

Fault Diagnosis and Maintenance of EX1 Switch in Volkswagen Magotan Lighting System

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Abstract

Study the lighting EX1 switch of the Volkswagen Magotan B8L model, analyze the switch control principle and composition structure. Through typical fault cases of EX1 switch LIN line and redundant line, analyze the fault phenomenon, carry out fault diagnosis, and complete fault maintenance.

Keywords

EX1 switch; Volkswagen Magotan; Fault diagnosis; Maintenance.

1. Introduction

The importance of car lighting as an important guarantee for driving is self-evident. Since the development of the B6, the FAW Volkswagen Magotan has become one of the popular models. The lighting system of the new generation Magotan B8L has undergone multiple changes, and studying its lighting system, diagnosing common faults, and carrying out maintenance work have practical significance.

2. Overview of Volkswagen Magotan B8L Lighting System

The front headlights of the Magotan B8L, including high and low beams, daytime running lights, turn signals, and side marker lights, are all LED headlights. The higher configuration models use lens type LED, which has better illumination effect and appearance than reflective LED. The fog lights of Volkswagen Magotan currently use halogen tungsten lamps. The yellow light is for better penetration in rainy and foggy days, and the tail light uses a full LED design. Through the combination of different colored LED beads, there are different style changes under different lighting forms such as side lights, brake lights, and backup lights, to better remind vehicles behind. In addition to the exterior lights, the reading lights and vanity mirror lights inside the car also use LED light sources.

3. Fault Diagnosis and Maintenance of Light EX1 Switch

3.1. Control principle and composition structure of EX1 switch

EX1 switch, also known as light rotary switch. The light rotary switch is installed below the dashboard on the left side of the steering column, as shown in Figure 1. The light rotary switch mainly consists of the following parts: the rotary switch; Rear fog lamp switch; Front fog lamp switch.

From the working principle Figure 2 of the light rotary switch, it can be seen that the driver controls the EX1 knob to change the voltage on the circuit connecting EX1 and J519, and controls J519 to supply power to the light.

The EX1 lighting control unit has four ports, and there are two control lines connected to J519, namely LIN line and redundant line. LIN line is mostly related to low beam control, and redundant line is mostly used for fog light control. In addition, the power cord of EX1 is connected to fuse SC8, and the ground wire is connected to the ground.



Fig.1 Composition of light rotary switch

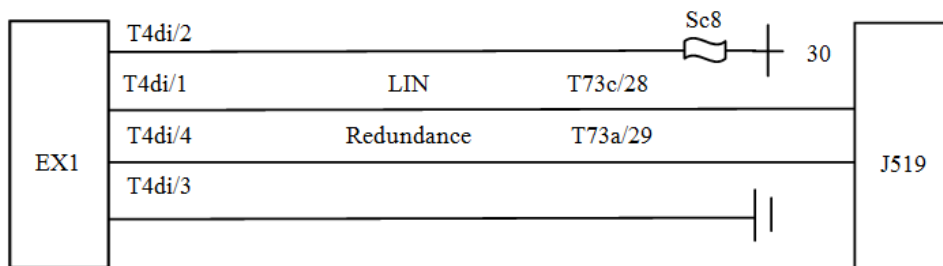


Fig.2 Working Principle of Light Rotating Switch

3.2. Common Fault Diagnosis and Maintenance of LIN Line

Case 1:

Fault symptom:

Turn on the ignition switch, the side marker light, and the low beam lights are abnormally lit. The instrument panel prompts "vehicle lighting malfunction" and the lighting malfunction indicator light is on; When the light rotary switch is placed in the side marker position, the side marker lights will light up normally. When the front and rear fog light switches are operated, both front and rear fog lights will not light up; But when the light rotary switch is placed in the low beam position, the low beam lights will light up normally. When the front and rear fog light switches are operated, the front and rear fog lights cannot be turned on, and the EX1 backlight will not light up.

Fault analysis:

When opening the car door, the EX1 backlight does not light up, indicating that the door switch→J386 (through CAN bus)→J519 (through LIN bus)→EX1 (including the backlight and its power supply) is working abnormally. However, when the fault diagnosis instrument is plugged in, it can light up normally, indicating that SC8 is normal and EX1 power supply is normal. The fault of EX1 backlight not lighting up may be in the range of J519 (through LIN bus)→EX1 (including itself, backlight and its power supply);

Turn on the ignition switch, and the side lights and low beam lights are all on, indicating that J519 has received an incorrect signal from EX1, triggering an emergency. The fault may be in J519 (via LIN bus)→EX1 (including itself and its power supply);

When in the position of side marker and low beam, the side marker and low beam work normally. When the front and rear fog light switches are operated, both front and rear fog lights do not work, indicating that J519 can receive the side marker and low beam gear signal, but cannot receive the fog light switch signal. Based on the structure and working principle of EX1, it indicates that the redundant signal communication between J519 and EX1 is normal, while there is a fault in the LIN bus communication.

Diagnostic process:

The first step is to read the fault code, turn on the ignition switch, and use a decoder. Fault codes 929796: No communication with the light switch, 934148: No communication with the rain/light recognition sensor, and 939524: No communication with the air humidity sensor.

Light switch position data flow:

Test conditions: ON, 0-gear -1st gear -2nd gear

Test Name: Disconnect; Lamplet; Headlight; Redundant signal

Standard description: Pressed→Not activated→Not activated; Not activated→Pressed→Not activated; Not activated→Not activated→Pressed; Disconnect→Side lights→Low beam lights

Actual measurement results: Unactivated unchanged; Unactivated unchanged; Unactivated unchanged; Disconnect→Side lights→Low beam lights

Test conclusion: abnormal; abnormal; abnormal; normal

The second step is to measure the LIN signal of the light switch at J519 end, turn on the ignition switch, and first check whether the power supply and grounding of EX1 switch are normal. If the power supply and grounding are normal, then use an oscilloscope to measure the ground waveform of J519's T73c/28 terminal, the actual measurement is normal.

The third step is to test the LIN signal at the EX1 end. Turn on the ignition switch and use an oscilloscope to measure the ground waveform of the T4di/1 terminal of EX1. The measured waveform is a 12V straight line and abnormal.

Based on Step 2, it is preliminarily determined that the T4di/1 of EX1 and the T73c/28 of J519 are open circuited. Disconnect the negative electrode of the battery, check the continuity of the circuit, and obtain an infinite resistance. The result is that the T4di/1 of EX1 and the T73c/28 of J519 are open circuited.

Finally, recover the fault, connect the broken pin, turn on the ignition switch to clear the fault code, operate EX1 again, and check if the fault still exists.

3.3. Common Fault Diagnosis and Maintenance of Redundant Lines

Case 2:

Fault symptom:

Turn on the ignition switch, the instrument panel prompts "vehicle lighting malfunction" and the light malfunction indicator light is on; When the light rotary switch is placed in the position of the side marker light, the side marker light will be delayed to turn on. When the front and rear fog light switches are operated, both front and rear fog lights will not turn on; When the light rotary switch is placed in the low beam position, the low beam lights will be delayed to turn on. When the front and rear fog light switches are operated, both the front and rear fog lights cannot be turned on, the EX1 background light will be on.

Fault analysis:

By operating the EX1 switch, both the large and small lights were delayed and the fog lights were not controlled. It is preliminarily inferred that the LIN communication between J519 and EX1 is normal, and J519 has received abnormal redundant information.

Possible causes: Redundant signal lines; EX1 itself; J519 partial.

Diagnostic process:

The first step is to read the fault code and data stream, turn on the ignition switch, use a decoder, 930056: Lamp switch, untrustworthy signal.

Data flow:

Conditions: OFF-small lights-headlights

Test Name: Break; Lamplet; Headlight; Redundant signal

Standard description: Pressed→Not activated→Not activated; Not activated→Pressed→Not activated; Not activated→Not activated→Pressed; Disconnect→Side lights→Low beam lights

Actual measurement results: Pressed→Not activated→Not activated; Not activated→Pressed→Not activated; Not activated→Not activated→Pressed; Disconnect unchanged

Test conclusion: normal; normal; normal; abnormal

The second step is to test the redundant signal of the light switch at the J519 end. Turn on the ignition switch and first check whether the power supply and grounding of the EX1 switch are normal. If the power supply and grounding are normal, then use an oscilloscope to measure the ground waveform of the T73a/29 terminal of J519, as shown in Figure 3. The measured result is a 12V straight line, which is abnormal.



Fig.3 Ground Waveform of J519T73a/29 Terminal

The third step is to test the redundant signal at the EX1 end. Turn on the ignition switch and use an oscilloscope to measure the ground waveform of the T4di/4 terminal of EX1. The measured result is shown in Figure 4, and it is a 12V straight line, which is abnormal.

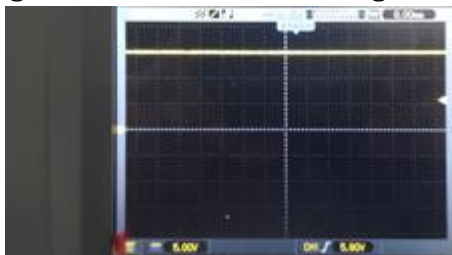


Fig.4 Ground waveform diagram of EX1T4di/4 terminal

Based on Step 2, it is preliminarily determined that T4di/4 of EX1 and T73a/29 of J519 are short circuited to the positive. Disconnect the negative terminal of the battery, check the continuity of the circuit, and obtain a resistance of 0.9 ohms from a point on the line to the positive terminal of the power supply. The result is that T4di/4 of EX1 and T73a/29 of J519 are short circuited to the positive. Finally, recover the fault, turn on the ignition switch to clear the fault code, operate EX1 again, and check if the fault still exists.

4. Conclusion

By analyzing the control principle and composition structure of the EX1 switch in the Volkswagen Magotan B8L lighting system, introducing typical fault cases, following the troubleshooting logic of the fault tree, observing lighting phenomena, and combining with decoder fault code prompts, conducting LIN line and redundant line diagnosis and analysis to eliminate lighting faults in the vehicle.

References

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