NO.27 VIBRATION CONCERNS (ENGINE) [SKYACTIV-D 2.2]

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27	VIBRATION CONCERNS (ENGINE)
DESCRIPTION	• Vibration from under bonnet or driveline.
POSSIBLE CAUSE	• PCM DTC is stored. • Erratic signal to PCM — ECT sensor or related circuit malfunction — Fuel pressure sensor or related circuit malfunction — Exhaust gas pressure sensor No.1 or related circuit malfunction — BARO sensor (integrated in PCM) or related circuit malfunction — A/F sensor or related circuit malfunction • Fuel injector injection amount correction procedure has not been completed. • Fuel injection system malfunction — Fuel leakage from fuel system — Common rail malfunction — Supply pump malfunction — Suction control valve malfunction — Fuel injector malfunction — Fuel pressure relief valve malfunction — Fuel check valve or fuel feed valve malfunction • Jet pump malfunction (4WD) • ATX malfunction (ATX) • Poor fuel quality • Mechanical (engine) malfunction — Large mechanical resistance — Improper engine compression — Improper valve timing — Engine oil malfunction (oil working up or down) • Engine mount installation loose **Warning** **• The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** **— Always keep sparks and flames away from fuel. Fuel can be easily ignited which could cause serious injury or death, and damage to equipment.** **— Fuel line spills and leakage from the pressurized fuel system are dangerous. Fuel can ignite and cause serious injury or death, and damage to property and facilities. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure", while referring to the "BEFORE SERVICE PRECAUTION". (See BEFORE SERVICE PRECAUTION [SKYACTIV-D 2.2].)** **— Fuel is highly flammable and dangerous. Fuel line spills and leakage can cause serious injury or death, and damage to equipment. When installing the fuel hose, always refer to the "AFTER SERVICE PRECAUTION" and perform the "Fuel Hose Installation Procedure". (See AFTER SERVICE PRECAUTION [SKYACTIV-D 2.2].)**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	**VERIFY PCM DTC** • Retrieve PCM DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-D 2.2].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-D 2.2].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
2	**VERIFY CURRENT INPUT SIGNAL STATUS** **Caution** **• While performing this step, always operate the vehicle in a safe and lawful manner.** **• When the M-MDS is used to observe monitor system status while driving, be sure to have another technician with you, or record the data in the M-MDS using the PID/DATA MONITOR AND RECORD capturing function and inspect later.** • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-D 2.2].) — ECT — FRP — EXHPRES1 — BARO — O2S11 • Do the PIDs indicate the correct values under the malfunction condition? (See PCM INSPECTION [SKYACTIV-D 2.2].)	Yes	Inspect the related sensor and circuit. • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results, then go to Step 16. • If there is no malfunction: — Go to the next step.
		No	Go to the next step.
3	**VERIFY THAT FUEL INJECTION AMOUNT CORRECTION IS CORRECTLY COMPLETED** • Perform the FUEL INJECTOR INJECTION AMOUNT CORRECTION. (See FUEL INJECTOR INJECTION AMOUNT CORRECTION [SKYACTIV-D 2.2].) • Start the engine. • Verify the glow indicator light. • Does the glow indicator light illuminate?	Yes	Re-perform the PCM fuel injection amount adjustment. (Perform the FUEL INJECTOR DATA RESET and FUEL INJECTOR CODE PROGRAM using the M-MDS.) (See FUEL INJECTOR DATA RESET [SKYACTIV-D 2.2].) (See FUEL INJECTOR CODE PROGRAM [SKYACTIV-D 2.2].) • If a malfunction occurs, change the learning method (use/do not use M-MDS), and re-implement the FUEL INJECTOR INJECTION AMOUNT CORRECTION. (See FUEL INJECTOR INJECTION AMOUNT CORRECTION [SKYACTIV-D 2.2].) Go to Step 16.
		No	Go to the next step.
4	**INSPECT FOR FUEL LEAKAGE FROM FUEL SYSTEM** • Visually inspect the following: — Fuel leakage from the fuel tank, fuel pump, hose, pipe, fuel injector, supply pump, common rail — Cracking and damage in fuel hose and pipe — Clamp installation condition for each hose and pipe — Fuel pipe securing condition due to deterioration such as rubber of clamp • Are all items normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 16.

STEP	INSPECTION	RESULTS	ACTION
5	**INSPECT FUEL INJECTION RELATED PARTS** • Inspect the following parts: — Common rail (See COMMON RAIL INSPECTION [SKYACTIV-D 2.2].) — Supply pump (See SUPPLY PUMP INSPECTION [SKYACTIV-D 2.2].) — Suction control valve (See SUCTION CONTROL VALVE INSPECTION [SKYACTIV-D 2.2].) — Fuel injector (See FUEL INJECTOR INSPECTION [SKYACTIV-D 2.2].) — Fuel pressure relief valve (See FUEL PRESSURE RELIEF VALVE INSPECTION [SKYACTIV-D 2.2].) • Are all items normal?	Yes	2WD/ATX: • Go to Step 7. 2WD/MTX: • Go to Step 9. 4WD: • Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 16.
6	**INSPECT JET PUMP** • Inspect the jet pump. (See JET PUMP INSPECTION [SKYACTIV-D 2.2].) • Is the jet pump normal?	Yes	ATX: • Go to the next step. MTX: • Go to Step 9.
		No	Replace the fuel gauge sender unit (main), then go to Step 16. (See FUEL GAUGE SENDER UNIT REMOVAL/ INSTALLATION [4WD].)
7	**VERIFY ATX RELATED DTC** • Retrieve TCM DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC SYSTEM DTC INSPECTION [GW6A-EL, GW6AX-EL].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See ON-BOARD DIAGNOSTIC SYSTEM DTC TABLE [GW6A-EL, GW6AX-EL].)
		No	Go to the next step.
8	**VERIFY MALFUNCTION SYMPTOM RELATED TO ATX** • Verify the malfunction symptom related to the ATX. (See SYMPTOM TROUBLESHOOTING ITEM TABLE [GW6A-EL, GW6AX-EL].) • Is a malfunction occurring which is applicable to the symptom diagnostic index?	Yes	Go to the applicable symptom troubleshooting. (See SYMPTOM TROUBLESHOOTING ITEM TABLE [GW6A-EL, GW6AX-EL].)
		No	Go to the next step.
9	**INSPECT FOR MALFUNCTION DUE TO POOR FUEL** • Replace the fuel. (See FUEL DRAINING PROCEDURE [SKYACTIV-D 2.2].) • Does the symptom disappear?	Yes	Advise the customer as to the change in the fuel used.
		No	Remove the accumulated matter in the cylinder head using the following procedure, then go to the next step. • Carbon remover • Overhauling
10	**DETERMINE IF MALFUNCTION IS DUE TO EXCESSIVE ENGINE SPEED RESISTANCE** • Rotate the crankshaft pulley lock bolt clockwise using a wrench. (See FRONT OIL SEAL REPLACEMENT [SKYACTIV-D 2.2].) • Can bolts be rotated?	Yes	Go to Step 12.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
11	**INSPECT FOR MALFUNCTION DUE TO EXCESSIVE MECHANICAL RESISTANCE OF ENGINE ACCESSORIES** • Remove all drive belts from engine accessories. (See DRIVE BELT REMOVAL/INSTALLATION [SKYACTIV-D 2.2].) **Caution** **• Do not run the engine for long periods with the drive belts of engine accessories removed. Otherwise the engine could be damaged from overheating.** • Start the engine. • Is cranking possible? (Does the engine start?)	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 16. (Large mechanical resistance in engine accessories.)
		No	Go to the next step.
12	**INSPECT ENGINE COMPRESSION** • Inspect the engine compression. (See COMPRESSION INSPECTION [SKYACTIV-D 2.2].) • Are compression pressures within specification? **Specification:** • Compression — Standard: **2255 kPa {22.99 kgf/cm^2, 327.1 psi} (180 rpm)** — Minimum: **1804 kPa {18.40 kgf/cm^2, 261.6 psi} (180 rpm)** — Maximum difference between cylinders: **147 kPa {1.50 kgf/cm^2, 21.3 psi} (180 rpm)**	Yes	Go to Step 15.
		No	Go to the next step.
13	**INSPECT FOR MALFUNCTION DUE TO DEVIATED VALVE TIMING** • Inspect the valve timing (timing chain installation condition). (See TIMING CHAIN REMOVAL/INSTALLATION [SKYACTIV-D 2.2].) • Is the valve timing normal?	Yes	Go to the next step.
		No	Adjust the valve timing to the correct timing, then go to Step 16.
14	**INSPECT FOR MALFUNCTION DUE TO INTERNAL ENGINE WEAR, DAMAGE** • Inspect for the following engine internal parts: — Cylinder — Piston ring — Intake valve — Exhaust valve — Such as cylinder head gasket • Are all items normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 16.
15	**INSPECT FOR MALFUNCTION DUE TO ENGINE MOUNT INSTALLATION LOOSE** • Verify the engine mount installation condition. • Is the engine mount installation condition normal?	Yes	Replace the lower case, then go to the next step. (Fuel may not inject normally because there is a malfunction in the fuel check valve and fuel feed valve.) (See LOWER CASE REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
		No	Repair or replace the malfunctioning part according to the inspection results, then go to the next step.
16	Verify the test results. • If normal, return to the diagnostic index to service any additional symptoms. (See SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-D 2.2].) • If a malfunction remains, inspect the related Service Information and perform the repair or diagnosis. — If the vehicle is repaired, troubleshooting is completed. — If the vehicle is not repaired or additional diagnostic information is not available, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)		