NO.20 EMISSION COMPLIANCE [SKYACTIV-D 2.2]

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20	EMISSION COMPLIANCE
DESCRIPTION	• Fails emissions test.
POSSIBLE CAUSE	**Note** • If the HC concentration is normal and the CO concentration is excessive, a rich A/F can be considered the cause. • If the CO concentration is normal and the HC concentration is excessive, a A/F lean can be considered the cause. • If the CO and HC concentration is excessive, incomplete combustion or a rich A/F can be considered the cause. • PCM DTC is stored. • Air cleaner malfunction (non-genuine part installed) • Cooling system malfunction — Thermostat 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 • Poor fuel quality • EGR cooler and EGR pipe clogging • Mechanical (engine) malfunction — Large mechanical resistance — Improper engine compression — Improper valve timing — Intake stroke EGR using double exhaust valve actuation system (IDEVA) malfunction (always off) — Engine oil malfunction (oil working up or down) • Catalytic converter deterioration or loss **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	**INSPECT AIR CLEANER FOR NON-GENUINE AIR CLEANER INSTALLATION** • Remove the non-genuine air cleaner. (See INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION [SKYACTIV-D 2.2].) • Verify the symptom. • Does the symptom disappear?	Yes	Explain to the customer that a malfunction occurred due to the installation of a non-genuine air cleaner. • Go to Step 17.
		No	Install the removed parts correctly, then go to the next step. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
3	**DETERMINE IF MALFUNCTION CAUSE IS THERMOSTAT OR OTHER** • Verify the radiator hose tension. **Warning** **• To prevent burns, use a cloth with your hand to verify the tension of the radiator hose.** • After the engine warms up, does the engine coolant circulate to the radiator hose?	Yes	Go to Step 5.
		No	Go to the next step.
4	**INSPECT THERMOSTAT** • Inspect the thermostat. (See THERMOSTAT INSPECTION [SKYACTIV-D 2.2].) • Is the thermostat normal?	Yes	Go to the next step.
		No	Replace the thermostat, then go to Step 17. (See THERMOSTAT REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
5	**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 17.
		No	Go to the next step.
6	**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 17.

STEP	INSPECTION	RESULTS	ACTION
7	**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	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 17.
8	**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
9	**INSPECT EGR COOLER AND EGR PIPE** • Inspect for clogging in the EGR cooler and EGR pipe. • Are the EGR cooler and EGR pipe normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 17.
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.
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 17. (Large mechanical resistance in engine accessories.)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
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 16.
		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 17.
14	**INSPECT IDEVA** • Inspect the IDEVA. (See OIL CONTROL VALVE (OCV) INSPECTION [SKYACTIV-D 2.2].) (See HYDRAULIC LASH ADJUSTER (HLA) INSPECTION [SKYACTIV-D 2.2].) • Is the IDEVA normal?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 17. (See OIL CONTROL VALVE (OCV) REMOVAL/ INSTALLATION [SKYACTIV-D 2.2].) (See HYDRAULIC LASH ADJUSTER (HLA) REMOVAL/ INSTALLATION [SKYACTIV-D 2.2].)
15	**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 17.
16	**INSPECT CATALYTIC CONVERTER** • Visually inspect the catalytic converter. • Is the catalytic converter 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	Replace the catalytic converter, then go to the next step. (See EXHAUST SYSTEM REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
17	**VERIFY SYMPTOM TROUBLESHOOTING COMPLETED** • Measure CO, HC, and NOx concentration again. • Is CO, HC, and NOx concentration within specification?	Yes	Symptom troubleshooting is completed. (Explain contents of repair to customer.)
		No	Repeat the inspection from Step 1.