

DTC P0301:00, P0302:00, P0303:00, P0304:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5]

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Note

- To determine the malfunctioning part, proceed with the diagnostics from "Function Inspection Using M-MDS".

Details On DTCs

DESCRIPTION	P0301:00: Cylinder No.1 misfire detected P0302:00: Cylinder No.2 misfire detected P0303:00: Cylinder No.3 misfire detected P0304:00: Cylinder No.4 misfire detected	
DETECTION CONDITION	Determination conditions	<ul style="list-style-type: none"> Any one of the following conditions is met: <ul style="list-style-type: none"> The misfire rate of specific cylinders for every 200 rotations of the crankshaft exceeds the specified value (misfire which may damage catalytic converter). The misfire rate of specific cylinders for every 1,000 rotations of the crankshaft exceeds the specified value (misfire going against emission regulations).
	Preconditions	<ul style="list-style-type: none"> Battery voltage: 9—18 V ^{*1} Engine speed: 500—6,700 rpm ^{*1} Engine coolant temperature: -10 °C {14 °F} or more ^{*1} Not cranking Not stalling Fuel-cut control not implemented Crankshaft installation tolerance learning completed Engine condition is stabilized (not directly after gear change) <p>^{*1}: Value can be verified by displaying PIDs using M-MDS</p>
	Malfunction determination period	<ul style="list-style-type: none"> 200 rotations of crankshaft (misfire which may damage catalytic converter) 1,000 rotations of crankshaft (misfire going against emission regulations)
	Drive cycle	2
	Self test type	CMDTC self test
	Sensor used	<ul style="list-style-type: none"> CKP sensor MAF sensor MAP sensor
FAIL-SAFE FUNCTION	<ul style="list-style-type: none"> Limits intake air amount Implement fuel-cut control (if the catalytic converter may be damaged, perform fuel-cut on cylinder misfiring the most). 	
VEHICLE STATUS WHEN DTCs ARE OUTPUT	<ul style="list-style-type: none"> Misfiring which may damage catalytic converter (number of drive cycles: 1): <ul style="list-style-type: none"> Check engine light flashes and pending code is recorded Drive cycle directly after above drive cycle (number of drive cycles: 2): <ul style="list-style-type: none"> Malfunction determined: check engine light is illuminated Normal is determined: Pending code cleared Rough idling, poor acceleration, stalling 	

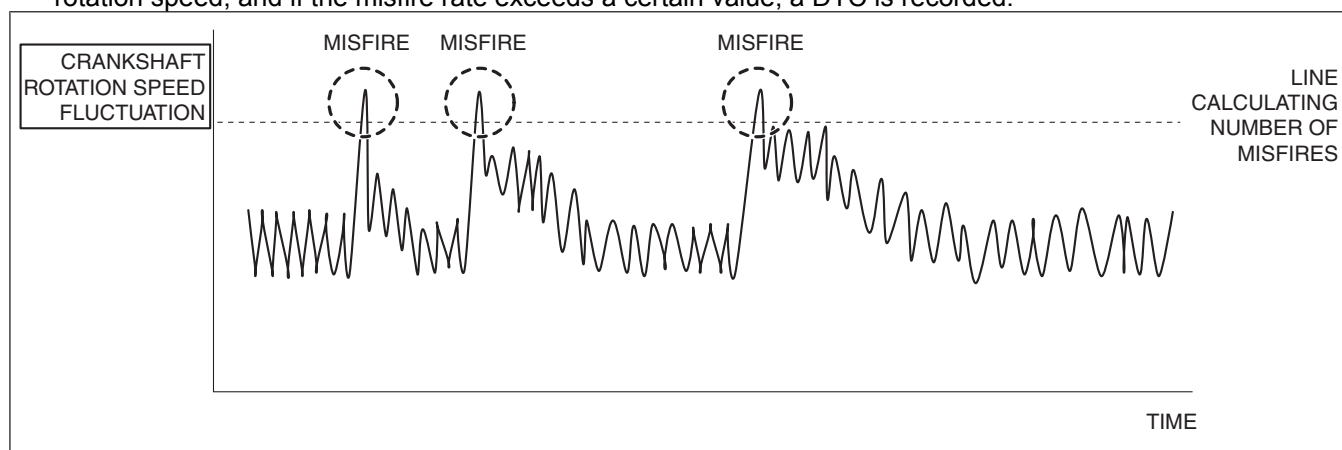
DESCRIPTION	P0301:00: Cylinder No.1 misfire detected P0302:00: Cylinder No.2 misfire detected P0303:00: Cylinder No.3 misfire detected P0304:00: Cylinder No.4 misfire detected
POSSIBLE CAUSE	<ul style="list-style-type: none"> • Improper operation of ignition system <ul style="list-style-type: none"> — Spark plug malfunction — Ignition coil related wiring harness or connector malfunction — Ignition coil malfunction • Fuel injector malfunction <ul style="list-style-type: none"> — Improper operation of fuel injector — Fuel injector related wiring harness malfunction • Erratic signal to PCM <ul style="list-style-type: none"> — CKP sensor signal malfunction — ECT sensor No.1 signal malfunction — MAF sensor signal malfunction — MAP sensor signal malfunction — IAT sensor No.1 signal malfunction — APP sensor signal malfunction — TP sensor signal malfunction — VSS signal malfunction — Related connector or terminals malfunction — Related wiring harness malfunction • Poor drive belt assembly or adhesion of oil • Drive belt auto tensioner malfunction • Air leakage from intake air system (between intake manifold and cylinder head) • Engine malfunction <ul style="list-style-type: none"> — Insufficient engine compression — Engine coolant leakage to combustion chamber • PCM malfunction

System Wiring Diagram

- Not applicable

Function Explanation (DTC Detection Outline)

- The PCM detects the crankshaft rotation speed based on the crankshaft position sensor signal. If there is a small amount of fluctuation in crankshaft rotation speed due to the effect of combustion of each cylinder while the engine is rotating and a misfire occurs in any of the pistons, the crankshaft rotation speed will change suddenly. The PCM adds the number of changes in sudden rotation speed (misfire rate) to each specified crankshaft rotation speed, and if the misfire rate exceeds a certain value, a DTC is recorded.



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Repeatability Verification Procedure

1. Drive the vehicle at a speed of **40 km/h {25 mph} or more**.
2. Shift to 3rd gear and rapidly accelerate the vehicle to **60 km/h {37 mph}** (to execute misfire monitor).
3. Release the accelerator pedal and decelerate the vehicle to **40 km/h {25 mph}**.
4. Repeat Step 1 to 3 operations **above 5 times**.

Note

- Match the engine coolant temperature in the recorded FREEZE FRAME DATA (Mode 2)/snapshot data, the vehicle speed, and engine speed values to the best extent possible while driving the vehicle.

- Try to reproduce the malfunction by driving the vehicle for **5 min** based on the values in the FREEZE FRAME DATA (Mode 2)/snapshot data.

PID Item/Simulation Item Used In Diagnosis**PID/DATA monitor item table**

—: Not applicable

Item	Definition	Unit/ Condition	Condition/Specification (Reference)
APP1	APP sensor No.1	%	<ul style="list-style-type: none"> Accelerator pedal released: Approx. 15% Accelerator pedal depressed: Approx. 82%
		V	<ul style="list-style-type: none"> Accelerator pedal released: Approx. 0.75 V Accelerator pedal depressed: Approx. 4.1 V
APP2	APP sensor No.2	%	<ul style="list-style-type: none"> Accelerator pedal released: Approx. 7.45% Accelerator pedal depressed: Approx. 41%
		V	<ul style="list-style-type: none"> Accelerator pedal released: Approx. 0.38 V Accelerator pedal depressed: Approx. 2.05 V
ECT	Engine coolant temperature	°C, °F	Displays ECT
		V	<ul style="list-style-type: none"> ECT is 20 °C {68 °F}: Approx. 3.10 V ECT is 40 °C {104 °F}: Approx. 2.16 V ECT is 60 °C {140 °F}: Approx. 1.40 V ECT is 80 °C {176 °F}: Approx. 0.87 V ECT is 100 °C {212 °F}: Approx. 0.54 V
IAT	Intake air temperature No.1	°C, °F	Displays IAT (No.1)
		V	<ul style="list-style-type: none"> IAT is 20 °C {68 °F}: Approx. 2.70 V IAT is 40 °C {104 °F}: Approx. 1.80 V IAT is 60 °C {140 °F}: Approx. 1.20 V
MAF	Mass airflow	g/Sec	Displays MAF
		V	<ul style="list-style-type: none"> Switch ignition ON (engine off) (MAF: 0.59 g/s {0.078 lb/min}): Approx. 0.72 V Idle (after warm up) (MAF: 2.17 g/s {0.287 lb/min}): Approx. 0.86 V Racing (engine speed is 2,000 rpm) (MAF: 4.73 g/s {0.626 lb/min}): Approx. 1.07 V
MAP	Manifold absolute pressure	KPa {MPa}, mBar {Bar}, psi, in H2O	Displays MAP
		V	<ul style="list-style-type: none"> Switch ignition ON (engine off) (MAP: 101 kPa {1.03 kgf/cm², 14.6 psi}): Approx. 4.07 V Idle (after warm up) (MAP: 33 kPa {0.34 kgf/cm², 4.8 psi}): Approx. 1.34 V Racing (engine speed is 2,000 rpm) (MAP: 26 kPa {0.27 kgf/cm², 3.8 psi}): Approx. 1.05 V
MF_CAT_2	Number of misfires corresponding to possible catalytic converter damage (No. 2 cylinder)	—	Displays number of misfires corresponding to possible catalytic converter damage (No.2 cylinder)
MF_CAT_3	Number of misfires corresponding to possible catalytic converter damage (No. 3 cylinder)	—	Displays number of misfires corresponding to possible catalytic converter damage (No.3 cylinder)
MF_CAT_4	Number of misfires corresponding to possible catalytic converter damage (No. 4 cylinder)	—	Displays number of misfires corresponding to possible catalytic converter damage (No.4 cylinder)
MF_CAT1	Number of misfires corresponding to possible catalytic converter damage (No. 1 cylinder)	—	Displays number of misfires corresponding to possible catalytic converter damage (No.1 cylinder)
MF_EMI_2	Number of misfires possibly affecting emission (No.2 cylinder)	—	Displays number of misfires possibly affecting emission (No.2 cylinder)

Item	Definition	Unit/ Condition	Condition/Specification (Reference)
MF_EMI_3	Number of misfires possibly affecting emission (No.3 cylinder)	—	• Displays number of misfires possibly affecting emission (No.3 cylinder)
MF_EMI_4	Number of misfires possibly affecting emission (No.4 cylinder)	—	• Displays number of misfires possibly affecting emission (No.4 cylinder)
MF_EMI1	Number of misfires possibly affecting emission (No.1 cylinder)	—	• Displays number of misfires possibly affecting emission (No.1 cylinder)
RPM	Engine speed	RPM	• Displays engine speed
TP_REL	Relative throttle position	%	• Accelerator pedal released: Approx. 12% • Accelerator pedal depressed: Approx. 82%
VSS	Vehicle speed	KPH, MPH	• Displays vehicle speed

Function Inspection Using M-MDS

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: VERIFY RELATED SERVICE INFORMATION AVAILABILITY <ul style="list-style-type: none"> Verify related Service Information availability. Is any related Service Information available? 	Yes	Perform repair or diagnosis according to the available Service Information.
		No	• If the vehicle is not repaired, go to the next step. Go to the next step.
2	PURPOSE: IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA (MODE 2) <ul style="list-style-type: none"> Is the DTC P0301:00, P0302:00, P0303:00 or P0304:00 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, SKYACTIV-G 2.5].)
3	PURPOSE: RECORD VEHICLE STATUS AT TIME OF DTC DETECTION TO UTILIZE WITH REPEATABILITY VERIFICATION <ul style="list-style-type: none"> Has the FREEZE FRAME DATA (Mode 2)/ snapshot data been recorded? 	Yes	Go to the next step.
		No	Record the FREEZE FRAME DATA (Mode 2)/snapshot data on the repair order, then go to the next step. Note <ul style="list-style-type: none"> Recording can be facilitated using the screen capture function of the PC.
4	PURPOSE: VERIFY RELATED PENDING CODE AND/OR DTC <ul style="list-style-type: none"> Switch the ignition off, then ON (engine off). Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Are any other PENDING CODEs and/or DTCs present? 	Yes	Go to the applicable PENDING CODE or DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
5	PURPOSE: VERIFY IF THERE IS PID ITEM CAUSING DRASTIC CHANGES OF ACCELERATION FLUCTUATION BY INPUT SIGNAL TO PCM <ul style="list-style-type: none"> Start the engine. Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) <ul style="list-style-type: none"> APP1 APP2 ECT IAT MAF MAP RPM TP_REL VSS Is there a PID item affected by acceleration fluctuation? 	Yes	Inspect the suspected sensor and related wiring harness. <ul style="list-style-type: none"> If there is any malfunction: <ul style="list-style-type: none"> Repair or replace the malfunctioning part. Go to the troubleshooting procedure to perform the procedure from Step 10. If there is no malfunction: <ul style="list-style-type: none"> Go to the next step.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
6	<p>PURPOSE: RECORD NUMBER OF CURRENT MISFIRES FOR USE WITH MISFIRE INSPECTION</p> <ul style="list-style-type: none"> • Display the misfire rate and record the number of misfires. <ul style="list-style-type: none"> — Access the following PIDs using the M-MDS (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • MF_CAT1 • MF_CAT_2 • MF_CAT_3 • MF_CAT_4 • MF_EMI1 • MF_EMI_2 • MF_EMI_3 • MF_EMI_4 	—	Go to the next step.
7	<p>PURPOSE: VERIFY IF MISFIRE CAUSE IS BAD SPARK PLUGS</p> <ul style="list-style-type: none"> • Switch the spark plugs on a cylinder that is misfiring and a cylinder that is not misfiring. (See SPARK PLUG REMOVAL/ INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Start the engine. • Verify all accessory loads (A/C, headlights, blower fan, rear window defroster) are off. • Under no-load conditions (P or N position (ATX)/neutral (MTX), increase the engine speed to 3,000 rpm. • Display the misfire rate and record the number of misfires. <ul style="list-style-type: none"> — Access the following PIDs using the M-MDS (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • MF_CAT1 • MF_CAT_2 • MF_CAT_3 • MF_CAT_4 • MF_EMI1 • MF_EMI_2 • MF_EMI_3 • MF_EMI_4 • Is there a change from the recorded number of misfires? 	Yes	Go to the troubleshooting procedure to perform the procedure from Step 1.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
8	PURPOSE: VERIFY IF MISFIRE CAUSE IS BAD IGNITION COIL <ul style="list-style-type: none"> Switch the ignition coils on a cylinder that is misfiring and a cylinder that is not misfiring. (See IGNITION COIL/ION SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Start the engine. Verify all accessory loads (A/C, headlights, blower fan, rear window defroster) are off. Under no-load conditions (P or N position (ATX)/neutral (MTX)), increase the engine speed to 3,000 rpm. Display the misfire rate and record the number of misfires. <ul style="list-style-type: none"> Access the following PIDs using the M-MDS (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See PCM INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) <ul style="list-style-type: none"> MF_CAT1 MF_CAT_2 MF_CAT_3 MF_CAT_4 MF_EMI1 MF_EMI_2 MF_EMI_3 MF_EMI_4 Is there a change from the recorded number of misfires? 	Yes	Go to the troubleshooting procedure to perform the procedure from Step 2.
		No	Go to the troubleshooting procedure to perform the procedure from Step 3.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure

- Step 1—2
 - Perform an ignition system parts inspection.
- Step 3
 - Perform a fuel injector control system inspection.
- Step 4—9
 - Perform an inspection of parts which may be affected by misfire except for ignition-related parts and fuel injection control-related parts.
- Step 10—11
 - Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: DETERMINE INTEGRITY OF SPARK PLUG <ul style="list-style-type: none"> Inspect the spark plug. (See SPARK PLUG INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction? 	Yes	Replace the spark plug, then go to Step 10. (See SPARK PLUG REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
2	PURPOSE: DETERMINE INTEGRITY OF IGNITION COIL <ul style="list-style-type: none"> Inspect the ignition coil. (See IGNITION COIL INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction? 	Yes	Replace the ignition coil/ion sensor, then go to Step 10. (See IGNITION COIL/ION SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
3	PURPOSE: DETERMINE INTEGRITY OF FUEL INJECTOR <ul style="list-style-type: none"> Inspect the fuel injector. (See FUEL INJECTOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Is there any malfunction? 	Yes	Replace the fuel injector, then go to Step 10. (See FUEL INJECTOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
4	PURPOSE: VERIFY IF MALFUNCTION RELATED TO INTAKE-AIR SYSTEM IS CAUSE OF MISFIRE <ul style="list-style-type: none"> • Visually inspect for loose, cracked or damaged hoses on intake air system. • Is there any malfunction? 	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 10.
		No	Go to the next step.
5	PURPOSE: VERIFY IF POOR DRIVE BELT ASSEMBLY IS CAUSE OF MISFIRE <ul style="list-style-type: none"> • Verify the condition of the drive belt assembly. (See DRIVE BELT INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction? 	Yes	Assemble drive belt correctly, then go to Step 10. (See DRIVE BELT REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
6	PURPOSE: VERIFY IF FOREIGN MATTER ON DRIVE BELT IS CAUSE OF MISFIRE <ul style="list-style-type: none"> • Verify if oil is on the drive belt. • Is there foreign matter on the drive belt? 	Yes	Remove the foreign matter on the drive belt, then go to Step 10.
		No	Go to the next step.
7	PURPOSE: DETERMINE INTEGRITY OF DRIVE BELT AUTO TENSIONER <ul style="list-style-type: none"> • Inspect the drive belt auto tensioner. (See DRIVE BELT AUTO TENSIONER INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is there any malfunction? 	Yes	Replace the drive belt auto tensioner, then go to Step 10. (See DRIVE BELT AUTO TENSIONER REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
8	PURPOSE: VERIFY IF MALFUNCTION RELATED TO ENGINE COMPRESSION IS CAUSE OF MISFIRE <ul style="list-style-type: none"> Inspect the engine compression. (See COMPRESSION INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Are compression pressures within specification? Specification: <ul style="list-style-type: none"> Compression [SKYACTIV-G 2.0, European (L.H.D. U.K.) specs.] <ul style="list-style-type: none"> Standard: 978 kPa {9.97 kgf/cm², 142 psi} (300 rpm) Minimum: 783 kPa {7.98 kgf/cm², 114 psi} (300 rpm) Maximum difference between cylinders: 166 kPa {1.69 kgf/cm², 24.1 psi} (300 rpm) Compression [SKYACTIV-G 2.0, Except European (L.H.D. U.K.) specs.] <ul style="list-style-type: none"> Standard: 885 kPa {9.02 kgf/cm², 128 psi} (300 rpm) Minimum: 708 kPa {7.22 kgf/cm², 103 psi} (300 rpm) Maximum difference between cylinders: 150 kPa {1.53 kgf/cm², 21.8 psi} (300 rpm) Compression [SKYACTIV-G 2.5] <ul style="list-style-type: none"> Standard: 954 kPa {9.73 kgf/cm², 138 psi} (300 rpm) Minimum: 763 kPa {7.78 kgf/cm², 111 psi} (300 rpm) Maximum difference between cylinders: 161 kPa {1.64 kgf/cm², 23.4 psi} (300 rpm) Note <ul style="list-style-type: none"> 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	Replace or overhaul the engine, then go to Step 10.
9	PURPOSE: VERIFY IF MALFUNCTION RELATED TO SEALING OF ENGINE UNIT (COMBUSTION CHAMBER AND ENGINE COOLANT PASSAGE) IS CAUSE OF MISFIRE <ul style="list-style-type: none"> Perform the "ENGINE COOLANT LEAKAGE INSPECTION". (See ENGINE COOLANT LEAKAGE INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) 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. <ul style="list-style-type: none"> Verify the conditions of the gasket and the cylinder head. <ul style="list-style-type: none"> If there is any malfunction: <ul style="list-style-type: none"> Repair or replace the malfunctioning part according to the inspection results, then go to the next step.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
10	PURPOSE: VERIFICATION OF VEHICLE REPAIR COMPLETION <ul style="list-style-type: none"> • Always reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Implement the repeatability verification procedure. (See Repeatability Verification Procedure.) • Perform the Pending Trouble Code Access Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) • Is the PENDING CODE/DTC P0301:00, P0302:00, P0303:00 or P0304:00 also present? 	Yes	Repeat the inspection from Step 1. • If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) Go to the next step.
		No	Go to the next step.
11	PURPOSE: VERIFY IF THERE IS ANY OTHER MALFUNCTION <ul style="list-style-type: none"> • Is any other DTC or pending code stored? 	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	DTC troubleshooting completed.