

胎压系统介绍

Introduction to TPMS

2023年4月
April 2023



胎压系统
TPMS

一、架构原理

I. Architecture principle

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。

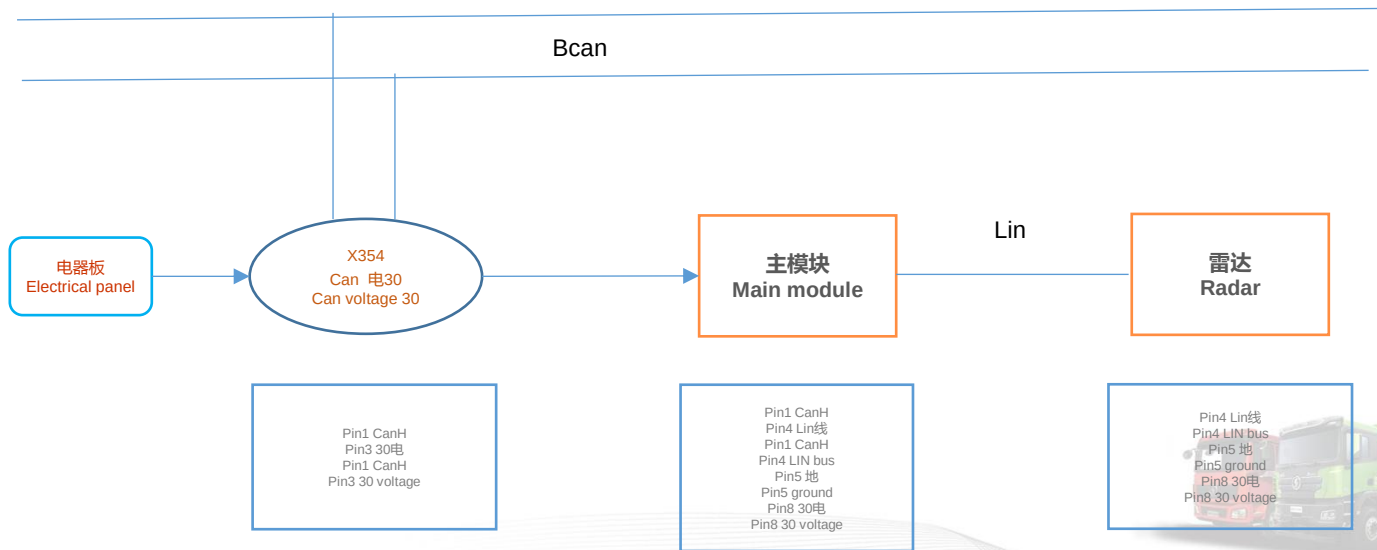
Architecture: this section mainly introduces the network for the main control unit, and points out other interaction control units or switches that are involved.

胎压系统TPMS位于整车Bcan，安装于底盘，需要经过防火墙X354连接到驾驶室电源及总线；

The tire pressure system TPMS is located on the vehicle Bcan and installed on the chassis, which must be connected to the cab power supply and bus through the firewall X354;

系统分为主从两个模块和内置于轮胎的传感器，主模块连接整车Can线，从模块与模块通过Lin线连接。

The system is divided into two modules of master and slave, and the sensor built inside the tires. The master module is connected to the vehicle's CAN bus, and the slave module is connected to modules through the Lin bus.



胎压系统 TPMS

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.

主模块管脚定义
Main module pin definition

针脚 Pin	定义 Definition	备注 Remarks
1	CAN_H	接入整车CAN,内部无终端电阻 Connect to vehicle CAN, without internal terminal resistance
2	CAN_L	
3	电源 Power supply	预留 Reserved
4	LIN	接入从接收器LIN,内阻在900Ω~1100Ω范围内 Connect to the receiver LIN, with the internal resistance in the 900 Ω ~ 1100 Ω range
5	GND	地 Ground
6	预留 Reserved	预留 Reserved
7	预留 Reserved	预留 Reserved
8	电源 Power supply	30电 30 voltage

针脚 Pin	定义 Definition	备注 Remarks
1	CAN_H	接入挂车接收器CAN,内部有120Ω终端电阻 Connect to the trailer receiver CAN with an internal 120 Ω terminal resistance
2	CAN_L	
3	电源 Power supply	15电 (接250K主接收器时) 15 voltage (when connected to 250 K main receiver) 预留 (接500K主接收器时) Reserved (when connected to 500 K main receiver)
4	LIN	接入主接收器LIN,内阻在20KΩ~60KΩ范围内 Connect to the main receiver LIN, with the internal resistance within the 20 KΩ ~ 60 KΩ range
5	GND	地 Ground
6	预留 Reserved	预留 Reserved
7	预留 Reserved	预留 Reserved
8	电源 Power supply	30电 30 voltage

雷从模块脚定义
Definition from the module pin



胎压系统
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二、功能逻辑

II. Functional logic

胎压监测系统是一种直接式无线监测装置，实时监测轮胎内部压力、温度、传感器电池电压、轮胎位置等信息。当轮胎压力、温度异常，传感器电池电压低于出厂推荐值时，系统进行报警。监测并警示慢漏气、快漏气、刺穿等轮胎异常情况及系统故障，并指示发生故障轮胎的位置。

TPMS is a direct wireless monitoring device that monitors tire internal pressure, temperature, sensor battery voltage, tire position and other information in real time. When the tire pressure and temperature are abnormal, and the sensor battery voltage is lower than the factory recommended value, the system will send alarm. It monitors and warns of tire abnormalities and system faults such as slow air leakage, rapid air leakage, puncture, etc., and indicates the location of the fault tire.

胎压状态监测及报警：

Tire pressure state monitoring and alarm:

实时监测轮胎内部压力、温度、传感器电池电压、轮胎位置等信息。

Real-time monitoring of tire internal pressure, temperature, sensor battery voltage, tire position and other information.

监测并警示快漏气（漏气速率）、刺穿等异常情况。

Monitor and warn of abnormal conditions such as fast air leakage (air leaking rate), puncture, etc.

轮胎防盗功能：

Anti-theft function of the tire:

Φ当TPMS监测不到轮胎发出的ID信号时，会发送总线报警。

Φ When the TPMS cannot detect the ID signal sent by the tire, it will send a bus alarm.



胎压系统
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二、功能逻辑

II. Functional logic

1. 输入

UDS: 诊断

标定轮胎标准压力 8.3bar

1. Input

UDS: diagnosis

Standard pressure 8.3 bar of tire calibration

标定轮胎标准温度 90℃

Standard temperature 90 °C of tire calibration

仪表: can线

Instrument: CAN bus

开关静态轮胎防盗功能

Switch the static tire anti-theft function

射频:

RF:

各轮胎传感器的: 温度、压力、电池电压、低电压信号。

For each tire sensor: temperature, pressure, battery voltage, low voltage signal.

2. 输出 can报文

2. Output CAN messages

轮胎位置

Tire position

轮胎压力

Tire pressure

轮胎温度

Tire temperature

报警等信息。

Alarm and other information.

3. 组成:

3. Composition:

该胎压系统包含六部分:

The TPMS consists of six parts:

1. 胎压传感器: 通过射频方式发送胎压、温度, 当有报警数据时, 发射的频率加快。
Tire pressure sensor: it sends tire pressure and temperature through radio frequency. When there is alarm data, the transmission frequency accelerates.
2. 高频接收天线: 在控制器内部集成, 接收射频信号。
High-frequency receiving antenna: integrated inside the control unit for receiving RF signals.
3. 胎压控制器: 接收射频信号转化为CAN信号发送到总线。
Tire pressure control unit: the received radio frequency signals are converted into CAN signals and sent to the bus.
4. 中继器: 挂车轮胎传感器首先发送给中继器, 然后再通过射频信号转给控制器接收。
Repeater: the trailer tire sensor first sends signal to the repeater, and then to the control unit through the radio frequency signal.
5. 轮胎防盗: 进入防盗模式时, 会定时唤醒射频模块, 检查每个轮胎的气压信号和状态信号, 如果在下电后的10min后检测不到信号, 认为轮胎被盗。
Tire anti-theft function: in the anti-theft mode, the radio frequency module will be woken up regularly to check the air pressure signal and state signal of each tire. If no signal is detected after 10 minutes of power-off, the tire is considered stolen.
6. 仪表报警显示。
Alarm display of instrument.



胎压系统
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二、功能逻辑

II. Functional logic

胎压报警功能:

Tire pressure alarm function:

1. 胎压系统故障报警

1. TPMS fault alarm

当胎压系统出现故障时, 系统发出报警。

When faults occur in the TPMS, the system will send an alarm.

2. 高温报警

2. High temperature alarm

当轮胎温度超过90°C时 (恢复时需要低于85°C), 系统发出高温报警信号, 报警频率1s。

When the tire temperature exceeds 90°C (temperature lower than 85°C is required for recovery), the system will send out a high temperature alarm signal with an alarm frequency of 1 second.

3. 欠压预警 SPN 2587

3. Early warning of low pressure SPN 2587

当轮胎压力低于标准压力15%, 系统发出欠压报警, 胎压故障灯闪烁, 频率2s。

When the tire pressure is lower than 15% of the standard pressure, the system will send an under-pressure alarm, with the tire pressure fault lamp flashing and a frequency of 2 seconds.

当轮胎压力低于标准压力25%, 系统发出欠压报警, 胎压故障灯闪烁, 频率1s。

When the tire pressure is lower than 25% of the standard pressure, the system will send an under-pressure alarm, with the tire pressure fault lamp flashing and a frequency of 1 second.

当轮胎压力低于标准压力50%, 系统发出极限欠压报警, 胎压故障灯闪烁, 频率0.5s。

When the tire pressure is lower than 50% of the standard pressure, the system will send a limit under-pressure alarm, with the tire pressure fault lamp flashing and a frequency of 0.5 seconds.

4. 高压预警

4. Early warning of high pressure

当轮胎压力低于标准压力25%, 系统发出高压报警, 胎压故障灯闪烁, 频率1s。

When the tire pressure is lower than 25% of the standard pressure, the system will send a high-pressure alarm, with the tire pressure fault lamp flashing and a frequency of 1 second.

当轮胎压力低于标准压力50%, 系统发出极限高压报警, 胎压故障灯闪烁, 频率0.5s。

When the tire pressure is lower than 50% of the standard pressure, the system will send an extremely high pressure alarm, with the tire pressure fault lamp flashing and a frequency of 0.5 seconds.



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二、功能逻辑

II. Functional logic

胎压报警功能:

Tire pressure alarm function:

5.快速漏气报警

5. Rapid air leakage alarm

漏气速率大于80kpa/min时, 系统发出快速漏气报警。

When the air leakage rate is greater than 80 kpa/min, the system will send a rapid air leakage alarm.

6.仪表显示温度、压力、电池电压异常、轮胎位置。

6. The IC displays temperature, pressure, abnormal battery voltage, and tire position.

7.传感器故障报警

7. Sensor fault alarm

当检测到传感器电量低时, 发出低电量报警。

When low battery is detected for the sensor, a low battery alarm will be sent.

当接收器10min后接收不到传感器信号时, 报短时未接收到传感器报警。

When the receiver cannot receive the sensor signal after 10 minutes, it will report a short time sensor alarm for not received.

连续产生4次无信号报警, 即40min接收不到信号, 报传感器故障报警。

If no signal alarm is generated consecutively for 4 times, that is, no signal is received for 40 minutes, a sensor fault alarm will be reported.

8.轮胎防盗报警

8. Tire anti-theft alarm

在Off电下, 轮胎防盗功能打开时, 接收不到传感器或者中继器时, 发出报警, 频率1s。

When the power is OFF and the tire anti-theft function is turned on, it sends alarm when the signals of sensor or relay are not received, with a frequency of 1s.

激活条件:

Activation conditions:

轮胎防盗报警功能开启

Tire anti-theft alarm function is turned on

钥匙电源OFF

Key power OFF

接收器下电10min后未接收到某已经自学习轮胎发射器信号。

After 10 minutes for power-off of the receiver, emitter signals from the self-learning tire shall not be received.

车辆行驶中不会激活轮胎防盗功能

During driving of the vehicle, activation of the tire anti-theft function will not take place.



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二、功能逻辑

II. Functional logic

9.漏气优先级优于高低压优先级。

9. Air leakage priority is superior to the high and low pressure priority.

10.ID学习

10. ID learning

该系统可以通过和工具通讯触发，快速的学习发射模块ID，并传输给胎压控制器完成接收模块对发射模块的ID学习。

The system can be triggered by communication with the tool, quickly learn the transmit module ID, and conduct transmission to the tire pressure control unit, so as to complete ID learning of the transmit module by the receiving module.

同时，可以通过仪表菜单选择学习状态查询。

At the same time, learning state query can be selected through the IC menu.

11.CAN总线通讯：主模块通过Can线将数据传输给仪表显示，同在Bcan。

11. CAN bus communication: the main module conducts data transmission to the IC display through the CAN line, also in Bcan.

12.标准压力、温度设置功能

12. Standard pressure and temperature setup functions

通过手持仪或诊断设备可以设置各个车轮的标准压力、温度。

The standard pressure and temperature of each wheel can be set with a handheld instrument or diagnosis equipment.

设置完成后，仪表显示是否设置成功，SPN 524055。

After the setup is completed, judge whether the IC display is set successfully, SPN 524055.



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二、功能逻辑

II. Functional logic

1. **胎压报警指示灯：**压力异常、传感器丢失、电量低、漏气、温度异常等。

Tire pressure alarm indication lamp: abnormal pressure, sensor loss, low battery, air leakage, abnormal temperature, etc.

来源：SPN2587

Source: SPN2587

压力监测：SPN 2587（高压 欠压等）频率不同：高 极高 欠 极欠 同时蜂鸣器工作

Pressure monitoring: SPN 2587 (high pressure, low voltage, etc.). Different frequency: high, extremely high, low, extremely low, and the buzzer works at the same time

SPN 2587=0（极高压）4（极低压）同时点亮STOP灯。

SPN 2587 = 0 (extremely high voltage), 4 (extremely low voltage). The STOP light comes on at the same time.

执行显示动作：**Perform actions of display:**

1) 胎压灯点亮，蜂鸣器响 5s，同时还关联 UI 轮胎变红，轮胎位置 参照 SPN（929）。否则，熄灭。

1) When the tire pressure light is on, the buzzer sounds for 5 s, and the related UI tire turns red at the same time, with the tire position referring to SPN (929). Otherwise, the light goes out.

2) SPN（2587）=0/4 时同时关联 STOP 指示灯。

2) When SPN (2587) = 0/4, the STOP indicator lamp is related at the same time.



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二、功能逻辑

II. Functional logic

1、液晶屏中显示轮胎压力、温度、位置/

1. The LCD screen displays tire pressure, temperature, and position/

2、显示数量根据配置字（驱动形式）决定：

2. The quantity of display is determined by the configuration bits (drive form):

驱动形式：4*x时，显示2轴； 6*x时，显示3轴； 8*x时，显示4轴；

Drive form: for 4*x, it displays 2 axes; for 6*x, it displays 3 axes; for 8*x, it displays 4 axes;

10*x时，显示5轴 12*x时，显示6轴； 其他不显示轴数及胎压数据。

For 10*x, it displays 5 axes; for 12*x, it displays 6 axes; otherwise, the axle number and tire pressure data are not displayed.

3、轮胎压力显示范围：

3. Display range of tire pressure:

压力范围：0~20bar； 温度范围：-273~1735℃。

Pressure range: 0 ~ 20 bar; temperature range: -273 ~ 1735 °C.

压力和温度在接收到0x18FE5B33x的胎压学习状态为学习过。

The received tire pressure and temperature for the 0x18FE5B33x learning state is displayed as learned.

4、显示方式：

4. Display mode:

上电接收到轮胎胎压数据，则正常显示；

When the tire pressure data is received after power-on, it will be displayed normally;

未接收到的轮胎则显示“未安装”；

Tires that have not received data will display "not installed";

当接收到任一轮胎的压力或温度为FF时，对应位置显示“----”；

When the received pressure or temperature of any tire is FF, the corresponding position displays "----";

接收到胎压报警信号时，对应的轮胎变红显示，根据SPN 929显示；

When a tire pressure alarm signal is received, the corresponding tire turns red and displays according to SPN 929;



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二、功能逻辑

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5、配置关联的轮胎防盗

5. Configure related anti-theft function of tire

当配置字显示轮胎防盗禁用时，仪表界面的静态轮胎防盗开关显示 未配；

When the configuration bits show the tire anti-theft function is disabled, the static tire anti-theft switch on the IC interface will display non-configured;

当配置字显示轮胎防盗开启时，仪表界面的静态轮胎防盗开关显示 开或关；

When the configuration bits show that the tire anti-theft switch is on, the static tire anti-theft switch on the IC interface displays on or off;

6、失效显示

6. Invalid display

连续60s未接收到对应轮胎数据，则对应轮胎的压力和温度显示----

If the corresponding tire data are not received for consecutive 60 seconds, the relative tire pressure and temperature will be displayed ----.

连续5S未接收到18FEF433时，所以轮胎显示----报“TPMS系统不在线”5S，胎压报警指示灯点亮。

When 18FEF433 is not received for consecutive 5 seconds, the tire will display ----, report "TPMS system is not online" for 5 seconds, and the tire pressure alarm indicator lamp will light on.

7、TPMS学习状态

液晶屏中可以查询TPMS中的学习状态，查询各个轮胎是否完成学习状态。

7. TPMS learning state

Check the learning status in TPMS on the LCD screen, and whether each tire has completed the learning state.



胎压系统
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三、胎压标定

III. Tire pressure calibration

轮胎**扫码标定**和**界面选择标定**，二者操作方式不同，但标定流程相同。

The operation methods for the tire **scanning calibration** and **interface selection calibration** are different, but with the same calibration process.

1、轮胎扫码标定

1. Tire scanning calibration

进入整车信息-ECU信息-TPMS控制器，然后准备标定，标定流程如下：

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:

- ① 点击左侧“轮胎扫码标定”按钮，进入标定界面；
Click the LH "Tire Scanning Calibration" button and enter the calibration interface;
- ② 输入轮胎规格、轮胎层级；
Input tire spec. and tier;
- ③ 输入要标定的轮胎传感器ID（新车轮胎上会贴有二维码和ID，若轮胎上无二维码，需要查看传感器上标注的ID），本次标定需要输入第一个轴左侧ID和第一个轴右侧ID，输入对应ID后点击确认，其余不需要输入的直接按确认键跳过；
Input the tire sensor IDs that require calibration (a QR code and ID will be stamped on the wheel tires of new cars. If there is no QR code on the tire, check the ID marked on the sensor). For this calibration, input the LH ID and RH ID of the first axis, and click OK after inputting the corresponding ID. Press the OK button directly to skip the rest that do not require input;
- ④ 所有需要标定的轮胎传感器对应ID输入完成后，出现“写入成功”即标定完成。
After the corresponding IDs of all tire sensors that require calibration are input, "Writing Successful" will appear, indicating the completion of calibration.



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三、胎压标定

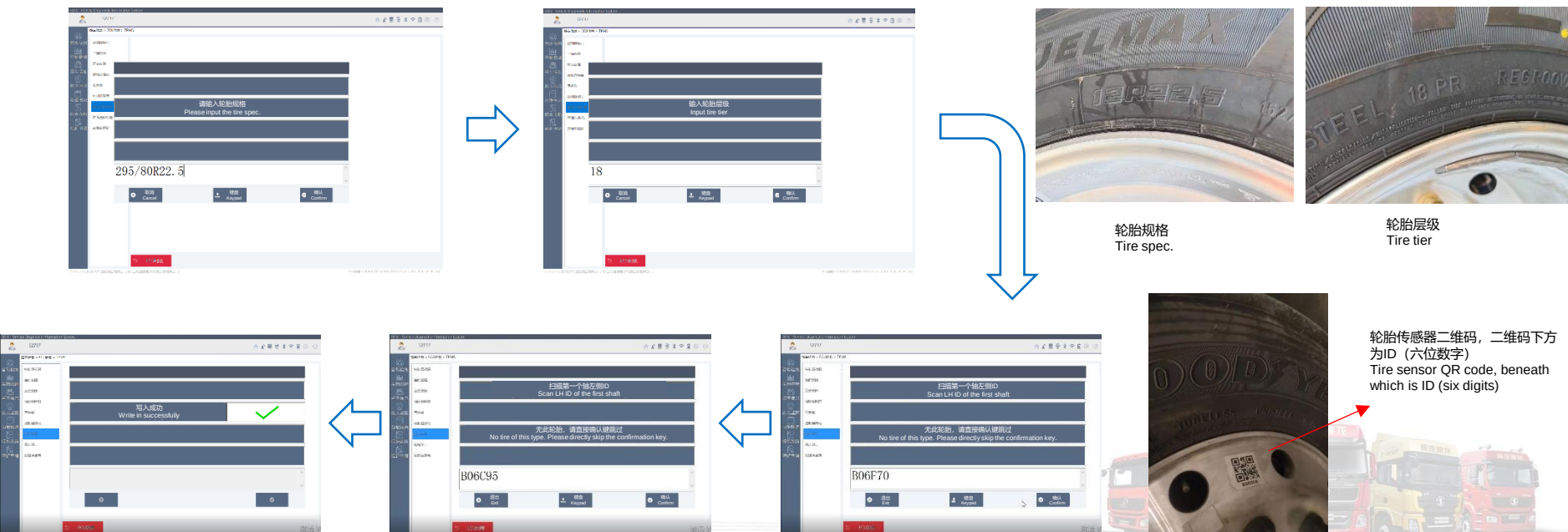
III. Tire pressure calibration

6.5.1 轮胎扫码标定

6.5.1 Tire scanning calibration

进入整车信息-ECU信息-TPMS控制器，然后准备标定，标定流程如下：

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:



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三、胎压标定:

III. Tire pressure calibration:

*注意: 标定前读取实车原胎压ID, 避免标签与实车不一致。

*Note: read the original tire pressure ID of the real car before calibration in case of inconsistency of the label with the real car.

轮胎扫码标定和界面选择标定, 二者操作方式不同, 但标定流程相同。

The operation methods for the tire scanning calibration and interface selection calibration are different, but with the same calibration process.

2、界面扫码标定

2. Interface scanning calibration

进入整车信息-ECU信息-TPMS控制器, 然后准备标定, 标定流程如下:

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:

- ① 点击左侧“界面选择标定”按钮, 进入标定界面;
Click the LH "Interface Selection Calibration" button and enter the calibration interface;
- ② 选择轮胎规格、轮胎层级 (轮胎规格与层级均在轮胎上查看, 见上一页右侧图所示);
Select tire spec. and tire tiers (check tire spec. and tire tiers on the tire, as is shown in the RH figure of the previous page);
- ③ 输入要标定的轮胎传感器ID (新车轮胎上会贴有二维码和ID, 若轮胎上无二维码, 需要查看传感器上标注的ID), 本次标定需要输入第一个轴左侧ID和第一个轴右侧ID, 输入对应ID后点击确认, 其余不需要输入的直接按“确认ID”键跳过;
Input the tire sensor IDs that require calibration (there will be a QR code and ID on the wheel tire of the new car. If there is no QR code on the tire, check the ID marked on the sensor). This calibration needs to input the LH ID and RH ID of the first axis. After inputting the corresponding ID, click Confirm. For other items that do not need to be input, directly press the "Confirm ID" button to skip;
- ④ 所有需要标定的轮胎传感器对应ID输入完成后, 点击“开始标定”, 出现“标定成功OK”即标定完成;
After inputting the corresponding IDs of all tire sensors for calibration, click "Start Calibration", and complete calibration when "Calibration Successful OK" appears;
- ⑤ 多轮胎输入顺序如何? 更换部分轮胎标定顺序如何?
What is the input order of multiple tires? What about replacing the calibration sequence for some tires?



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三、胎压标定 III. Tire pressure calibration

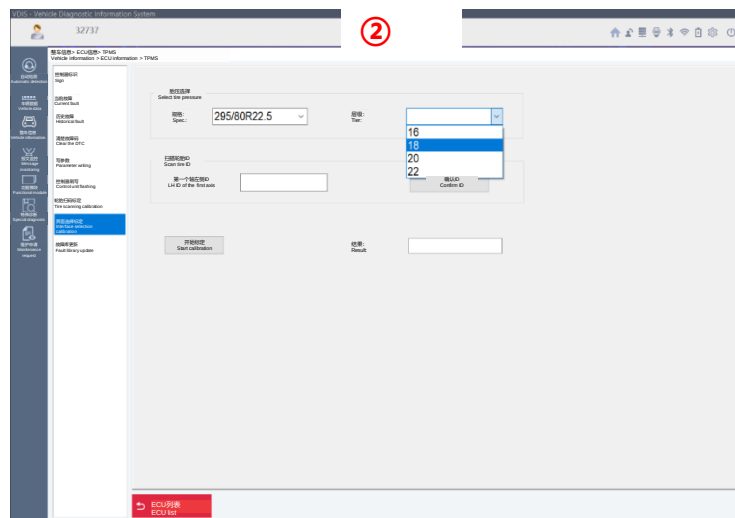
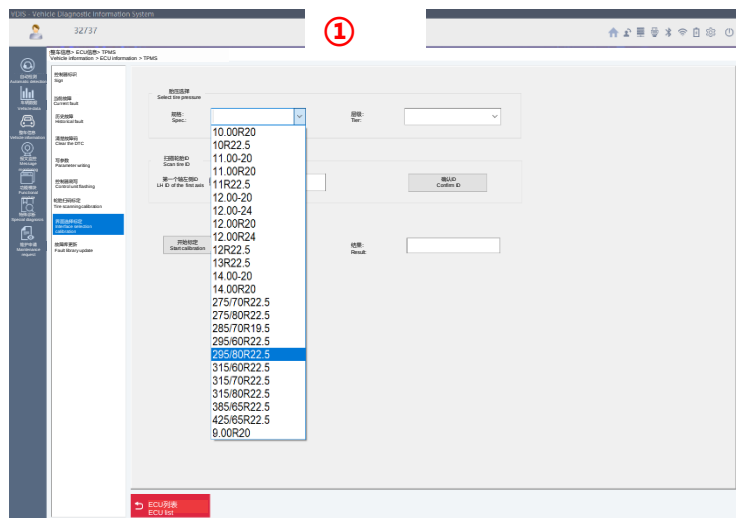
2、界面扫码标定 2. Interface scanning calibration

进入整车信息-ECU信息-TPMS控制器，然后准备标定，标定流程如下：

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:

*注意：标定前读取实车原胎压ID，避免标签与实车不一致。

*Note: read the original tire pressure ID of the real car before calibration in case of inconsistency of the label with the real car.



胎压系统 TPMS

三、胎压标定

III. Tire pressure calibration

2、界面扫码标定

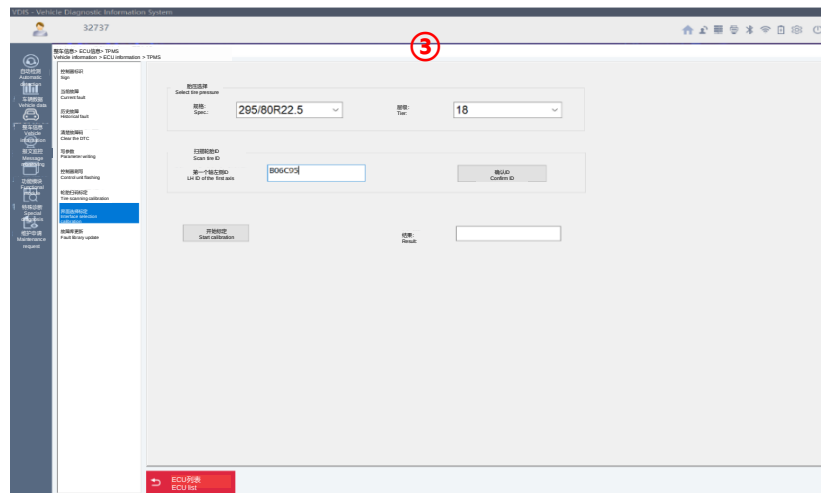
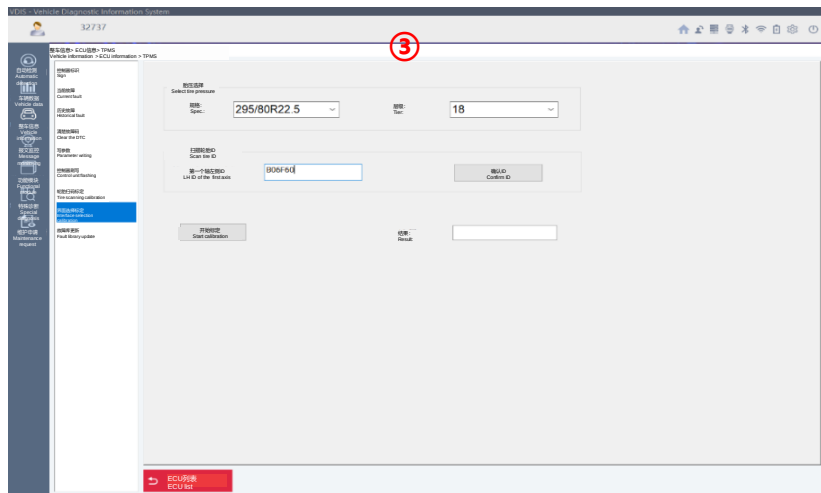
2. Interface scanning calibration

进入整车信息-ECU信息-TPMS控制器，然后准备标定，标定流程如下

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:

*注意：标定前读取实车原胎压ID，避免标签与实车不一致。

*Note: read the original tire pressure ID of the real car before calibration in case of inconsistency of the label with the real car.



胎压系统 TPMS

三、胎压标定

III. Tire pressure calibration

2、界面扫码标定

2. Interface scanning calibration

进入整车信息-ECU信息-TPMS控制器，然后准备标定，标定流程如下：

Enter vehicle information - ECU information - TPMS control unit, and then prepare for calibration. The calibration process is as follows:

*注意：标定前读取实车原胎压ID，避免标签与实车不一致。

*Note: read the original tire pressure ID of the real car before calibration in case of inconsistency of the label with the real car.

