

DTC P0731 the TCM detects an incorrect 1st gear ratio

Circuit Description

The TCM calculates gear ratio based on data from the automatic transmission input shaft speed and output shaft speed sensors. The TCM compares the known transmission gear ratio to a calculated ratio for each commanded gear. If the TCM detects an incorrect 1st gear ratio, indicating excessive slip or drag within the transmission, then DTC P0731 sets. DTC P0731 is a type C DTC.

Conditions for Running the DTC

- No TP sensor DTC P0120.
- No ISS DTCs P0716 or P0717.
- No OSS DTCs P0722 or P0723.
- No IMS DTCs P1815, P1820, P1822, P1823, P1825 or P1826.
- The engine run time is greater than 5 seconds.
- The transmission temperature is 20–130°C (68–266°F).
- The transmission is not in PARK or NEUTRAL.
- The elapsed time since the most recent range change is greater than 6 seconds.
- The engine torque is greater than 55 N·m (41 lb ft).
- The throttle position is greater than 10 percent.
- The gear ratio is between 0.61:1 and 4.14:1.
- The gear ratio is not Reverse: 3.1:1 to 2.95:1.
- The vehicle speed is greater than 5 km/h (3 mph).

Conditions for Setting the DTC

The TCM commands 1st gear and the actual gear ratio is not within one of the following ranges for 2 seconds:

- 3.76:1 to 3.33:1
- 2.44:1 to 2.10:1
- 1.76:1 to 1.44:1
- 1.10:1 to 0.90:1
- 0.83:1 to 0.68:1

Action Taken When the DTC Sets

- The TCM does not request the ECM to illuminate the malfunction indicator

- lamp (MIL).
- SERVICE TRANSMISSION displays on the driver information center (DIC).
- The TCM inhibits first gear.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM records the operating conditions when the Conditions for Setting the DTC are met. The TCM stores this information as a Failure Record.
- The TCM stores DTC P0731 in TCM history.

Conditions for Clearing the DIC/DTC

- The TCM clears the DIC message when the condition no longer exists.
- A scan tool can clear the DTC.
- The TCM clears the DTC from TCM history if the vehicle completes 40 warm-up cycles without a non emission related diagnostic fault occurring.
- The TCM cancels the DTC default actions when the ignition is OFF long enough in order to power down the TCM.

Diagnostic Aids

Ask the customer about overloading the vehicle, exceeding the trailer towing limit, or towing in Overdrive.

Test Description

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

3. This step tests for low fluid level, which may cause slipping, and result in an incorrect gear ratio.
4. This step verifies that the correct 1st gear ratio occurs for commanded 1st gear. If necessary, use the Shift Transmission function of the scan tool in order to command 1st gear for the length of time necessary to read the gear ratio from the display.
5. This step tests for low line pressure.

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Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check – Vehicle?	—	Go to Step 2	Go to Diagnostic System Check - Vehicle in Vehicle DTC Information
2	<p>1. Visually inspect the transmission cooling system for fluid leaks.</p> <p>2. Repair leaks as necessary. Refer to Fluid Leak Diagnosis.</p> <p>Did you find and correct a condition?</p>	—	Go to Step 12	Go to Step 3
3	Perform the Transmission Fluid Checking Procedure. Refer to Transmission Fluid Checking Procedure. Is the action complete?	—	Go to Step 4	—

Step	Action	Value(s)	Yes	No
4	<ol style="list-style-type: none"> 1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. Important: <ul style="list-style-type: none"> • Before clearing the DTC, use the scan tool in order to record the ECM and the TCM Failure Records. Using the Clear Info function erases the Failure Records from the ECM and TCM. • Using the Clear Info function erases stored DTCs in both the ECM and TCM. 3. Record the DTC Failure Records. 4. Clear the DTC. 5. Use the scan tool snapshot mode in order to record commanded gear and gear ratio. 6. Drive the vehicle in D5 and record the 1st gear ratio. <p>Is the 1st gear ratio within the specified range?</p>	3.33:1–3.76:1	Go to Intermittent Conditions in Engine Controls – 4.6L	Go to Step 5
5	Perform the Line Pressure Check Procedure. Refer to Line Pressure Check Procedure. Is the action complete?	—	Go to Step 6	—
6	<ol style="list-style-type: none"> 1. Remove the transmission oil pan. Refer to Automatic Transmission Fluid/Filter Replacement. 2. Inspect the bottom of the pan for excessive sediment. Did you find excessive amounts of sediment? 	—	Go to Step 10	Go to Step 7

Step	Action	Value(s)	Yes	No
7	Inspect for the following conditions: <ul style="list-style-type: none"> • 1-2 shift valve (387) stuck in the release position • 1-2 shift solenoid valve assembly (368) mechanically stuck on • 1-2 shift control valve (366) stuck in the release position • 2-3 shift solenoid valve assembly (369) mechanically stuck off or leaking • 2-3 shift control valve (370) stuck • 2-3 shift valve (371) stuck Refer to Rear Control Valve Body Disassemble on page 0-0 in Transmission Unit Repair Manual. Did you find any of the above conditions?	—	Go to Step 9	Go to Step 8
8	Has the control valve body been serviced within the past 3 months or 4 828 km (3,000 miles)?	—	Go to Step 10	Go to Step 9
9	Repair or replace the control valve body. Refer to Control Valve Body Accumulator Assembly Replacement. Is the action complete?	—	Go to Step 12	—

Step	Action	Value(s)	Yes	No
10	<p>Inspect for the following conditions:</p> <ul style="list-style-type: none"> • The input shaft fluid seal ring (432) worn or damaged • Retainer ring (451) out of position or damaged • Clutch plates (444 and 449) slipping, dragging or damaged • Clutch apply plates (442 and 447) seized or damaged • Forward clutch piston seal assembly (436) or coast clutch piston assembly (438) rolled, worn or damaged • Forward and coast clutch spring assembly (439) damaged • Forward clutch housing check ball valve assembly (434) blocked by debris or damaged Refer to Forward and Coast Clutch Disassemble on page 0-0 and Forward and Coast Clutch Assemble on page 0-0 in Transmission Unit Repair Manual. • The forward clutch sprag (461) not holding or damaged Refer to Input Sun Gear Shaft Disassemble on page 0-0 and Input Sun Gear Shaft Assemble on page 0-0 in Transmission Unit Repair Manual. <p>Did you find any of the above conditions?</p>	—	Go to Step 11	—

Step	Action	Value(s)	Yes	No
11	Repair or replace the transmission. Refer to Transmission Replacement. Is the action complete?	—	Go to Step 12	—
12	<p>1. Replace the AT fluid and filter. Refer to Automatic Transmission Fluid/Filter Replacement.</p> <p>2. Inspect for the correct AT fluid level.</p> <p>3. Add new fluid as necessary. Important: The Reset Transmission Adapts function will clear all adapt cells. This may affect transmission performance. The TCM will update the adapt cell values as the vehicle is driven.</p> <p>4. Use the scan tool in order to perform the following:</p> <ul style="list-style-type: none"> • Reset oil life monitor to 100 percent • Perform the Reset Transmission Adapts. <p>Did you complete the above procedures?</p>	—	Go to Step 13	—

Step	Action	Value(s)	Yes	No
13	<p>Perform the following procedure in order to verify the repair:</p> <ol style="list-style-type: none"> 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: <ul style="list-style-type: none"> • The TFT is 20–130°C (68–266°F). • The engine torque is greater than 55 N·m (41 lb ft). • Drive the vehicle in D5 with the throttle position angle greater than 10 percent in order to obtain a correct 1st gear ratio for 2 seconds. 4. Select Specific DTC. 5. Enter DTC P0731. <p>Has the test run and passed?</p>	—	Go to Step 14	Go to Step 2
14	<p>With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?</p>	—	Go to Diagnostic Trouble Code (DTC) List - Vehicle in Vehicle DTC Information	System OK