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1998 MAZDA MX-3 OEM Service and Repair Workshop Manual

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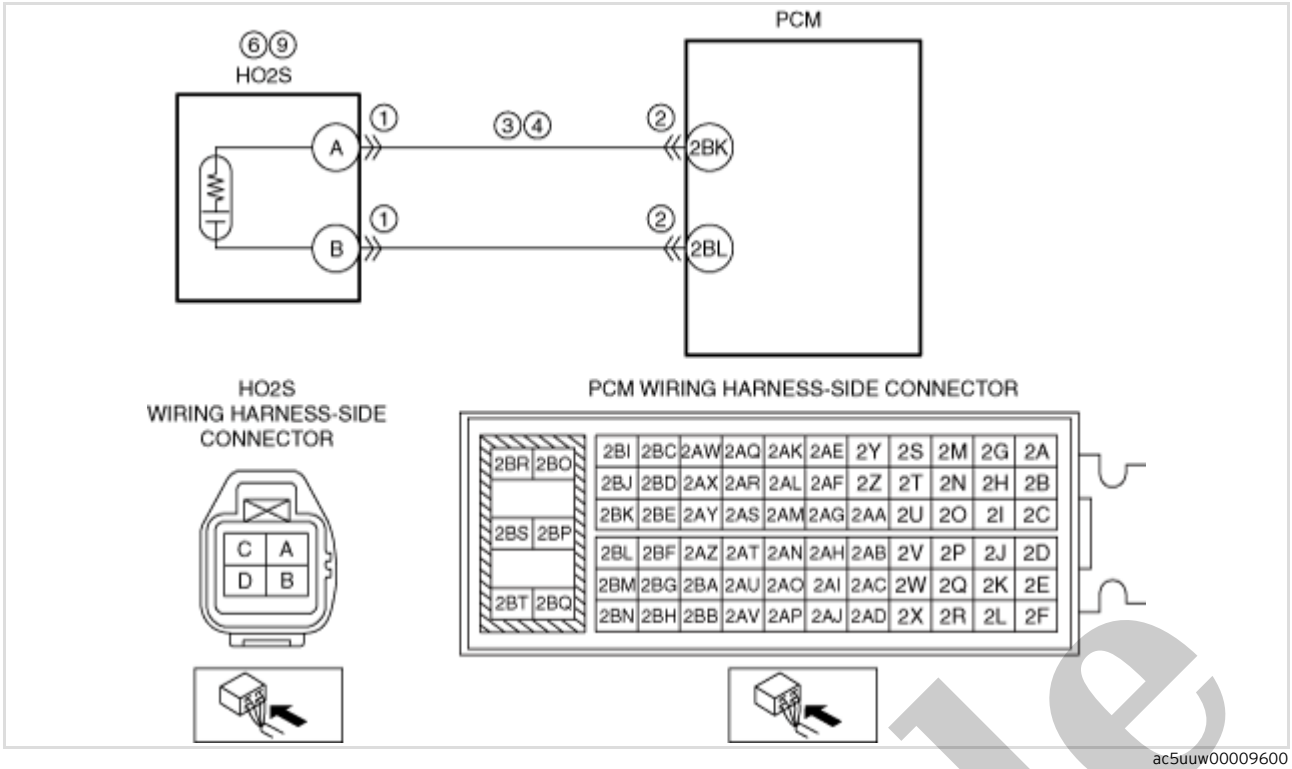
STEP	INSPECTION	RESULTS	ACTION
2	PURPOSE: RECORD FREEZE FRAME DATA/SNAPSHOT DATA AND DIAGNOSTIC MONITORING TEST RESULTS TO UTILIZE WITH REPEATABILITY VERIFICATION Note • Recording can be facilitated using the screen capture function of the PC. • Record the FREEZE FRAME DATA/snapshot data and DIAGNOSTIC MONITORING TEST RESULTS (A/F sensor, HO2S related) on the repair order.	–	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure
• Step 1–2
— Perform an inspection of the HO2S and PCM-related connectors.
• Step 3
— Perform an inspection of the short to power supply in wiring harness between HO2S and PCM.
• Step 4
— Perform a unit inspection of the HO2S.
• Step 5–6
— Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: INSPECT HO2S CONNECTOR CONDITION • Switch the ignition off. • Disconnect the HO2S connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Step 5.
		No	Go to the next step.
2	PURPOSE: INSPECT PCM CONNECTOR CONDITION • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Step 5.
		No	Go to the next step.
3	PURPOSE: INSPECT HO2S CIRCUIT FOR SHORT TO POWER SUPPLY • Verify that the HO2S and PCM connectors are disconnected. • Switch the ignition ON (engine off). Note • Another DTC may be stored by the PCM detecting an open circuit. • Measure the voltage at the following terminals (wiring harness-side): — HO2S terminal A — HO2S terminal B • Is the voltage 0 V?	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: • HO2S terminal A–PCM terminal 2BK • HO2S terminal B–PCM terminal 2BL If there is a common connector: • 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 power supply. • Repair or replace the malfunctioning part. If there is no common connector: • Repair or replace the wiring harness which has a short to power supply. Go to Step 5.



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Function Explanation (DTC Detection Outline)

• If the output voltage of the HO2S continues to be low for the specified time or more even though the estimated temperature of the HO2S element after the engine is started exceeds the specified value, the PCM determines that the HO2S is not activating, and stores a DTC. The malfunction determination time varies depending on the intake air amount.

Repeatability Verification Procedure

1. Warm up the engine to allow the engine coolant temperature to reach 80 °C {176 °F} or more.
2. Start the engine and leave it idling for 1 min.

Note

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

3. Try to reproduce the malfunction by driving the vehicle for 5 min based on the values in the FREEZE FRAME DATA/snapshot data.

PID Item/Simulation Item Used In Diagnosis

PID/DATA monitor item table

Item	Definition	Unit	Condition/Specification
HTR12	HO2S heater operation status	Off/On	• Ignition switched ON (engine off): Off • Idle (after warm up): On
	HO2S heater control duty value	%	• Ignition switched ON (engine off): 0% • Idle (after warm up): Approx. 53%
O2S12	HO2S voltage	V	• 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

STEP	INSPECTION	RESULTS	ACTION
6	PURPOSE: DETERMINE INTEGRITY OF HO2S • Reconnect all disconnected connectors. • Inspect the HO2S. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Is there any malfunction?	Yes	Replace the HO2S, then go to Step 10. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
		No	Go to the next step.
7	PURPOSE: VERIFY IF MALFUNCTION RELATED TO EMISSION SYSTEM AFFECTS HO2S SIGNAL • Verify the exhaust gas leakage from the exhaust system. (between A/F sensor and HO2S) • 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.
8	PURPOSE: VERIFY IF MALFUNCTION RELATED TO ENGINE COMPRESSION AFFECTS DIAGNOSTIC RESULTS • Inspect the engine compression. (See COMPRESSION INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Are compression pressures within specification?	Yes	Go to the next step.
		No	Replace or overhaul the engine, then go to Step 10.
9	PURPOSE: DETERMINE INTEGRITY OF HO2S HEATER • Inspect the HO2S heater. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Is there any malfunction?	Yes	Replace the HO2S, then go to the next step. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
		No	Go to the next step.
10	PURPOSE: VERIFICATION OF VEHICLE REPAIR COMPLETION • Always reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the M-MDS. (See CLEARING DTC [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Implement the repeatability verification procedure. (See Repeatability Verification Procedure.) • Perform the Pending Trouble Code Access Procedure. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Is the PENDING CODE for this DTC present?	Yes	Repeat the inspection from Step 1. • If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) Go to the next step.
		No	Go to the next step.
11	PURPOSE: VERIFY IF THERE IS ANY OTHER MALFUNCTION • Is any other DTC or pending code stored?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].)
		No	DTC troubleshooting completed.

STEP	INSPECTION	RESULTS	ACTION
1	**RECORD VEHICLE STATUS AT TIME OF DTC DETECTION TO UTILIZE WITH REPEATABILITY VERIFICATION** **Note** **• Recording can be facilitated using the screen capture function of the PC.** • Record the FREEZE FRAME DATA/snapshot data on the repair order.	–	Go to the next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Verify related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
3	**INSPECT THROTTLE BODY CONNECTOR CONDITION** • Switch the ignition off. • Disconnect the throttle body connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Step 9.
		No	Go to the next step.
4	**INSPECT TP SENSOR No.2 CIRCUIT FOR SHORT TO GROUND** • Verify that the throttle body connector is disconnected. • Inspect for continuity between the following terminals (wiring harness-side) and body ground: — Throttle body terminal B — Throttle body terminal C • Is there continuity?	Yes	Disconnect the PCM connector and inspect the wiring harness for short to ground. • If the short to ground circuit could be detected in the wiring harness: — Refer to the wiring diagram and verify whether or not there is a common connector between the following terminals: • Throttle body terminal B–PCM terminal 1L • Throttle body terminal C–PCM terminal 1V **If there is a common connector:** • 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. • Repair or replace the malfunctioning part. **If there is no common connector:** • Repair or replace the wiring harness which has a short to ground. • If the short to ground circuit could not be detected in the wiring harness: — Replace the PCM (short to ground in the PCM internal circuit). (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) Go to Step 9.
		No	Go to the next step.

DTC P2237:00 [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))]

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Note

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

Details On DTCs

DESCRIPTION	**Open circuit between A/F sensor terminal B and PCM terminal 1M**	
DETECTION CONDITION	Determination conditions	• After A/F sensor activation, a condition in which PCM terminal 1S voltage is within the specified range continues for 5 s or more.
	Preconditions	• Battery voltage: 11–18 V *1 • The following DTC is not detected: — Internal PCM malfunction: P064D:00 *1: Standard can be verified by displaying PIDs using M-MDS
	Drive cycle	• 2
	Self test type	• CMDTC self test, KOER self test
	Sensor used	• A/F sensor
FAIL-SAFE FUNCTION	• Fixes duty value of A/F sensor heater • Stops fuel feedback control of A/F sensor	
VEHICLE STATUS WHEN DTCs ARE OUTPUT	• Illuminates check engine light.	
POSSIBLE CAUSE	• A/F sensor connector or terminals malfunction • PCM connector or terminals malfunction • Open circuit in wiring harness between A/F sensor terminal B and PCM terminal 1M • A/F sensor malfunction • PCM malfunction	

System Wiring Diagram

STEP	INSPECTION	RESULTS	ACTION
3	**PURPOSE: INSPECT A/F SENSOR CIRCUIT FOR OPEN CIRCUIT** • Verify that the A/F sensor and PCM connectors are disconnected. • Inspect for continuity between A/F sensor terminal B (wiring harness-side) and PCM terminal 1M (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Refer to the wiring diagram and verify whether or not there is a common connector between A/F sensor terminal B and PCM terminal 1M. **If there is a common connector:** • 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. • Repair or replace the malfunctioning part. **If there is no common connector:** • Repair or replace the wiring harness which has an open circuit. Go to Step 5.
4	**PURPOSE: DETERMINE INTEGRITY OF A/F SENSOR** • Start the engine and warm it up completely. • Access the O2S11 PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Drive the vehicle under the following conditions. **Warning** **• 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.** **• While performing this step, always operate the vehicle in a safe and lawful manner.** — After increasing the engine speed to 3,000 rpm, decelerate using engine braking. • Is the displayed PID value as follows? — O2S11: 0.25 mA or more	Yes	Go to the next step.
		No	Replace the A/F sensor, then go to the next step. (See AIR FUEL RATIO (A/F) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
5	**PURPOSE: VERIFICATION OF VEHICLE REPAIR COMPLETION** • Always reconnect all disconnected connectors. • Clear the DTC from the PCM memory using the M-MDS. (See CLEARING DTC [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Perform the KOER self test. (See KOEO/KOER SELF TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Is the PENDING CODE for this DTC present?	Yes	Repeat the inspection from Step 1. • If the malfunction recurs, replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) Go to the next step.
		No	Go to the next step.
6	**PURPOSE: VERIFY IF THERE IS ANY OTHER MALFUNCTION** • Is any other DTC or pending code stored?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].)
		No	DTC troubleshooting completed.

PID/DATA monitor item table

Item	Definition	Unit	Condition/Specification
O2S11	A/F sensor current	μA	• 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

Function Inspection Using M-MDS

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: VERIFY RELATED REPAIR INFORMATION AVAILABILITY • Verify related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to the available repair information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	PURPOSE: RECORD VEHICLE STATUS AT TIME OF DTC DETECTION TO UTILIZE WITH REPEATABILITY VERIFICATION Note • Recording can be facilitated using the screen capture function of the PC. • Record the FREEZE FRAME DATA/snapshot data on the repair order.	−	Go to the next step.
3	PURPOSE: INSPECT A/F SENSOR CONNECTOR CONDITION • Switch the ignition off. • Disconnect the A/F sensor connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.
		No	Go to the next step.
4	PURPOSE: INSPECT PCM CONNECTOR CONDITION • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.
		No	Go to the next step.
5	PURPOSE: INSPECT A/F SENSOR CIRCUIT FOR OPEN CIRCUIT • Verify that the A/F sensor and PCM connectors are disconnected. • Inspect for continuity between A/F sensor terminal D (wiring harness-side) and PCM terminal 1S (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Refer to the wiring diagram and verify whether or not there is a common connector between A/F sensor terminal D and PCM terminal 1S. If there is a common connector: • 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. • Repair or replace the malfunctioning part. If there is no common connector: • Repair or replace the wiring harness which has an open circuit. Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.

DTC U1100:00 [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))]

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DTC U1100:00	LIN communication: communication error to engine oil level sensor
DETECTION CONDITION	• With the following conditions continued for 1.5 s, a communication error between the PCM and engine oil level sensor is continued for 5 s or more. — Battery voltage: 10–16 V — Ignition switched ON (engine off or on) Diagnostic support note • This is an intermittent monitor (other). • The check engine light does not illuminate. • FREEZE FRAME DATA is not available. • Snapshot data is available. • DTC is stored in the PCM memory.
FAIL-SAFE FUNCTION	• Not applicable
POSSIBLE CAUSE	• LIN communication line malfunction between engine oil level sensor and PCM • Engine oil level sensor connector or terminals malfunction • Short to ground or open circuit in engine oil level sensor power supply circuit — Short to ground in wiring harness between ENGINE3 15 A fuse and engine oil level sensor terminal A — ENGINE3 15 A fuse malfunction — Open circuit in wiring harness between sub relay terminal C and engine oil level sensor terminal A • PCM connector or terminals malfunction • Engine oil level sensor malfunction • PCM malfunction

STEP	INSPECTION	RESULTS	ACTION
5	**INSPECT ENGINE OIL LEVEL SENSOR POWER SUPPLY CIRCUIT FOR SHORT TO GROUND OR OPEN CIRCUIT** • Verify that the engine oil level sensor connector is disconnected. • Switch the ignition ON (engine off). **Note** **• Another DTC may be stored by the PCM detecting an open circuit.** • Measure the voltage at the engine oil level sensor terminal A (wiring harness-side). • Is the voltage B+?	Yes	Go to the next step.
		No	Inspect the ENGINE3 15 A fuse. • If the fuse is blown: — Refer to the wiring diagram and verify whether or not there is a common connector between ENGINE3 15 A fuse and engine oil level sensor terminal A. **If there is a common connector:** • 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. • Repair or replace the malfunctioning part. **If there is no common connector:** • Repair or replace the wiring harness which has a short to ground. • Replace the fuse. • If the fuse is damaged: — Replace the fuse. • If the fuse is normal: — Refer to the wiring diagram and verify whether or not there is a common connector between sub relay terminal C and engine oil level sensor terminal A. **If there is a common connector:** • 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. • Repair or replace the malfunctioning part. **If there is no common connector:** • Repair or replace the wiring harness which has an open circuit. Go to Step 8.
6	**INSPECT PCM CONNECTOR CONDITION** • Switch the ignition off. • Disconnect the PCM connector. • Inspect for poor connection (such as damaged/pulled-out pins, corrosion). • Is there any malfunction?	Yes	Repair or replace the connector and/or terminals, then go to Step 8.
		No	Go to the next step.