

16、 Environmental Monitoring System-Front Camera 环境监控系统-前摄像头

◆ Disassembly Instructions 拆卸说明

The front camera assembly set is mounted on the sunshade bracket in the position shown in the figure.

前摄像头总成套装在遮阳罩支架上，安装位置如图所示。

Step1: Remove the sunshade panel.

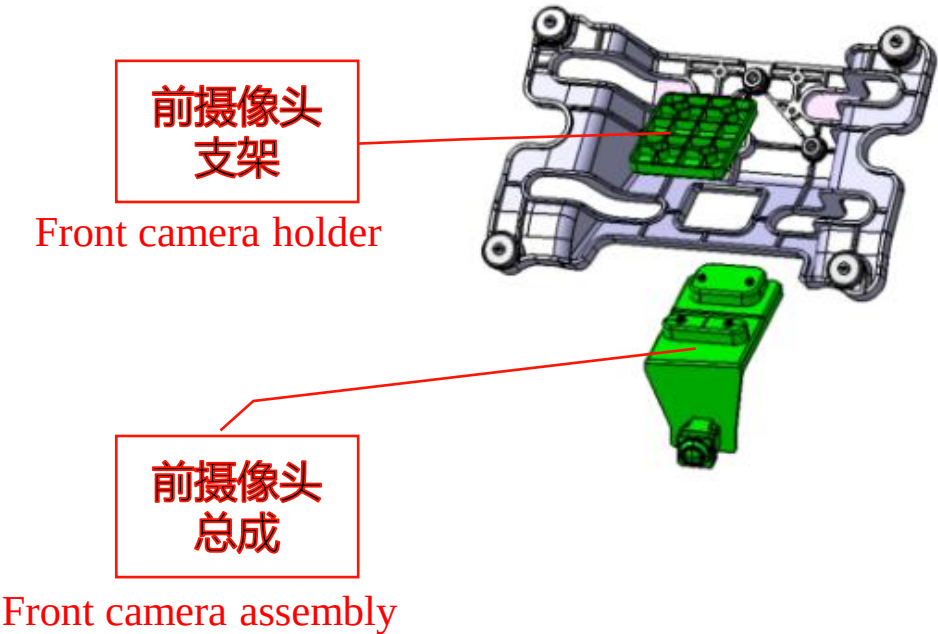
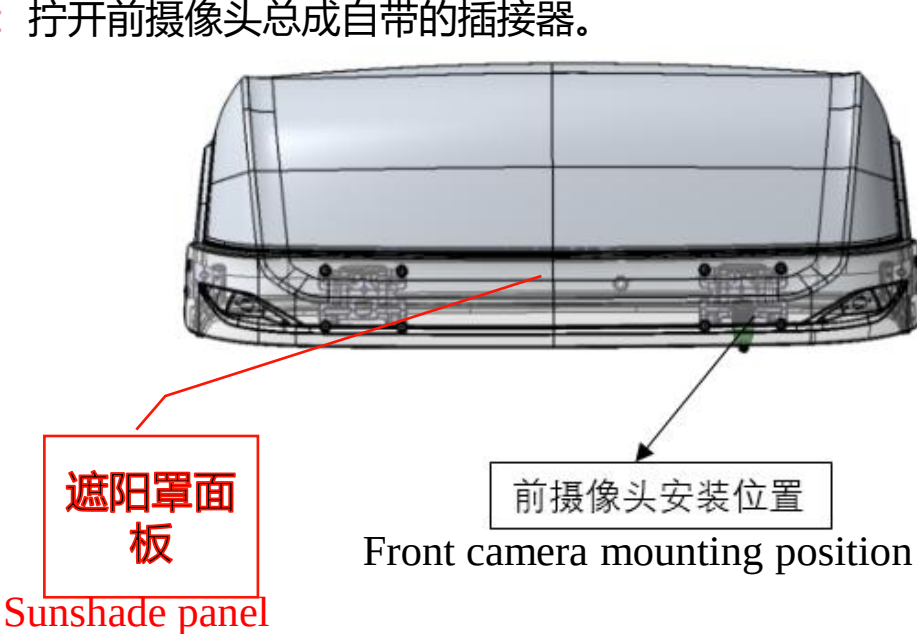
第一步：拆掉遮阳罩面板；

Step2: Unscrew the four set screws on the front camera bracket to separate the front camera assembly from the front camera bracket.

第二步：拧出前摄像头支架上的4个固定螺丝，分离前摄像头总成与前摄像头支架；

Step3: Unscrew the plug that comes with the front camera assembly.

第三步：拧开前摄像头总成自带的插接器。



16、 Environmental Monitoring System-Side Camera 环境监控系统-侧面摄像头

◆Disassembly Instructions拆卸说明

The side camera assembly is mounted in the lower rearview mirror housing, and the mounting position is shown in the figure.

侧面摄像头总成安装在后视镜下护壳内，安装位置如图所示。

Step1: Remove the inner door panel and unscrew the side camera assembly with its own plug;

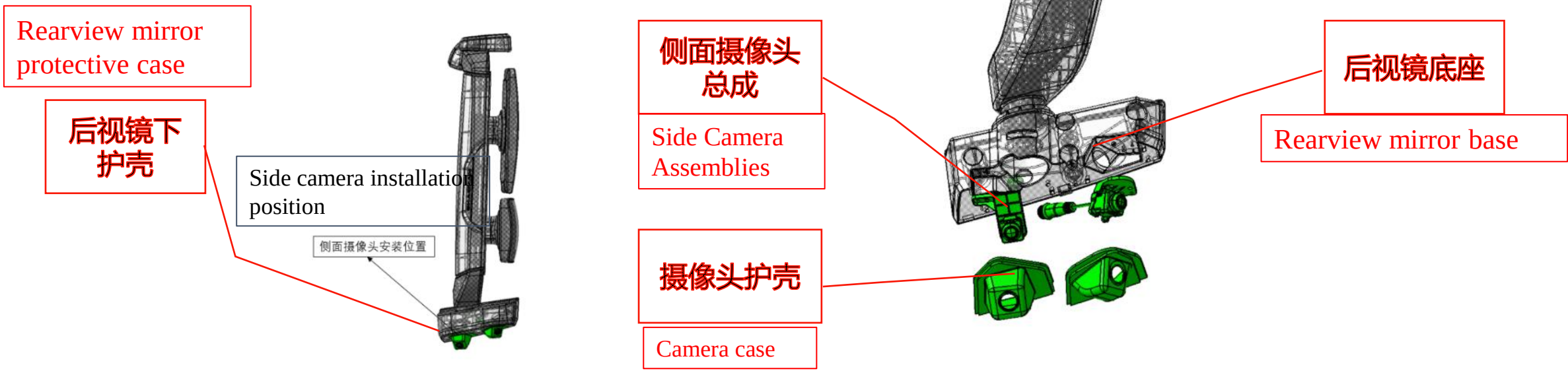
第一步: 拆掉车门内板，拧开侧面摄像头总成自带插接器；

Step2: Remove the lower rearview mirror housing and camera housing;

第二步: 拆掉卡接的后视镜下护壳和摄像头护壳；

Step3: Unscrew the four set screws on the side camera assembly to separate the side camera assembly from the mirror base;

第三步: 拧出侧面摄像头总成上的4个固定螺丝，分离侧面摄像头总成和后视镜底座。



16、 Environmental Monitoring System-Reversing Camera 环境监控系统-倒车摄像头

◆Disassembly Instructions 拆卸说明

The reversing camera assembly is mounted on the tail beam of the frame, and the mounting position is shown in the figure.

倒车摄像头总成安装在车架尾梁上，安装位置如图所示。

Step1: Unscrew the four fixing bolts on the reversing camera assembly to separate the reversing camera assembly from the reversing camera bracket.

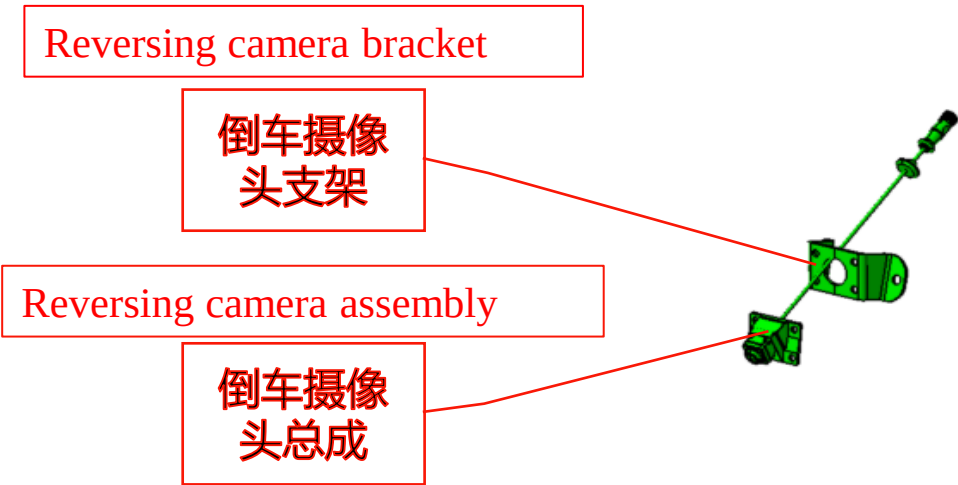
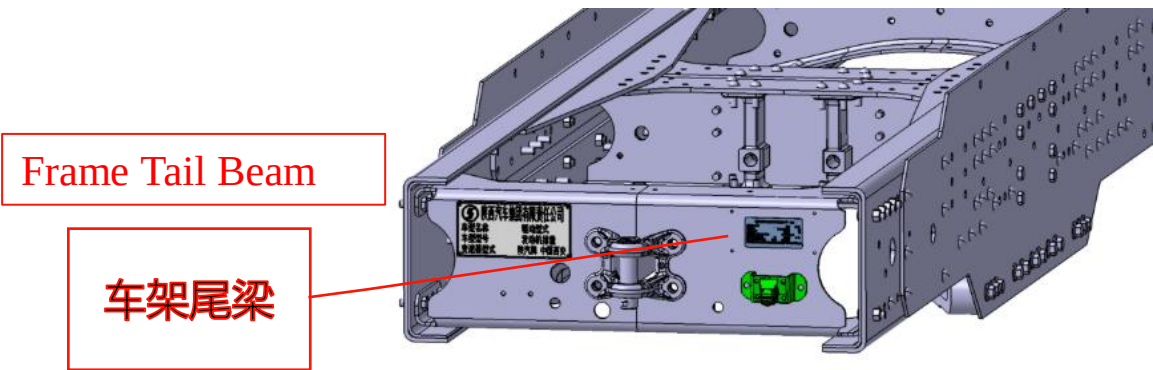
第一步: 拧出倒车摄像头总成上的4个固定螺栓，分离倒车摄像头总成和倒车摄像头支架；

Step2: Unscrew the plug that comes with the reversing camera assembly

第二步: 拧开倒车摄像头总成自带的插接器；

Step3: Unscrew the 2 fixing bolts on the reversing camera bracket to separate the reversing camera assembly from the frame tail beam.

第三步: 拧出倒车摄像头支架上的2个固定螺栓，分离倒车摄像头总成和车架尾梁。



16、 Environmental Monitoring System- Saddle surveillance camera 环境监控系统-鞍座监视摄像头

◆Disassembly Instructions 拆卸说明

The saddle surveillance camera assembly is mounted at the top center of the cab rear enclosure, and the mounting position is shown in the figure.

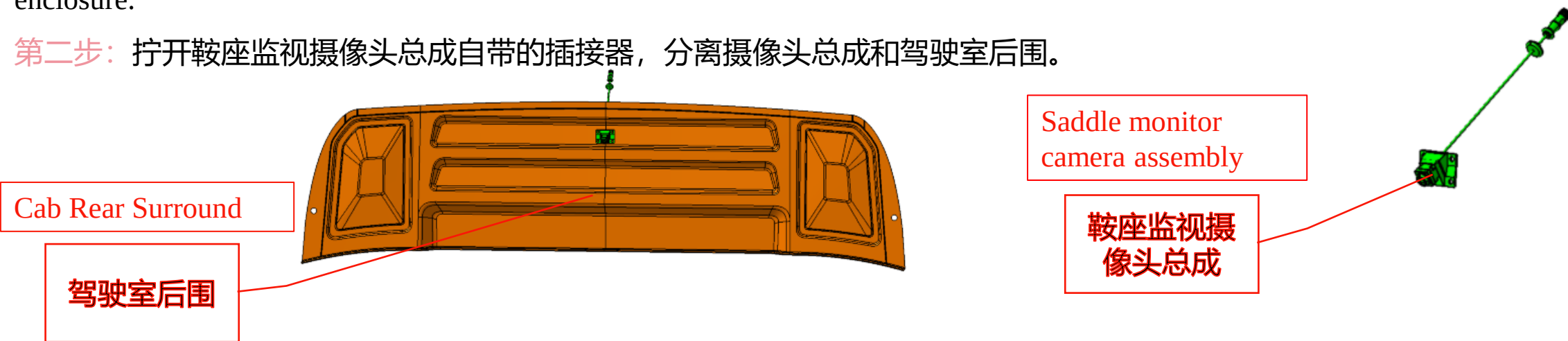
鞍座监视摄像头总成安装在驾驶室后围顶部居中位置，安装位置如图所示。

Step1: Unscrew the four fixing bolts on the saddle surveillance camera assembly;

第一步: 拧出鞍座监视摄像头总成上的4个固定螺栓;

Step2: Unscrew the plug that comes with the saddle surveillance camera assembly and separate the camera assembly from the cab rear enclosure.

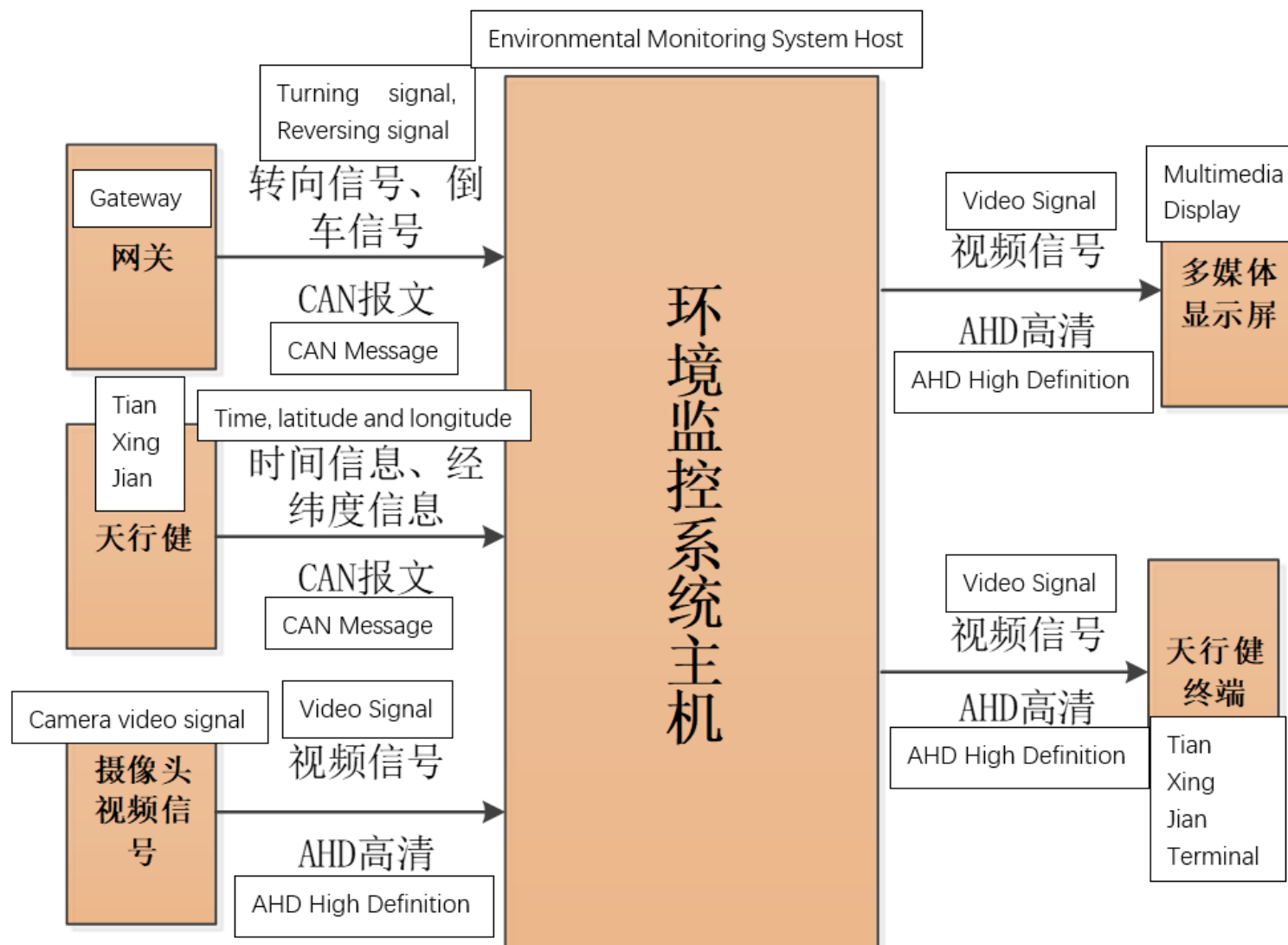
第二步: 拧开鞍座监视摄像头总成自带的插接器，分离摄像头总成和驾驶室后围。



16、Environmental Monitoring System- Functional schematic diagram

环境监控系统-功能原理图

◆ Functional schematic diagram功能原理图



16、Environmental Monitoring System- Functional schematic diagram

环境监控系统-功能原理图

The environment monitoring system is composed of main vehicle front camera, main vehicle left front/left rear camera, main vehicle right front/right rear camera, reversing rear camera, saddle seat monitoring (main vehicle rear) camera, and monitoring camera in the cargo compartment. The cameras monitor the situation of each key part, and switch the video of each channel by the button on the AV system.

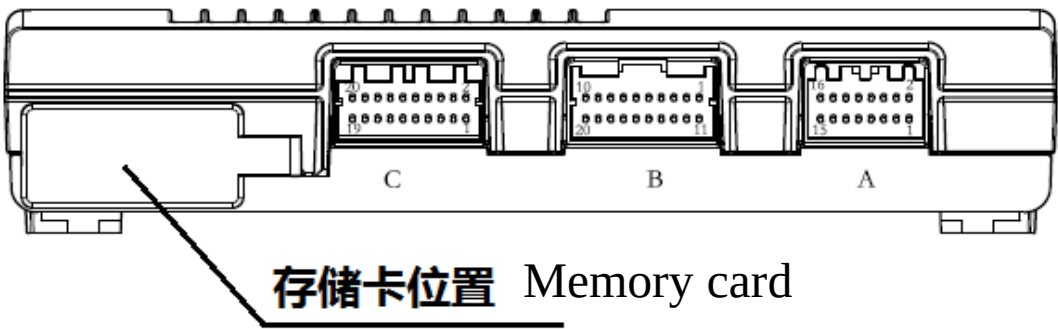
环境监控系统是由主车前部摄像头、主车左前/左后摄像头、主车右前/右后摄像头、倒车后部摄像头、鞍座监视（主车后）摄像头、货厢内监控摄像头组成。摄像头监控各重点部位的情况，通过影音系统上的按键对各路视频进行切换。

After processing the corresponding video, the environmental monitoring controller can integrate the screen into a 360° surround view screen to provide intuitive feedback on the situation around the vehicle. The main functions include: vision enhancement when driving, vision enhancement when reversing, trailer visual reversing, trailer combined with monitoring, cargo compartment internal monitoring, 360° surround view, reversing and steering automatic switching function and video storage and playback function.

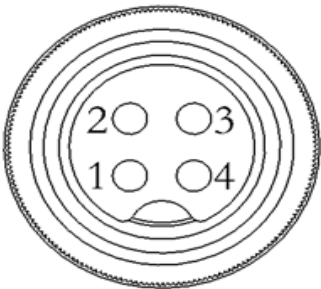
环境监控控制器将相应视频处理后，可以将画面整合为360°环视画面，直观的反馈车辆周围的情况。主要功能包括：行驶时视野增强，倒车时视野增强，挂车可视倒车，挂车结合监视，货厢内部监视，360°环视，倒车、转向自动切换功能和视频存储、回放功能。

16、Environmental Monitoring System - Pin Definition 环境监控系统-针脚定义

◆Interface Definition 接口定义



Camera Pin Definition 摄像头针脚定义



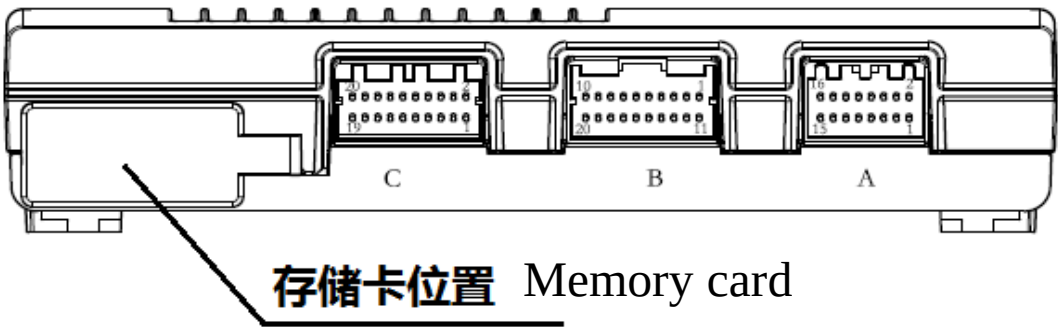
Pluggger	Pin	Definitions	Remarks
Four-pole aviation plug	1	Video output	Output
	2	video ground	Input
	3	Ground	Output
	4	Power(DC 12V)	Input

Controller Pin Definition控制器针脚定义

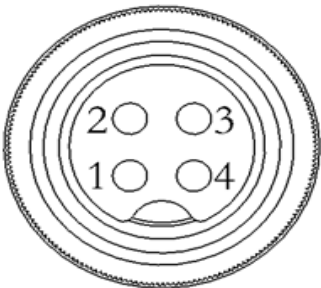
Pin No	Function Description	Signal Properties	Pin No	Function Description	Signal Properties
A1	Power B+	+24V normal power input	B13	BBC2_+12V	Reversing camera + 12V power supply
A2	Ground	GND	B14	BBC2_AUD	Reversing camera video input
A3	Cargo door opening/c	Switch input (high active)	B15	BBC3_+12V	Trailer/carriage left camera + 12V power supply
A4			B16	BIC3_AHD	Trailer/Carriage left camera video input
A5			B17	IC4_+12V	In-cab camera + 12V power supply
A6	Key switch ON positio	Switch input	B18	IC4_AHD	In-cab camera video input
A7	CAN bus high positio	CAN_H	B19		
A8	CAN bus low position	CAN_L	B20		
A9			C1	FC1_+12V	Front camera + 12V power supply
A10			C2	FC1_GND	Front camera ground
A11	Left radar ground		C3	FC1_AHD	Front camera video input
A12	Left radar 12V power	Power output	C4	FC1_AND_GND	Front camera video ground
A13	Right radar ground		C5	RC2_+12V	Right camera + 2V power supply
A14	Right radar 12V power	Power output	C6	RC2_GND	Right camera ground
A15	Radar CAN bus high p	CAN2_H	C7	RC2_AHD	Right camera video input
A16	Radar CAN bus low p	CAN2_L	C8	RC2_AHD_GND	Right camera video ground
B1	BRC1_GND	Trailer/carriage right camera ground	C9	BC3_+12V	Rear camera + 12V power supply
B2	BRC1_AHD_GND	Trailer/car right camera video ground	C10	BC3_GND	Rear camera ground
B3	BBC2_GND	Reversing camera ground	C11	BC3_AHD	Rear camera video input
B4	BBC2_AHD_GND	Reversing camera video ground	C12	BC3_AHD_GND	Rear camera video ground
B5	BLC3_GND	Trailer/carriage left camera ground	C13	LC4_+12V	Left camera + 12V power supply
B6	BLC3_AHD_GND	Trailer/carriage left camera video ground	C14	LC4_G/D	Left camera ground
B7	IC4_GND	In-Cab Camera Ground	C15	IC4_AHD	Left camera video input
B8	IC4_AHD_GND	In-Cab Camera Video Ground	C16	LC4_AHD_GND	Left camera video ground
B9			C17	MP5_AHD	Output to MP5AHD video
B10			C18	IP5_AHD_GND	Output to MP5AHD ground signal
B11	BRC1_+12V	Trailer/Carriage Right Camera 12V Power	C19	SHACMAN Telematics_AHD	Output to SHACMAN Telematics AHD video
B12	BRC1_AUD	Trailer/Carriage right camera video input	C20	SHACMAN Telematics_AHD_GND	Output to SHACMAN Telematics AHD ground signal

16、Environmental Monitoring System - Pin Definition 环境监控系统-针脚定义

◆Interface Definition 接口定义



Camera Pin Definition 摄像头针脚定义



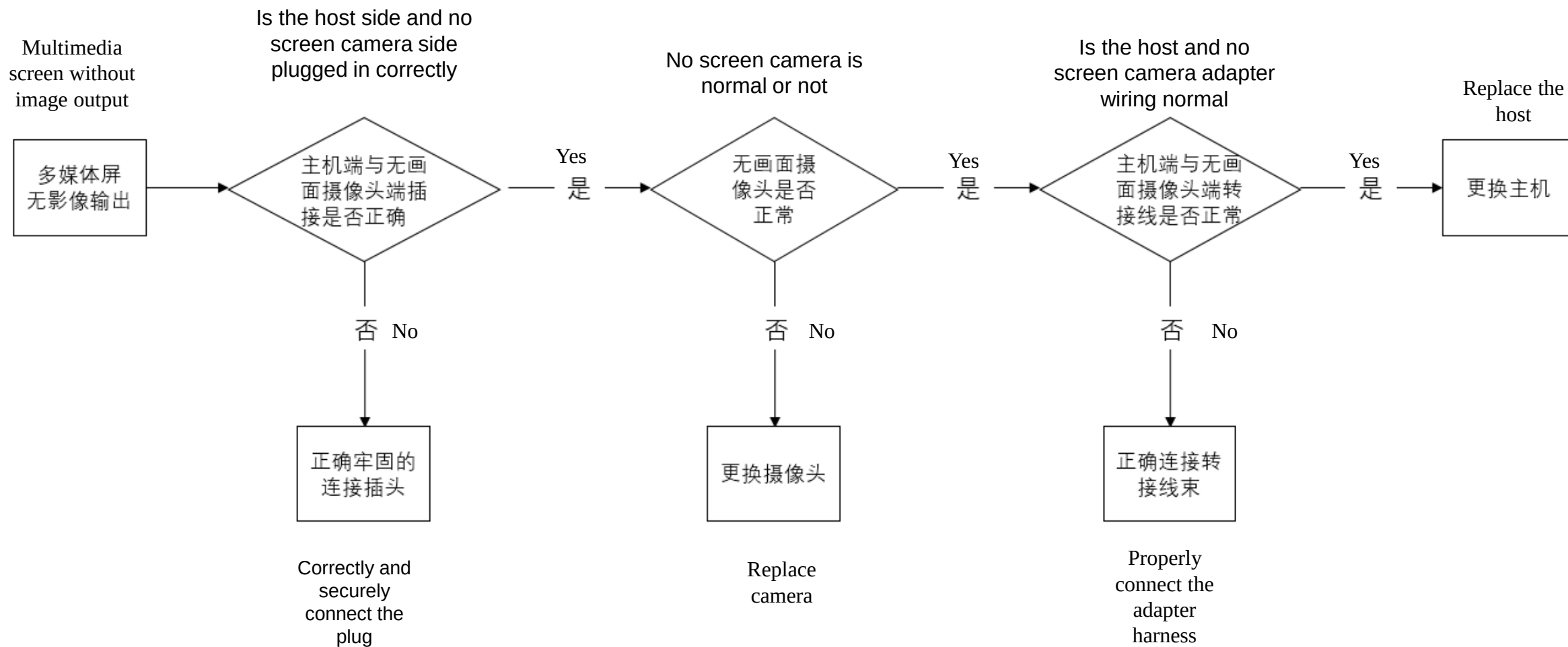
插接器	针脚	定义	备注
四芯航空插头	1	视频输出	输出
	2	视频地	输入
	3	地	输出
	4	电源（DC 12V）	输入

Controller Pin Definition控制器针脚定义

针脚号	功能描述	信号特性	针脚号	功能描述	信号特性
A1	电源B+	+24V常电输入	B13	BBC2_+12V	倒车摄像头+12V电源
A2	地	GND	B14	BBC2_AHD	倒车摄像头视频输入
A3	货厢门开关信号	开关输入（高有效）	B15	BLC3_+12V	挂车/车厢左摄像头+12V电源
A4			B16	BLC3_AHD	挂车/车厢左摄像头视频输入
A5			B17	IC4_+12V	货厢内摄像头+12V电源
A6	钥匙开关ON档	开关输入	B18	IC4_AHD	货厢内摄像头视频输入
A7	CAN总线高位	CAN_H	B19		
A8	CAN总线低位	CAN_L	B20		
A9			C1	FC1_+12V	前摄像头+12V电源
A10			C2	FC1_GND	前摄像头地
A11	左雷达地		C3	FC1_AHD	前摄像头视频输入
A12	左雷达12V电源输出	电源输出	C4	FC1_AHD_GND	前摄像头视频地
A13	右雷达地		C5	RC2_+12V	右摄像头+12V电源
A14	右雷达12V电源输出	电源输出	C6	RC2_GND	右摄像头地
A15	雷达CAN总线高位	CAN2_H	C7	RC2_AHD	右摄像头视频输入
A16	雷达CAN总线低位	CAN2_L	C8	RC2_AHD_GND	右摄像头视频地
B1	BRC1_GND	挂车/车厢右摄像头地	C9	BC3_+12V	后摄像头+12V电源
B2	BRC1_AHD_GND	挂车/车厢右摄像头视频地	C10	BC3_GND	后摄像头地
B3	BBC2_GND	倒车摄像头地	C11	BC3_AHD	后摄像头视频输入
B4	BBC2_AHD_GND	倒车摄像头视频地	C12	BC3_AHD_GND	后摄像头视频地
B5	BLC3_GND	挂车/车厢左摄像头地	C13	LC4_+12V	左摄像头+12V电源
B6	BLC3_AHD_GND	挂车/车厢左摄像头视频地	C14	LC4_GND	左摄像头地
B7	IC4_GND	货厢内摄像头地	C15	LC4_AHD	左摄像头视频输入
B8	IC4_AHD_GND	货厢内摄像头视频地	C16	LC4_AHD_GND	左摄像头视频地
B9			C17	MP5_AHD	输出至MP5 AHD视频
B10			C18	MP5_AHD_GND	输出至MP5 AHD地信号
B11	BRC1_+12V	挂车/车厢右摄像头12V电源	C19	天行健_AHD	输出至天行健AHD视频
B12	BRC1_AHD	挂车/车厢右摄像头视频输入	C20	天行健_AHD_GND	输出至天行健AHD地信号

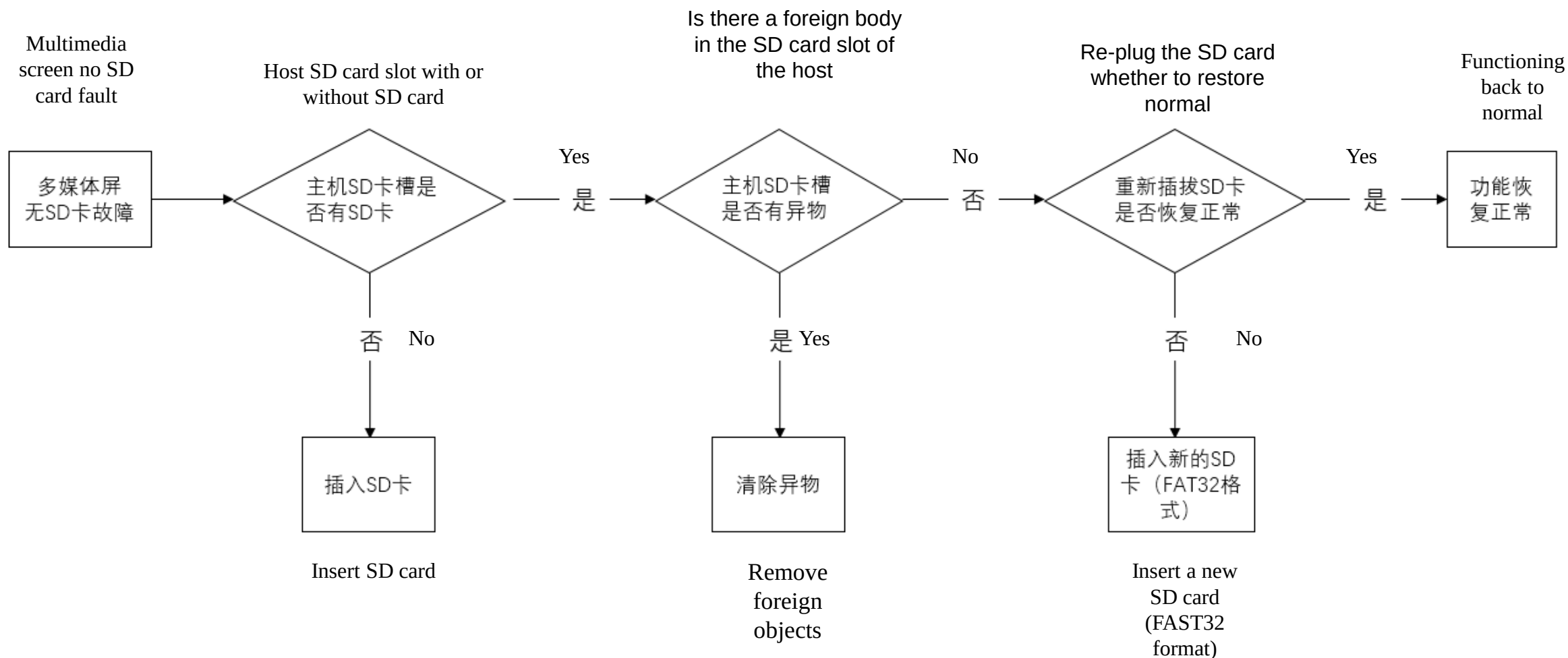
16、Environmental monitoring system - failure cases 环境监控系统——故障案例

◆ No image output from the camera in the environment interface 环境界面内摄像头无影像输出



16、Environmental monitoring system - failure cases 环境监控系统——故障案例

◆ Multimedia screen shows no SD card fault 多媒体屏显示无SD卡故障



监控系统介绍:

Introduction to TMS:

行为监控: 驾驶员身份识别和行为监控, 在新国标执行之前需要1路是摄像头安装于左A立柱, 采集驾驶员脸部信息, 识别驾驶员、疲劳 (分神、哈欠) 及不良驾驶习惯 (抽烟、电话) 提醒; 新国标之后需要2路, 另一路安装于驾驶室左上方, 采集安全带、方向盘、双手、副驾驶员等信息。

TMS: as for driver identification and behavior monitoring, 1 channel of camera needs to be installed on the left A-pillar before the implementation of the new national standard, which is used to collect the driver's facial information, identify the driver, fatigue (distraction, yawn) and remind bad driving habits (smoking, telephone); after the implementation of the new national standard, 2 channels of camera are required, with the other one installed on the LH upper cab, for collecting information such as seat belts, steering wheel, hands, and co-driver.

环境监控: 又称360监控系统, 默认监控6路摄像, 可选挂车结合处, 实现360环视、行驶视野增强 (分屏)、左右视野增强 (分屏)、倒车视野增强 (不分屏)、挂车结合监控功能 (不分屏)、货箱内部监控 (预留)。

EVM: also known as 360 monitoring system, which monitors 6-channel cameras by default; optional for the trailer connection to realize 360 around view, enhanced driving visibility (split screen), enhanced LH / RH visibility (split screen), enhanced reversing visibility (no split screen), the trailer connection monitoring functions (no split screen) and cargo box interior monitoring (reserved).

分屏指分2屏, 另一屏显示360画面; 不分屏只有1屏显示需求画面。

The split screen refers to a division of 2 screens, with the other screen displaying 360 images; the screen without splitting only display 1 screen with the required image.

另可装2个侧后向毫米波雷达, 多个超声波雷达, 毫米波测距, 超声波测人、物, 结合摄像头融和后向MMI并预警。

In addition, it can be equipped with 2 side back MMW radars and multiple ultrasonic radars, with millimeter-wave ranging, ultrasonic detection of people and objects, combined with cameras merging backward MMI and sending early warning.





行为监控
TMS

一、架构原理

I. Architecture principle

- 1、架构：此部分主要介绍主要控制器所在网络，并点出涉及的其他交互控制器或开关。
1. Architecture: this section mainly introduces the network for the main control unit, and points out other interaction control units or switches that are involved.

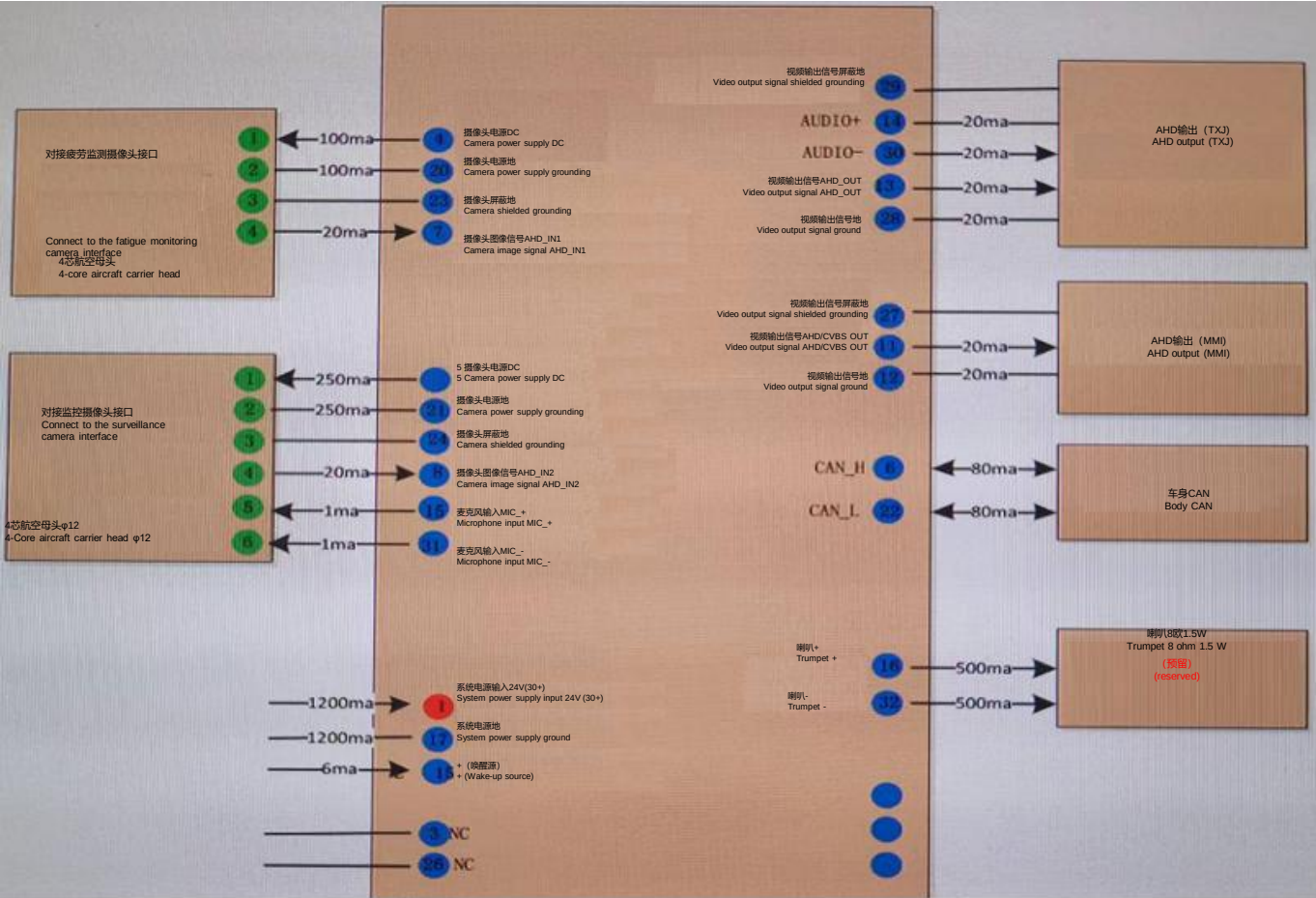
行为监控TMS位于Ican，与TXJ、EVM均位于Ican。
TMS is located in Ican, along with TXJ and EVM.
最多接收2路摄像头输入，在融合后输出1路音视频信号给TXJ，
输出1路视频信号给MMI。
At most receive inputs of 2 channels of camera, output 1 channel of audio and video signals to TXJ, and 1 channel of video signal to MMI after fusion.

疲劳检测摄像头
Fatigue detection camera

插接器 Connector	引脚 Pin	定义 Definition	备注 Remarks
4芯母头、RS765 4-core carrier head, RS765	1	DC 24V	摄像头电源 Camera power supply
	2	GND	摄像头电源地 Camera power supply grounding
	3	摄像头屏蔽地 Camera shielded grounding	图像信号屏蔽地 Image signal shielded grounding
	4	Video_IN	摄像头视频输入 Camera video input

驾驶室监控摄像头
Cab surveillance camera

插接器 Connector	引脚 Pin	定义 Definition	备注 Remarks
6芯母头 6-core carrier head	1	DC 24V	摄像头电源 Camera power supply
	2	GND	摄像头电源地 Camera power supply grounding
	3	摄像头屏蔽地 Camera shielded grounding	图像信号屏蔽地 Image signal shielded grounding
	4	Video_IN	摄像头视频输入 Camera video input
	5	麦克风MIC+ Microphone MIC+	
	6	麦克风MIC- Microphone MIC-	



行为监控 TMS

一、架构原理

I. Architecture principle

线束结构：线束拓扑、接插件对接、各线束重点或特殊功能，例如继电器、保险、卡接等。

Wire harness structure: wire harness topology, connector docking, key points or special functions of each wire harness, such as relay, fuse, clip, etc.

.行为监控位于BCM旁边。

TMS is located next to the BCM.

.30电源来源驾驶室右侧的预留保险丝座。F57的pin3/4。

Reserved fuse holder of RH cab from 30 voltage power supply. F57 pin 3/4.

.ON电来源X515分线器pin8,在驾驶室右侧打铁点附近。

ON power source X515 splitter pin8, near the ironing point of RH cab.

.B320立柱摄像头直接在仪表台线束左侧对接。

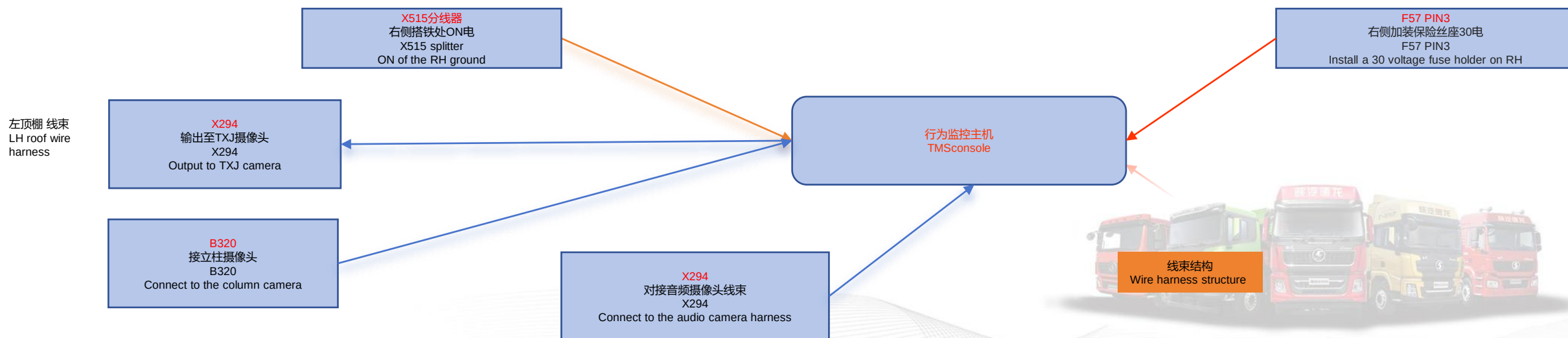
The B320 column camera is directly connected to the LH dashboard harness.

.对接TXJ的摄像头通过X252在左侧与左顶棚线束对接。

The camera linked with TXJ is connected to the LH roof wire harness on the RH through X252.

.对接驾驶行为的音视频摄像头，在仪表台右侧中央电器板附近通过X294对接。

The audio and video camera connected to the driving behavior is linked through X294 near the central electrical panel on RH of the dashboard.





行为监控
TMS

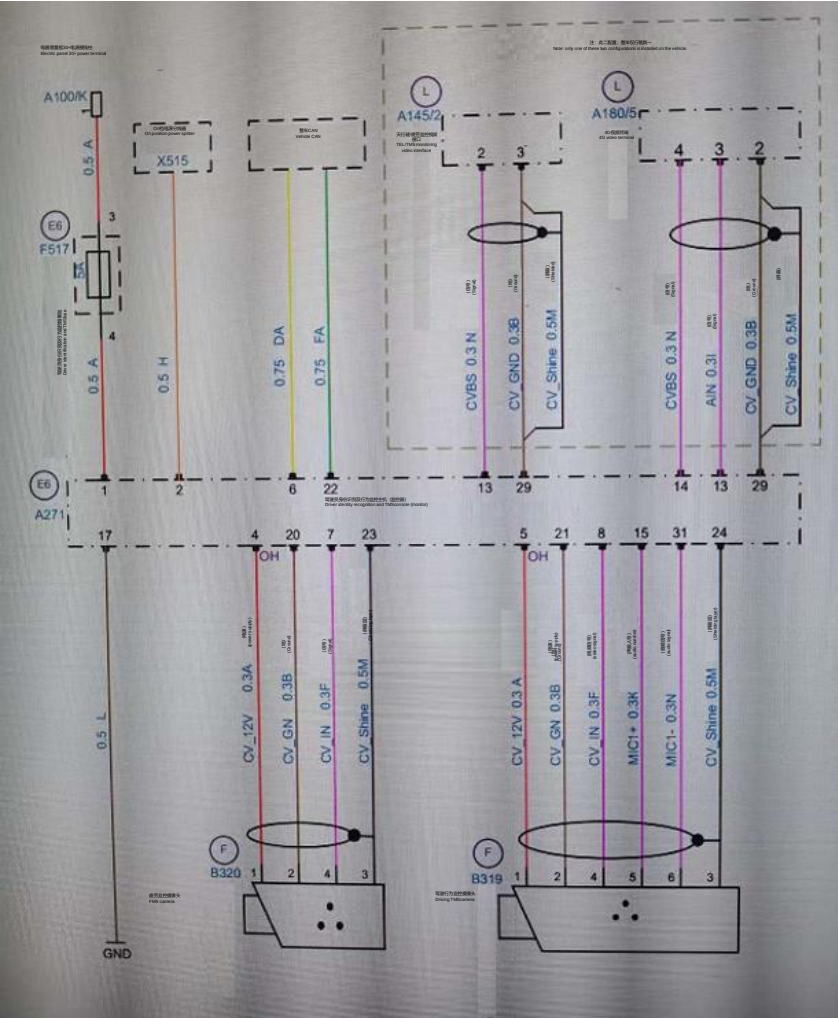
一、架构原理

I. Architecture principle

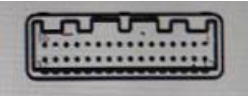
管脚定义：重点子系统介绍、管脚定义。

Pin definition: introduction of key subsystems, pin definition.

电气原理图
Electrical schematic diagram



接插器针脚定义
Connector pin definition
适配端型号: DZ9M259121119
Adapter model: DZ9M259121119



序号 S/N	名称 Description	备注 Remarks	序号 S/N	名称 Description	备注 Remarks
1	24V		17	GND	
2	15+		18	NC	
3	NC		19	NC	
4	人脸摄像头+ Face camera+		20	人脸摄像头GND Face camera GND	
5	驾驶室摄像头+ Cab camera+		21	驾驶室摄像头GND Cab camera GND	
6	CAN_H CAN_H		22	CAN_L	
7	人脸摄像头视频输入 Face camera video input		23	人脸摄像头视频屏蔽地 Face camera video shielding ground	
8	驾驶室摄像头视频输入 Cab camera video input		24	驾驶室摄像头视频屏蔽地 Cab camera video shielding ground	
9	NC		25	NC	
10	NC		26	NC	
11	显示屏视频输出 Display video output		27	显示屏视频输出屏蔽地 Display video output shielded grounding	
12	显示屏视频输出信号地 Display video output signal ground		28	天行健视频输出信号地 TEL video output signal ground	
13	天行健视频输出 TEL video output		29	天行健视频输出屏蔽地 TEL video output shielded grounding	
14	天行健音频输出 TEL audio output		30	天行健音频输出屏蔽地 TEL audio output shielded grounding	
15	音频输入 Audio input		31	音频地 Audio grounding	
16	扬声器+ (预留) Speaker+ (reserved)		32	扬声器GND (预留) Speaker GND (reserved)	

电气管脚图
Electrical Pin Diagram



行为监控
TMS二、功能逻辑
II. Functional logic

身份识别:

Identity recognition:

多媒体实现身份注册、查看、管理，信息存储本地也可远程同步（接收MMI报文获知）；

MMI realizes identity registration, viewing, and management, and local information storage can also be remotely synchronized (known by receiving MMI messages);

上15电后识别面部信息校验比对，查看是否是已经注册驾驶员。

After powering on for 15 voltage, identify the facial information for verification and comparison, and check if it is a registered driver.

驾驶室监控（低配版不具备，需要驾驶室左上部摄像头）

Cab monitoring (not available in the low-end version, the upper LH camera in the cab is required)

双手脱离方向盘；舱内录音；监控主副驾驶员。

Both hands off the steering wheel; interior sound recording; monitoring the main and co-drivers.

行为监控:

Behavior monitoring:

采用补光摄像头，全天候采集驾驶员面部信息，

包括：闭眼、打哈欠、左顾右盼、抽烟、打电话、离岗、安全带未系、看手机、带反红外墨镜等。

With light supplementary camera, collect the driver's facial information around the clock,

including: closing eyes, yawning, looking LH and RH, smoking, making phone calls, leaving work, not wearing seat belts, looking at mobile phones, wearing anti-infrared sunglasses, etc.

其他功能:

Other functions:

摄像头遮挡提醒。

Camera blocking reminder.

本地可存储超过72h的音视频。

More than 72 h of audios and videos can be stored locally.

触发报警时从CAN线提取车速、里程、时间、经纬度、行驶方向等信息，叠加视频存储，可回放得知问题时间和地点等情况。

When an alarm is triggered, information such as vehicle speed, mileage, time, longitude and latitude, and driving direction are extracted from the CAN bus, superposed with video storage which can be played back to learn situations, e.g. time and location of the problem.



行为监控
TMS二、功能逻辑
II. Functional logic

部分参数如下:

Some parameters are as follows:

.主机最大电流 < 1A, 故障温度-40~85℃; 视频输入2路、输出2路 (PAL制式), 音频输入1路、输出1路, 带存储卡128G。

The maximum current of the host is < 1 A, and the fault temperature is -40 ~ 85℃; 2 video input channels, 2 video output channels (PAL system), 1 audio input channel, 1 audio output channel, with a 128 G memory card.

.疲劳监控摄像头, 水平视角82°, 垂直≥44°, 输出PAL制式。

TMS camera, with a horizontal view angle of 82°, verticality ≥ 44°, and output of PAL system.

.驾舱监控摄像头, 水平视角130~145°之间°, 垂直80°, 输出PAL制式

Cab monitoring camera, with a horizontal view angle of 130 ~ 145°, verticality 80° and output of PAL system

主要功能是身份识别行为检测, 驾驶室监控。上15电后可实现所以功能, 下15电存储完成后关闭所有功能。

The main functions are identity recognition, behavior detection and cab monitoring. All functions can be realized after 15 voltage is powered on, and closed after 15 voltage is powered off and the storage is completed.

.两路摄像头实时录像, 间隔5min覆盖式存储至本地TF卡中。

Two channels of cameras record videos in real time, and overwrite and store them in the local TF card for every 5 minutes.

.触发报警时, 将报警后10s的视频单独保存到本地, 非覆盖式存储, 不可自动删除, 视频计数到200次。

When an alarm is triggered, the 10 s video is saved separately to the local after the alarm, stored in non-covered forms, which cannot be automatically deleted, with the video counts up to 200 times.



行为监控 TMS

二、功能逻辑 II. Functional logic

行为监控报警交互:

Interaction of TMS and alarm:

.天行健接收到主机输出的报警信号后，根据车速判断报警等级，将二级报警点前后10s的视频进行存储，并上传后台。

After TEL receives the alarm signals output by the host computer, it judges the alarm level according to the vehicle speed, stores the 10 s video before and after the level-2 alarm point, and uploads it to the background.

.上传视频为2路拼接视频，左为行为监控，右为人脸监控。

The uploaded video is a 2-channel spliced video, with the TMS on LH and the facial monitoring on RH.

.根据周期及优先级，对不良驾驶行为进行语音报警。

Send voice alarms for bad driving behavior according to the cycle and priority.

MMI回放:

MMI playback:

.视频存储在本地TF卡中，且叠加时间、地点、车速等信息；

The video is stored in the local TF card, superposed with information such as time, location, and vehicle speed;

.系统可以自适应摄像头数量，根据数量调整视频宫格数量；

The system can self-adapt to the quantity of cameras, according to which it can adjust the quantity of video grids;

.视频回放功能在MMI的“360环视”界面内。

The video playback function is built in the "360 Around View" interface of MMI.



行为监控
TMS二、功能逻辑
II. Functional logic

行为监控及报警：同上，报警前后10s视频叠加地点、时间等上传TXJ，由TXJ上传后台。

TMS and alarm: as same as above, the 10 s video before and after the alarm will be superposed with location, time, etc. and uploaded to TXJ, which will in turn upload it to the background.

报警信号执行由仪表、TXJ、MMI完成。判断报警逻辑，输出报文信号，仪表执行声音报警。

The alarm signal execution is completed by the IC, TXJ, and MMI, which judge the alarm logic, output the message signal, and the IC executes the sound alarm.

闭眼报警：车速 ≥ 10 kph且闭眼2s以上。录视频，仪表滴滴提示。

Eye-closed alarm: vehicle speed ≥ 10 kph and eyes closed for more than 2 seconds. Record video, and IC reminder of Didi.

分神报警：车速 ≥ 30 kph且（低头 $> 12^\circ$ 或视线朝下 > 2 S），此时TXJ提醒；弱若车速 ≥ 50 kph，触发二级报警，录视频传后台。

Distraction alarm: if the vehicle speed is ≥ 30 kph and (lowered head $> 12^\circ$ or downward gaze > 2 seconds), TXJ will remind at this time; if the vehicle speed is ≥ 50 kph with a triggered level-2 alarm, a video will be recorded and reported to the background.

打哈欠报警：车速 ≥ 10 kph且打哈欠2s以上。TXJ提醒，录视频传后台。

离岗报警：车速 ≥ 10 kph且面部被遮挡或严重偏离2s以上。TXJ提醒，录视频传后台。

左顾右盼报警：车速 ≥ 30 kph且左右看超5S，此时TXJ提醒；弱若车速 ≥ 50 kph，触发二级报警，录视频传后台。

吸烟报警：点烟吸烟超过1S。此时TXJ提醒；弱若车速 ≥ 50 kph，触发二级报警，录视频传后台。

打电话玩手机报警：车速 ≥ 10 kph且手持电话通话超5S，此时TXJ提醒；弱若车速 ≥ 50 kph，触发二级报警，录视频传后台。

遮挡报警：车速 ≥ 0 kph且遮挡超过10S，此时TXJ提醒，录视频传后台。

Yawning alarm: vehicle speed ≥ 10 kph and yawning for more than 2 seconds. TXJ reminder and video record for uploading to the background.

Leaving duty alarm: the vehicle speed is ≥ 10 kph and the face is blocked or seriously deviating for more than 2 seconds. TXJ reminder and video record for uploading to the background.

Look left and right to alarm: if the vehicle speed is ≥ 30 kph and the LH / RH views exceed 5 seconds, TXJ will send alarm at this time; if the vehicle speed is ≥ 50 kph, a level-2 alarm will be triggered, and a video will be recorded and sent to the background.

Smoking alarm: light up a cigarette and smoke for more than 1 second. At this time, TXJ will send alarm; if the vehicle speed is ≥ 50 kph, a level-2 alarm will be triggered, and a video will be recorded and transmitted to the background.

Alarm by making calls and playing mobile phone: if the vehicle speed is ≥ 10 kph and calling over handset for over 5 s, TXJ will send alarm at this time; if the vehicle speed is ≥ 50 kph, a level-2 alarm will be triggered, and a video will be recorded and sent to the background.

Blocking alarm: when the vehicle speed is ≥ 0 kph and the blocking lasts over 10 s, TXJ will send alarm at this time, and the recorded video will be sent to the background.

双手脱方向盘：车速 ≥ 30 kph且双手脱离方向盘超2S，此时TXJ提醒；弱若车速 ≥ 50 kph，触发二级报警，录视频传后台。

Hands off the steering wheel: if the vehicle speed is ≥ 30 kph and hands are off the steering wheel for more than 2 seconds, TXJ will send alarm; if the vehicle speed is ≥ 50 kph, a level-2 alarm will be triggered, and a video will be recorded and transmitted to the background.

未系安全带：车速 ≥ 25 kph且未系安全带超5S且仪表发送安全带未系信号，此时TXJ提醒，录视频传后台。

Not fastening the seat belt: if the vehicle speed is ≥ 25 kph, the driver has not fastened the seat belt for more than 5 seconds and the IC sends the signal of not fastening the seat belt, TXJ will send alarm, and a video will be recorded and sent to the background.

佩戴反红外墨镜：车速 ≥ 0 kph且带墨镜超10S，此时TXJ提醒，录视频传后台。

Wear anti-infrared sunglasses: when the vehicle speed is ≥ 0 kph and the driver wears sunglasses for more than 10 seconds, TXJ will send alarm, and a video is recorded and send to the background.



环境监控 EVM

一、架构原理

I. Architecture principle

1、架构：此部分主要介绍主要控制器所在网络，并点出涉及的其他交互控制器或开关。

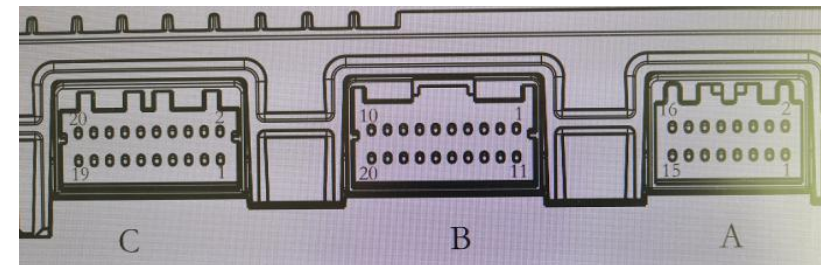
1. Architecture: this section mainly introduces the network for the main control unit, and points out other interaction control units or switches that are involved.

.环境监控位于Ican，与TXJ、TMS均位于Ican。

EVM is located at Ican, along with TXJ and TMS.

.默认6路摄像头，最多8路，可装2路毫米波雷达、多路超声波雷达，雷达需要有雷控制器作为子can，实车一般直接6路摄像头。

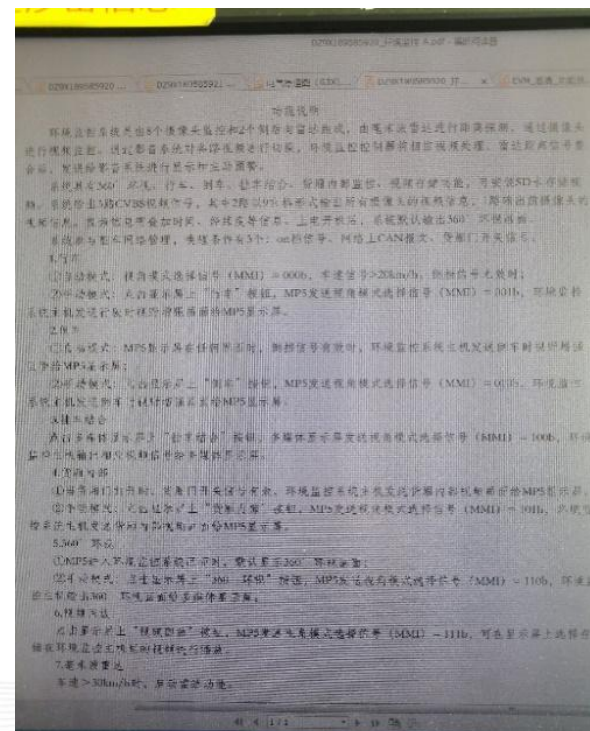
It defaults to a 6-channel camera, or at most 8-channel. A 2-channel MMW radar and multi-channel ultrasonic radar can be installed. The radar must be equipped with a radar control unit as a sub-can. Real vehicles generally adopt 6-channel cameras.



*管脚分布图 特殊

*Pin layout diagram, special

针脚号	功能描述	信号特性	针脚号	功能描述	信号特性
A1	电源B+	+24V常电输入	B13	BBC2_+12V	倒车摄像头+12V电源
A2	地	GND	B14	BBC2_CVBS	倒车摄像头视频输入
A3	货厢门开关信号	高电平有效 (高电平)	B15	BLC3_+12V	挂车/车厢左摄像头+12V电源
A4	红外灯电源		B16	BLC3_CVBS	挂车/车厢左摄像头视频输入
A5	红外灯电源线		B17	IC4_+12V	货厢内摄像头+12V电源
A6	创建开关OK性	高电平有效	B18	IC4_CVBS	货厢内摄像头视频输入
A7	CAN总线唤醒	CAN_H	B19	视频输出给天行健	
A8	CAN总线唤醒	CAN_L	B20	视频输出给天行健	
A9	右后转向灯电源		C1	FC1_+12V	前摄像头+12V电源
A10	右后转向灯电源	电源输入	C2	FC1_GND	前摄像头地
A11	右后转向灯电源		C3	FC1_CVBS	前摄像头视频输入
A12	右后转向灯电源		C4	FC1_CVBS_GND	前摄像头视频输入
A13	右后转向灯		C5	RC2_+12V	右摄像头+12V电源
A14	右后转向灯	电源输入	C6	RC2_GND	右摄像头地
A15	右后转向灯		C7	RC2_CVBS	右摄像头视频输入
A16	右后转向灯		C8	RC2_CVBS_GND	右摄像头视频输入
B1	BRC1_GND	挂车/车厢右摄像头地	C9	BCL3_+12V	后摄像头+12V电源
B2	BRC1_CVBS_GND	挂车/车厢右摄像头视频地	C10	BCL3_GND	后摄像头地
B3	BBC2_GND	倒车摄像头地	C11	BC3_CVBS	后摄像头视频输入
B4	BBC2_CVBS_GND	倒车摄像头视频地	C12	BC3_CVBS_GND	后摄像头视频输入
B5	BLC3_GND	挂车/车厢左摄像头地	C13	LC4_+12V	左摄像头+12V电源
B6	BLC3_CVBS_GND	挂车/车厢左摄像头视频地	C14	LC4_GND	左摄像头地
B7	IC4_GND	货厢内摄像头地	C15	LC4_CVBS	左摄像头视频输入
B8	IC4_CVBS_GND	货厢内摄像头视频地	C16	LC4_CVBS_GND	左摄像头视频输入
B9			C17	MP5_CVBS	输出至MP5 AHD视频
B10			C18	MP5_CVBS_GND	输出至MP5 AHD视频
B11	BRC1_+12V	挂车/车厢右摄像头12V电源	C19	光敏传感器+	光敏传感器地
B12	BRC1_CVBS	挂车/车厢右摄像头视频输入	C20	光敏传感器地	光敏传感器地



*原理图不准确 规范管脚图不准确

*The schematic diagram is inaccurate.

The specification pin diagram is inaccurate.



环境监控 EVM

一、架构原理

I. Architecture principle

线束结构：有专用附加线，自己取电、接地；（DZ9X189776240）

Wire harness structure: special additional wires are provided, for self-supplying and grounding; (DZ9X189776240)

左侧与顶棚线束、左车门线束、中间与仪表台线束对接MMI、右侧对接防火墙、右顶棚线束、右车门线束。

LH and roof wire harness, LH door wire harness, the middle and dashboard harness connected to MMI, RH connected to the firewall, RH roof harness, RH door harness.

.电源来自B+：来自中央电器盒E12（线号30012_1），带端子需要总装分装安装,在控制器A1。

The power supply comes from B+: from the central electrical box E12 (wire size 30012_1), with terminals that require final assembly / sub-assembly / installation in the control unit A1.

.电源30电：来自接线柱（线号30011_4），再通过线束自带保险F530输出（30012_2）电源至控制器A1。

Power supply 30 voltage: from the terminal (wire size 30011_4), and then output power through the wire harness self-contained fuse F530 (30012_2) to the control unit A1.

.ACC电：来自ACC电源分线器X516（线号ACF_3）。需要总装分装安装，在控制器A6。

ACC power: from ACC power splitter X516 (wire size ACF_3), which requires final assembly / sub-assembly / installation in the control unit A6.

.线束结构：专用附加险自己取电接地。

Wire harness structure: special additional insurance for taking power and grounding by oneself.

通过仪表台线束对接，将视频输出信号给到MMI；

Send the video output signal to the MMI by connecting to the dashboard wire harness;

通过左车门线束，采集左侧后视镜处的左侧、左后摄像头；

Through the LH door wire harness, collect LH of the LH mirror and the LH rear camera;

通过右车门线束，采集右侧后视镜处的右侧、右后摄像头；

Through the RH door harness, collect RH of the RH mirror and RH rear camera;

通过防火墙，将采集倒车摄像头的线束预留至后工作灯的龙门架处，载货车会直接连接摄像头，牵引车随车发送；

Through the firewall, reserve the wire harness for collecting the reversing camera to the gantry of the rear work lamp. The load truck will directly connect to the camera, and the tractor will send on board;

通过有顶棚线束，采集前方摄像头，如有夜视功能，需要前方和左侧补光信号也在此线束。

Through the roof wire harness, connect the front camera. If there is a night vision function, the front and LH light supplementary signals are also required in this harness.

需要注意的是，该控制附加线有后摄像头，目前无用，预留。

It should be noted that the additional control wire is provided with a rear camera, which is currently useless and reserved.



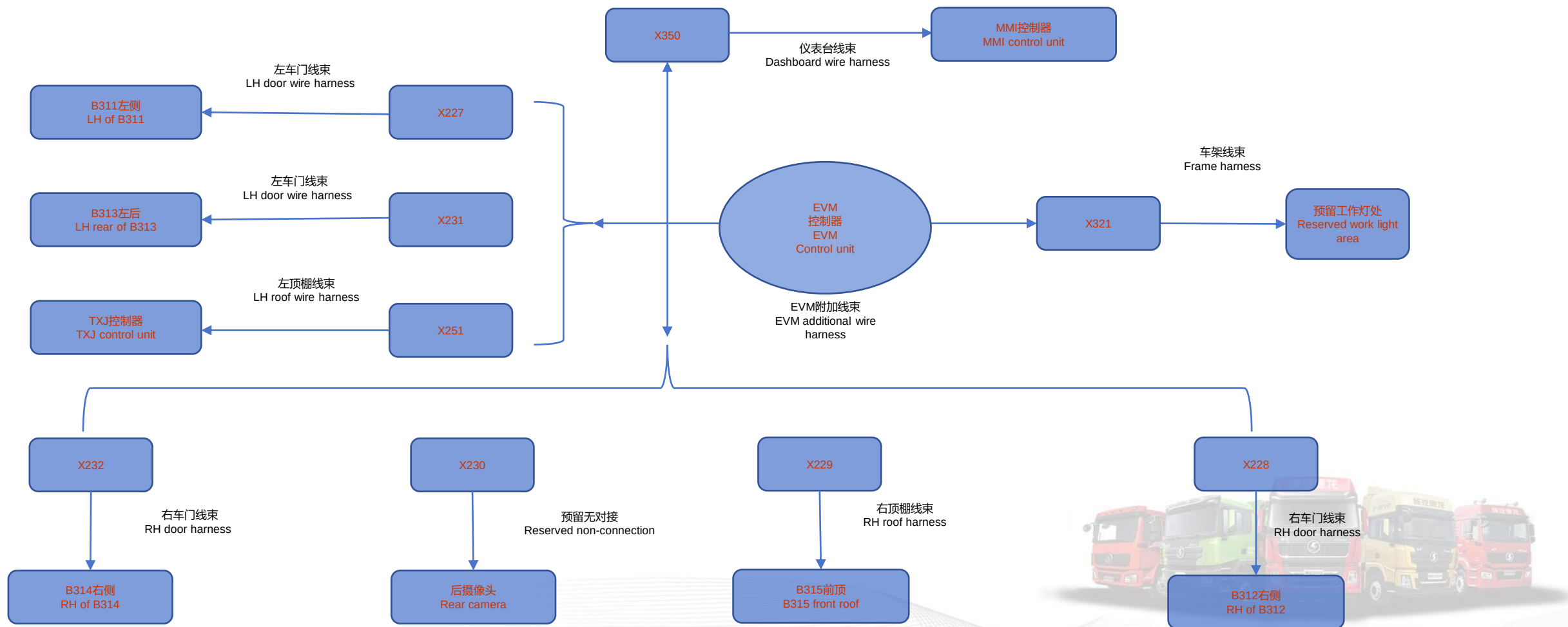
环境监控 EVM

一、架构原理

I. Architecture principle

线束结构：左侧与顶棚线束、左车门线束、中间与仪表台线束对接MMI、右侧对接防火墙、右顶棚线束、右车门线束。

Wire harness structure: LH and roof wire harness, LH door wire harness, the middle and dashboard harness connected to MMI, RH connected to the firewall, RH roof harness and RH door harness.



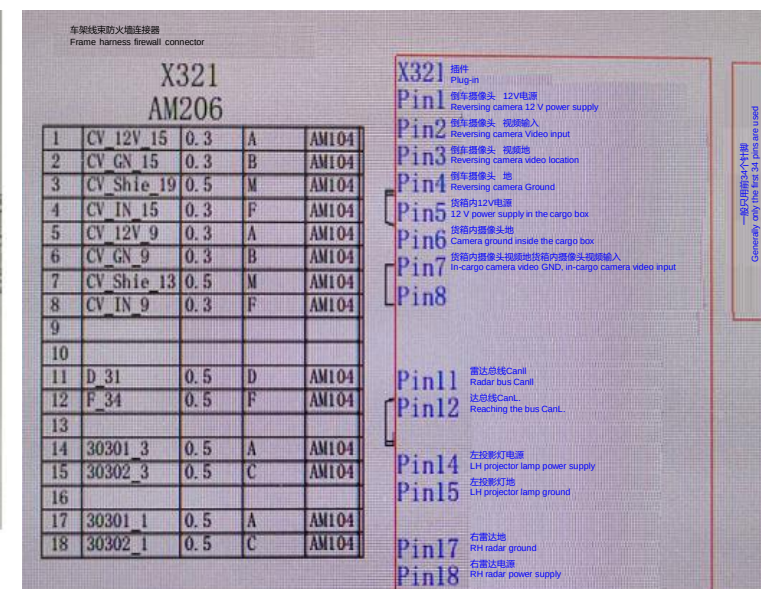
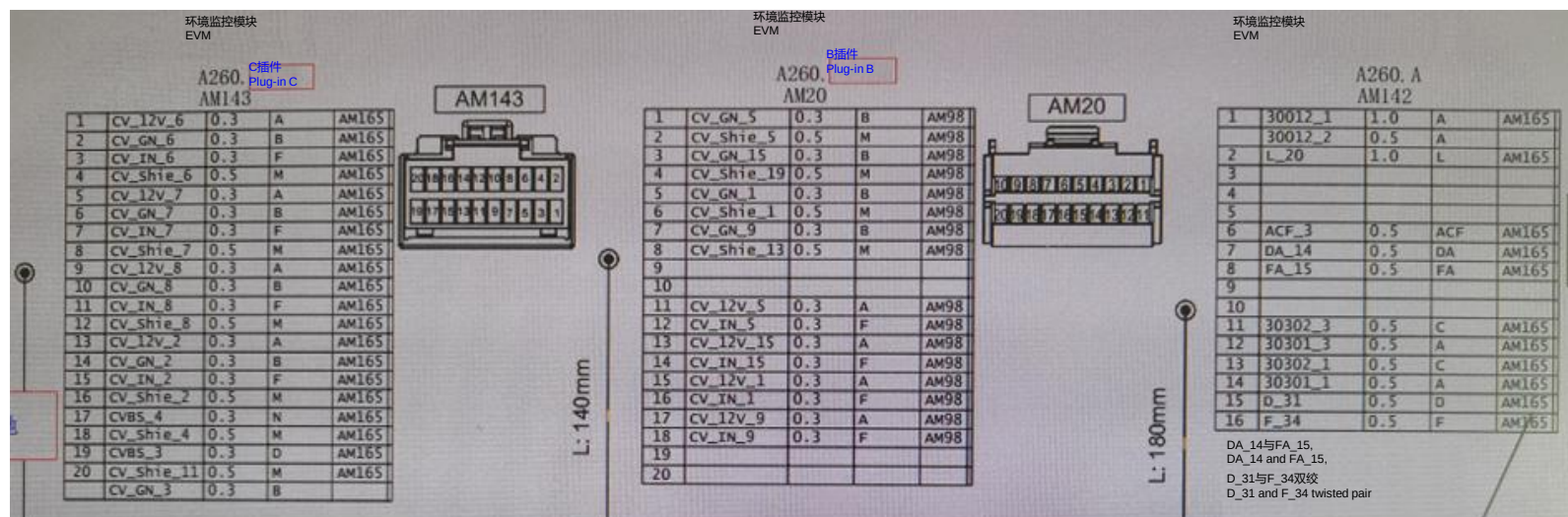
环境监控 EVM

一、架构原理

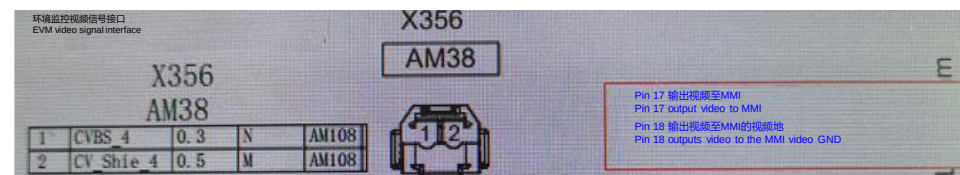
I. Architecture principle

线束结构：左侧与顶棚线束、左车门线束、中间与仪表台线束对接MMI、右侧对接防火墙、右顶棚线束、右车门线束。

Wire harness structure: LH and roof wire harness, LH door wire harness, the middle and dashboard harness connected to MMI, RH connected to the firewall, RH roof harness and RH door harness.



针脚No. Pin No.	功能定义 Functional definition
1	+12V电源 +12 V power supply
2	GND
3	Video_GND
4	Video_OUT



环境监控
EVM

二、功能逻辑
II. Functional logic

- 1、系统的作用，各节点的分作用介绍。重点功能的逻辑。
1. Introduction to the system functions and the sub-functions of each node. The logic of key functions.

摄像启动时间：上电15s内启动。
Camera startup time: start within 15 seconds after power-on.
记录数据：影像、时间、日期。
Record data: image, time, date.

货箱内部监控：（暂未用）
Monitoring of cargo box interior: (not used yet)

仅有B+电时就可以应用，当货箱门开时，唤醒监控系统，并存储视频输出至TXJ。
It can be used even there is only B+ voltage. When the cargo door is open, the monitoring system will be awakened, videos are saved and output to TXJ.

环境监控：
EVM:

上15电时所有功能可用。
All functions are available when 15 voltage is powered on.

视频显示：
The video shows:
通过MMI显示画面，画面可切换。
The picture is displayed through MMI, which can be switched.

雷达信号整合：
Integrated radar signal:
将雷达探测的距离信号和报警信号整合到画面中。
Integrate the distance signal and alarm signal detected by the radar into the picture.

视频记录：
Video recording:
允许存储记忆，且记忆时间取决于SD卡容量，最大支持2T。
It is allowed to store memory, and the memory time depends on the capacity of SD card, with the maximum support of 2 T.

名称 Description	默认值 Default value
雷达报警区域 Radar alarm area	左右： 5m LH / RH: 5 m 向后： 50m Backward: 50 m
雷达启动车速 Radar start vehicle speed	30km/h
行驶时视野增强行驶车速 Vehicle speed with enhanced visibility in driving	20km/h
单个记录视频时长 Video duration of a single record	5min
货箱内部视频强制关闭时间 Compulsory closing time for the video of the cargo box interior	5h



环境监控 EVM

二、功能逻辑

II. Functional logic

1、系统的作用，各节点的分作用介绍。重点功能的逻辑。

1. Introduction to the system functions and the sub-functions of each node. The logic of key functions.

雷达探测功能:

Radar detection function:

使用安装在车辆两侧的盲区雷达进行变道辅助，雷达能够探测障碍物距离，融合视频显示，并在并线转向时发出报警信号用于提示和显示。

Blind spot radars installed on both sides of the vehicle are used for lane change assistance. The radar can detect the distance of obstacles, integrate video display, and send out alarm signals for prompts and displays during merging and steering.

毫米波雷达即使安装，还受配置字控制软件；毫米波雷达政策距离左右5m，前后80m探测能力，在50m是为报警距离。

Even if the MMW radar is installed, it is still controlled by the configuration bits control software; the MMW policy distance is 5 m to LH and RH, with the detection capability of 80 m in the front and rear, and the alarm distance of 50 m.

车速 > 30kph时，检测到障碍物，且车辆相应侧有转向信号，EVM输出报警级别和对应侧的并线报警，仪表显示，TXJ报警。

When the vehicle speed is > 30 kph, an obstacle is detected and there is a turn signal on the corresponding side of the vehicle. The EVM outputs the alarm level and the parallel alarm on the corresponding side, with the IC display and TXJ alarm.

超声波雷达报警:

Ultrasonic radar alarm:

最大可安装8路超声波雷达，一般安装于保险杠、上车踏板、左右侧翼子板、后防护板等处。

A maximum of 8 channels of ultrasonic radars can be installed, usually on bumpers, doorsteps, LH / RH fenders, rear fenders, etc.

超声波雷达报警无车速条件，只要15电即可报警；EVM发出报文，TXJ执行报警声音；

The ultrasonic radar alarm is not limited by vehicle speed conditions and can send alarms only with 15 voltage; EVM sends messages and TXJ performs the alarming sound;

报警距离 < 2.5m就报警，为一级报警；< 1m为二级报警；每个雷达满足条件均会报警。

The alarm with the distance < 2.5 m is a level-1 alarm; the alarm distance < 1 m, it is a level-2 alarm; each radar will send alarm if it meets the conditions.

左右视野增强:

Enhanced LH / RH visibility:

系统自动检测左右共4路摄像头，当检测均未连接时，在EVM1报文中输出“左右转界面切换”禁止，若有1路正常，额输出允许。

The system automatic detection involves 4 channels of cameras on LH and RH. When none of them are detected to be connected, the output "LH / RH turn interface switching" in the EVM1 message is prohibited. If one channel is normal, the output will be allowed.

当左右有摄像头正常连接，且左右转向开关信号有效，EVM会输出增强画面至多媒体，具体是否显示由多媒体决定。

When the LH / RH cameras are connected normally, and the LH / RH steering switch signals are valid, the EVM will output the enhanced image to MMI, which shall be decided whether to display by MMI.



环境监控 EVM

二、功能逻辑

II. Functional logic

1、系统的作用，各节点的分作用介绍。重点功能的逻辑。

1. Introduction to the system functions and the sub-functions of each node. The logic of key functions.

行驶视野增强：

Enhanced driving vision:

融合左前、右前和前方摄像头，对左右盲区和前方黑暗道路辨别，提供给MMI显示。

By Integrating the LH front, RH front and front cameras, distinguish the LH / RH blind spots and the dark roads ahead, and provide them to MMI for display.

分为自动和手动模式，手动时点击“行车”，MMI发送视角模式请求为01“行车”，EVM输出行车增强画面；

自动模式时，判断非倒挡，且车速 $\geq 10\text{kph}$ ，具体是否显示受MMI控制，车速 $< 5\text{kph}$ 时退出发送；

且自动模式优先级低于手动模式；且自动模式下倒车优先级最高，其次左右转向、最好。

It is divided into automatic and manual modes. Click "Driving" in the manual mode, so that MMI sends the request in the view angle mode as 01 "Driving", and EVM outputs the enhanced driving image;

In the auto mode, it is judged as non-R position with the vehicle speed $\geq 10\text{ kph}$, controlled by MMI for whether to be displayed, and exit sending when the vehicle speed is $< 5\text{ kph}$;

And priority of the auto mode is lower than the manual mode; and the priority of reversing in the auto mode is the highest, followed by LH / RH steering, which is the best.

倒车视野增强：

Enhanced reversing visibility:

倒车涉及倒挡信号识别，不同车型倒挡信号不一致，6000车型VCU1, X5000 M000S车型CPD1，车型识别见专门章节。

自动模式下，倒挡显示优先级最高；同时收到左右转信号时，重点显示左后、右后信息，转向信号消失后恢复纯倒车画面。

倒车视野增强涉及两个摄像头，倒车摄像头（尾梁）和后摄像头（驾驶室后部），分牵引、非牵引，带挂不带挂：

Reversing involves recognition of R signal, with inconsistent R signals among different models. Refer to the special chapters for model recognition of 6000 VCU1, X5000 M000S CPD1.

In the auto mode, the R displays the highest priority; when the LH / RH turn signals are received simultaneously, with the focus on LH rear and RH rear information, the pure reversing image is restored after the turn signals disappear.

Enhanced reversing visibility involves two cameras, the reversing camera (tail beam) and the rear camera (rear of the cab), and are divided into traction and non-traction, with or without suspension:

牵引车带挂（BCM1发送）：优先输出倒车摄像头画面，无倒车摄像头时输出后摄像头。倒车画面都不显示鞍座标记线；

Tractor with trailer (sent by BCM1): the reversing camera image is output in priority, and the rear camera is output without a reversing camera. The reversing image does not display the fifth wheel marking line;

牵引车不带挂（BCM1发送）：输出后摄像头，带鞍座标记线；

Tractor without trailer (sent by BCM1): the rear camera is output, with the fifth wheel marking line;

渣土车、载货车：只有倒车摄像头，不带鞍座标记线。

Dirt trucks, cargo trucks: with only reversing cameras, without the fifth wheel marking lines.

*车型识别

*Model identification

*目前牵引车也不带后摄像头

*Currently the tractor does not have a rear camera



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挂车结合监控:

Monitoring with trailer connection:

用于牵引车，且未接挂车情景，显示鞍座影像，增强视觉操作，需要有鞍座标记线；

It is used for the tractor without a trailer, which displays the fifth wheel image and enhances visual operation. A fifth wheel marking line is required;

条件（自动模式）：挂号侧检测信号无效，倒车摄像头未接入（接入就显示倒车画面带鞍座标记），倒挡有效。

Conditions (auto mode): detection signal on the registration side is invalid, without connection to the reversing camera (when connected, the reversing screen with a fifth wheel mark is displayed), and the R position is valid.

手动模式直接操作即可。

Manual mode can be operated directly.

货箱内部监控:

Cargo box interior monitoring:

监控货箱内部画面，识别到货箱内部接头有效。

By monitoring the cargo box interior images, connectors inside the cargo box is recognized as valid.

三种情况：自动模式 15电下货箱门开，硬线输入EVM；B+电下货箱门开，硬线输入EVM；手动模式。

Three situations: 15 voltage in the auto mode, the cargo box door opens, when the hardwire inputs EVM; B + voltage, the cargo box door opens, when the hardwire inputs EVM; the manual mode.

自动模式在15电，正常记录传输；在B+电下，硬线唤醒EVM，EVM再唤醒TXJ，都不发送报文，但正常记录传输视频信号。

15 voltage in the auto mode, normal recording and transmission; B+ voltage, the hardwire wakes up EVM, and the EVM wakes up the TXJ again, without sending messages, but the video signal is recorded and transmitted normally.

且在B+电下，需要检测蓄电池电压，挡电压低于24持续1s即停止功能；恢复时需要电压至24.6V持续1s以上，开启监控记录。

And with B+ voltage, the battery voltage needs to be detected. If the voltage is lower than 24 V for constant 1 s, the function will stop; when it is recovered, the voltage needs to keep at 24.6 V for more than 1 s, and start monitoring record.

360°环视:

360° AVM:

功能提供车辆360°环视监控，拼接前、倒车、左前、左后、右前、右后6个摄像头画面，为环境监控的默认界面。

The function provides 360° AVM monitoring of the vehicle, with 6 camera pictures of before splicing, reversing, LH front, LH rear, RH front and RH rear, which is the default interface for EVM.



环境监控 EVM

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记录存储:

Record storage:

记录存储画面最多为9宫格画面，结合从天行健获取的经纬度、时间、车速等信息叠加到视频上，前8宫格为视频信号，最后1宫格为叠加信息。没有存储卡时再视频显示画面显示红色存储卡的图标闪烁提示。

The recorded and stored images are a maximum of 9 grids, which are superimposed on the video by combining the latitude and longitude, time, vehicle speed and other information obtained from TEL, with the first 8 grids of video signals, and the last 1 grid of superimposed information. When there is no memory card, the video screen will display a flashing red memory card icon.

视频输出:

Video output:

输出2路视频，分别给TXJ和多媒体屏。

Output 2 channels of video, respectively to TXJ and multimedia screen.

系统自适应摄像头数量，根据数量调整输出的宫格数，最多为9宫格。

The system self-adapts to the quantity of cameras, according to which it adjusts the quantity of output grids with 9 grids at most.

与多媒体MMI的交互:

Interaction with multimedia MMI:

多媒体设置虚拟按键多个，当MMI接收不到EVM的标志报文EVM1时只有“返回”按钮点亮，其他按钮灰显。

The MMI sets many visual keys. When it cannot receive the EVM flag message EVM1, only the "Return" button lights up and others are gray.

“挂车结合”“货箱监控”图标时根据EVM2报文的环境识别码显示的，为6路时不显示，其他值时显示。

The "trailer connection" and "cargo box monitoring" icons display according to the environment identification code of the EVM2 message. They will not display when there are 6 channels, and display for other values.

各个按钮点击时，发送MMI1中视角选择信号给EVM，EVM根据此信号切换模式，并反馈EVM1中的视角选择信号给MMI，MMI根据反馈信号点亮对应按键的图标为亮显。即按键亮显是受EVM1反馈控制的。

Click each button and send the view angle selection signal in MMI1 to the EVM, the EVM switches modes according to the signal and feeds it back to the MMI, and the MMI lights up the icon of the corresponding key as highlight according to the feedback signal. So to speak, the highlight button is controlled by EVM1 feedback.

MMI事件性发送触摸坐标，EVM根据坐标判断按键指令，

MMI sends touch coordinates event-wise, and EVM determines key commands based on the coordinates.



环境监控 EVM

二、功能逻辑

II. Functional logic

1、系统的作用，各节点的分作用介绍。重点功能的逻辑。

1. Introduction to the system functions and the sub-functions of each node. The logic of key functions.

诊断标定：

Calibration of diagnosis:

MMI将非菜单界面的屏幕分为6个区，按照左上为1，右下为6区的规则，点击1-4-6-3-2-5区域的顺序，可进入环视标定主菜单。

MMI divides the screen of the non-menu interface into 6 areas. According to the rule in which the upper LH is zone 1 and the lower RH is zone 6, click the order of 1-4-6-3-2-5 areas and enter the main menu of around view calibration.

区域的判定是MMI通过坐标发送，点击时MM发送坐标的事件性报文，EVM根据该坐标判断点击区域。

The area judgement is sent by MMI through coordinates. By clicking, MMI sends an event message of coordinates, based on which EVM determines the click area.

其诊断功能，除了无SD卡之外，其他检测

The diagnosis function, no SD card, other detection

车型自适应：

Car model self-adaptation:

环境监控识别X6000平台与非6000平台（X5000和M3000S）两者网络管理不一致，区别方式是上电时识别GW的网络管理报文；有网关的网络管理报文就认为是X6000，且永久记忆。两个平台区别在与网络管理及倒挡识别，影响功耗休眠及倒挡自动显示。

EVM identifies that the network management of the X6000 platform and non-6000 platforms (X5000 and M3000S) are inconsistent. The way to distinguish them is identifying the network management message of GW during power-on; the network management message with gateways are considered to be X6000 with permanent memory. The difference between the two platforms lies in network management and R position recognition, which affect power consumption sleep and automatic display of R position.

自适应结果会存储，也可以再次清除。

The self-adaptive results will be stored and cleared again.

自适应错误的判断方法标志：倒挡信号识别错误，挂倒挡都不能显示对应画面；分别是VCU1和CPD1（BCM1）。

Judgment method signs for self-adaptive errors: reversing signal recognition error, and the corresponding image cannot be displayed in the R position; they are VCU1 and CPD1 (BCM1), respectively.

其中非6000平台车辆，识别错误时认为成6000车型，会播报“与EVM/MMI失去通讯”。

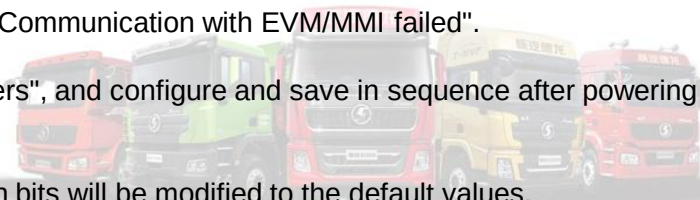
Among them, vehicles on the non-6000 platform, when recognized incorrectly, are considered to be 6000 models, and will report "Communication with EVM/MMI failed".

自适应清除：需要按顺序1-4-6-3-2-5操作进入系统主菜单，点击“清除自适应参数”，重新上电后会挨次适配保存。

Self-adaptive clearing: it is required to enter the main system menu in the order of 1-4-6-3-2-5, click "Clear Self-adaptive Parameters", and configure and save in sequence after powering on again.

其中，6000平台需要接收配置字，适配更变化时，配置字参数会修改为默认值。

Among them, the 6000 platform needs to receive the configuration bits. When the adaptation changes, parameters of configuration bits will be modified to the default values.





四方位监控
Four-direction monitoring

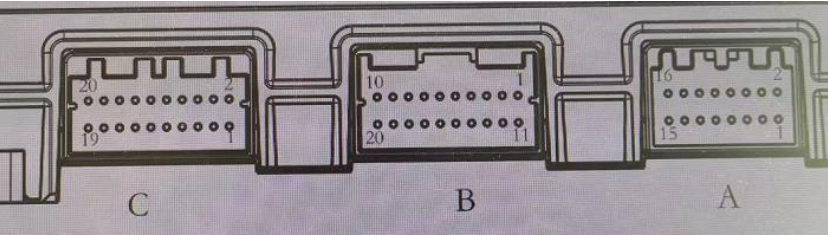
一、架构原理

I. Architecture principle

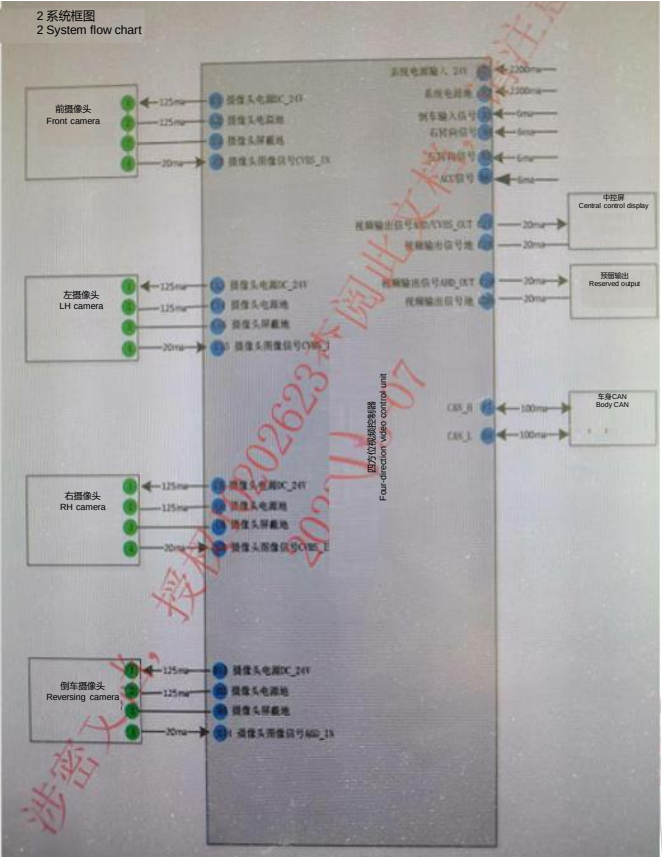
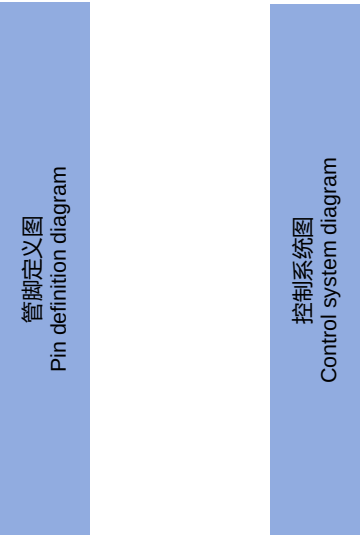
1、架构：此部分主要介绍主要控制器所在网络，并点出涉及的其他交互控制器或开关。
1. Architecture: this section mainly introduces the network for the main control unit, and points out other interaction control units or switches that are involved.

.四方位监控有一个主机、4个摄像头（前后左右），采集信息是4宫格显示，数据不融合，不检测摄像头。
The four-position monitoring is equipped with a host computer and 4 cameras (front, rear, LH and RH). The collected information is displayed in 4 grids, without integrating data or detecting cameras.
.四方位监控位于Ican，与TXJ、TMS均位于Ican。
Four-direction monitoring is located at Ican, along with TXJ and TMS.

引脚号 Pin number	功能描述 Description of function	信号特性 Signal characteristics	引脚号 Pin number	功能描述 Description of function	信号特性 Signal characteristics
A1	电源30+ Power supply 30+	+24v常电输入 +24v normal power input	B13	BBC2_+12V	倒车摄像头+12V电源 Reversing camera +12V power supply
A2	地 Ground	GND	B14	BBC2_+AHD	倒车摄像头视频输入 Reversing camera video input
A3	倒挡开关信号 R switch signal	开关输入（高有效，预留） Switch input (active-high, reserved)	B15		
A4	右转向信号 RH turn signal	开关输入（高有效，预留） Switch input (active-high, reserved)	B16		
A5	左转向信号 LH turn signal	开关输入（高有效，预留） Switch input (active-high, reserved)	B17		
A6	钥匙开关ACC档 Key switch ACC gear	开关输入 Switch input	B18		
A7	CAN总线高位 CAN bus high level	CAN_H	B19		
A8	CAN总线低位 CAN bus low level	CAN_L	B20		
A9			C1	FC1_12V	前摄像+12V电源 Front camera +12V power supply
A10			C2	FC1_GND	前摄像头地 Front camera GND
A11			C3	FC1_AHD	前摄像头视频输入 Front camera video input
A12			C4	FC1_AHD_GND	前摄像头视频地 Front camera video GND
A13			C5	RC2_+12V	右摄像头+12V电源 RH camera +12V power supply
A14			C6	RC2_GND	右摄像头地 RH camera GND
A15			C7	RC2_AHD	右摄像头视频输入 RH camera video input
A16			C8	RC2_AHD_GND	右摄像头视频地 RH camera video GND
B1			C9		
B2			C10		
B3	BBC2_GND	倒车摄像头地 Reversing camera GND	C11		
B4	BBC2_AHD_GND	倒车摄像头视频地 Reversing camera video GND	C12		
B5			C13	LC4_+12V	左摄像头+12V电源 LH camera +12 V power supply
B6			C14	LC4_GND	左摄像头地 LH camera GND
B7			C15	LC4_AHD	左摄像头视频输入 LH camera video input
B8			C16	LC4_AHD_GND	左摄像头视频地 LH camera video GND
B9			C17	MP5_AHD	输出至MP5 CVBS视频 Output to MP5 CVBS video
B10			C18	MP5_AHD_GND	输出至MP5 CVBS地信号 Output to MP5 CVBS ground signal
B11			C19	TEL_AHD	输出至天行健CVBS视频 Output to TEL CVBS video
B12			C20	TEL_AHD_GND	输出至天行健CVBS地信号 Output to TEL CVBS ground signal



*管脚分布图 特殊
*Pin layout diagram, special



四方监控

Four-direction monitoring

一、架构原理

I. Architecture principle

2、结构

2. Structure

有专用附加线，自己取电、接地；（DZ9X189776240）

Equipped with a dedicated additional line for self-supplying of power and grounding; (DZ9X189776240)

左侧与顶棚线束、左车门线束、中间与仪表台线束对接MMI、右侧对接防火墙、右顶棚线束、右车门线束。

LH and roof wire harness, LH door wire harness, the middle and dashboard harness connected to MMI, RH connected to the firewall, RH roof harness, RH door harness.

.电源来自B+：来自中央电器盒E12（线号30012_1），带端子需要总装分装安装,在控制器A1。

The power supply comes from B+: from the central electrical box E12 (wire size 30012_1), with terminals that require final assembly / sub-assembly / installation in the control unit A1.

.电源30电：来自接线柱（线号30011_4），再通过线束自带保险F530输出（30012_2）电源至控制器A1。

Power supply 30 voltage: from the terminal (wire size 30011_4), and then output power through the wire harness self-contained fuse F530 (30012_2) to the control unit A1.

.ACC电：来自ACC电源分线器X516（线号ACF_3）。需要总装分装安装，在控制器A6。

ACC power: from ACC power splitter X516 (wire size ACF_3), which requires final assembly / sub-assembly / installation in the control unit A6.

*控制器A1同时接30和B+?

*Is control unit A1 connected to 30 and B+ at the same time?

.线束结构：专用附加险自己取电接地。

Wire harness structure: special additional insurance for taking power and grounding by oneself.

通过仪表台线束对接，将视频输出信号给到MMI；

Send the video output signal to the MMI by connecting to the dashboard wire harness;

通过左车门线束，采集左侧后视镜处的左侧、左后摄像头；

Through the LH door wire harness, collect LH of the LH mirror and LH rear camera;

通过右车门线束，采集右侧后视镜处的右侧、右后摄像头；

Through the RH door harness, collect RH of the RH mirror and RH rear camera;



四方位监控

Four-direction monitoring

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系统由主机+4个摄像头组成，监控整车前后左右，上电开机默认“四分屏”画面，车辆转向、倒车、手动点击可用切换画面；每个画面切换时间 $\leq 0.5S$ 。

The system consists of a host + 4 cameras, which monitors the front, rear, LH/RH of the vehicle. The power-on defaults to the "quadrant screen" picture, and switching pictures are used for vehicle steering, reversing, and manually clicking; the switching time of each picture is ≤ 0.5 s.

左右视野显示：

Display of LH/RH visibility:

系统自动检测左右共2路摄像头，当检测均未连接时，在EVM1报文中输出“左右转界面切换”禁止，若有1路正常，则输出允许。

The system automatically detects LH / RH 2 channels of cameras. When the detection is not connected, it outputs "LH / RH interface switching" prohibited in the EVM1 message.

If 1 channel is normal, it is allowed to output.

当左右有摄像头正常连接，且左右转向开关信号有效，EVM会输出增强画面至多媒体，单屏显示。

When the LH / RH cameras are connected normally with valid LH / RH steering switch signals are valid, the EVM will output enhanced images to MMI for single-screen display.

倒车视野增强：

Enhanced reversing visibility:

倒车涉及倒挡信号识别，不同车型倒挡信号不一致，6000车型VCU1,X5000 M000S车型CPD1，车型识别见专门章节。

自动模式下，倒挡显示优先级最高；同时收到左右转信号时，分屏显示倒车和左右侧画面，转向信号消失后恢复纯倒车画面。

不涉及鞍座显示。

Reversing involves recognition of R signal, with inconsistent R signals among different models. Refer to the special chapters for model recognition of 6000 VCU1, X5000 M000S CPD1.

In the auto mode, the reversing gear display has the highest priority; at the same time when LH / RH turn signals are received, display in split screens the reversing and LH / RH images, and restore to the pure reversing picture after the turn signals disappear.

Not involving the fifth wheel.

行驶视野增强：

Enhanced driving vision:

点击“前方”按钮，显示前摄像头的画面，方便驾驶观察盲区，前方显示并非必须功能，只有手动模式。

此时接受到左右转信号时，切换左右转显示，不再显示前方画面。

Click the "Front" button and display the picture of the front camera, which is convenient for observing blind spots in driving. The front display is not a mandatory function, with only the manual mode.

At this time, when the LH / RH turn signal is received, switch to the LH / RH turn display, and the front images will not display.



四方位监控

Four-direction monitoring

二、功能逻辑

II. Functional logic

1、系统的作用，各节点的分作用介绍。重点功能的逻辑。

1. Introduction to the system functions and the sub-functions of each node. The logic of key functions.

系统由主机+4个摄像头组成，监控整车前后左右，上电开机默认“四分屏”画面，车辆转向、倒车、手动点击可用切换画面；每个画面切换时间 $\leq 0.5S$ 。

The system consists of a host + 4 cameras, which monitors the front, rear, LH, and RH of the vehicle. The power-on defaults to the "quadrant screen" image, and switching images are available for vehicle steering, reversing, and manual clicking; the switching time of each screen is ≤ 0.5 s.

四分屏显示:

Quadrant screen display:

系统默认显示4分屏，自左向右、自上向下，依次为前方、倒车、左侧、右侧显示。

The system displays a 4-split screen by default, from LH to RH, top to bottom, and displays in sequence of forward, reversing, LH, and RH.

转向激活时，只显示左转或右转一个画面。

With activation of the steering, only one image of LH turn or RH turn is displayed.

存储与回放:

Storage and playback:

ACC信号的硬线或报文有效即支持存储；

Valid hardwire or messages of ACC signals will support storage;

并可以通过回放查看，同环境监控。

It can also be viewed through playback, as the same with EVM.



四方位监控 Four-direction monitoring

二、功能逻辑 II. Functional logic

与MMI的交互。

Interaction with MMI.

1、MMI通过EVM2或者配置字报文识别是四方位还是环境监控。X5000等A或C架构时，当EVM2中显示是4路标清（0x44）时，就判断是四方位；X6000等G3平台，使用配置字，61Byte 5~6bit表示四方位监控类型，为0表示无，为1表示4方位。

1. MMI identifies four-dimension or environmental monitoring through EVM2 or configuration bits messages. As for A or C architectures of X5000, etc., it will be judged as 4-directional when 4-channel standard definition (0 x 44) is displayed in EVM2; G3 platforms, such as X6000, etc., adopts **configuration bits**. 61Byte 5~6 bits indicate the four-direction monitoring type, with 0 meaning null and 1 meaning 4-direction.

2、四方位具备视频采集功能，包含“四分屏”、“前方”、“左侧”、“右侧”、“倒车”、“视频回放”6个按键，按下后发出报文。当四分位通过EVM1的视角模式回馈时，点亮对应的按键。

2. The four-direction is provided with the video capture function, including 6 keys of "Quadrant Screen", "Front", "LH", "RH", "Reversing" and "Video Playback", which is pressed for sending messages. When the quartile is fed back through the EVM1's perspective mode, the corresponding key will light up.

3、当接收不到EVM1时，类似环境监控，只显示“返回”界面。

3. When EVM1 cannot be received, the similar environment monitoring only displays the "Return" interface.

4、显示屏的逻辑“倒挡”：当检测到VCU1重点额倒挡信号有效时，直接自动切换到360或四分屏应用，但所有按键不可用；此时监控系统也会推送倒车画面供多媒体显示。所以只有倒挡画面或只有260四分屏画面不可切换，可能是倒挡接收信号异常。

4. The logical "R" of the display: when the VCU1 focus R signal is detected valid, it will directly and automatically switch to 360 or the quadrant screen application, but all keys are unavailable;

At this time, the monitoring system will also push the reversing image for MMI display. Therefore, only the reversing image or the 260 quadrant screen will not be switched, which is probably due to abnormal R reception signals.

5、显示屏的逻辑“转向”：当检测EVM1中“左右转许可指令允许”，且检测到左右转向信号，即直接自动切换到360或四分屏应用，但所有按键不可用；此时监控系统也会推送倒车画面供多媒体显示。

*左右转许可指令允许就是报文为0，是指左右摄像头只要有1路可用就允许，全部不可用就为禁用。

5. The logic "steering" of the display: when the "LH / RH turn permission command is allowed" in EVM1 is detected, as well as the LH / RH turn signals, it will directly and automatically switch to 360 or the quadrant screen app,

but all keys are unavailable; at this time, the monitoring system will also push the reversing image for MMI display.

*The LH / RH turn permission command is allowed if the message is 0, which means only 1 available channel of the LH / RH cameras shall be deemed permissible, and disabled if all channels are unavailable.

所以只有左右画面或只有360四分屏画面不可切换，可能是左右转接收信号异常。

Therefore, only the LH / RH images or the 360 quadrant screen images cannot be switched, possibly due to the abnormal LH / RH turn reception signals.

