

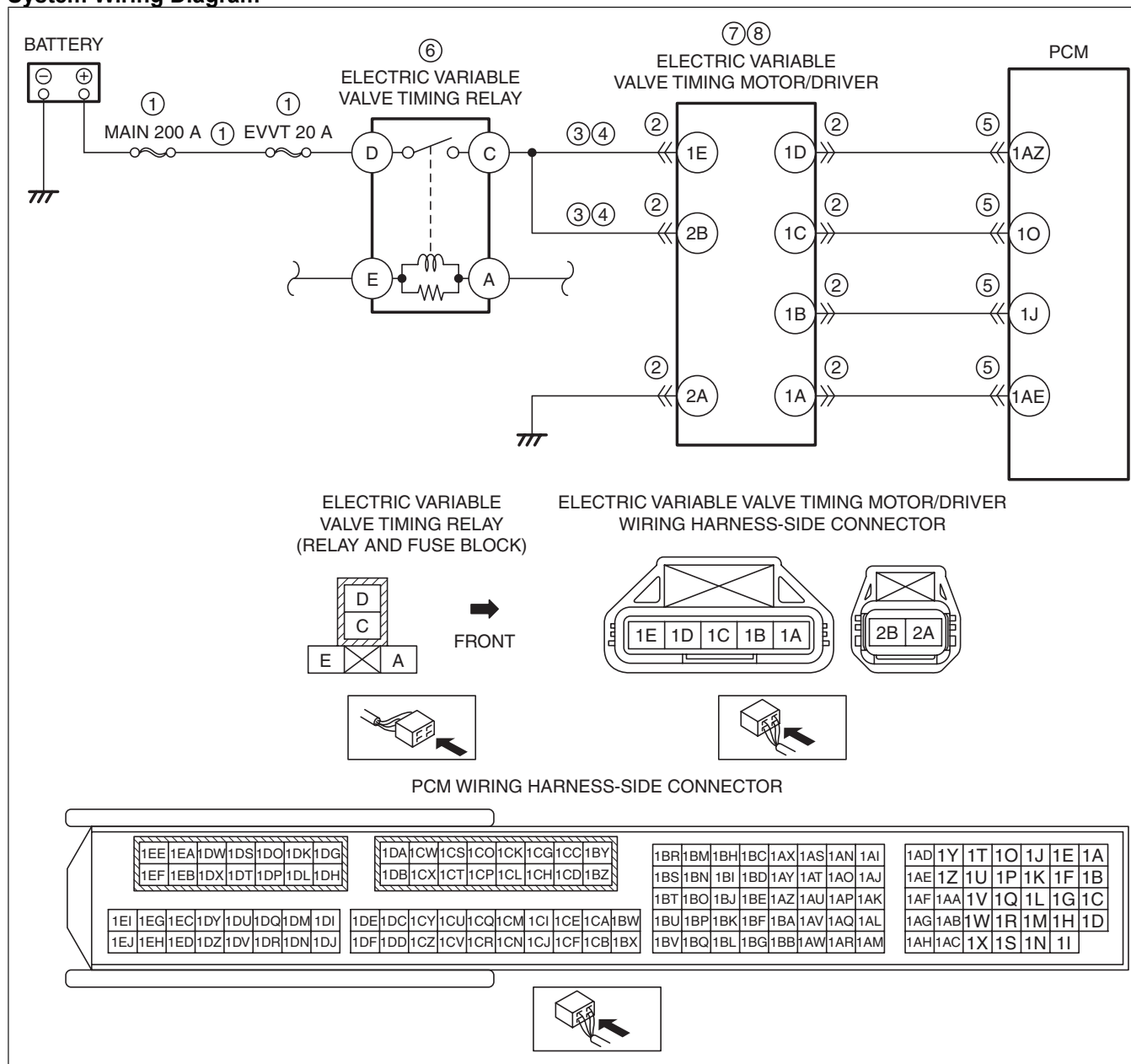
**Note**

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

**Details On DTCs**

<b>DESCRIPTION</b>	<b>Electric variable valve timing control system:</b> <ul style="list-style-type: none"> <li>P0011:00: Over-advanced</li> <li>P0012:00: Over-retarded</li> </ul>	
<b>DETECTION CONDITION</b>	Determination conditions	<ul style="list-style-type: none"> <li>P0011:00: A condition in which the actual intake valve timing advances (excess advance) compared to the target intake valve timing continues for the specified period.</li> <li>P0012:00: A condition in which the actual intake valve timing retards (excess retard) compared to the target intake valve timing continues for the specified period.</li> </ul>
	Preconditions	<ul style="list-style-type: none"> <li>Battery voltage: <b>above 11 V</b> <sup>*1</sup></li> <li>Engine speed: <b>5,000 rpm or less</b> <sup>*1</sup></li> <li>Engine coolant temperature: <b>60 °C {140 °F} or more</b> <sup>*1</sup></li> <li>The following DTCs are not detected: <ul style="list-style-type: none"> <li>P0010:00, P0335:00, P0340:00</li> </ul> </li> </ul> <p><sup>*1</sup>: Value can be verified by displaying PIDs using M-MDS</p>
	Malfunction determination period	Difference is 15 degrees C or more for a continuous approx. <b>10 s</b>
	Drive cycle	<b>1</b>
	Self test type	CMDTC self test
	Sensor used	<ul style="list-style-type: none"> <li>CKP sensor</li> <li>Intake CMP sensor</li> </ul>
<b>FAIL-SAFE FUNCTION</b>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	
<b>VEHICLE STATUS WHEN DTCs ARE OUTPUT</b>	<ul style="list-style-type: none"> <li>Illuminates check engine light.</li> </ul>	
<b>POSSIBLE CAUSE</b>	<ul style="list-style-type: none"> <li>Electric variable valve timing motor/driver connectors or terminals malfunction</li> <li>Short to ground or open circuit in electric variable valve timing relay power supply circuit <ul style="list-style-type: none"> <li>Short to ground in wiring harness between battery positive terminal and electric variable valve timing relay terminal D</li> <li>MAIN 200 A fuse and/or EVVT 20 A fuse malfunction</li> <li>Open circuit in wiring harness between battery positive terminal and electric variable valve timing relay terminal D</li> </ul> </li> <li>Short to ground in wiring harness between the following terminals: <ul style="list-style-type: none"> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 1E</li> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 2B</li> </ul> </li> <li>Open circuit in wiring harness between the following terminals: <ul style="list-style-type: none"> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 1E</li> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 2B</li> </ul> </li> <li>PCM connector or terminals malfunction</li> <li>Electric variable valve timing relay malfunction</li> <li>Electric variable valve timing motor malfunction</li> <li>Electric variable valve timing actuator malfunction <ul style="list-style-type: none"> <li>Electric variable valve timing actuator is stuck in advanced position</li> <li>Electric variable valve timing actuator is stuck in retarded position</li> </ul> </li> <li>Loose timing chain or improper intake valve timing due to timing chain slippage</li> <li>Timing chain malfunction <ul style="list-style-type: none"> <li>Poor assembly of timing chain</li> <li>Looseness or jumping</li> </ul> </li> <li>Mis-detection of intake CMP sensor</li> <li>Mis-detection of CKP sensor</li> <li>PCM malfunction</li> </ul>	

## System Wiring Diagram

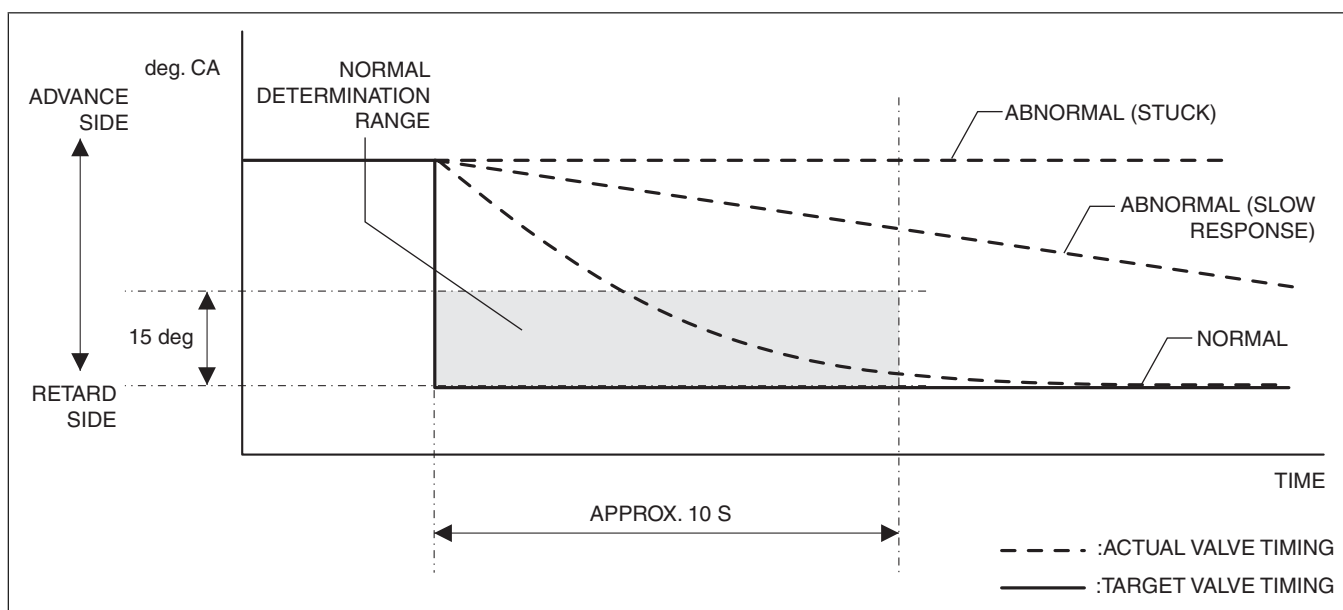


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## Function Explanation (DTC Detection Outline)

### P0011:00

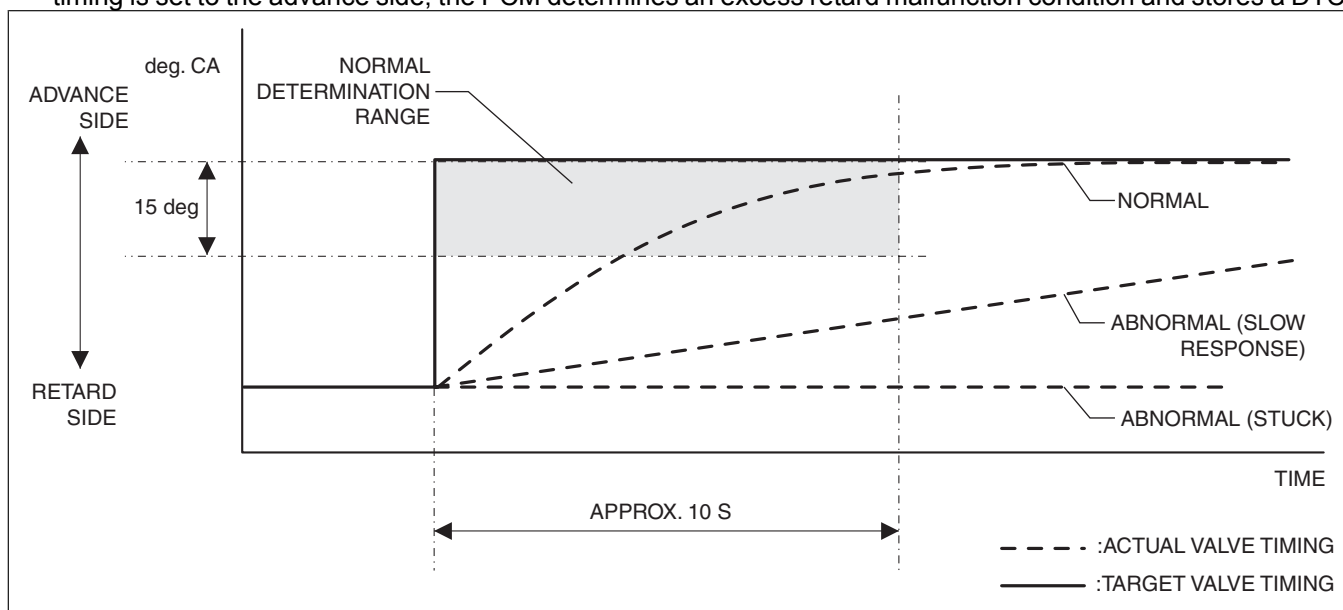
- With the preconditions met, the PCM verifies the conformity of the actual timing relative to the target valve timing. If it does not conform to the normal determination range (difference between target valve timing and actual valve timing is 15 degrees or less) during the malfunction determination period (approx. 9 s), even if the target valve timing is set to the retard side, the PCM determines an excess advance malfunction condition and stores a DTC.



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#### P0012:00

- With the preconditions met, the PCM verifies the conformity of the actual timing relative to the target valve timing. If it does not conform to the normal determination range (difference between target valve timing and actual valve timing is 15 degrees or less) during the malfunction determination period (approx. 9 s), even if the target valve timing is set to the advance side, the PCM determines an excess retard malfunction condition and stores a DTC.



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#### Repeatability Verification Procedure

- Warm up the engine to allow the engine coolant temperature to reach **80 °C {176 °F} or more**.

##### 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

Item	Definition	Unit/ Condition	Condition/Specification (Reference)
VT IN_ACT	Actual intake valve timing	° (deg)	• Displays actual intake valve timing

Item	Definition	Unit/ Condition	Condition/Specification (Reference)
VT IN_DES	Desired intake valve timing	° (deg)	• Displays desired intake valve timing

### Function Inspection Using M-MDS

STEP	INSPECTION	RESULTS	ACTION
1	<b>PURPOSE: VERIFY RELATED SERVICE INFORMATION AVAILABILITY</b> <ul style="list-style-type: none"> <li>• Verify related Service Information availability.</li> <li>• Is any related Service Information available?</li> </ul>	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	<b>PURPOSE: RECORD VEHICLE STATUS AT TIME OF DTC DETECTION TO UTILIZE WITH REPEATABILITY VERIFICATION</b> <ul style="list-style-type: none"> <li>• Has the FREEZE FRAME DATA (Mode 2)/ snapshot data been recorded?</li> </ul>	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.  <b>Note</b> • Recording can be facilitated using the screen capture function of the PC.
3	<b>PURPOSE: VERIFY IF DIAGNOSTIC RESULT IS AFFECTED BY OTHER RELATED DTCs OCCURRING</b> <ul style="list-style-type: none"> <li>• Perform the Pending Trouble Code Access Procedure and DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>• Is the PENDING CODE/DTC P0010:00, P0335:00, P0340:00 or P1380:00 also present?</li> </ul>	Yes	Go to the applicable DTC inspection. (See DTC P0010:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0335:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P0340:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See DTC P1380:00 [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
4	<b>PURPOSE: VERIFY CONFORMITY OF ACTUAL INTAKE VALVE TIMING</b> <ul style="list-style-type: none"> <li>• Start the engine and idle it.</li> <li>• Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) — VT IN_ACT — VT IN_DES</li> <li>• Perform the following:               <ol style="list-style-type: none"> <li>1. Race the engine at an engine speed of <b>3,000 rpm or less.</b></li> <li>2. Run it at idle.</li> <li>3. Repeat Step 1 and 2 operations above five times in succession.</li> </ol> </li> <li>• Does the monitor value of the PID item VT IN_ACT conform to the VT IN_DES PID value?</li> </ul>	Yes	Go to the next step.
		No	Go to the troubleshooting procedure to perform the procedure from Step 1.
5	<b>PURPOSE: VERIFY CONNECTOR CONNECTIONS</b> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Access the VT IN_ACT PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>• Does the PID value fluctuate when the following connectors are shaken?               <ul style="list-style-type: none"> <li>— Electric variable valve timing motor/driver</li> <li>— PCM</li> </ul> </li> </ul>	Yes	Repair or replace the applicable wiring harness or connector parts. Go to the troubleshooting procedure to perform the procedure from Step 12.
		No	Go to the troubleshooting procedure to perform the procedure from Step 1.

### Troubleshooting Diagnostic Procedure

#### Intention of troubleshooting procedure

- Step 1—5
  - Perform an inspection of the connectors and wiring harnesses between the battery positive terminal and electric variable valve timing relay and the electric variable valve timing motor/driver.
- Step 6
  - Perform a unit inspection of the electric variable valve timing relay.
- Step 7—9

- Perform an inspection of the electric variable valve timing drive parts.
- Step 10—11
  - Inspect the intake CMP sensor and CKP sensor detection areas for adhesion of foreign matter.
- Step 12—13
  - Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	<b>PURPOSE: INSPECT ELECTRIC VARIABLE VALVE TIMING RELAY POWER SUPPLY CIRCUIT FOR SHORT TO GROUND OR OPEN CIRCUIT</b> <ul style="list-style-type: none"> <li>• Switch the ignition off.</li> <li>• Remove the electric variable valve timing relay.</li> <li>• Measure the voltage at the electric variable valve timing relay terminal D (wiring harness-side).</li> <li>• Is the voltage <b>B+</b>?</li> </ul>	Yes	Go to the next step.
		No	Inspect the MAIN 200 A fuse and EVVT 20 A fuse. <ul style="list-style-type: none"> <li>• If the fuse is burnt out:               <ul style="list-style-type: none"> <li>— Refer to the wiring diagram and verify whether or not there is a common connector between battery positive terminal and electric variable valve timing relay terminal D.</li> </ul> </li> <li><b>If there is a common connector:</b> <ul style="list-style-type: none"> <li>• Determine the malfunctioning part by inspecting the common connector and the terminal for corrosion, damage, or pin disconnection, and the common wiring harness for a short to ground.</li> <li>• Repair or replace the malfunctioning part.</li> </ul> </li> <li><b>If there is no common connector:</b> <ul style="list-style-type: none"> <li>• Repair or replace the wiring harness which has a short to ground.</li> <li>• Replace the malfunctioning fuse.</li> </ul> </li> <li>• If the fuse is damaged:               <ul style="list-style-type: none"> <li>— Replace the malfunctioning fuse.</li> </ul> </li> <li>• If all fuses are normal:               <ul style="list-style-type: none"> <li>— Refer to the wiring diagram and verify whether or not there is a common connector between battery positive terminal and electric variable valve timing relay terminal D.</li> </ul> </li> <li><b>If there is a common connector:</b> <ul style="list-style-type: none"> <li>• Determine the malfunctioning part by inspecting the common connector and the terminal for corrosion, damage, or pin disconnection, and the common wiring harness for an open circuit.</li> <li>• Repair or replace the malfunctioning part.</li> </ul> </li> <li><b>If there is no common connector:</b> <ul style="list-style-type: none"> <li>• Repair or replace the wiring harness which has an open circuit.</li> </ul> </li> </ul> Go to Step 12.
2	<b>PURPOSE: INSPECT ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER CONNECTOR CONDITION</b> <ul style="list-style-type: none"> <li>• Disconnect the electric variable valve timing motor/driver connector.</li> <li>• Inspect for poor connection (such as damaged/pulled-out pins, corrosion).</li> <li>• Is there any malfunction?</li> </ul>	Yes	Repair or replace the connector and/or terminals, then go to Step 12.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
3	<b>PURPOSE: INSPECT ELECTRIC VARIABLE VALVE TIMING RELAY CONTROL CIRCUIT FOR SHORT TO GROUND</b> <ul style="list-style-type: none"> <li>Electric variable valve timing relay is removed.</li> <li>Verify that the electric variable valve timing motor/driver connector is disconnected.</li> <li>Inspect for continuity between electric variable valve timing relay terminal C (wiring harness-side) and body ground.</li> <li>Is there continuity?</li> </ul>	Yes	Refer to the wiring diagram and verify whether or not there is a common connector between the following terminals: <ul style="list-style-type: none"> <li>Electric variable valve timing relay terminal C— Electric variable valve timing motor/driver terminal 1E</li> <li>Electric variable valve timing relay terminal C— Electric variable valve timing motor/driver terminal 2B</li> </ul> <b>If there is a common connector:</b> <ul style="list-style-type: none"> <li>Determine the malfunctioning part by inspecting the common connector and the terminal for corrosion, damage, or pin disconnection, and the common wiring harness for a short to ground.</li> <li>Repair or replace the malfunctioning part.</li> </ul> <b>If there is no common connector:</b> <ul style="list-style-type: none"> <li>Repair or replace the wiring harness which has a short to ground.</li> </ul> Go to Step 12.
		No	Go to the next step.
4	<b>PURPOSE: INSPECT ELECTRIC VARIABLE VALVE TIMING RELAY CONTROL CIRCUIT FOR OPEN CIRCUIT</b> <ul style="list-style-type: none"> <li>Electric variable valve timing relay is removed.</li> <li>Verify that the electric variable valve timing motor/driver connector is disconnected.</li> <li>Inspect for continuity between the following terminals (wiring harness-side): <ul style="list-style-type: none"> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 1E</li> <li>Electric variable valve timing relay terminal C—Electric variable valve timing motor/driver terminal 2B</li> </ul> </li> <li>Is there continuity?</li> </ul>	Yes	Go to the next step.
		No	Refer to the wiring diagram and verify whether or not there is a common connector between the following terminals: <ul style="list-style-type: none"> <li>Electric variable valve timing relay terminal C— Electric variable valve timing motor/driver terminal 1E</li> <li>Electric variable valve timing relay terminal C— Electric variable valve timing motor/driver terminal 2B</li> </ul> <b>If there is a common connector:</b> <ul style="list-style-type: none"> <li>Determine the malfunctioning part by inspecting the common connector and the terminal for corrosion, damage, or pin disconnection, and the common wiring harness for an open circuit.</li> <li>Repair or replace the malfunctioning part.</li> </ul> <b>If there is no common connector:</b> <ul style="list-style-type: none"> <li>Repair or replace the wiring harness which has an open circuit.</li> </ul> Go to Step 12.
5	<b>PURPOSE: INSPECT PCM CONNECTOR CONDITION</b> <ul style="list-style-type: none"> <li>Disconnect the PCM connector.</li> <li>Inspect for poor connection (such as damaged/pulled-out pins, corrosion).</li> <li>Is there any malfunction?</li> </ul>	Yes	Repair or replace the connector and/or terminals, then go to Step 12.
		No	Go to the next step.
6	<b>PURPOSE: DETERMINE INTEGRITY OF ELECTRIC VARIABLE VALVE TIMING RELAY</b> <ul style="list-style-type: none"> <li>Inspect the electric variable valve timing relay. (See RELAY INSPECTION.)</li> <li>Is there any malfunction?</li> </ul>	Yes	Replace the electric variable valve timing relay, then go to Step 12.
		No	Go to the next step.
7	<b>PURPOSE: DETERMINE INTEGRITY OF ELECTRIC VARIABLE VALVE TIMING MOTOR</b> <ul style="list-style-type: none"> <li>Inspect the electric variable valve timing motor. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is there any malfunction?</li> </ul>	Yes	Replace the electric variable valve timing motor/driver, then go to Step 12. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
8	<b>PURPOSE: DETERMINE INTEGRITY OF ELECTRIC VARIABLE VALVE TIMING ACTUATOR</b> <ul style="list-style-type: none"> <li>Inspect the electric variable valve timing actuator. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is there any malfunction?</li> </ul>	Yes	Replace the electric variable valve timing actuator, then go to Step 12. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR, HYDRAULIC VARIABLE VALVE TIMING ACTUATOR REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
9	<b>PURPOSE: VERIFY ASSEMBLY CONDITION OF TIMING CHAIN</b> <ul style="list-style-type: none"> <li>Verify the condition of the timing chain assembly (intake valve timing, looseness, jumping). (See TIMING CHAIN REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is there any malfunction?</li> </ul>	Yes	Repair or replace the malfunctioning part. Assemble the timing chain using the correct timing, then go to the Step 12. (See TIMING CHAIN REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	Go to the next step.
10	<b>PURPOSE: VERIFY IF FOREIGN MATTER ON INTAKE CMP SENSOR DETECTION AREA AFFECTS DIAGNOSTIC RESULTS</b> <ul style="list-style-type: none"> <li>Visually inspect for intake CMP sensor. (See CAMSHAFT POSITION (CMP) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is there foreign matter such as metallic dust on the intake CMP sensor detection area?</li> </ul>	Yes	Remove the foreign matter, then go to Step 12.
		No	Go to the next step.
11	<b>PURPOSE: VERIFY IF FOREIGN MATTER ON CKP SENSOR DETECTION AREA AFFECTS DIAGNOSTIC RESULTS</b> <ul style="list-style-type: none"> <li>Visually inspect for CKP sensor. (See CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is there foreign matter such as metallic dust on the CKP sensor detection area?</li> </ul>	Yes	Remove the foreign matter, then go to the next step.
		No	Go to the next step.
12	<b>PURPOSE: VERIFICATION OF VEHICLE REPAIR COMPLETION</b> <ul style="list-style-type: none"> <li>Always reconnect all disconnected connectors.</li> <li>Clear the DTC from the PCM memory using the M-MDS. (See AFTER REPAIR PROCEDURE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Implement the repeatability verification procedure. (See Repeatability Verification Procedure.)</li> <li>Perform the DTC Reading Procedure. (See ON-BOARD DIAGNOSTIC TEST [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> <li>Is the DTC P0011:00 or P0012:00 also present?</li> </ul>	Yes	Repeat the inspection from Step 1. <ul style="list-style-type: none"> <li>If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)</li> </ul> Go to the next step.
		No	Go to the next step.
13	<b>PURPOSE: VERIFY IF THERE IS ANY OTHER MALFUNCTION</b> <ul style="list-style-type: none"> <li>Is any other DTC or pending code stored?</li> </ul>	Yes	Go to the applicable DTC inspection. (See DTC TABLE [SKYACTIV-G 2.0, SKYACTIV-G 2.5].)
		No	DTC troubleshooting completed.