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2010 MAZDA CX-9 OEM Service and Repair Workshop Manual

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SCR SYSTEM PRESSURE LINE INITIALIZATION [SKYACTIV-D 2.2]

SM2897915

id0140z799840

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

2.After the vehicle is identified, select the following item from the initial screen of the M-MDS.

(1)Select the “Powertrain”.

3.Then, select the items from the screen menu in the following order.

(1)Select the “Replacement of SCR system”.

(2)Select the “Pressure line”.

4.Perform the procedure according to the directions on the screen.

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.3 REMOVAL/INSTALLATION [SKYACTIV-D 2.2]

SM2897857

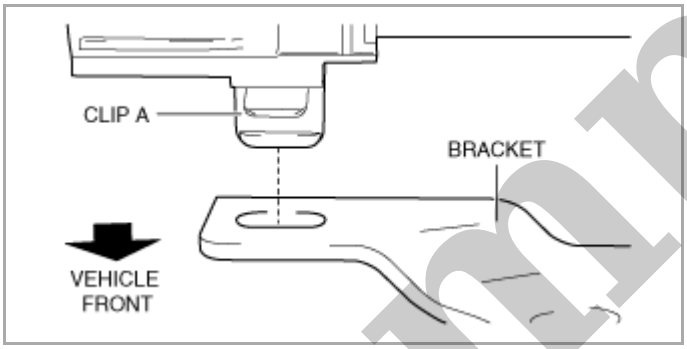
id0140z750020

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

2.Remove the engine cover. (See ENGINE COVER REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)

3.Disconnect the IAT sensor No.3 connector.

4.Remove clip A from the bracket.



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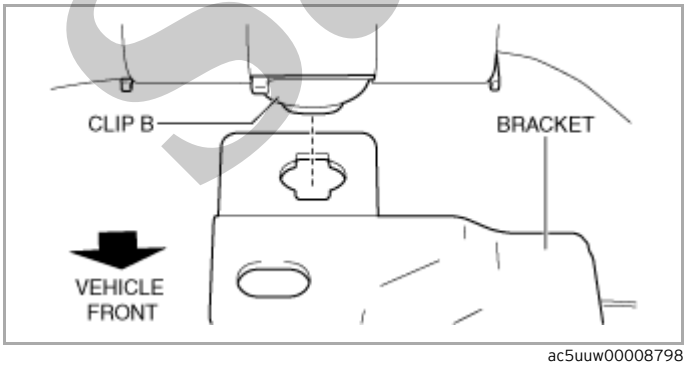
5.Remove clip B from the bracket.



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6.Set the wiring harness aside.

ENGINE OIL LEVEL SENSOR INSPECTION [SKYACTIV-D 2.2]

SM2897858

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PID/DATA Monitor Inspection

1. Verify that there is no engine oil leakage.

• If there is any malfunction, repair or replace the malfunctioning part according to the inspection results.

2.Inspect the engine oil level. (See ENGINE OIL LEVEL INSPECTION [SKYACTIV-D 2.2].)

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

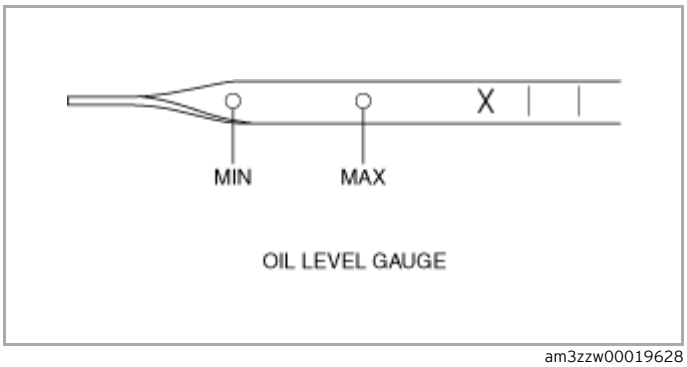
4.Switch the ignition ON (engine off).

5.Access the PID/DATA monitor item EOL using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-D 2.2)].)

6.Verify that the PID EOL value and the engine oil amount measured using the oil level gauge are same.

Engine oil level sensor output value (Reference)

PID EOL value		Measurable upper limit value of engine oil level sensor
Dipstick level: MIN	Dipstick level: MAX	
Approx. 73 mm {2.9 in}	Approx. 89 mm {3.5 in}	96 mm {3.8 in}



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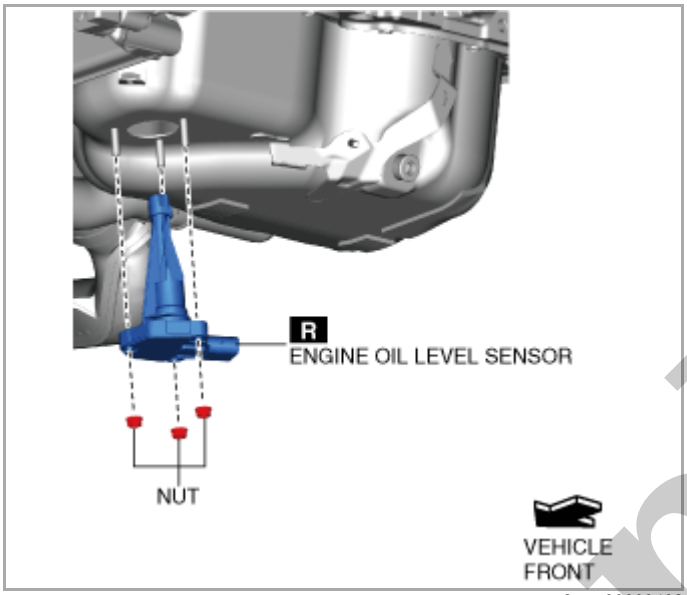
Note

• Due to the structure of the engine oil level sensor, a value exceeding the measurable upper limit value may be detected. If the oil level gauge is the upper limit position or more and the engine oil level sensor output value exceeds the measurable upper

8.Disconnect the short cord connector.

9.Remove the short cord.

10.Remove the nuts. (See Nut Installation Note.)



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11.Remove the engine oil level sensor.

12.Install in the reverse order of removal.

13.Refill with the specified type and amount of the engine oil. (See ENGINE OIL REPLACEMENT [SKYACTIV-D 2.2].)

14.Start the engine and confirm that there is no oil leakage.

- If there is oil leakage, repair or replace the malfunctioning part according to the inspection results.

15.Inspect the engine oil level. (See ENGINE OIL LEVEL INSPECTION [SKYACTIV-D 2.2].)

Nut Installation Note

1.Temporarily tighten the nuts.

GLOW PLUG DATA RESET [SKYACTIV-D 2.2]

SM2897917

id0140z799890

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

2.After the vehicle is identified, select the following item from the initial screen of the M-MDS.

(1)Select the “Powertrain”.

3.Then, select the items from the screen menu in the following order.

(1)Select the “Glowplug”.

(2)Select the “Reset after replacement”.

4.Perform the procedure according to the directions on the screen.

ENGINE TECHNICAL DATA [SKYACTIV-D 2.2]

SM2897918

id0150f680010

Item	Specification
Difference between target idle speed and the engine speed	Within 50 rpm
Target idle speed (reference)	Normal: 800 rpm DPF auto regeneration: 800 rpm Injector learning: 775 rpm
Standard cylinder head bolt length	169.2–169.8 mm {6.662–6.685 in}
Maximum cylinder head bolt length	170.5 mm {6.713 in}
Front oil seal press on amount	0–0.5 mm {0–0.019 in} from edge surface of engine front cover
Rear oil seal press on amount	0–0.5 mm {0–0.019 in} from edge surface of cylinder block
Engine oil capacity (approx. quantity)	Oil replacement: 4.6 L {4.9 US qt, 4.0 Imp qt} Oil and oil filter replacement: 4.9 L {5.2 US qt, 4.3 Imp qt} Total (dry engine): 6.0 L {6.3 US qt, 5.3 Imp qt}
Oil pressure (reference value) [oil temperature: 70–80 °C {158–176 °F}, coolant temperature: 70–80 °C {158–176 °F}]	Lo: 140–190 kPa {1.43–1.93 kgf/cm ^{2}, 20.4–27.5 psi} [1,500 rpm] Hi: 310–450 kPa {3.17–4.58 kgf/cm ^{2}, 45.0–65.2 psi} [3,500 rpm]
Engine coolant capacity (approx. quantity)	8.7 L {9.2 US qt, 7.7 Imp qt}
Cooling system cap valve opening pressure	93.2–122.6 kPa {0.951–1.250 kgf/cm ^{2}, 13.6–17.7 psi}
Thermostat initial-opening temperature	80–84 °C {176–183 °F}
Thermostat full-open temperature	95 °C {203 °F}
Thermostat full-open lift	8.5 mm {0.33 in} or more
Cooling fan motor No.1, No.2 standard current	15–21 A [12 V]
Glow plug resistance (specification)	Approx. 0.3 ohms [20 °C {68 °F}]
Compressor bypass solenoid valve resistance (specification)	30–34 ohms [20 °C {68 °F}]
Regulating solenoid valve resistance (specification)	9.8–11.2 ohms [20 °C {68 °F}]
Wastegate solenoid valve resistance (specification)	9.8–11.2 ohms [20 °C {68 °F}]
Fuel pressure relief valve resistance (specification)	0.96–1.16 ohms [20 °C {68 °F}]
Suction control valve resistance (specification)	Approx. 2.1 ohms [20 °C {68 °F}]
Fuel warmer resistance (specification)	Approx. 0.5–2.0 ohms
EGR valve resistance (specification)	0.3–100 ohms [20 °C {68 °F}]
EGR cooler bypass valve resistance (specification)	Other than infinity [20 °C {68 °F}]
Intake shutter valve resistance (specification)	0.3–100 ohms [20 °C {68 °F}]
Urea tank heater resistance	1.2–2.66 ohms [25 °C {77 °F}]
Urea hose heater resistance	2.72–3.32 ohms
Urea injector resistance	11–13 ohms [20 °C {68 °F}]
Parasitic draw (When the ignition is off (key is removed), all doors and the hood are closed.)	40–65 mA
Battery slow charge current	80D26L (65A.h/20HR): 5.5–6.5 A 95D31L (80A.h/20HR): 6.5–8.0 A
Battery quick charge current [30 min]	80D26L (65A.h/20HR): 35 A 95D31L (80A.h/20HR): 40 A
Generator standard voltage [IG-ON]	Terminal 1A: B+ Terminal 2A: Approx. 1 V or less Terminal 2B: Approx. 0 V

ENGINE TECHNICAL DATA [SKYACTIV-G 2.5T]

SM2897919

id0150g580010

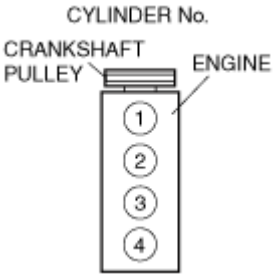
Item	Specification
Idle speed (P position or N position)	650–750 rpm
Ignition timing	Approx. BTDC 21°
CO concentration	Within the regulation
HC concentration	Within the regulation
Idle-up speed (P position or N position)	A/C on: 650–800 rpm Electrical loads on: 650–800 rpm
OCV coil resistance	6.9–7.55 ohms [20°C {68°F}]
Cylinder head bolt length L	145.2–145.8 mm {5.717–5.740 in}
Cylinder head bolt length L maximum	146.5 mm {5.767 in}
Front oil seal press on amount	0–1.0 mm {0–0.039 in}
Rear oil seal press on amount	0–0.5 mm {0–0.019 in}
Engine oil capacity (approx. quantity)	Oil replacement: 4.6 L {4.9 US qt, 4.0 Imp qt} Oil and oil filter replacement: 4.8 L {5.1 US qt, 4.2 Imp qt} Total (dry engine): 5.9 L {6.2 US qt, 5.2 Imp qt}
Oil pressure (reference value) [oil temperature: 80–90 °C {176–194 °F}, coolant temperature: 80–90 °C {176–194 °F}]	Lo: 135–165 kPa {1.38–1.68 kgf/cm ^{2}, 19.6–23.9 psi} [1,500 rpm] Hi: 225–275 kPa {2.30–2.80 kgf/cm ^{2}, 32.7–39.8 psi} [4,500 rpm]
Engine coolant capacity (approx. quantity)	8.5 L {9.0 US qt, 7.5 Imp qt}
Cooling system cap valve opening pressure	93.2–122.6 kPa {0.951–1.250 kgf/cm ^{2}, 13.6–17.7 psi}
Thermostat initial-opening temperature	86.5–89.5 °C {188–193 °F}
Thermostat full-open temperature	100 °C {212 °F}
Thermostat full-open lift	8.5 mm {0.33 in} or more
Throttle body resistance	0.3–100 ohms [20 °C {68 °F}]
Air bypass valve resistance	12.7–13.7 ohms [23 °C {73 °F}]
Fuel pressure	545–695 kPa {5.56–7.08 kgf/cm ^{2}, 79.1–100.0 psi}
Fuel hold pressure	175–326 kPa {1.79–3.32 kgf/cm ^{2}, 25.4–47.2 psi}
Battery electrolyte specific gravity	1.22–1.29 [20 °C {68 °F}]
Battery load test current	55D23L (60 A·h/20HR): 180 A 75D23L (65 A·h/20HR): 195 A
Parasitic draw (When the ignition is off (lock), all doors and the hood are closed.)	40–65 mA
Battery slow charge current	55D23L (60 A·h/20HR): 4.5–5.5 A 75D23L (65 A·h/20HR): 5.0–6.0 A
Battery quick charge current [30 min]	55D23L (60 A·h/20HR): 30 A 75D23L (65 A·h/20HR): 35 A
Generator standard voltage [IG-ON]	Terminal 1A: B+ Terminal 2A: Approx. 1 V or less Terminal 2B: Approx. 0 V
Generator standard voltage [Idle, 20 °C {68 °F}]	Terminal 1A: 13–15 V Terminal 2A: Approx. 3–8 V Terminal 2B: Turn the electrical loads (such as headlights, blower motor, rear window defroster, brake lights) on and verify that the voltage reading increases.
Generator generated current minimum value	70% of the nominal output current (nominal output current: 100 A) [Ambient temp. 20 °C {68 °F}, voltage 13.0–15.0 V, both engine and generator are hot]

ENGINE TECHNICAL DATA [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)]

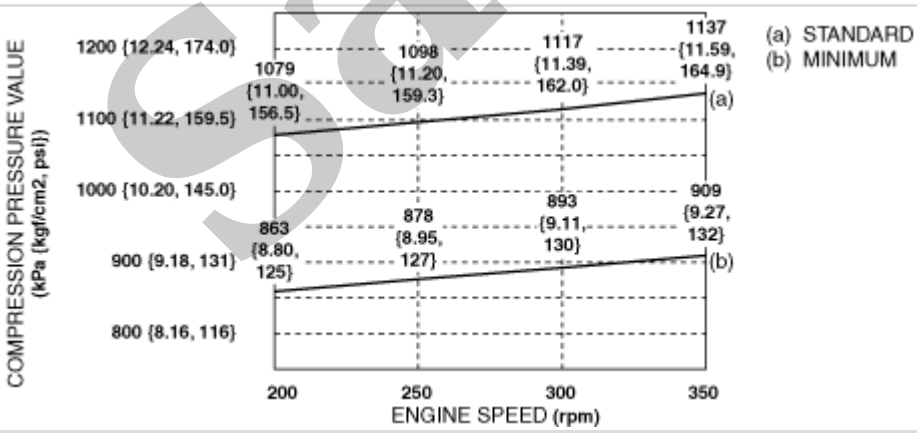
SM2897920

id0150g980010

Item	Specification
Idle speed (P position or N position)	600–700 rpm
Ignition timing	Approx. BTDC 7°
CO concentration	Within the regulation
HC concentration	Within the regulation
Idle-up speed (P position or N position)	A/C on: 650–800 rpm Electrical loads on: 600–750 rpm
OCV for No.1 cylinder deactivation coil resistance	8.4–9.4 ohms [20°C {68°F}]
OCV for No.4 cylinder deactivation coil resistance	8.4–9.4 ohms [20°C {68°F}]
OCV for hydraulic variable valve timing system coil resistance	6.9–7.5 ohms [20°C {68°F}]
Standard cylinder head bolt length	145.2–145.8 mm {5.717–5.740 in}
Maximum cylinder head bolt length	146.5 mm {5.767 in}
Front oil seal press on amount	0–1.0 mm {0–0.039 in} from edge surface of engine front cover
Rear oil seal press on amount	0–0.5 mm {0–0.019 in} from edge surface of cylinder block
Engine oil capacity (approx. quantity)	Oil replacement: 4.3 L {4.5 US qt, 3.8 Imp qt} Oil and oil filter replacement: 4.5 L {4.8 US qt, 4.0 Imp qt} Total (dry engine): 5.5 L {5.8 US qt, 4.8 Imp qt}
Oil pressure (reference value) [oil temperature: 80–90 °C {176–194 °F}, coolant temperature: 80–90 °C {176–194 °F}]	Lo: 135–165 kPa {1.38–1.68 kgf/cm ^{2}, 19.6–23.9 psi} [1,500 rpm] Hi: 225–275 kPa {2.30–2.80 kgf/cm ^{2}, 32.7–39.8 psi} [4,500 rpm]
Engine coolant capacity (approx. quantity)	7.5 L {7.9 US qt, 6.6 Imp qt}
Cooling system cap valve opening pressure	93.2–122.6 kPa {0.951–1.250 kgf/cm ^{2}, 13.6–17.7 psi}
Cooling fan motor No.1, No.2 standard current	4.5–8.5 A [12 V]
Throttle body resistance	0.3–100 ohms [20°C {68 °F}]
Fuel pressure	405–485 kPa {4.13–4.94 kgf/cm ^{2}, 58.8–70.3 psi}
Fuel hold pressure	230 kPa {2.35 kgf/cm ^{2}, 33.4 psi} or more
Exhaust shutter valve resistance	0.3–100 ohms [20 °C {68 °F}]
Battery electrolyte specific gravity [20 °C {68 °F}]	1.22–1.29
Battery load test current	60A·h/20HR: 180 A 65A·h/20HR: 195 A 80A·h/20HR: 250 A
Parasitic draw (When the ignition is off (lock), all doors and the hood are closed.)	40–65 mA
Battery slow charge current	55D23L (60A.h/20HR): 4.5–5.5 A 75D23L (65A.h/20HR): 5.0–6.0 A
Battery quick charge current [30 min]	55D23L (60A.h/20HR): 30 A 75D23L (65A.h/20HR): 35 A
Generator standard voltage [IG-ON]	Terminal 1A: B+ Terminal 2A: Approx. 1 V or less Terminal 2B: Approx. 0 V
Generator standard voltage [Idle, 20 °C {68 °F}]	Terminal 1A: 13–15 V Terminal 2A: Approx. 3–8 V Terminal 2B: Turn the electrical loads (such as headlights, blower motor, rear window defroster, brake lights) on and verify that the voltage reading increases.

Item	Specification
Generator brush length	Standard: 22.5 mm {0.886 in} Minimum: 5.0 mm {0.20 in}
Generator brush spring force	Standard: 4.1–5.3 N {0.42–0.54 kgf, 1.0–1.1 lbf} Minimum: 1.7 N {0.17 kgf, 0.38 lbf}
Firing order	1–3–4–2 (all cylinders independent firing) 
Spark plug type	PE5R-18-110-A, PE5S-18-110
Spark plug gap	Standard: 1.05–1.40 mm {0.0414–0.0551 in} New spark plug (reference): 1.05–1.15 mm {0.0414–0.0452 in}
Spark plug resistance [25°C {77 °F}]	3.0–7.5 kilohms
Starter no-load test voltage	11 V
Starter no-load test current	90 A or less
Starter pinion gap	0.5–2.0 mm {0.02–0.07 in}
Starter armature runout	0.1 mm {0.004 in} max.
Starter commutator diameter	Standard: 29.4 mm {1.16 in} Minimum: 28.8 mm {1.13 in}
Segment groove depth of starter commutator	Standard: 0.5 mm {0.02 in} Minimum: 0.2 mm {0.008 in}
Starter brush length	Standard: 12.3 mm {0.484 in} Minimum: 5.5 mm {0.22 in}
Starter brush spring force	Standard: 15.0–20.4 N {1.53–2.08 kgf, 3.38–4.58 lbf} Minimum: 2.75 N {0.280 kgf, 0.618 lbf}

Compression pressure



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Standard: Refer to the graph.

Minimum: Refer to the graph.

Maximum difference between cylinders: 149 kPa {1.52 kgf/cm ^{2}, 21.6 psi} [250 rpm]

Engine oil specification