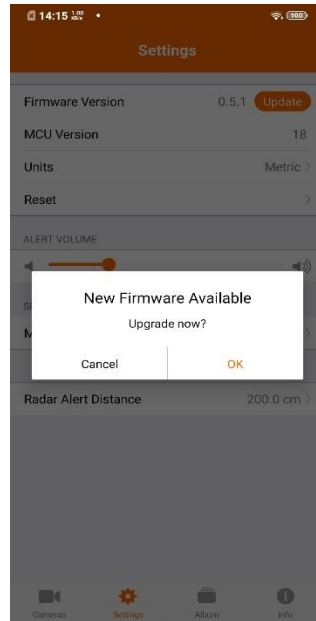


Figure 17

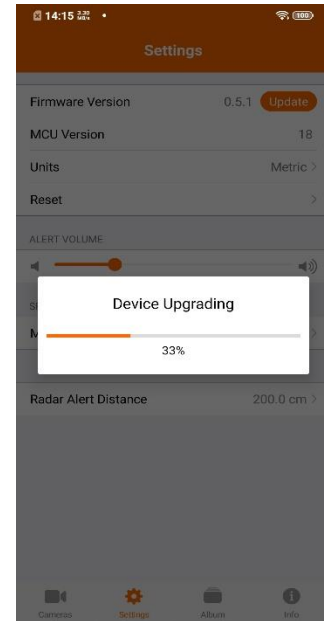


Figure 18

## 6.4 LCD Display Description



| Item | Description                  |
|------|------------------------------|
| 1    | UI display                   |
| 2    | 4G signal                    |
| 3    | Front camera screen          |
| 4    | Rear camera screen           |
| 5    | Front collision alert        |
| 6    | Safety belt alert (Optional) |
| 7    | Speed (Optional)             |
| 8    | DMS alert                    |
| 9    | Rear collision alert         |

### 6.4.1 LCD Display Note

- The front and rear cameras are blue when the alarm state is not calibrated
- The seat belt (optional) icon is not displayed by default. It will only be displayed when the seat belt is detected for the first time.
- The vehicle speed (optional) icon is not displayed by default, it will only be displayed when the vehicle speed sensor has a speed detected for the first time

## **6.5 Record Save Description**

M500 can record videos recorded by 3 cameras, but an SD card must be installed. APK album searches for videos in the device according to the front camera (Front), rear camera (Rear) and inside camera (Inside).

Folders are named and recorded in order of time, and each file is cycled in three minutes. In the album, download the local video file to the phone and save it in a folder named after the device WIFI. It is recommended to modify the default name to facilitate the management of multiple devices.

### **EU DECLARATION OF CONFORMITY**



Hereby, VIA Technologies, Inc. declares that the radio equipment type Mobile360 M500 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:

<https://www.viatech.com.cn>

This device may be operated in all member states of the EU.

Do not expose your device to extreme temperatures lower than - 20°C and higher than + 70°C.

The product shall only be connected to a DC power supply source with output voltage higher than 9V and lower than 36V.

This equipment complies with CE radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

## Restrictions in the 5 GHz band

According to Article 10 (10) of Directive 2014/53/EU, the packaging shows that this radio equipment will be subject to some restrictions when placed on the market in Belgium (BE), Bulgaria (BG), the Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (EL), Spain (ES), France (FR), Croatia (HR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Luxembourg (LU), Hungary (HU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE), the United Kingdom (UK), Turkey (TR), Norway (NO), Switzerland (CH), Iceland (IS), and Liechtenstein (LI).

The WLAN function for this device is restricted to indoor use only when operating in the 5150 to 5350 MHz frequency range.

## Frequency Band(s)

This device operates with the following frequency bands and maximum frequency power.

### NOTE:

The product is compliant with these power limits required by the European Union. Frequency bands supported by the product vary by model.

WCDMA B1/B8: 23.35dBm

LTE Band 1/3/7/8/20/28/38/40: 23.98dBm

2.4G&5G WIFI: <20dBm

BT/BLE: <13dBm

## **FCC Caution**

### § 15.19 Labelling requirements.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### § 15.21 Information to user.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### § 15.105 Information to the user.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

ISED Warning:

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

- French:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.