

DTC C0455

Circuit Description

The steering wheel position sensor inputs to the rear wheel steering control module consists of 3 digital input circuits, phase A, phase B, and index marker pulse and 1 analog signal circuit. The analog signal is a class 2 message from the TBC. The steering wheel position sensor supply voltage is between 4.9--5.1 volts.

Phase A and phase B circuits are digital pulse signals whose output represents one degree of steering wheel rotation. When observing the phase A data and the phase B data parameters on the scan tool, the parameters will not have the same value at the same time. When the steering wheel is rotated, the phase A data and the phase B data parameters will be shown as high or low on the scan tool.

The marker pulse is a digital pulse that is displayed as high on the scan tool for 20° only when the steering wheel angle is between -10 and +10°.

Steering wheel position sensor, analog signal, voltage is at or near 2.5 volts with the wheels at center voltage increases/decreases for less than 1 full turn (+/- 225°) then plateaus for remainder of wheel travel. The body control module (BCM), which receives an analog steering position sensor input, transmits steering position data on the serial data line. The rear wheel steering control module monitors the serial data information as an added fail-safe for the steering position sensor circuitry. Battery voltage is supplied to the digital portion of the steering wheel position sensor from the cruise control fuse. The analog portion of the steering wheel position sensor is supplied a 5-volt reference from the BCM. This circuit is also used for a lamp dimming function.

Conditions for running the DTC

Turn ON the ignition, with engine ON.

Conditions for Setting the DTC

- The marker pulse data parameter is high for less than 20° of the steering wheel angle.
- The marker pulse data parameter is high for greater than 20° of the steering wheel angle.
- The marker pulse data parameter is high when the steering wheel angle parameter is greater than +90°.
- The marker pulse data parameter is high when the steering wheel angle parameter is less than -90 degrees.
- The steering wheel sensor analog output voltage is less than 0.125 volts.
- The steering wheel sensor analog output voltage is greater than 4.875 volts.
- The steering wheel position sensor phase A circuit is shorted to ground, open or shorted to voltage.
- The steering wheel position sensor phase B circuit is shorted to ground, open or shorted to voltage.
- The BCM detects an invalid steering wheel position sensor signal, sets a DTC, and therefore, cannot transmit valid serial data information. The BCM sends a serial data message to the RWSCM, which causes the DTC to set.

Action Taken When the DTC Sets

- The Service 4 Wheel Steer indicator in IPC will be displayed.
- The code is displayed on the scan tool as DTC C0455.
- The output to the motor is ramped down slowly, at a rate of 2° per second to 0° and held.
- The rear wheels will be returned to the centered position.

Conditions for Clearing the DTC

- Conditions for DTC are not currently present.
- The module receives a clear code comm and from the scan tool.
- The DTC clears after 100 malfunction free ignition cycles.

Diagnostic Aids

The following conditions are possible causes:

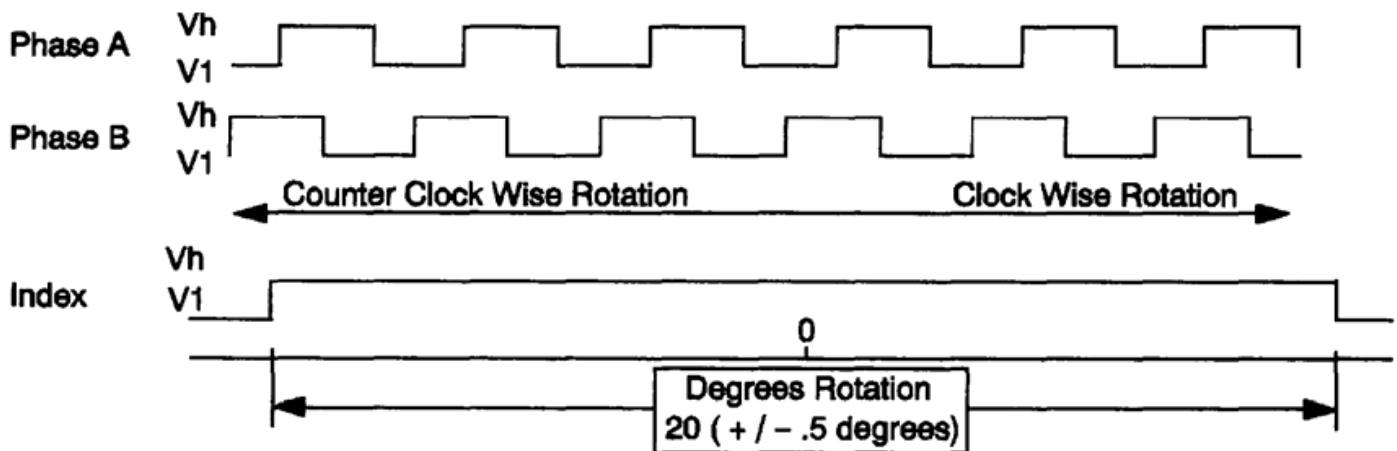
- A class 2 communication problem with the TBC.
- The steering wheel was rotated with the steering gear disconnected.
- A malfunctioning steering wheel position sensor is present.
- A steering wheel position sensor circuit is open.
- A steering wheel position sensor circuit was shorted.

Perform an inspection of the wiring and of the connectors. Failure to carefully inspect the wiring and the connectors may result in misdiagnosis. Misdiagnosis causes part replacement with reappearance of the malfunction.

Steering Wheel Position Sensor - Digital Signal

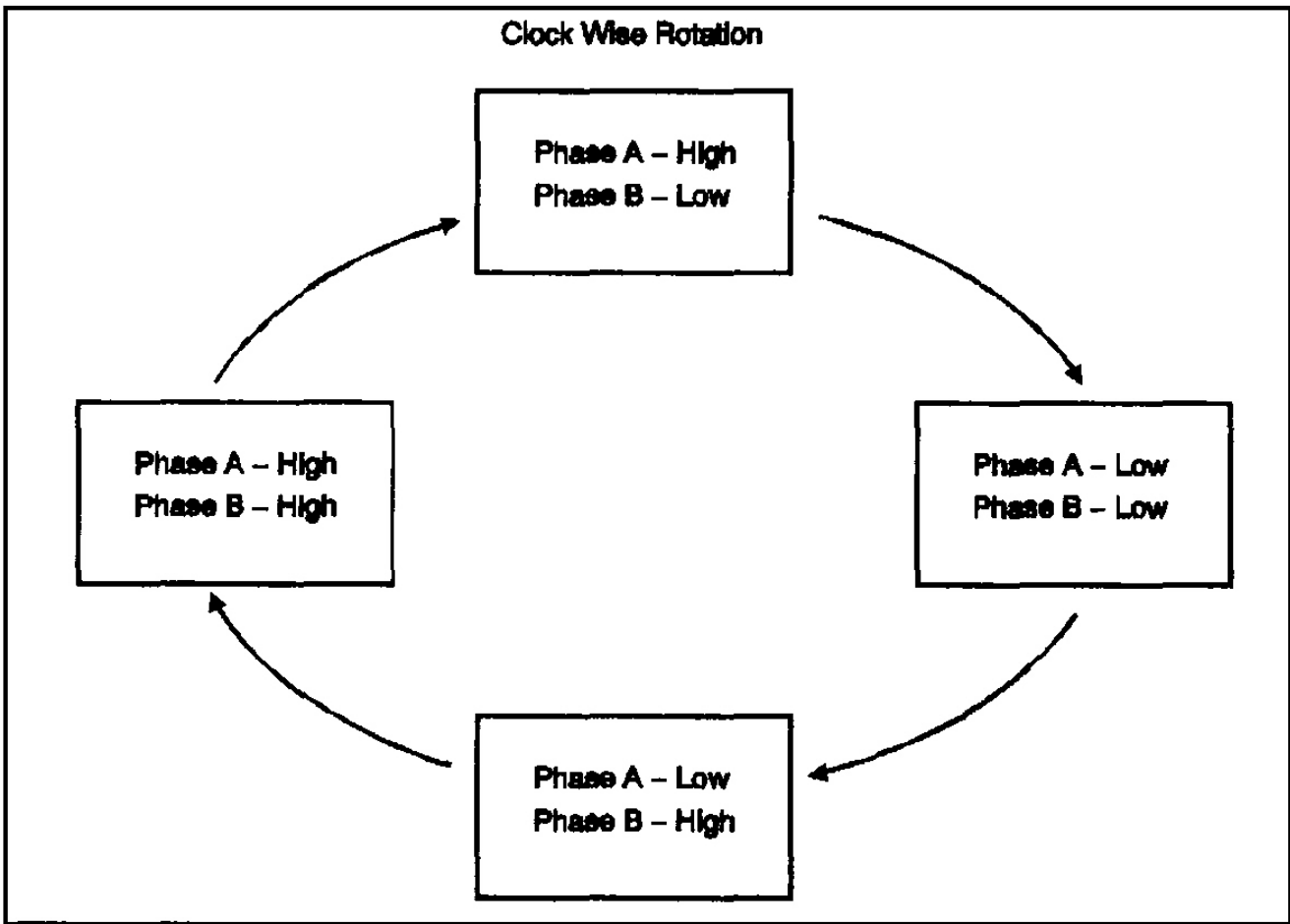
- 3 outputs used (Phase A, Phase B, Index Pulse)
- Phase A & Phase B. Offset PWM wave forms created when turning the wheel
- Index pulse. Signal is present only when steering wheel is within 10 degrees either side of center

Output is used to determine Direction of Rotation and Rate of Rotation.

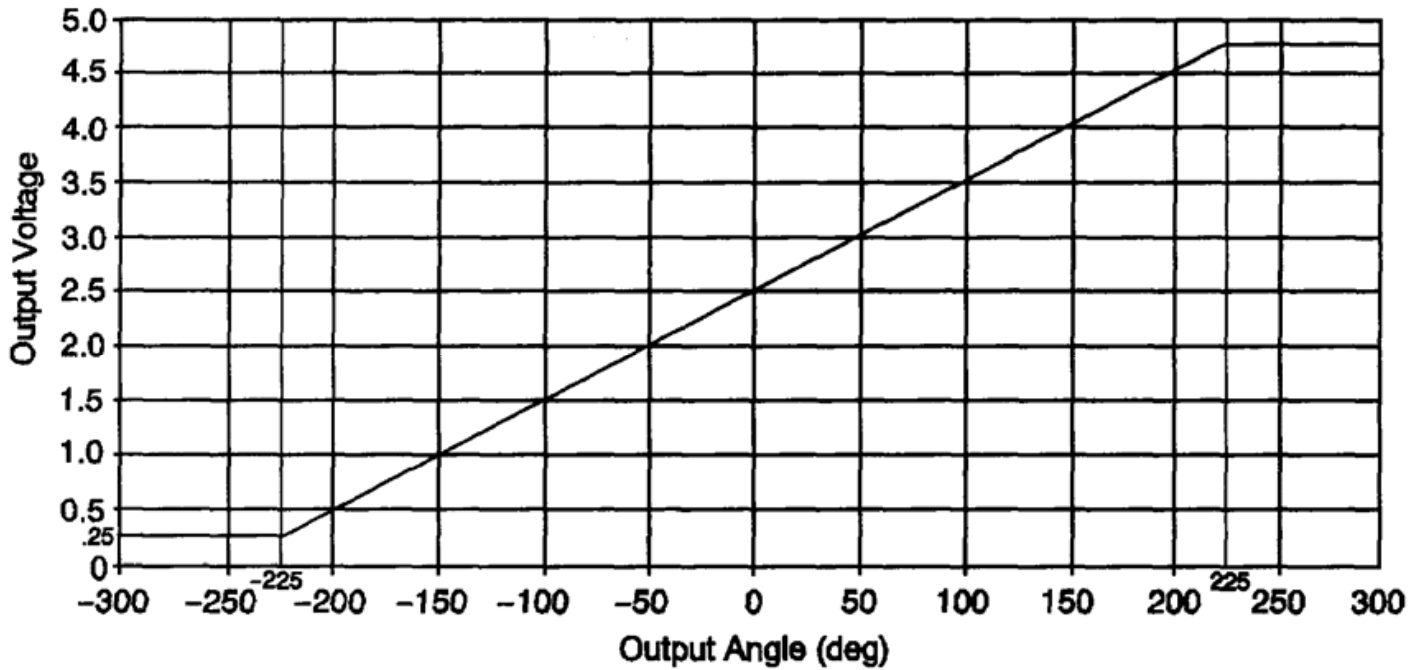


Steering Wheel Position Sensor - Digital Signal Chart

Courtesy of GENERAL MOTORS CORP.



Steering Wheel Position Sensor - A & B Phase Chart



Steering Wheel Position Sensor - Analog Signal Chart

Courtesy of GENERAL MOTORS CORP.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

- 3) - This step will help determine if the 5 volt reference circuit is open.
- 4) - This step will help determine if the sensor return circuit is open.
- 5) - Test for the proper operation of the phase A circuit.
- 7) - Test for the proper operation of the phase B circuit.
- 9) - Test for the proper operation of the marker pulse circuit.
- 11) - Test for the proper operation of the sensor signal circuit.
- 14) - Test for a short to ground in the 5 volt reference circuit.

DTC C0455 Diagnosis

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check—Rear Wheel Steering?	—	Go to Step 2	Go to Diagnostic System Check - Rear Wheel Steering
2	1. Install a scan tool. 2. Turn the ignition switch to the ON position, with the engine ON. 3. With a scan tool observe the phase A, the phase B, marker pulse, and sensor signal data parameters while slowly turning the steering wheel to the left and to the right. Do all of the parameters change?	—	Go to Diagnostic Aids	Go to Step 3
3	Does the scan tool indicate that phase A, the phase B, marker pulse data parameter are all high and the sensor signal data parameter equals 5 volts?	—	Go to Step 14	Go to Step 4
4	Does the scan tool indicate that phase A, the phase B, marker pulse data parameter are all low and the sensor signal data parameter equals 0 volt?	—	Go to Step 13	Go to Step 5
5	With a scan tool, observe the phase A parameter, while turning the steering wheel. Does the phase A data parameter change state?	high/low	Go to Step 7	Go to Step 6

Step	Action	Values	Yes	No
6	Does the scan tool indicate that the phase A data parameter is high?	—	Go to Step 18	Go to Step 17
7	With a scan tool, observe the phase B parameter, while turning the steering wheel. Does the phase B data parameter change state?	high/low	Go to Step 9	Go to Step 8
8	Does the scan tool indicate that the phase B data parameter is high?	—	Go to Step 18	Go to Step 17
9	With a scan tool, observe the marker pulse data parameter while turning the steering wheel. Does the marker pulse data parameter change state?	high/low	Go to Step 11	Go to Step 10
10	Does the scan tool indicate that the marker pulse data parameter is high?	—	Go to Step 18	Go to Step 17
11	With a scan tool, observe the sensor signal data parameter, while turning the steering wheel. Is the voltage of the sensor signal data parameter greater than the specified value?	4.875 V	Go to Step 18	Go to Step 12
12	Is the voltage of the sensor signal data parameter less than the specified value?	0.125 V	Go to Step 17	Go to Step 13
13	<ol style="list-style-type: none"> 1. Turn the ignition switch to the OFF position. 2. Connect a 3 amp fused jumper wire between the sensor signal circuit of the steering wheel position sensor and the sensor return circuit of the steering wheel position sensor 3. Turn the ignition switch to the ON position, with the engine OFF. 4. With a scan tool, observe the sensor signal data parameter. Does the scan tool indicate that the sensor signal data parameter is greater than the specified value?	4.875 V	Go to Step 19	Go to Step 20
14	<ol style="list-style-type: none"> 1. Turn the ignition switch to the OFF position. 2. Connect a 3 amp fused jumper wire between the sensor signal circuit of the steering wheel position sensor and the 5 volt reference circuit of the steering wheel position sensor 3. Turn the ignition switch to the ON position, with the engine OFF. 4. With a scan tool, observe the sensor signal data parameter. Does the scan tool indicate that the sensor signal data parameter is less than the specified value?	0.125 V	Go to Step 16	Go to Step 15
15	Test the steering wheel position sensor 5 volt reference circuit for a short to ground. Refer to <i>Circuit Testing and Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 17
16	Test the steering wheel position sensor 5 volt reference circuit for an open or a short to voltage. Refer to <i>Circuit Testing and Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 22
17	Test the steering wheel position sensor phase A, phase B, marker pulse, or sensor signal circuit for a short to ground. Refer to <i>Circuit Testing and Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 21

Step	Action	Values	Yes	No
18	Test the steering wheel position sensor phase A, phase B, marker pulse, or sensor signal circuit for an open or short to voltage. Refer to <i>Circuit Testing</i> and <i>Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 21
19	Test the steering wheel position sensor return circuit for a short to voltage. Refer to <i>Circuit Testing</i> and <i>Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 22
20	Test the steering wheel position sensor return circuit for an open or high resistance. Refer to <i>Circuit Testing</i> and <i>Wiring Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 22
21	Inspect for poor connections at the harness connector of the steering wheel position sensor connector. Refer to <i>Testing for Intermittent and Poor Connections</i> and <i>Connector Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 23
22	Inspect for poor connections at the harness connector of the rear wheel steering control module connector. Refer to <i>Testing for Intermittent and Poor Connections</i> and <i>Connector Repairs</i> in Wiring Systems. Did you find and correct the condition?	—	Go to Step 25	Go to Step 24
23	Important: Perform the Learn Alignment procedure. Refer to <i>Measuring Wheel Alignment (With Rear Wheel Steering)</i> or <i>Measuring Wheel Alignment (Without Rear Wheel Steering)</i> in Wheel Alignment Replace the steering wheel position sensor. Refer to <i>Steering Wheel Position Sensor Replacement</i> in Steering Wheel and Column. Is the replacement complete?	—	Go to Step 25	—
24	Important: Perform the Learn Alignment procedure. Refer to <i>Measuring Wheel Alignment (With Rear Wheel Steering)</i> or <i>Measuring Wheel Alignment (Without Rear Wheel Steering)</i> in Wheel Alignment. Replace the rear wheel steering module. Refer to <i>Rear Wheel Steering Control Module Replacement</i> . Did you complete the replacement?	—	Go to Step 25	—
25	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	—	Go to Step 2	System OK