

# Dongfeng Nissan Xuanyi classic air-conditioning refrigerant sensor failure maintenance case

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## Abstract

**This paper analyzes the air-conditioning system fault of a Dongfeng Nissan Xuanyi. According to the working principle of the air-conditioning system, it starts to check from the fault code, eliminates the faults of the relevant control units of the air-conditioning system, and finally determines that the cause is the air-conditioning system fault caused by the unqualified performance of the air-conditioning refrigerant pressure sensor. On this basis, it explores the influence of the electrical characteristics of the air-conditioning pressure sensor on the air-conditioning system.**

## Keywords

**Dongfeng Nissan Xuanyi, air-conditioning ,maintenance case.**

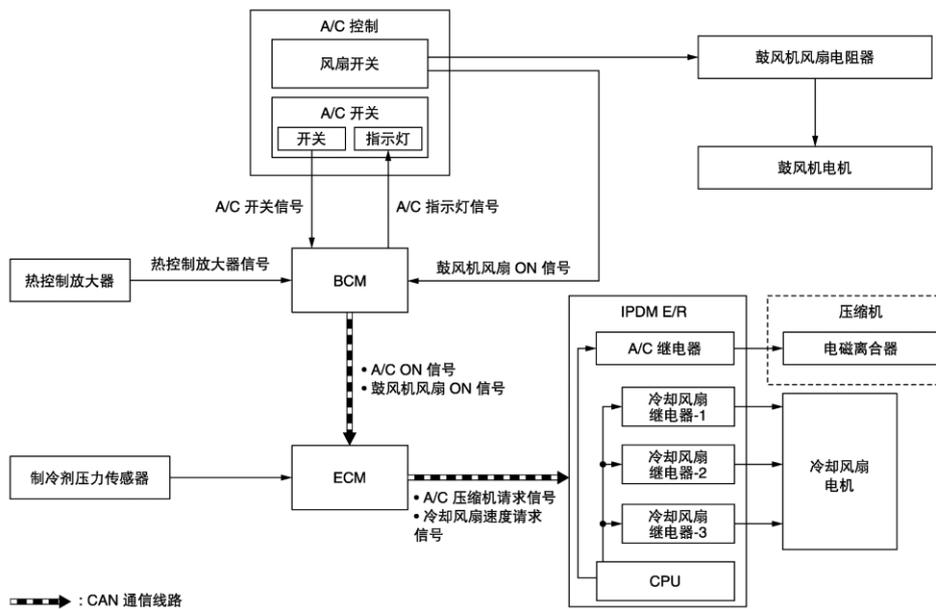
## 1. The fault phenomenon

A Dongfeng Nissan 2012 classic Xuanyi refrigeration system failed, the fault was manifested as: after starting the vehicle, open the air conditioning switch, in the idling state, detect the engine air outlet temperature and humidity are normal; When the accelerator pedal is pressed, the engine speed rises, the air conditioner air outlet is normal, the air outlet temperature is the ambient temperature, and the air conditioner is not refrigerated. The body control module (BCM) and engine control module (ECM) are self-diagnostic using a fault diagnostician without fault codes. Ask the user to learn that the vehicle had an accident and replaced the refrigeration system line, compressor and chiller pressure sensor.

## 2. Fault analysis and troubleshooting

The air conditioner of the faulty vehicle is a manual air conditioner, and the air conditioner refrigeration is normal under idling conditions, indicating that the compressor mechanical system is working normally. In the process of driving, step on the accelerator pedal, the engine speed increases, the air conditioner is not refrigerated, but the air volume of the air outlet is normal, indicating that the blower is working normally, and it is necessary to check the air conditioning compressor to judge the working condition of the compressor. The air conditioning system information is read by using a diagnostic instrument, and the electromagnetic clutch of the air conditioner is in an unabsorbed state. Initial analysis of the possible causes of the failure, only in a specific operating situation in the occurrence of uncooled failure, priority is given to the air conditioning system related sensors or control module failures. Focus on refrigerant pressure sensors and body control modules (BCMs), engine control modules (ECMs), and engine compartment intelligent power distribution modules (IPDM E/R). Turn on the fan switch of the air conditioner blower, and the blower fan can work normally under idle conditions and normal driving conditions. Preliminary judgment that the body control module (BCM) is working properly. At the same time, the blower fan switch signal and the air conditioning compressor A/C signal are sent to the body control module (BCM), the body control module (BCM) sends the blower fan ON signal and the air conditioning compressor A/C signal to the engine control module (ECM) in the form of a message through

the CAN bus, and the engine control module (ECM) sends the cooling fan request signal and the air conditioning compressor A/C request signal to the engine compartment intelligent power distribution module (IPDM E/R) through the CAN bus. The engine compartment intelligent power distribution module controls the cooling fan relay to control the cooling fan motor, and the compressor electromagnetic clutch is controlled by A/C relay. Observe the working situation of the cooling fan, the cooling fan can work normally, indicating that the transmission data between the body control module (BCM), the engine control module (ECM) and the engine compartment intelligent distribution module (IPDM E/R) is normal, and the failure of the three control modules is initially excluded.



In the event of a pressure failure, the compressor protection is controlled by the Engine Control Module (ECM). When the value of the high pressure side detected by the refrigerant pressure sensor is the following state, ECM requests IPDM E/R to turn off the air conditioning relay and stop the compressor.

3.12MPa (31.82kg/cm<sup>2</sup>,452.4psi) or above (when engine speed is less than 1500rpm)

2.74MPa (27.95kg/cm<sup>2</sup>, 397.3psi) or above (when engine speed is 1500rpm or above)

0.1MPa (1.43kg/cm<sup>2</sup>, 20.3psi) or below

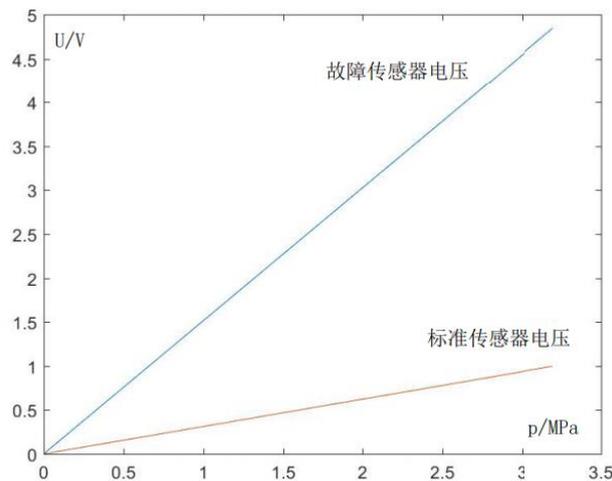
The air conditioner pressure is used to measure the refrigerant pressure of the high and low pressure lines of the air conditioner, and the specific pressure is shown in the following table

Measure the high and low pressure line pressure without the state of triggering the shutdown of the air conditioning relay. When the acceleration pedal is pressed, when the engine speed is higher than 1500r/min, the compressor stops working after the pressure on the high pressure side rises, and the pressure becomes about 0.6MPa. Based on the pressure test results and the user feedback on the repair replacement, it is speculated that the pressure sensor is faulty. The signal of the 3 terminals of the refrigerant pressure sensor is measured using the back plug. The 1# terminal is the power supply terminal, the measurement result is 5V, the 3# terminal is the iron end, and the measurement voltage is about 0V, which is normal. Measuring the signal terminal 2# terminal, the voltage is 4.03V under idling conditions, and by checking the refrigerant pressure sensor signal voltage and pressure correspondence, it is found that the standard voltage should be 2.03V, and the sensor signal voltage is high. When the brake pedal is pressed, the engine speed is 2000r/min, the measured signal voltage is about 4.91V, the standard voltage should be 2.32V, the sensor signal voltage is high, and the threshold of the

departure compressor shutdown protection is reached 4.85V, and the air conditioning compressor stops working. At this point, it can be determined that the cause of the failure is caused by the unqualified electrical characteristics of the refrigerant pressure sensor. Replace the refrigerant pressure sensor with a new refrigerant pressure sensor, re-add the refrigerant according to the process, and troubleshoot.

Working conditions pipeline	idle speed	Non-idle speed
High pressure	1.34MPa	Form 1.53MPa to 0.6MPa
Low pressure	0.36MPa	From 0.34MPa to 0.6MPa

### 3. Analysis of electrical characteristics of air conditioning pressure sensors



The image fitting of the two sets of voltages of the fault pressure sensor is compared with the voltage image of the standard pressure sensor, and the output voltage signal of the fault pressure sensor is significantly higher, resulting in the intelligent power distribution module (IPDM E/R) in the engine compartment misjudging the pressure of the refrigerant in the high-voltage pipeline, triggering the compressor shutdown protection. For the sensors and actuators used in the repair process, the electrical characteristics and electromagnetic compatibility (EMC) are very important for the use of the vehicle.

### References

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