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2009 MAZDA CX-9 OEM Service and Repair Workshop Manual

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Item (definition)	Unit/Condition	Value type	Condition/Specification (Reference)
FUELPW (Fuel injector duration)	Sec	Calculation	• Idle (after warm up): Approx. 1.26 ms • Racing (engine speed is 2,000 rpm): Approx. 1.2 ms • Racing (engine speed is 4,000 rpm): Approx. 1.1 ms
FUELSYS *3 (Fuel system status)	OL/CL/ OL_Drive/ OL_Fault/ CL_Fault	Calculation	• Idle (after warm up): OL or CL • Racing (engine speed is 2,000 rpm): CL • Deceleration fuel cut (accelerator pedal released from engine speed of 4,000 rpm or more): OL-Drive
FUELSYS_CL *3 (Feedback status of fuel injection control)	Yes/No	Calculation	• Ignition switched ON (engine off): Yes • Idle: No • Racing (engine speed is 2,000 rpm): No • Racing (engine speed is 4,000 rpm): No
FUELSYS_CL_FAULT *3 (Feedback status of fuel injection control)	Yes/No	Calculation	• Ignition switched ON (engine off): Yes • Idle: Yes • Racing (engine speed is 2,000 rpm): Yes • Racing (engine speed is 4,000 rpm): Yes
FUELSYS_OL *3 (Feedback status of fuel injection control)	Yes/No	Calculation	• Ignition switched ON (engine off): Yes • Idle: Yes • Racing (engine speed is 2,000 rpm): Yes • Racing (engine speed is 4,000 rpm): Yes
FUELSYS_OL_DRIVE *3 (Feedback status of fuel injection control)	Yes/No	Calculation	• Ignition switched ON (engine off): Yes • Idle: Yes • Racing (engine speed is 2,000 rpm): Yes • Racing (engine speed is 4,000 rpm): Yes
FUELSYS_OL_FAULT *3 (Feedback status of fuel injection control)	Yes/No	Calculation	• Ignition switched ON (engine off): Yes • Idle: Yes • Racing (engine speed is 2,000 rpm): Yes • Racing (engine speed is 4,000 rpm): Yes
GEAR (Gear commanded)	Unknown/1st/2nd/3rd/4th/5th/6th/Not in P/Park/Neutral/Drive/Reverse	Calculation	• Selector lever at P position: Park • Selector lever at R position: Reverse • Selector lever at N position: Neutral • Selector lever in 1GR at D position: 1st
GENVDSD *3 (Generator voltage desired)	V	Calculation	• Displays generator voltage desired.
HTR11 (A/F sensor heater)	Off/On	Calculation	• Ignition switched ON (engine off): Off • Idle (after warm up): On
	%	Calculation	• Ignition switched ON (engine off): 0% • Idle (after warm up): Approx. 43%
HTR12 (HO2S heater control)	Off/On	Calculation	• Ignition switched ON (engine off): Off • Idle (after warm up): On
	%	Calculation	• Ignition switched ON (engine off): 0% • Idle (after warm up): Approx. 53%
IAT (Intake air temperature No.1)	°C, °F	Input	• Displays IAT (No.1)
	V	Calculation	• IAT is 20 °C {68 °F}: Approx. 0.16 V • IAT is 40 °C {104 °F}: Approx. 0.26 V • IAT is 60 °C {140 °F}: Approx. 0.36 V
IAT2 (Intake air temperature No.2)	°C, °F	Calculation	• Displays IAT (No.2)
	V	Input	• IAT2 is 20 °C {68 °F}: Approx. 3.57 V • IAT2 is 40 °C {104 °F}: Approx. 2.70 V • IAT2 is 60 °C {140 °F}: Approx. 1.87 V
IMRC *3	Displays in the M-MDS but it does not operate.		
IMTV *3	Displays in the M-MDS but it does not operate.		
IG_CNT_LT *3 (Ignition counter (Lifetime))	–	Calculation	• Displays ignition counter (Lifetime)
IG_CNT_R *3 (Ignition counter (Recent))	–	Calculation	• Displays ignition counter (Recent)

Item (definition)	Unit/Condition	Value type	Condition/Specification (Reference)
NEUTRAL_SW1 *3 (Neutral switch No.1)	Displays in the M-MDS but it does not operate.		
NEUTRAL_SW2 *3 (Neutral switch No.2)	Displays in the M-MDS but it does not operate.		
O2_SH_PM_F *3 (Oxygen sensor heater monitoring/PM filter monitoring)	No/Yes	Calculation	• Displays oxygen sensor heater monitoring/PM filter monitoring
O2_SH_PM_F_CP *3 (Oxygen sensor heater monitoring completed/PM filter monitoring completed)	YES/NO	Calculation	• Displays oxygen sensor heater monitoring completed/PM filter monitoring completed
O2_SM_EGSM *3 (Oxygen sensor monitoring/Exhaust gas sensor monitoring)	No/Yes	Calculation	• Displays oxygen sensor monitoring/exhaust gas sensor monitoring
O2_SM_EGSM_CP *3 (Oxygen sensor monitoring completed/Exhaust gas sensor monitoring completed)	YES/NO	Calculation	• Displays oxygen sensor monitoring completed/exhaust gas sensor monitoring completed
O2S11 (A/F sensor)	μA	Input	• Idle (after warm up): Approx. -39 μA • Deceleration fuel cut (accelerator pedal released from engine speed of 4,000 rpm or more): Approx. 3.84 mA
O2S12 (HO2S)	V	Input	• Idle (after warm up): 0−1.0 V • Deceleration fuel cut (accelerator pedal released from engine speed of 4,000 rpm or more): Approx. 0 V
ODO_LTOIC *3	Displays in the M-MDS but it does not operate.		
OIL_P_DUTY *3 (Engine oil pressure control circuit duty cycle)	%	Output	• Displays engine oil pressure control circuit duty cycle
OIL_P_SOL (Engine oil solenoid valve)	Off/On	Calculation	• ECT above 98 °C {208 °F} or engine speed above 4,000 rpm: Off • ECT below 98 °C {208 °F} and engine speed below 4,000 rpm: On
OIL_PRES (Engine oil solenoid valve)	V	Calculation	• Displays estimated engine oil pressure
OIL_TEMP (Estimated engine oil)	°C, °F	Calculation	• Displays estimated engine oil temperature
	V	Calculation	• Displays estimated engine oil temperature voltage
OPSV_DD_R *3	Displays in the M-MDS but it does not operate.		
OPSV_EDRS *3	Displays in the M-MDS but it does not operate.		
OPSV_ODRR *3	Displays in the M-MDS but it does not operate.		
PKTC_ENE_LT *3 (Positive kinetic energy (Lifetime) (km/hr2))	−	Calculation	• Displays positive kinetic energy (Lifetime) (km/hr2)
PKTC_ENE_R *3 (Positive kinetic energy (Recent) (km/hr2))	−	Calculation	• Displays positive kinetic energy (Recent) (km/hr2)
PN_SW (Parking/neutral)	Open/Closed	Calculation	• Selector lever at P position or N position Closed • Except above: Open
PRS_TRQ_ACT *3 (Actual engine-percent torque)	%	Calculation	• Displays actual engine-percent torque
REV_SW *3 (Back-up light switch status)	Displays in the M-MDS but it does not operate.		

Item (definition)	Unit/Condition	Value type	Condition/Specification (Reference)
VPWR (Battery positive voltage)	V	Input	• Displays battery voltage
VSS (Vehicle speed)	KPH, MPH	Calculation	• Displays vehicle speed
VT_Adv_CM	• Displays in the M-MDS but it does not operate.		
VT_CM			
VT_EX_DES (Desired exhaust valve timing)	° (deg)	Calculation	• Displays desired exhaust valve timing
VT_IN_ACT (Actual intake valve timing)	° (deg)	Calculation	• Displays actual intake valve timing
VT_IN_DES (Desired intake valve timing)	° (deg)	Calculation	• Displays desired intake valve timing
VT_EX_ACT (Actual exhaust valve timing)	° (deg)	Calculation	• Displays actual exhaust valve timing
VT_EX_DUTY (OCV control)	%	Calculation	• Idle (after warm up): Approx. 0% • Racing (engine speed is 2,000 rpm): Approx. 40%
WGP *3	Displays in the M-MDS but it does not operate.		
WGV *3	Displays in the M-MDS but it does not operate.		
WGV_ACT *3	Displays in the M-MDS but it does not operate.		
WGV_DSD *3	Displays in the M-MDS but it does not operate.		

*1:With active air shutter

*2:Performs retard correction (negative indication) according to the occurrence of engine knock, and it approaches approx. 0° by the advance correction due to engine knock suppression.

*3:If equipped

*4:With i-stop

KNOCK SENSOR (KS) INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)]

SM2897775

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Resistance Inspection

1.Disconnect the negative battery terminal. (See NEGATIVE BATTERY TERMINAL DISCONNECTION/CONNECTION.)

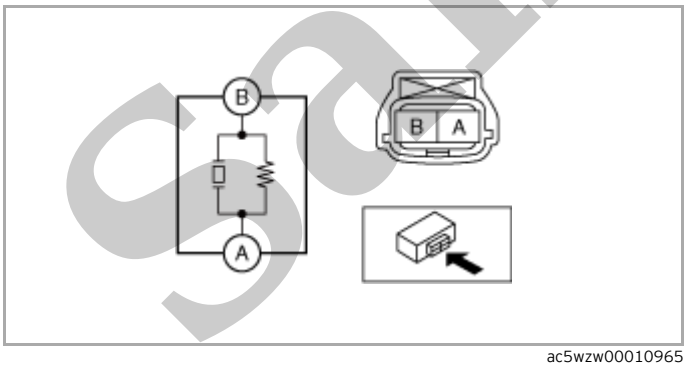
2.Remove the plug hole plate. (See PLUG HOLE PLATE REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

3.Remove the intake manifold. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [SKYACTIV-G (WITHOUT EGR COOLER)].) (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [SKYACTIV-G (WITH EGR COOLER)].)

4.Disconnect the KS connector.

5.Remove the KS. (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

6.Measure the resistance between KS terminals A and B.



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- If not as specified, replace the KS. (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

Specification

504–616 kilohms [10–30 °C {50–86 °F}]

ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)]

SM2897777

id0140h380320

Note

• Because the APP sensor is integrated in the accelerator pedal, replacing the APP sensor includes replacement of the accelerator pedal.

Function Inspection

1.Connect the M-MDS to the DLC-2.

2.Switch the ignition ON (engine off).

3.Display the PIDs APP1 and APP2. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].) (See PCM INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

4.Compare the voltage and opening angle indications for the PIDs APP1 and APP2 with the standard in the table indicated below.

• If they do not match the standard, perform the voltage inspection. (See Voltage Inspection.)

Standard

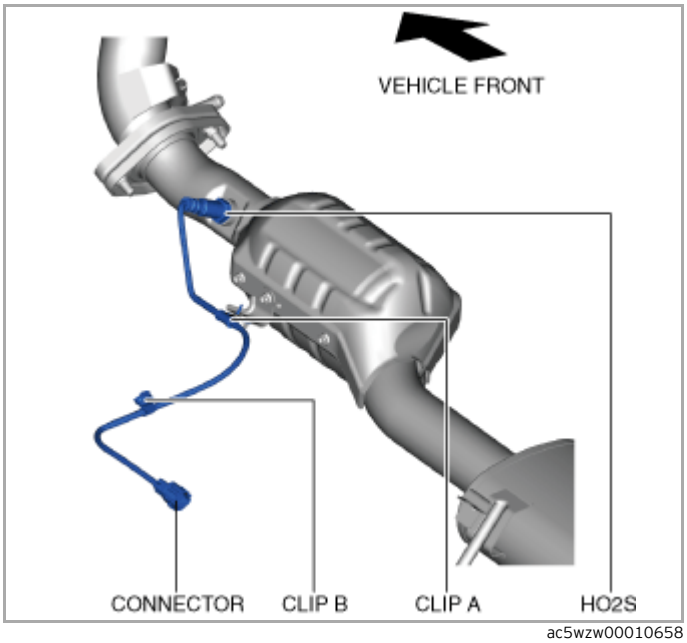
Condition/	APP1		APP2	
	V	%	V	%
Accelerator pedal released	Approx. 0.75	Approx. 15	Approx. 0.38	Approx. 7.45
Accelerator pedal depressed	Approx. 4.52	Approx. 90.58	Approx. 2.26	Approx. 45.49

Voltage Inspection

1.Connect the M-MDS to the DLC-2.

2.Switch the ignition ON (engine off).

3.Verify that the APP sensor output voltage (PID: APP1, APP2) increases according to the increase in the accelerator opening angle when the accelerator opening angle is gradually increased. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].)



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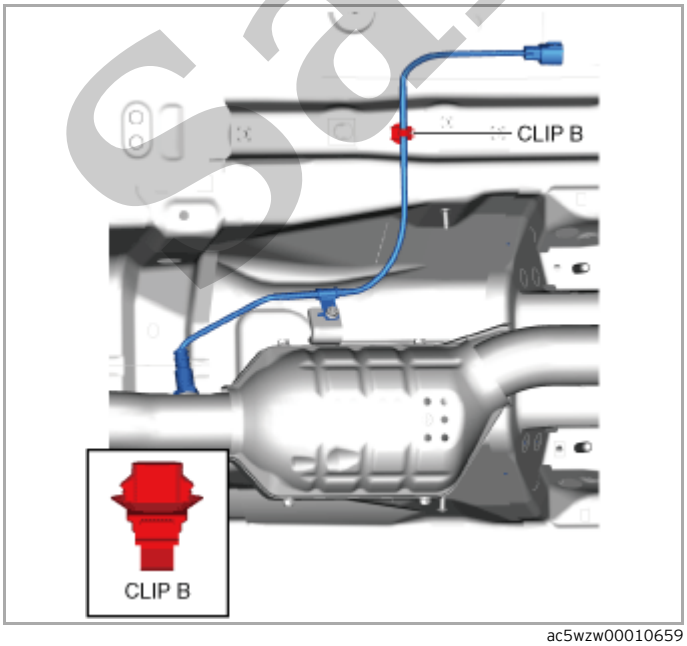
1.Disconnect the negative battery terminal. (See NEGATIVE BATTERY TERMINAL DISCONNECTION/CONNECTION.)

2.Lift up the vehicle.

3.Remove the floor under cover (LH). (See FLOOR UNDER COVER REMOVAL/INSTALLATION.)

4.Disconnect the HO2S connector.

5.Remove the clip B from the body.



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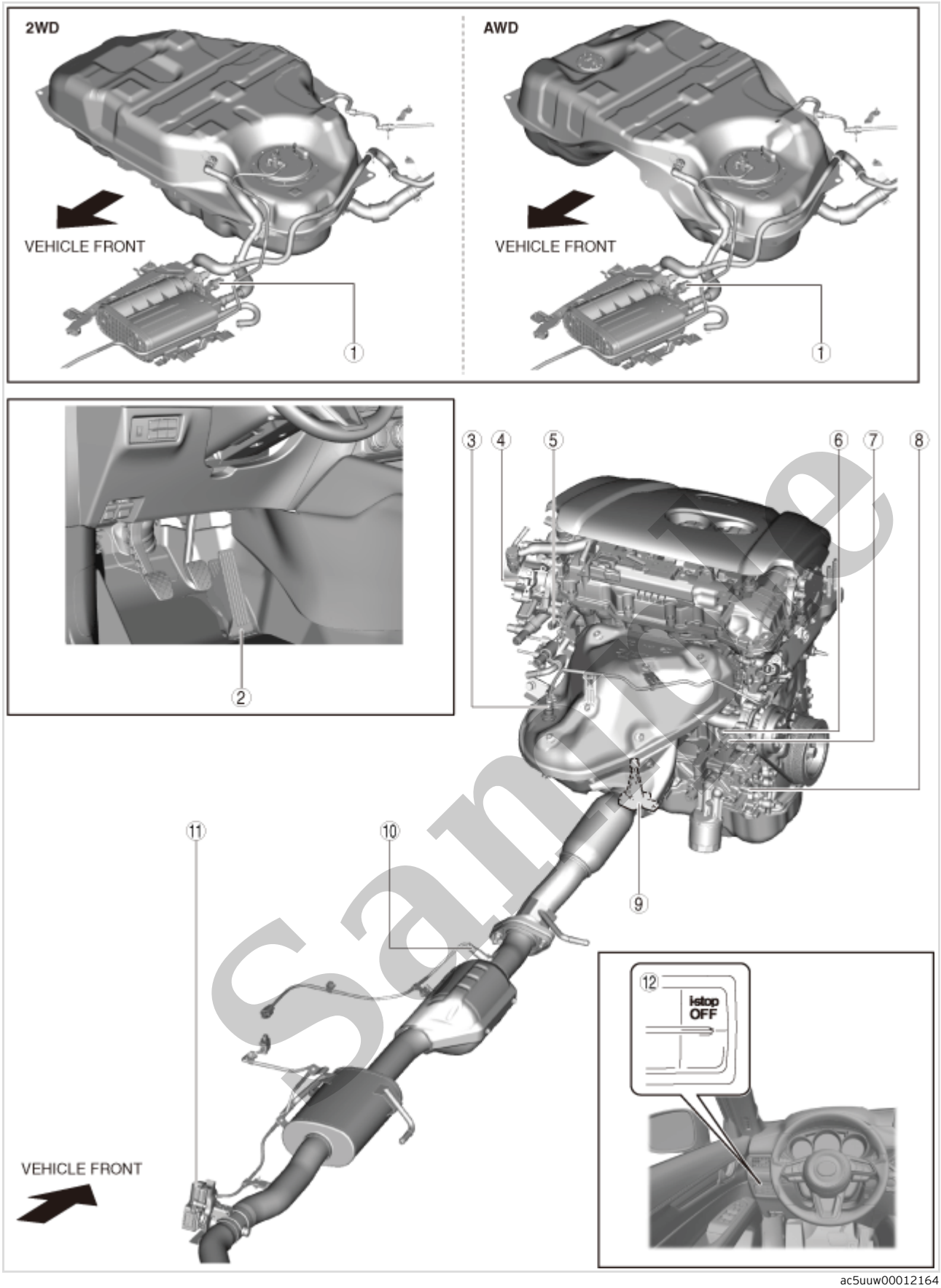
6.Remove the clip A from the bracket.

2	Intake CMP sensor (See CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See CAMSHAFT POSITION (CMP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
3	Coolant control valve position sensor (See COOLANT CONTROL VALVE POSITION SENSOR REMOVAL/INSTALLATION [SKYACTIV-G (WITHOUT EGR COOLER)].) (See COOLANT CONTROL VALVE POSITION SENSOR INSPECTION [SKYACTIV-G (WITHOUT EGR COOLER)].)
4	MAF sensor/IAT sensor No.1 (See MASS AIR FLOW (MAF) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.1 REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See MASS AIR FLOW (MAF) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
5	PCM (BARO sensor) (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See PCM INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See PCM CONFIGURATION (USING READ/WRITE FUNCTION) [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See PCM CONFIGURATION (USING AS-BUILT DATA) [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See BAROMETRIC PRESSURE (BARO) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See BAROMETRIC PRESSURE (BARO) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
6	TP sensor (See THROTTLE POSITION (TP) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See THROTTLE POSITION (TP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
7	MAP sensor/IAT sensor No.2 (See MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR/INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
8	KS (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See KNOCK SENSOR (KS) INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
9	Fuel pressure sensor (See FUEL PRESSURE SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)

With EGR cooler



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1	Fuel tank pressure sensor (See FUEL TANK PRESSURE SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See FUEL TANK PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
2	APP sensor (See ACCELERATOR PEDAL POSITION (APP) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) (See ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

CURRENT SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)]

SM3344943

id0140h380530

DTC Inspection

1.Connect the M-MDS to the DLC-2.

2.Perform the DTC inspection using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].)

- If any DTC related to the current sensor is present, repair the malfunctioning location according to the applicable DTC troubleshooting. (See DTC TABLE [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].)

Visual Inspection

Caution

- **Be careful not to contact the positive battery terminal.**
- **If the nut for the current sensor is loosened with the negative battery terminal connected to the battery, excessive torque will be applied to the negative battery terminal and the battery terminal will be damaged. When removing the negative battery terminal and current sensor, be careful not to damage the battery terminal.**
- **Connect the negative battery terminal before connecting the current sensor connector. If the current sensor connector is connected first, the PCM may mistakenly recognize a signal from the current sensor and learn the battery condition incorrectly.**
- **Verifying the tightness while holding the current sensor may apply excessive force to the terminal and the terminal could loosen, causing poor engine starting. When verifying the tightness of the negative battery terminal, only hold the terminal area, not the current sensor.**

1.Disconnect the current sensor connector.

2.Disconnect the negative battery terminal. (See NEGATIVE BATTERY TERMINAL DISCONNECTION/CONNECTION.)

3.Remove the current sensor. (See CURRENT SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

4.Verify that there is no damage to the current sensor, and no corrosion and damage to the connector.

- If there is a malfunction, replace the current sensor. (See CURRENT SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)