DTC P0133:00 [SKYACTIV-G 2.0]

id0102h1702400

DTC P0133:00	A/F sensor circuit slow response
DETECTION CONDITION	• The PCM monitors the peak differential value of the oxygen sensor signal after the A/F fluctuation being provided when the following conditions are met. If the peak differential value is lower than the threshold value, the PCM determines that the A/F sensor circuit is slow. **MONITORING CONDITIONS** — Drive Mode 03 (Variable Valve Timing, A/F Sensor Heater, HO2S Heater, A/F Sensor, HO2S and TWC Repair Verification Drive Mode) — Following conditions are met: • A/F sensor heater monitor is completed. • Fuel system loop status is closed loop fuel control. — ECT sensor and A/F sensor heater are normal. — Engine speed: **1,100—3,500 rpm** — Charging efficiency: **16—63 %** (at engine speed: **2,500 rpm**) — Intake airflow amount: **5—40 g/s {0.7—5.2 lb/min.}** — ECT: **above 50 °C {122 °F}** **Diagnostic support note** • This is an intermittent monitor (A/F sensor, HO2S). • The check engine light illuminates if the PCM detects the above malfunction condition in two consecutive drive cycles or in one drive cycle while the DTC for the same malfunction has been stored in the PCM. • PENDING CODE is available if the PCM detects the above malfunction condition during first drive cycle. • FREEZE FRAME DATA (Mode 2)/Snapshot data is available. • The DTC is stored in the PCM memory.
FAIL-SAFE FUNCTION	—
POSSIBLE CAUSE	• Erratic signal from A/F sensor — A/F sensor loose — Exhaust system leakage • Purge solenoid valve malfunction — Improper connection of evaporative hose (purge solenoid valve side) • High-pressure side fuel delivery system malfunction — Fuel pressure sensor malfunction — Spill valve control solenoid valve control circuit malfunction (damage to driver in PCM caused by short circuit to ground system) — Spill valve control solenoid valve (built-into high pressure fuel pump) malfunction — Relief valve (built-into high pressure fuel pump) malfunction — High pressure fuel pump malfunction • Low-pressure side fuel delivery system malfunction — Fuel leakage in fuel line — Low pressure side fuel line restriction (between fuel pump unit and high pressure fuel pump) — Fuel filter clogged — Pressure regulator (built-into fuel pump unit) malfunction — Fuel pump unit malfunction • Engine malfunction — Insufficient engine compression — Engine coolant leakage to combustion chamber • A/F sensor malfunction — A/F sensor deterioration • PCM malfunction
SYSTEM WIRING DIAGRAM	—

Diagnostic Procedure

STEP	INSPECTION		ACTION
1	**IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA (MODE 2)** • Perform the Freeze Frame PID Data Access Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0].) • Is the DTC P0133:00 on FREEZE FRAME DATA (Mode 2)?	Yes	Go to the next step.
		No	Go to the troubleshooting procedure for DTC on FREEZE FRAME DATA (Mode 2). (See DTC TABLE [SKYACTIV-G 2.0].)
2	**VERIFY FREEZE FRAME DATA (MODE 2)/ SNAPSHOT DATA AND DIAGNOSTIC MONITORING TEST RESULTS HAVE BEEN RECORDED** • Have the FREEZE FRAME DATA (Mode 2)/ snapshot data and DIAGNOSTIC MONITORING TEST RESULTS (A/F sensor, HO2S related) been recorded?	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA (Mode 2)/snapshot data and DIAGNOSTIC MONITORING TEST RESULTS on the repair order, then go to the next step.
3	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Verify related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
4	**VERIFY RELATED PENDING CODE AND/OR DTC** • Switch the ignition to off, then to ON (engine off). • Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0].) • Is the PENDING CODE/DTC P0443:00 also present?	Yes	Go to the applicable PENDING CODE or DTC inspection. (See DTC P0443:00 [SKYACTIV-G 2.0].)
		No	Go to the next step.
5	**INSPECT CURRENT SIGNAL STATUS OF A/F SENSOR** • Inspect the A/F sensor. (See AIR FUEL RATIO (A/F) SENSOR INSPECTION [SKYACTIV-G 2.0].) • Is there any malfunction?	Yes	Go to the next step.
		No	Go to Step 8.
6	**INSPECT INSTALLATION OF A/F SENSOR** • Inspect installation of A/F sensor. • Is the A/F sensor installed securely?	Yes	Go to the next step.
		No	Retighten the A/F sensor, then go to Step 18. (See AIR FUEL RATIO (A/F) SENSOR REMOVAL/ INSTALLATION [SKYACTIV-G 2.0].)
7	**INSPECT EXHAUST SYSTEM FOR LEAKAGE** • Visually inspect for exhaust leakage between exhaust manifold and A/F sensor. • Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
8	**INSPECT PURGE SOLENOID VALVE AND EVAPORATIVE HOSE** • Inspect the purge solenoid valve and evaporative hose connection. (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0].) (See INTAKE-AIR SYSTEM VACUUM HOSE ROUTING DIAGRAM [SKYACTIV-G 2.0].) • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18. (See PURGE SOLENOID VALVE REMOVAL/ INSTALLATION [SKYACTIV-G 2.0].)
		No	Go to the next step.
9	**INSPECT FOR FUEL LINE LEAKAGE** • Visually inspect for leakage from fuel line between fuel distributor and fuel pump. • Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.

STEP	INSPECTION		ACTION
10	**INSPECT FUEL PRESSURE (HIGH-SIDE)** • Start the engine and warm it up completely. • Access the FUEL_PRES PID using the M-MDS at idle. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0].) • Is the FUEL_PRES PID value **approx. 3 MPa {31 kgf/cm^2, 435 psi}**?	Yes	Go to Step 14.
		No	Lower than **3 MPa {31 kgf/cm2, 435 psi}**: • Inspect the following: — Fuel leakage at the fuel line and fuel injector — Fuel pump • Perform the Fuel Pump (Low-pressure Side) Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.0].) — Fuel pressure sensor (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.0].) — High pressure fuel pump (See HIGH PRESSURE FUEL PUMP INSPECTION [SKYACTIV-G 2.0].) • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results, then go to Step 18. • If there is no malfunction: — Go to Step 13. Higher than **3 MPa {31 kgf/cm2, 435 psi}**: • Go to the next step.
11	**IDENTIFY CAUSE BY FUEL PRESSURE SENSOR OR HIGH PRESSURE FUEL PUMP** • Is the vehicle acceleration performance normal?	Yes	Go to the next step.
		No	Go to Step 13.
12	**INSPECT FUEL PRESSURE SENSOR** • Inspect the fuel pressure sensor. (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.0].) • Is there any malfunction?	Yes	Replace the fuel distributor, then go to Step 18. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0].)
		No	Go to Step 14.
13	**INSPECT SPILL VALVE CONTROL SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Switch the ignition to off. • Disconnect the high pressure fuel pump and PCM connectors. • Inspect for continuity between high pressure fuel pump terminal A (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness for a possible short to ground, then go to Step 18.
		No	Replace the high pressure fuel pump, then go to Step 18. (See HIGH PRESSURE FUEL PUMP REMOVAL/INSTALLATION [SKYACTIV-G 2.0].)
14	**INSPECT FUEL PRESSURE (LOW-SIDE)** • Connect the fuel pressure gauge between fuel pump and high pressure fuel pump. • Measure the low side fuel pressure. (See FUEL LINE PRESSURE INSPECTION [SKYACTIV-G 2.0].) • Is the low side fuel pressure within specification? **Specification:** • **405—485 kPa {4.13—4.94 kgf/cm^2, 58.8—70.3 psi}**	Yes	Go to the next step.
		No	Inspect the following: • Fuel line restriction • Fuel filter clogged — If there is any malfunction: • Repair or replace the malfunctioning part according to the inspection results. — If there is no malfunction: • Replace the fuel pump unit. (See FUEL PUMP UNIT REMOVAL/INSTALLATION [SKYACTIV-G 2.0].) Go to Step 18.

STEP	INSPECTION		ACTION
15	**INSPECT ENGINE COMPRESSION** • Inspect the engine compression. (See COMPRESSION INSPECTION [SKYACTIV-G 2.0].) • Are compression pressures within specification? **Specification:** • Compression [European (L.H.D. U.K.) specs.] — Standard: **978 kPa {9.97 kgf/cm^2, 142 psi} (300 rpm)** — Minimum: **783 kPa {7.98 kgf/cm^2, 114 psi} (300 rpm)** — Maximum difference between cylinders: **166 kPa {1.69 kgf/cm^2, 24.1 psi}** • Compression [Except European (L.H.D. U.K.) specs.] — Standard: **885 kPa {9.02 kgf/cm^2, 128 psi} (300 rpm)** — Minimum: **708 kPa {7.22 kgf/cm^2, 103 psi} (300 rpm)** — Maximum difference between cylinders: **150 kPa {1.53 kgf/cm^2, 21.8 psi}** **Note** • Because the SKYACTIV-G 2.0 retards the intake valve closing timing, compression pressure is low.	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
16	**INSPECT SEALING OF ENGINE COOLANT PASSAGE** • Perform the “ENGINE COOLANT LEAKAGE INSPECTION”. (See ENGINE COOLANT LEAKAGE INSPECTION [SKYACTIV-G 2.0].) • Does the radiator cap tester needle drop even though there is no engine coolant leakage from the radiator or the hoses?	Yes	Engine coolant leakage from the engine (between the combustion chamber and the engine coolant passage) may have occurred. • Verify the conditions of the gasket and the cylinder head. — If there is any malfunction: • Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
17	**INSPECT A/F SENSOR** • Switch the ignition to off. • Reconnect all disconnected connectors. • Inspect the A/F sensor. (See AIR FUEL RATIO (A/F) SENSOR INSPECTION [SKYACTIV-G 2.0].) • Is there any malfunction?	Yes	Inspect the related wiring harness. • If there is any malfunction: — Repair or replace the suspected wiring harness, then go to the next step. • If there is no malfunction: — Replace the A/F sensor, then go to the next step. (See AIR FUEL RATIO (A/F) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0].)
		No	Go to the next step.
18	**VERIFY DTC TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0].) • Drive the vehicle under the monitoring conditions. • Perform the Drive Mode 03 (Variable Valve Timing, A/F Sensor Heater, HO2S Heater, A/F Sensor, HO2S and TWC Repair Verification Drive Mode). (See OBD DRIVE MODE [SKYACTIV-G 2.0].) • Is the PENDING CODE for this DTC present?	Yes	Repeat the inspection from Step 1. • If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0].) Go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
19	**VERIFY AFTER REPAIR PROCEDURE** • Perform the “AFTER REPAIR PROCEDURE”. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0].)
		No	DTC troubleshooting completed.