NO.15 EMISSION COMPLIANCE [SKYACTIV-G 2.0, SKYACTIV-G 2.5]

id0103g3802100

15	EMISSION COMPLIANCE
DESCRIPTION	• Fails emissions test.
POSSIBLE CAUSE	• Engine overheating • Cooling system malfunction • PCM DTC is stored • Incorrect ignition timing • Spark plug malfunction • Purge solenoid valve malfunction • Inadequate fuel pressure — Fuel leakage at the fuel line and/or fuel injector — Fuel pressure sensor or related circuit malfunction — High pressure fuel pump 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 — Fuel line restriction — Fuel pump unit malfunction • Air leakage from intake-air system • Vacuum lines leakage or blockage • Charcoal canister damage • Improper engine coolant level • Excessive carbon built-up in combustion chamber • Improper engine compression • Improper intake valve timing • Improper exhaust valve timing • Exhaust system and/or TWC restriction • Exhaust gas leakage from the exhaust system • TWC malfunction (PCM DTC is stored.) • PCV valve malfunction or incorrect valve installation **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** **• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** **• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injury or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE SERVICE PRECAUTION" and "AFTER SERVICE PRECAUTION" described in this manual. (See BEFORE SERVICE PRECAUTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See AFTER SERVICE PRECAUTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)** **Caution** **• Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign matter.**

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	**VERIFY PCM DTC** • Retrieve any DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
2	**VERIFY DRIVE MODE CONDITION** • Verify that the drive mode is completed. • Is the drive mode completed?	Yes	Go to the next step.
		No	Perform the Drive Mode. (See OBD DRIVE MODE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

STEP	INSPECTION	RESULTS	ACTION
3	**INSPECT FOR ANY OTHER MALFUNCTION** • Can malfunction symptoms other than “NO.15 EMISSION COMPLIANCE” be verified?	Yes	Go to the applicable symptom troubleshooting. (See SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
4	**VERIFY CO AND HC CONCENTRATION** • Verify CO and HC concentration. • Is the CO or HC concentration excessive?	Yes	Go to Step 6. **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.
		No	Go to the next step.
5	**VERIFY NOx CONCENTRATION** • Verify NOx concentration. • Is the NOx concentration excessive?	Yes	Go to the next step.
		No	Symptom troubleshooting is completed.
6	**VERIFY IF MALFUNCTION CAUSED BY IGNITION TIMING MALFUNCTION** • Inspect the ignition timing. (See ENGINE TUNE-UP [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Inspect the following: • Spark plug (See SPARK PLUG INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Ignition coil/ion sensor No.1 (See IGNITION COIL INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Ignition coil/ion sensor No.2 • Ignition coil/ion sensor No.3 • Ignition coil/ion sensor No.4 — 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 18.
		No	Go to the next step.
7	**INSPECT PURGE CONTROL SYSTEM OPERATION** • Perform the Purge Control System Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Does the purge solenoid valve work properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.

STEP	INSPECTION	RESULTS	ACTION
8	**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, SKYACTIV-G 2.5].) • Is the FUEL_PRES PID value **approx. 3 MPa {31 kgf/cm^2, 435 psi}**?	Yes	Go to the next step.
		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, SKYACTIV-G 2.5].) — Fuel pressure sensor (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) — High pressure fuel pump (See HIGH PRESSURE FUEL PUMP INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Higher than **3 MPa {31 kgf/cm2, 435 psi}**: • Inspect the following: — Fuel line and fuel injector restriction — Fuel pressure sensor (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) — High pressure fuel pump (Relief valve clogged) Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
9	**INSPECT INTAKE-AIR SYSTEM FOR AIR LEAKAGE** • Inspect for leakage in intake-air system. • 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.
10	**INSPECT RESTRICTION IN VENTILATION HOSE** • Inspect for restriction in the ventilation hose. • Is there any restriction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
11	**VERIFY IF MALFUNCTION CAUSE IS CHARCOAL CANISTER** • Inspect the charcoal canister. (See CHARCOAL CANISTER INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the charcoal canister damaged?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18. (See CHARCOAL CANISTER REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
12	**VERIFY IF MALFUNCTION CAUSED BY LACK OF ENGINE COOLANT** • Inspect the engine coolant level. (See ENGINE COOLANT LEVEL INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Add engine coolant and verify that there is no engine coolant leakage. (See ENGINE COOLANT REPLACEMENT [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See ENGINE COOLANT LEAKAGE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • 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 18.
		No	Go to the next step.
13	**VERIFY CARBON ACCUMULATION CONDITION IN COMBUSTION CHAMBER** • Verify carbon accumulation condition in combustion chamber. • Has carbon accumulated?	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	RESULTS	ACTION
14	**INSPECT ENGINE COMPRESSION** • Measure the compression pressure for each cylinder. (See COMPRESSION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Are compression pressures within specification? **Specification:** • Compression [SKYACTIV-G 2.0, 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}** (**300 rpm**) • Compression [SKYACTIV-G 2.0, 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}** (**300 rpm**) • Compression [SKYACTIV-G 2.5] — Standard: **954 kPa {9.73 kgf/cm^2, 138 psi} (300 rpm)** — Minimum: **763 kPa {7.78 kgf/cm^2, 111 psi} (300 rpm)** — Maximum difference between cylinders: **161 kPa {1.64 kgf/cm^2, 23.4 psi}** (**300 rpm**) **Note** • Because the SKYACTIV-G 2.0 and SKYACTIV-G 2.5 retards the intake valve closing timing, compression pressure is low.	Yes	Go to the next step.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper intake valve timing • Improper exhaust valve timing Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
15	**INSPECT TWC FOR RESTRICTION** • Inspect for restriction in the TWC. • Is there any restriction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18. (See EXHAUST SYSTEM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
16	**INSPECT EXHAUST SYSTEM FOR LEAKAGE** • Visually inspect for exhaust gas leakage from the exhaust system. • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
17	**INSPECT PCV VALVE** • Inspect the PCV valve. (See POSITIVE CRANKCASE VENTILATION (PCV) VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction?	Yes	Replace the PCV valve, then go to the next step. (See POSITIVE CRANKCASE VENTILATION (PCV) VALVE REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
18	**VERIFY SYMPTOM TROUBLESHOOTING COMPLETED** • Measure CO, HC, and NOx concentration again. • Is CO, HC, and NOx concentration within specification?	Yes	Symptom troubleshooting is completed.
		No	Repeat the inspection from Step 1.