Yuwei

Intelligent Video Terminal　（V5）
Technical Manual

V2.0

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FCC Statement

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 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.

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

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.

目录

1. Product Introduction

Intelligent Car Recorder V5 is a 4G car recorder with integrated HD video recording function. The technical standards of the product refer to the technical requirements of JT/T 794-2019 "GNSS system for operating vehicles -Technical specification for BD compatible vehicle terminals " and JT/T 808-2011 "GNSS system for operational vehicles-General specifications for vehicle terminal communication protocol and data format", JT/T 1076-2016 "GNSS system for operational vehicles-Technical specifications for vehicle video terminal" and JT/T 1078-2016 "GNSS system for operational vehicles-Video Communication Protocol".

Adopt Linux system, maximum support for 4-way in-vehicle and out-vehicle cameras, real-time local audio and video recording. Maximum support for dual TF card audio and video storage, 4G network real-time video transmission and Beidou/GPS positioning, can be built-in active safety algorithm to achieve safe driving warning function. It is widely used in the video monitoring industry of net car, cab, city distribution logistics car, and official car.

2.   Function Description

Detailed description of product features and corresponding protocol messages.

2.1 Upgrade

Function	Function Description	Protocol Message
Local Upgrade	Use a TF card (FAT32 format) to make an upgrade card and insert it into the device card slot to upgrade	
Remote Upgrade	Device connects to Cloud Guardian platform for remote upgrade	
FTP Upgrade	Upload the upgrade program to the FTP server to complete the upgrade action	

2.2 Equipment indicator

● Red Light

Device Status	Light status
Before program readiness	Always on
Upgrade in progress	On for 1 second, off for 4 seconds
Upgrade complete	/
Camera lost	Light on for 0.1 sec, off for 0.1 sec, flashing 4 times at a time, flashing once every 4 sec
SIM card not connected	On for 1 second, off for 1 second
Other status	Always off

● Green Light

Device Status	Light status
Before program readiness	Always on
Upgrade in progress	On for 1 second, off for 4 seconds
Upgrade complete	/
The card is recording normally	1 second on, 1 second off
Card not recording abnormally	On for 0.1 sec, off for 0.1 sec, flashing 4 times at a time, flashing once every 4 sec
Other status	Always on

2.3 Wifi

Function	Function Description	Protocol Message
Hotspot	The device is inserted into the SIM card and the hotspot is turned on for cell phone connection	

2.4 Operations and Maintenance Assistant

You can connect to the operation and maintenance assistant in two ways, through WeChat or web login, to configure some parameters of the equipment.

Function	Function Description	Protocol Message

	Mainly active safety calibration, including ADAS, DSM camera calibration, camera parameter setting	
Calibration		
Multimedia	View real-time and historical video of each channel	
Parameter Configuration	Including terminal parameters configuration, monitoring platform online address configuration, set video image encoding parameters	
System Settings	Including terminal status query, terminal parameter debugging, video parameter debugging, testing simulation function, debugging function, etc.	

2.5 Go Online

Function	Function Description	Protocol Message
Register	The terminal sends a message to the platform informing it is installed on a certain vehicle	[808]Message ID: 0x0100 Answer ID: 0x8100
Go Online	After the terminal is successfully online, it sends location information 0704 batch upload and 0200 location information data sent every 30s	[808]Answer ID: 0x0200

*Note: The prerequisite for the above function is that the terminal has a network

2.6 Face Recognition

Function	Function Description	Protocol Message
Face Registration	Platform/SMS/local serial debugging, send face registration instruction *#313*101* PersonID *Name*Card number*Registration time*Picture ID*Practice license#, so that the driver information is successfully bound to the	

	platform	
Face Verification	Short press the emergency button for 1 second to trigger face verification and wait for face recognition result	

*Note: The prerequisite for the above function is that the terminal is online

2.7 Button

Function	Function Description	Protocol Message
Power button	Press and hold the power button for 3 seconds to reset and restart the terminal	
SOS alarm	Long press the emergency alarm switch for 3 seconds, the emergency alarm bit of 0200 messages uploaded by the terminal is set to 1	[808] Answer ID: 0x0200
Face Recognition	Short press the emergency button for 1 second to trigger face verification and wait for face recognition results	

*Note: The prerequisite for the above function is that the terminal is online

2.8 Heartbeat function

Function	Function Description	Protocol Message
Heartbeat interval	Query the heartbeat interval and heartbeat interval configuration by command (default 10 minutes/time)	[808] Message ID: 0x0002

*Note: The prerequisite for the above function is that the terminal is online

2.9 Location Information Reporting

Function	Function Description	Protocol Message
Timed reporting	Set the location reporting policy (0x0020) to timed reporting (0x00) by issuing the 8103 command	[808] Message ID: 0x8103 0x0020 0x00

		Answer ID：0x0200
Dormant	Set the reporting interval (0x0027) when the terminal parameter sleeps by issuing the command 8103	[808] Message ID: 0x8103 0x0027 Answer ID：0x0200
Distance reporting	Set the terminal parameter default distance reporting interval by issuing the command 8103 (0x002C)	[808] Message ID: 0x8103 0x002C Answer ID：0x0200
Login status/ACC status reporting	Set the location reporting scheme (0x0021) to report according to login status and ACC status (0x01) by issuing 8103 command	[808] Message ID: 0x8103 0x002C Answer ID：0x0200

*Note: The prerequisite for the above function is that the terminal is online

2.10 Parameter query and setting

Function	Function Description	Protocol Message
Parameter Search	Query the parameters of the terminal (including heartbeat transmission interval, TCP message response, location reporting policy, etc.) by issuing the command 8104	[808] Message ID: 0x8104 Answer ID：0x0104
Parameter Setting	Set various parameters of the terminal by issuing 8103 command	[808] Message ID: 0x8103 Answer ID: 0x0001

*Note: The prerequisite for the above function is that the terminal is online

2.11 Positioning monitoring

Function	Function Description	Protocol Message
Location Information	The terminal periodically sends a location information reporting message	[808] Answer ID: 0x0200

Reporting	0200 according to the parameter settings	
Location Information Inquiry	Querying terminal location information by issuing 8201 command	[808] Message ID: 0x8201 Answer ID: 0x0201

*Note: The prerequisite for the above function is that the terminal is online

2.12 Wireless Communication

Function	Function Description	Protocol Message
Location Information Supplemental Transmission	If the terminal does not send location information reporting message 0200 within 1 minute due to network and other reasons, it will upload positioning data in bulk after the terminal is normally online	[808] Answer ID: 0x0704
Center online	Support 4-way center access, which can be expanded to 8-way, of which active security attachment upload only supports the 1st and 2nd center	

*Note: The prerequisite for the above function is that the terminal is online

2.13 Alarm prompt

Function	Function Description	Protocol Message
Emergency Alerts	Long press the emergency alarm button for 3 seconds, triggering the platform to report the event, the terminal takes pictures and uploads photo attachments (the first road camera), while supporting the platform to lift the alarm	[808]Message ID:0x8001
Over speed warning/alarm	Set the speed warning threshold by sending 8103 command, when the speed reaches the threshold, prompt	[808]Message ID:0x8103

	the voice warning of imminent speeding; speed exceeds the threshold, prompt the voice alarm of speeding	
Fatigue alarm	Set the fatigue driving time threshold by issuing 8103 command, when the driving time is 30 minutes away from the threshold, prompt the imminent overtime voice warning; after that, prompt the warning every 5 minutes; when the time threshold is reached, prompt the overtime alarm	[808]Message ID:0x8103

*Note: The prerequisite for the above function is that the terminal is online

2.14 Other Alarms

Function	Function Description	Protocol Message
GNSS Alarm	The bit5 alarm bit of the terminal 0200 message is set to 1 when the terminal positioning antenna is disconnected	[808]Answer ID: 0x0200
Undervoltage	If the terminal voltage is around 10V, the bit7 alarm bit of the terminal 0200 message is set to 1.	
Illegal ignition	If the driver is not logged in and ignition operation is performed, the bit24 alarm bit of the terminal 0200 message is set to 1.	
Illegal vehicle displacement	(Supported only by NJ General version)	
Camera failure	When ACC is turned off, the longitude and latitude (vehicle position) are changed and bit28 of terminal 0200 message is set to 1.	
Rollover	The terminal is not connected to the camera, the bit11 alarm bit of the	

	terminal 0200 message is set to 1	
Collision	When the vehicle (terminal) is overturned, the bit30 alarm bit of the terminal 0200 message is set to 1, and at the same time the overturning alarm is reported on the platform.	

*Note: The prerequisite for the above function is that the terminal is online

2.15 Terminal Control

Function	Function Description	Protocol Message
Turn off data communication	The platform sends 8105 commands, receives generic answers, and the terminal closes data communication and goes offline immediately	[808] Message ID: 0x8105 Answer ID: 0x0001
Turn off all wireless communications	The platform sends 8105 commands, receives generic answers, and the terminal closes data communication and goes offline immediately	
Terminal reset	The platform sends 8105 commands, receives generic answers, and resets and restarts the terminal	
Terminal shutdown	The platform issues 8105 command, receives generic answer, and the terminal is shut down.	
Restore the terminal to the factory	The platform sends 8105 command, receives generic answer, and restores the terminal to the factory	

*Note: The prerequisite for the above function is that the terminal is online

2.16 TTS

Function	Function Description	Protocol Message

Text message broadcasting	The terminal receives the 8300 message from the platform, makes a generic reply and plays the complete text message content by voice	[808] Message ID: 0x8300 Answer ID: 0x0001
Volume settings	Login to the operation and maintenance assistant and enter the volume setting interface, which can read the current broadcast volume of the terminal, the default is the maximum value of 9	

*Note: The prerequisite for the above function is that the terminal is online

2.17 Driving record data

Function	Function Description	Protocol Message
Downlink driving record parameters	The platform sends the driving record parameter downlink command message 8701, requests the terminal to upload the specified data, and the terminal replies to the general reply message	[808]Message ID: 0x8701 Answer ID:0x0001
Acquisition of travel record data	The platform sends the driving record data collection command message 8700, asks the terminal to upload the specified data, and the terminal replies to the driving record data upload message, the content conforms to the requirements in GB/T 19056 and matches with the recorder information	[808]Message ID: 0x8700 Answer ID:0x0700

*Note: The prerequisite for the above function is that the terminal is online

2.18 Camera photo taking

Function	Function Description	Protocol Message
Take a photo	The platform sends a certain way camera immediately shooting command	[808] Message ID: 0x8801

	8801, the terminal answers; the terminal uploads 0800 multimedia event information, and the platform views the photos taken by the corresponding camera	Answer ID: 0x0805 Message ID：0x0800
Photo Search	The platform sends down the storage multimedia data retrieval 8802, the multimedia type selects the image, and the terminal answers (only Nanjing general platform + version support)	[808] Message ID: 0x8802 Answer ID：0x0802

*Note: The prerequisite for the above function is that the terminal is online

2.19 Cell phone to give instructions

Function	Function Description	Protocol Message
Send command Send	Use any cell phone to send a *# command to the Sim card number in the terminal, for example, to set the online parameters, and after sending the command, an SMS will return the command result and is correct.	

*Note: The prerequisite for the above function is that the terminal is online

2.20 Audio and video

Function	Function Description	Protocol Message
Video Parameter Search	The platform sends a video parameter query command 9003, and the terminal replies 1003	[1078]Message ID: 0x9003 Answer ID：0x1003
Video parameter setting	The platform sends the command 8103 to set terminal parameters, which can modify screen quality, brightness, saturation, etc., and the terminal replies with a general reply message	[808]Message ID: 0x8103 Answer ID：0x0001

Storage unit alarm	Insert the TF card in NTFS format into the terminal, and the additional message of 0200 shows memory failure	[808]Answer ID：0x0200
Intercom	The platform sends command 9101 to open two-way intercom, the terminal replies with a general reply message, and the terminal and the platform can talk to each other in both directions.	[1078]Message ID: 0x9101 Answer ID：0x0001
Remote Live Video	The platform sends 9101 to open real-time video, the terminal replies to the general reply message, and the platform sends 9102 to close the audio and video channels	[1078]Message ID: 0x9101 Answer ID：0x0001 Message ID: 0x9102
Delayed video recording	The terminal video card can retain the video recording for 3 minutes after ACC is disconnected	
History video query	The platform selects the start and end time, selects the channel, and can query the corresponding history video within the time interval	
History Video Playback	Platform select history video click play, there will be a corresponding progress bar, time, speed, location watermark display	
History Video Download	Through the platform, you can download the video recordings in the terminal to the local computer	
Video Storage	The terminal can record video by inserting TF card (4G ~ 2TB), which is a patented DXR stream storage format, and the card reader can read the TF card and view the video using the player tool	
Loop Recording	When the video card is full, it adopts bad overwrite recording, i.e. the newly recorded video will overwrite the	

	earliest recorded video in the video card	

*Note: The prerequisite for the above function is that the terminal is online

3. Voice prompt instructions

3.1 ADAS algorithms

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Forward Collision Warning （FCW）	Real-time monitoring of the distance ahead can warn the driver as early as 2.7 seconds before a collision is expected to occur to prevent rear-end accidents (triggered by speed ≥ 30km/h)	Collision hazard	Collision hazard	Yes
Lane Departure Warning （LDW）	Monitor current lane markings and vehicle trajectory to alert drivers when they are about to unintentionally drift out of their lane, reminding them to keep driving in a safe lane (triggered at speeds ≥ 30km/h)	Lane Departure	Lane Departure	No
		Do not change lanes in solid lines	Do not change lanes in solid lines	No
Headway Monitoring Warning （HMW）	Display the distance of the vehicle ahead (in seconds) and alert when approaching the preset danger distance	Keep your distance	Keep your distance	No

	(triggered at speeds ≥ 30km/h)			
ADAS camera Occlusion	Obscure ADAS camera	Please do not cover the forward camera	Please do not cover the forward camera	No

PCW：

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Pedestrian Collisions	Monitor pedestrians appearing in a rectangular area 30m in front of the vehicle and 1.8m on both sides of the vehicle center, and warn (~2s) when the danger distance (in seconds) (Speed ≥ 30km/h trigger)	Please watch out for pedestrians	Please watch out for pedestrians	No
Bicyclist Collision	Monitoring of cyclists (including bicycles, electric bicycles, motorcycles, etc.) appearing in a rectangular area 30m in front of the vehicle and 1.8m on both sides of the vehicle center, warning (~2s) at the danger distance (in seconds) (Speed ≥ 30km/h trigger)	Please watch out for pedestrians	Please watch out for pedestrians	No

Crosswalk alarm	Crosswalk appears in front of the vehicle, reaching the trigger range (Speed ≥ 30km/h trigger)	Pedestrian crossing recognized	Pedestrian crossing recognized	No
Front car start	Vehicle speed is 0 when the timing starts, 8 seconds later, if the distance with the vehicle in front of more than 2 meters, the voice will prompt the driver (Speed = 0km/h trigger)	Front car start	/	No
Low-speed front car collision	Real-time monitoring of the distance between the vehicle in front of you at low speed, can warn the driver before a collision is expected to occur (Speed ≤30km/h trigger)	Collision hazard	Collision hazard	No

Traffic sign identification:

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Maximum Speed Limit	When the maximum speed limit sign is monitored, voice prompts the driver for the speed limit (Speed > 0km/h trigger)	Maximum speed limit xx	/	No

No Parking	When the vehicle speed is 0, monitor the stationary stop sign, voice warning of no stop (Speed = 0km/h trigger)	No Parking	/	No

3.2 DSM algorithm

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Fatigued driving	Constantly closed eyes and yawning state (divided into two levels: mild and severe) (triggered by speed $\geq$ 30km/h)	Please be aware of the danger	Please pay attention to the danger	No
Distracted attention	Continuous left/right head-turning state and low/head-up state (triggered by speed $\geq$ 30km/h)	Please pay attention to the road conditions	Please pay attention to the road conditions	No
Talking on the phone	phone calls(triggered by speed $\geq$30km/h)	Please do not talk on the phone	No phone calls	Yes
Smoking	Smoking (Triggered by speed $\geq$ 30km/h)	Please do not smoke	No Smoking	No
Infrared glasses blocking	Wearing sunglasses with poor light transmission or dark color (Triggered by speed $\geq$ 30km/h)	Please wear proper glasses	Infrared blocking , Please change your glasses	No
Camera obscuring	Obstructing DSM camera	Please do not cover up	Please do not cover the camera	Yes

3.3 FACE ID

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Face Registration	Send the driver information down to the terminal and do the registration operation	Successful registration of personnel	Driver registration success	No
	Delete the driver's information from the terminal	People deleted successfully	Driver deleted successfully	No
Face Recognition	Short press the emergency button for 1 second to trigger the face recognition operation, voice prompts to start identity recognition, wait for the recognition result	Identification in progress	/	No
		Driver identification Identification successful	Driver identification successful	No
		Driver identification anomalies	Driver identity anomalies	No
	The terminal has no registered driver information	No collection information	No information collected	No
	The camera is not focused on the face during the recognition process	No face detected	Face not detected	No
Timed detection	The platform sets whether the terminal opens the timed driver face recognition detection	Timing detection is on	Timing detection is on	No
		Timing detection is turned off	Timing detection is off	No

3.4 Intelligent AI

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Mask Testing	Monitor the wearing of masks by all occupants in the vehicle, and send an alarm to prompt the wearing of masks if they are not wearing them	Please wear a mask	/	No
People Count	Count the number of occupants in the vehicle	/	/	No
Seat belt use	Monitor whether the driver and co-driver are using seat belts correctly	Please fasten your seat belt	/	No

3.5 BSD

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
Cargo tank safety inspection	When the cargo box is filled with scrap steel and someone enters the calibration area at this time, it will trigger an alarm (special camera is required)	Warning, theft of steel scrap	/	No
Fuel tank safety inspection	When a person is detected in the calibration area for 2 consecutive seconds, the oil theft alarm is	Warning, fuel stolen	/	No

	triggered (special camera is required)			

3.6 Others

Voice type	Trigger scene	Prompt tone	Multi-language prompts	ARM
SD card operation	Insert and remove the terminal SD card	Card is pulled out	SD card is pulled out	No
	Inserting a non-video recording card	Card data format abnormal	SD card data is abnormal	No
Over speed alarm	Platform configuration speed threshold, the vehicle driving speed close to the threshold or exceed the threshold	Please note that your car has exceeded the speed limit, please slow down	Please note that your car has exceeded the speed limit, please slow down	No
		You are about to exceed the speed limit, please maintain a safe driving speed	/	No
Timeout alarm	Platform configuration driving time threshold, the vehicle driving time accumulation close to the threshold or exceed the threshold	Please note that you have exceeded your driving hours, please stop for a break	/	No
		You are about to exceed your driving hours. Please stop for a break	/	No
Horizontal	The platform sends	Horizontal angle	Horizontal angle	No

calibration	commands to control the terminal for horizontal calibration	calibration is completed, the angle is equal to... degree	calibration completed, angle equal to …	

3.7 Multi-language

For more language tips, see the annexes at the end of the manual.

- Annex 1: English, Vietnamese, German
- Annex 2: Spanish, Arabic, French
- Annex 3: Russian, Thai, Portuguese

4. Storage Metrics

Use stream	Number of channels	Encoding method	Resolution		Screen	Frame rate	Code rate	Storage space(MB)/hour	Storage space(GB)/hour
Main Code Stream	1	H264	CIF	352*288	Static	25	512Kbps	227	0.222
					Dynamic	25	512Kbps	224	0.219
			D1	704*576	Static	25	1Mbps	449	0.438
					Dynamic	25	1Mbps	453	0.443
			720P	1280*720	Static	25	1.5Mbps	804	0.786
					Dynamic	25	1.5Mbps	816	0.797
			1080P	1920*1080	Static	25	2Mbps	1077	1.05
					Dynamic	25	2Mbps	1082	1.05

Note: This table counts the traffic consumption of single-way real-time transmission and the storage space occupied when single-way storage

Commonly used TF card storage length reference:

TF card specifications(GB)	Storable hours (hours)			
	1 channel （1080p）	2channel （1080p+720p）	3channel （1080p+720p*2）	4channel （1080p+720p*3）
32	37.6	22.5	16.1	12.5
64	75.2	45.0	32.1	25.0
128	150.4	90.0	64.4	50.0
256	300.8	180.0	128.5	99.9

5. Wireless communication module

Modules	EC200A-CN	EC25AFX	EC200A-EU	EC200A-AU

Region / Operator	China/India	United States	Europe / Asia Pacific (including Southeast Asia)	Latin America / Australia / New Zealand

6. Algorithm test environment and configuration description

6.1 Algorithm test environment and configuration description

Camera description:

Function	Style	Mounting position
ADAS Front Camera (1080P)		Use the 3M adhesive to stick the device in the front windshield mirror directly below the position, adjust the angle of the camera to look straight ahead, parallel to the ground position
DSM Camera (720P)		The camera is installed on the left side of the driver's dashboard, adjust the camera to align with the driver according to the actual situation with the hexagon to ensure that the driver's face appears in the middle of the image

Inside the car Wide angle long pole camera (720P)		Use its own 3M adhesive installed in the rear-view mirror above the main driver's side (if the DSM use the camera for algorithm detection, you can slightly tilt the lens to the direction of the main driver about 10 degrees, so that the main driver's face can be completely in the lens screen)

6.2 Algorithm calibration

(1) Use WeChat operation and maintenance assistant, log in to your account, and enter the terminal ID on the terminal label to calibrate the algorithm and set the parameters.
（2）ADAS calibration: park the vehicle on a horizontal road, enter the ADAS camera calibration interface, measure the body width (between the wheels), the height of the camera, the front and rear distance from the camera to the wheels, the distance from the camera to the front bumper of the vehicle, and fill in the parameter form according

to the actual vehicle measurement values. Meanwhile, control the movement of the red cross in the screen by modifying the coordinates of the ADAS vanishing point X/Y axis pixel points to ensure that the cross horizontal axis coincides with the heaven and earth line, the vertical axis is in the middle of the lane, and the cross intersection is the extinction point of the lane.

（3）DSM calibration: enter the DSM camera calibration interface, adjust the camera angle according to the DSM screen in the APP, so that the face is in the center of the screen (yellow box), and then click "calibration", about twenty seconds prompt "calibration success" after the two screws on the universal joint with the hexagonal lock (must be the maximum tighten the screws to prevent later human intervention to screw the camera angle).

(4) BSD calibration: It is an exclusive function for special version, you need to use special camera calibration. Enter [Cargo Area Calibration] and [Fuel Tank Area Calibration], adjust the camera angle according to the camera screen in APP, so that the cargo tank and fuel tank are within the camera shooting range.

6.3 Algorithm parameters configuration

Enter ADAS camera, DSM camera, PCW parameter configuration, cargo security alarm algorithm (special version proprietary), fuel tank security alarm algorithm (special version proprietary), configure parameters such as algorithm trigger speed, alarm interval, etc., click [Configure] button after completing, green "Set parameters successfully" will appear at the top. "Face ID face recognition algorithm does not need parameter configuration and calibration.

6.4 Reference

Vehicle: Dongfeng Junfeng pure electric car
Camera installation reference:

ADAS camera installation location	In-car camera installation location	DSM camera installation location

【Configuration scheme 1: small angle】

● ADAS: Terminal front camera (under the rearview mirror)
● DSM, FaceID: DSM infrared camera (left front of the main driver)

Testing environment: bright daytime scenes, no bright light shining on the camera, face facing the camera during face recognition;

Algorithm accuracy: Due to the limitation of DSM camera installation position, it will lead to the driver's right side action (looking right, head down to the right, etc.) cannot capture the complete face, so it is not included in the accuracy statistics.

Algorithm	Function	Accuracy（%）
ADAS	Lane Departure	95
	Forward Collision	90
	Distance between cars too close	90
	Camera Obstruction	100
PCW	Pedestrian collision	95
	Crosswalk alarm	90
	Front car start	90
	Low-speed front car collision	95
DSM （Dedicated DSM camera）	Fatigue driving	95
	Distracted attention	92
	Answering phone calls	95
	Smoking	94
	Infrared glasses blocking	95
	Camera obscuring	100

FACE ID（Dedicated DSM camera）	Driver identification	98
Intelligent AI (In-car camera)	Mask detection	98
	People counting	98
	Seat belt use	95
BSD （Dedicated camera）	Cargo Box Safety Detection	95
	Fuel tank safety detection	95

Algorithm parameter configuration reference:

Algorithm	Function	Parameter	Reference value
ADAS	Lane Departure	Alarm interval(s)	5
		Alarm time threshold(s)	1
		Trigger speed(km/h)	30
	Forward Collision	Alarm interval(s)	5
		Alarm time threshold(s)	2.7
		Start speed(km/h)	30
	Car distance too close	Alarm interval(s)	5
		Alarm time threshold(s)	1
		Trigger speed(km/h)	30
DSM	Distraction	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30
		Head left turn angle	50
		Head right turn angle	46
		Head up angle	10
		Head down angle	15
	Loss of face	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30
	Eyes closed	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30

	Talking on the phone	Detection time(s)	2
		Alarm interval(s)	3
		Start speed(km/h)	30
	Smoking	Detection time(s)	2
		Alarm interval(s)	3
		Start speed(km/h)	30
	Yawning	Detection time(s)	2
		Alarm interval(s)	2
		Start speed(km/h)	30
	blocking	Detection time(s)	5
		Alarm interval(s)	30
		Start speed(km/h)	30
	Obstructing	Detection time(s)	5
		Alarm interval(s)	20
		Start speed(km/h)	30
PCW	Pedestrian collision	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30
	Crosswalk	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30
	Front car start	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	0
		Upper speed limit (km/h)	0
	Low-speed front-end collision	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30

BSD	Cargo Box Safety Monitoring	Detection time (s)	0
		Alarm interval (s)	10
		Lower speed limit (km/h)	0
		Upper speed limit (km/h)	10
	Fuel tank safety monitoring	Detection time (s)	0
		Alarm interval (s)	10
		Lower speed limit (km/h)	0
		Upper speed limit (km/h)	10

【Configuration Plan 2: Large angle】

● ADAS: Terminal front facing camera (below rear-view mirror)

● DSM, Face ID: Long pole wide-angle camera (upper right of the driver's seat)

● Compared with 【Configuration Scheme 1】, there are mainly differences in the accuracy of the DSM algorithm.

Test environment: In a bright daytime scene, there is no strong light shining on the camera, and the face is facing the camera during facial recognition;

Algorithm accuracy: Due to the limitation of the installation position of the long pole camera, the driver's left side movements (such as looking left, bowing his head to the left, making a phone call with his left hand, etc.) exceed the boundary of the algorithm's captured image, so it is not included in the accuracy statistics.

Algorithm	**Function**	**Accuracy（%）**
ADAS	Lane Departure	95
	Forward Collision	90
	Distance between cars too close	90
	Camera Obstruction	100
PCW	Pedestrian collision	95
	Crosswalk alarm	90
	Front car start	90
	Low-speed front car collision	95
DSM	Fatigue driving	93

（In-car camera）	Distracted attention	90
	Answering phone calls	94
	Smoking	92
	Infrared glasses blocking	92
	Camera obscuring	100
FACE ID（In-car camera）	Driver identification	95
Intelligent AI (In-car camera)	Mask detection	98
	People counting	98
	Seat belt use	95
BSD （Dedicated camera）	Cargo Box Safety Detection	95
	Fuel tank safety detection	95

Algorithm parameter configuration reference:

Algorithm	Function	Parameter	Reference value
ADAS	Lane Departure	Alarm interval(s)	5
		Alarm time threshold(s)	1
		Trigger speed(km/h)	30
	Forward Collision	Alarm interval(s)	5
		Alarm time threshold(s)	2.7
		Start speed(km/h)	30
	Car distance too close	Alarm interval(s)	5
		Alarm time threshold(s)	1
		Trigger speed(km/h)	30
DSM	Distraction	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30
		Head left turn angle	42
		Head right turn angle	65
		Head up angle	15
		Head down angle	20

	Loss of face	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30
	Eyes closed	Detection time(s)	3
		Alarm interval(s)	3
		Start speed(km/h)	30
	Talking on the phone	Detection time(s)	2
		Alarm interval(s)	3
		Start speed(km/h)	30
	Smoking	Detection time(s)	2
		Alarm interval(s)	3
		Start speed(km/h)	30
	Yawning	Detection time(s)	2
		Alarm interval(s)	2
		Start speed(km/h)	30
	blocking	Detection time(s)	5
		Alarm interval(s)	30
		Start speed(km/h)	30
	Obstructing	Detection time(s)	5
		Alarm interval(s)	20
		Start speed(km/h)	30
PCW	Pedestrian collision	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30
	Crosswalk	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30
	Front car start	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	0

		Upper speed limit (km/h)	0
	Low-speed front-end collision	Detection time (s)	5
		Alarm interval (s)	30
		Lower speed limit (km/h)	1
		Upper speed limit (km/h)	30
BSD	Cargo Box Safety Monitoring	Detection time (s)	0
		Alarm interval (s)	10
		Lower speed limit (km/h)	0
		Upper speed limit (km/h)	10
	Fuel tank safety monitoring	Detection time (s)	0
		Alarm interval (s)	10
		Lower speed limit (km/h)	0
		Upper speed limit (km/h)	10