ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5]

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Main Relay Operation Inspection

1. Verify that the main relay clicks when the ignition is switched ON and then off.
   - If there is no operation sound, inspect the following:
     — Main relay (See RELAY INSPECTION.)
     — Wiring harness and connector between battery and main relay terminal A
     — Wiring harness and connector between PCM terminal 2K and main relay terminal E

Intake Manifold Vacuum Inspection

1. Verify the air intake hoses are installed properly.
2. Start the engine and let it idle.
3. Disconnect the vacuum hose between the intake manifold and purge solenoid valve from the intake manifold side.
4. Connect a vacuum gauge to the intake manifold and measure the intake manifold vacuum.
   - If not within specification, inspect the following:

   Specification
   −60.0 kPa {−450 mmHg, −17.7 inHg}

   Note
   - Air suction can be located by the engine speed change when lubricant is sprayed on the area where suction is occurring. Check the following places:
     — Air suction at throttle body, charge air cooler, intake manifold and PCV valve installation points
     — Engine compression (See COMPRESSION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Electric Variable Valve Timing Driver Control System Inspection

1. Connect the M-MDS to the DLC-2.
2. Perform the KOER self test. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
3. Verify that DTC P0010:00 or P1380:00 is not displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If DTC P0010:00 or P1380:00 is displayed, perform the DTC inspection. (See DTC P0010:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P1380:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. 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, SKYACTIV-G 2.5].)
5. Verify that DTC P0011:00 or P0012:00 is not displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If DTC P0011:00 or P0012:00 is displayed, perform the DTC inspection. (See DTC P0011:00, P0012:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
6. Access the following PCM PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - VT_IN_ACT
   - VT_IN_DES

   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.**

7. Accelerate and decelerate the vehicle, and drive at normal speed, and verify that the data monitor item VT_IN_ACT value changes in conjunction with the VT_IN_DES value.
   - If this change cannot be verified, replace the electric variable valve timing motor/driver. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Engine Oil Solenoid Valve Control System Inspection

1. Connect the M-MDS to the DLC-2.
2. Perform the KOER self test. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
3. Verify that DTC P06DA:00 is not displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If DTC P06DA:00 is displayed, perform the DTC inspection. (See DTC P06DA:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Inspect the engine oil pressure. (See OIL PRESSURE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

- If the engine oil pressure is not as specified, repair or replace the malfunctioning part according to the inspection results:

5. Access the following PCM PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - OIL_P_SOL
   - RPM
   - ECT
6. With the engine coolant temperature at **98 °C**, increase the engine speed to **4,000 rpm or higher**, and verify that the oil pressure gauge value changes when the data monitor item OIL_P_SOL value is changed from ON to OFF.
   - If the oil pressure gauge value change cannot be verified, inspect the engine oil solenoid valve. (Perform the Engine Oil Solenoid Valve Operation Inspection.)
     (See ENGINE OIL SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Drive-by-wire Control System Inspection
Engine coolant temperature compensation inspection
1. Connect the M-MDS to the DLC-2.
2. Select the following PIDs: (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - ECT
   - IAT
   - RPM
3. Verify that the engine is cold, then start the engine.
4. Verify that the engine speed decreases as the engine warms up.
   - If the engine speed does not decrease or decreases slowly, inspect the following:
     — ECT sensor and related wiring harness (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
     — Throttle body and related wiring harness (See THROTTLE BODY INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Load compensation inspection
1. Start the engine and let it idle.
2. Connect the M-MDS to the DLC-2.
3. Verify that DTC P0506:00 or P0507:00 is not displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If DTC P0506:00 or P0507:00 is displayed, perform the DTC inspection. (See DTC P0506:00, P151B:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0507:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Select the RPM PID.

   Note
   - Excludes temporary idle speed drop just after the loads are turned on.

5. Verify that the engine speed is within specification under each load condition.
   - If the load condition is not as specified, inspect the following:
     — A/C switch and related wiring harness system (A/C request signal is always on or off) (See NO.23 A/C DOES NOT WORK SUFFICIENTLY [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
     — Electrical load
     — Charging system (See BATTERY INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See BATTERY INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5 (WITHOUT i-stop)].) (See GENERATOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Idle-up speed (MTX: Neutral position, ATX: P, N position) (SKYACTIV-G 2.0)
No load: 500—600 rpm (MTX), 550—650 rpm (ATX)
A/C on: 650—800 rpm
Electrical loads on: 600—750 rpm

Idle-up speed (MTX: Neutral position, ATX: P, N position) (SKYACTIV-G 2.5)
No load: 560—660 rpm (MTX), 550—650 rpm (ATX)
A/C on: 650—800 rpm
Electrical loads on: 600—750 rpm

Electronic Control Throttle Operation Inspection
1. Connect the M-MDS to the DLC-2.

2. Perform the KOEO or KOER self test. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
3. Verify that none of the following DTCs are displayed:
   - P0122:00, P0123:00, P0222:00, P0223:00, P0638:00, P2101:00, P2107:00, P2109:00, P2110:00, P2112:00, P2119:00, P2122:00, P2123:00, P2127:00, P2128:00, P2135:00, P2138:00
     — If any one DTC is displayed, perform the DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Access the following PCM PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - ETC_ACT
   - ETC_DSD
5. With the accelerator pedal not depressed and with it depressed to the floor, verify that the data monitor item ETC_ACT value changes in conjunction with the ETC_DSD value.
   - If this change cannot be verified, perform the Resistance Inspection for the throttle body. (See THROTTLE BODY INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Brake override system operation inspection

Note
- If the brake override system operates normally after performing the following inspection, the PCM detects DTC P2299:00.

1. Start the engine and let it idle.
2. Verify that the engine speed becomes **less than 1,200 rpm** under the following conditions.
   - Neutral (MTX)
   - N position (ATX)
   - Engine speed of **3,000 rpm or more** with accelerator pedal depressed
   - Brake pedal depressed
     — If the engine speed becomes **approx. 1,200 rpm**, clear the PCM DTC using the M-MDS. (System operation is normal.)
     — If the engine speed does not become **approx. 1,200 rpm**, inspect for the following parts, then repair or replace the malfunctioning part:
       - APP sensor (See ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
       - Neutral switch No.1 (MTX) (See NEUTRAL SWITCH INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
       - CPP switch (MTX) (See CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
       - Brake switch No.1 (See BRAKE SWITCH INSPECTION.)
       - Brake switch No.2 (See BRAKE SWITCH INSPECTION.)
       - Communication between PCM and TCM (ATX) (See FOREWORD [SKYACTIV-G 2.0, SKYACTIV-G 2.5 (L.H.D.)].) (See FOREWORD [SKYACTIV-G 2.0, SKYACTIV-G 2.5 (R.H.D.)].)

Fuel Injector Operation Inspection

If simulation function of M-MDS is used:

STEP	INSPECTION		ACTION
1	Start the engine and warm it up completely.	Yes	Fuel injectors work properly.
	Access the INJ_1, INJ_2, INJ_3 and INJ_4 PIDs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Turn each fuel injector from on to off using the PIDs for each cylinder. Does the engine speed drop?	No	Engine speed does not drop an any cylinder: • Go to the next step. Engine speed drops on some cylinders: • Go to Step 4.
2	Perform the Main Relay Operation Inspection. (SeeMain Relay Operation Inspection.) Does the main relay work properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results.

STEP	INSPECTION		ACTION
3	Inspect the fuel injector of the suspected cylinder. (See FUEL INJECTOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction?	Yes	Replace the fuel injector. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Inspect the fuel injector power and/or ground systems related wiring harness and connectors for the suspected cylinder. • If all items normal: — Replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • If not: — Repair or replace the malfunctioning part according to the inspection results.
4	Perform the KOER self test using the M-MDS. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Are the DTCs P0201:00, P0202:00, P0203:00 and/or P0204:00 present?	Yes	Go to the appropriate DTC inspection. (See DTC P0201:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0202:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0203:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0204:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
5	Inspect the fuel injector of the suspected cylinder. (See FUEL INJECTOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction?	Yes	Replace the fuel injector. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Inspect the following for the suspected cylinder: • PCM terminals (pulled-out pins, corrosion) • Fuel injector terminals (pulled-out pins, corrosion) • If all items normal: — Replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • If not: — Repair or replace the malfunctioning part according to the inspection results.

If simulation function of M-MDS is not used:

STEP	INSPECTION		ACTION
1	Perform the KOER self test using the M-MDS. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Are the DTCs P0201:00, P0202:00, P0203:00 and/or P0204:00 present?	Yes	Go to the appropriate DTC inspection. (See DTC P0201:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0202:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0203:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0204:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
2	Inspect the fuel injector of the suspected cylinder. (See FUEL INJECTOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction?	Yes	Replace the fuel injector. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
3	Inspect the following for the suspected cylinder: • Fuel injector power and/or ground system related wiring harnesses and connectors • PCM terminals (pulled-out pins, corrosion) • Fuel injector terminals (pulled-out pins, corrosion) Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results.
		No	Replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Fuel Cut Control System Inspection

Note
- This inspection has to be performed after the Fuel Injector Operation Inspection.

If data monitor function of M-MDS is used:
1. Warm up the engine and idle it.
2. Connect the M-MDS to the DLC-2.
3. Select the RPM and the FUELPW PIDs. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

4. Monitor both PIDs while performing the following steps:
   (1) Depress the accelerator pedal and increase the RPM PID to **4,000 rpm**.
   (2) Quickly release the accelerator pedal (brake pedal is not depressed) and verify that the FUELPW PID is **0 msec**, and **2—5 msec** when the RPM PID drops **below 1,200 rpm**.
      • If not as specified, inspect the following:
         — ECT sensor and related wiring harness (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

If data monitor function of M-MDS is not used:
1. Warm up the engine and idle it.
2. Measure the fuel injector control signal wave profile using the oscilloscope while performing the following steps:
   (1) Depress the accelerator pedal and increase the engine speed to **4,000 rpm**.
   (2) Quickly release the accelerator pedal (brake pedal is not depressed) and verify that the wave profile constant **B+**, and the wave appears when the engine speed drops **below 1,200 rpm**. (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
      • If not as specified, inspect the following:
         — ECT sensor and related wiring harness (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Fuel Pump (Low-pressure Side) Operation Inspection
1. Connect the M-MDS to the DLC-2.
2. Remove the fuel-filler cap.
3. Switch the ignition ON (engine off).
4. Turn the fuel pump relay from off to on using the FP PID and inspect if the operation sound of the fuel pump is heard. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   • If operation sound is heard, fuel pump is normal.
   • If no operation sound is heard, proceed to the next step.
5. Measure the voltage at the wiring harness side fuel pump unit terminal A with the FP PID turned on.
   • If the voltage is as specified, inspect the following:
      — Fuel pump continuity
      — Fuel pump ground
      — Wiring harness between the fuel pump relay and PCM terminal 2AQ
   • If not as specified, inspect the following:
      — Fuel pump relay (See RELAY INSPECTION.)
      — Wiring harness connector (Battery—Fuel pump relay—Fuel pump control module—Fuel pump unit)

   Specification
   8.0—11.5 V (Ignition switched ON)

Fuel Pump (Low-pressure Side) Control System Inspection
If simulation function of M-MDS is used:
1. Connect the M-MDS to the DLC-2.
2. Switch the ignition ON (engine off).
3. Select the FP PID. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Turn the fuel pump relay from off to on and inspect if the operation sound of the fuel pump relay is heard.
   • If no operation sound is heard, inspect the fuel pump relay. (See RELAY INSPECTION.)
   • If the fuel pump relay is normal, inspect the following:
      — Wiring harness and connectors (Ignition switch—Fuel pump relay—PCM terminal 2AQ)

If simulation function of M-MDS is not used:
1. Crank the engine and verify that the fuel pump relay operation sound is heard.
2. If the operation sound is not heard, inspect the following:
   • Fuel pump relay (See RELAY INSPECTION.)
   • Wiring harness and connectors (Ignition switch—Fuel pump relay—PCM terminal 2AQ)

Spark Test
1. Disconnect the fuel pump relay and fuel injector relay.
2. Verify that each ignition coil and connector is connected properly.
3. Inspect the ignition system in the following procedure:

   Warning
   • **High voltage in the ignition system can cause strong electrical shock which can result in serious injury. Avoid direct contact with the vehicle body during the following spark test.**

STEP	INSPECTION		ACTION
1	Disconnect the ignition coils from the spark plugs. Remove the spark plugs. (See SPARK PLUG REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Verify that the spark plugs do not have carbon deposits. Is there any malfunction?	Yes	Perform no-load racing at **4,000 rpm** for **2 min**, **2 times** to burn off the carbon deposits. Repeat this step.
		No	Go to the next step.
2	Inspect the spark plugs for damage, wear, and proper plug gap. Is there any malfunction?	Yes	Re-gap or replace the spark plugs, then go to the next step. (See SPARK PLUG REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
3	Reconnect the spark plugs to the ignition coil. Ground the spark plugs to the engine. Is a strong blue spark visible at each cylinder while cranking the engine?	Yes	Ignition system is normal.
		No	Some cylinders do not spark: • Go to the next step. All cylinders do not spark: • Go to Step 5.
4	Switch the ignition off. Inspect the wiring harness between the following terminals (wiring harness-side) for an open or short circuit: • Ignition coil/ion sensor No.1 terminal B—PCM terminal 1AY • Ignition coil/ion sensor No.2 terminal B—PCM terminal 1AT • Ignition coil/ion sensor No.3 terminal B—PCM terminal 1AO • Ignition coil/ion sensor No.4 terminal B—PCM terminal 1AJ Is there any malfunction?	Yes	Repair or replace the suspected wiring harness.
		No	Inspect the ignition coil. (See IGNITION COIL INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Replace the ignition coil/ion sensor. (See IGNITION COIL/ION SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
5	Switch the ignition off. Disconnect the ignition coil/ion sensor connectors. Switch the ignition ON (engine off). Measure the voltage at each ignition coil/ion sensor terminal A (wiring harness-side). Is the voltage **B+**?	Yes	Go to the next step.
		No	Inspect for power supply circuit in wiring harness between ignition switch and ignition coils. Repair or replace the wiring harness for a possible short to power supply.
6	Switch the ignition off. Inspect for continuity between terminal D (wiring harness-side) in each ignition coils and body ground. Is there continuity?	Yes	Go to the next step.
		No	Inspect the connection of the PCM ground point. • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results. • If there is no malfunction: — Repair or replace the wiring harness for a possible open circuit. Repeat from Step 1.
7	Inspect the connection of the PCM and ignition coil/ion sensor connectors. Are the PCM connector or ignition coil/ion sensor connectors poorly connected?	Yes	Repair or replace the connector. Repeat from Step 1.
		No	Go to the next step.
8	Inspect the CKP sensor and crankshaft pulley. (See CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results. (See CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Inspect for an open or short circuit in wiring harness and connector of the CKP sensor. Repair or replace the malfunctioning part according to the inspection results.

Purge Control System Inspection
If simulation function of M-MDS is used:
1. Start the engine.

2. Disconnect the vacuum hose between the purge solenoid valve and the charcoal canister.
3. Put a finger to the purge solenoid valve and verify that there is no vacuum applied when the engine is cold.
   - If there is a vacuum, inspect the following:
     — Wiring harness and connectors (Purge solenoid valve—PCM terminal 1AI)
     — Purge solenoid valve (stuck open) (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Connect the M-MDS to the DLC-2 and verify that DTC P0443:00 is displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - Perform the DTC inspection. (See DTC P0443:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
5. Select the EVAPCP PID.
6. Increase the duty value of the purge solenoid valve to **50 %** and inspect if the operation sound of the valve is heard.
   - If the operation sound is heard, inspect for loose or damaged vacuum hoses. (Intake manifold—Purge solenoid valve—Charcoal canister)
   - If the operation sound is not heard, perform the purge solenoid valve inspection. (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
7. Warm up the engine to normal operating temperature.
8. Monitor the EVAPCP PID using the M-MDS, and drive the vehicle **approx. 2000 rpm** for **30 s or more**. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If the EVAPCP PID is **0 %**, inspect the following PIDs:
     — MAF, APP1, APP2, TP REL and LOAD PIDs (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

If simulation function of M-MDS is not used:
1. Start the engine.
2. Disconnect the vacuum hose between the purge solenoid valve and the charcoal canister.
3. Put a finger to the purge solenoid valve and verify that there is no vacuum applied when the engine is cold.
   - If there is a vacuum, inspect the following:
     — Wiring harness and connectors (Purge solenoid valve—PCM terminal 1AI)
     — Purge solenoid valve (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Warm up the engine to the normal operating temperature.
5. Stop the engine.
6. Connect the M-MDS to the DLC-2 and verify that DTC P0443:00 is displayed.
   - Perform the DTC inspection. (See DTC P0443:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
7. Switch the ignition ON (engine off).
8. Select the ECT PID. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
9. Verify that the engine coolant temperature is **above 60 °C {140 °F}**.
   - If the M-MDS indicates that the temperature is **below 60 °C {140 °F}**, perform the ECT sensor inspection. (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
10. Set the vehicle on a dynamometer or chassis roller.

    Warning
    - **When the dynamometer or chassis roller is operating, there is a possibility that the operator may come into contact with or be caught up in the rotating parts, leading to serious injuries or death. When performing work while the dynamometer or chassis roller is operating, be careful not to contact or be caught up in any of the rotating parts.**

11. Drive the vehicle at an engine speed to **approx. 2000 rpm** for **30 s or more**.
12. Put a finger to the purge solenoid valve and verify that there is no vacuum applied during Step 2.
    - If there is no vacuum, inspect the following:
      — Wiring harness and connector (Main relay—Purge solenoid valve—PCM terminal 1AI)
      — Purge solenoid valve (See PURGE SOLENOID VALVE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
      — MAF, APP1, APP2, TP REL and LOAD PIDs (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
    - If there is vacuum, inspect the following:
      — Vacuum hose (Purge solenoid valve—Charcoal canister)

A/C Cut-off Control System Inspection
1. Start the engine.
2. Turn the A/C switch and fan switch on.
3. Verify that the A/C compressor magnetic clutch actuates.

- If it does not actuate, perform the symptom troubleshooting “NO.23 A/C DOES NOT WORK SUFFICIENTLY“. (See NO.23 A/C DOES NOT WORK SUFFICIENTLY [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

4. Fully open the throttle valve and verify that the A/C compressor magnetic clutch does not actuate for **2—5 s**.
   - If it actuates, inspect the following:
     — A/C relay (See RELAY INSPECTION.)
     — Open or short to ground in wiring harness and connectors (Ignition switch—A/C relay—PCM terminal 2AF)
     — A/C related parts
     — APP1, APP2 PIDs (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Cooling Fan Control System Inspection

1. Connect the M-MDS to the DLC-2.
2. Start the engine and warm it up to normal operating temperature.
3. Perform the KOER self test. (See KOEO/KOER SELF TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Verify that DTC P0480:00 or P0482:00 is not shown and the cooling fan operates during the KOER self test.
   - If the DTC P0480:00 or P0482:00 is displayed, perform the DTC inspection. (See DTC P0480:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0482:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If the cooling fans do not operate, proceed to the following:
     — Inspect the following parts in the indicated order in accordance with fan operation conditions.
       - Open circuit between cooling fan relay and battery positive terminal
       - Open circuit between cooling fan relay and ground
       - Poor connection of the cooling fan relay
     — If there is no malfunction:
       - Replace the cooling fan component. (See COOLING FAN MOTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

Hydraulic Variable Valve Timing Control System Operation Inspection
When idling cannot be continued

1. Connect the M-MDS to the DLC-2 and verify that DTC P2090:00 or P2091:00 is displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - Perform the DTC inspection. (See DTC P2090:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P2091:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
2. Remove the OCV and verify that the spool valve is at maximum advanced position. (See OIL CONTROL VALVE (OCV) INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
3. Connect the OCV.
4. Switch the ignition ON (engine off).
5. Verify that the spool valve is at the maximum advanced position.
   - If the spool valve is stuck in the retard direction, inspect for the following:
     — Short circuit in wiring harnesses or connectors between OCV and PCM
6. Inspect the hydraulic variable valve timing actuator. (See HYDRAULIC VARIABLE VALVE TIMING ACTUATOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

When idling can be continued
If simulation function of M-MDS is used:

1. Warm up the engine to normal operating temperature.
2. Connect the M-MDS to the DLC-2.
3. Verify that DTC P2090:00 or P2091:00 is displayed. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   — Perform the DTC inspection. (See DTC P2090:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P2091:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
4. Start the engine and let it idle.
5. Select the VT EX_DES PID. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
6. Increase the OCV duty value and verify that the engine idles rough or stalls.
   - If as specified, inspect the timing belt component (valve timing deviation). (See HYDRAULIC VARIABLE VALVE TIMING ACTUATOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
   - If not as specified, go to the next step.
7. Remove the OCV while the connector is connected. (See OIL CONTROL VALVE (OCV) REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
8. Switch the ignition ON (engine off).
9. Select the VT EX_DES PID. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
10. Increase the OCV duty value and verify that the spool valve operates in the retard direction.

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   - If as specified, inspect the following hydraulic passage for restriction and/or leakage:
     — Oil pressure switch—OCV

— OCV—Exhaust camshaft
— Exhaust camshaft internal passage
• If not as specified, inspect the following:
— OCV operation (See OIL CONTROL VALVE (OCV) INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

11. If they are normal, replace the exhaust camshaft pulley. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR, HYDRAULIC VARIABLE VALVE TIMING ACTUATOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)

If simulation function of M-MDS is not used:

1. Connect the M-MDS to the DLC-2 and verify that DTC P2090:00 or P2091:00 is displayed.
— Perform the DTC inspection. (See DTC P2090:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P2091:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
2. Disconnect the OCV connector.
3. Warm up the engine and idle it.
4. Apply the battery voltage to the OCV and verify that the engine idles rough or stalls.
• If the engine idles rough or stalls, inspect the timing belt component (valve timing deviation).
• If the engine does not idle rough or stalls, go to the next step.
5. Remove the OCV and perform the spool valve operation inspection. (See OIL CONTROL VALVE (OCV) REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
• If not as specified, inspect the following:
— OCV (See OIL CONTROL VALVE (OCV) INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
— Harnesses and connectors between OCV and PCM have an open or short circuit
• If as specified, inspect the following hydraulic passages for restriction or leakage or both:
— Oil pressure switch—OCV
— OCV—Exhaust camshaft
— Exhaust camshaft internal passage
6. If they are normal, replace the exhaust camshaft pulley. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR, HYDRAULIC VARIABLE VALVE TIMING ACTUATOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)