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1998 MAZDA RX-7 (FD) OEM Service and Repair Workshop Manual

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DTC P1260:00 [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))]

SM2897016

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DTC P1260:00	Immobilizer system problem
DETECTION CONDITION	• The start stop unit detects an immobilizer system malfunction. **Diagnostic support note** • This is a continuous monitor (other). • The check engine light does not illuminate. • FREEZE FRAME DATA is not available. • Snapshot data is available. • DTC is not stored in the PCM memory.
FAIL-SAFE FUNCTION	• Not applicable
POSSIBLE CAUSE	• Immobilizer system malfunction
SYSTEM WIRING DIAGRAM	• Not applicable

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	**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	**VERIFY IMMOBILIZER SYSTEM DTC** • Verify the immobilizer system DTC. (See DTC INSPECTION [START STOP UNIT].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [START STOP UNIT].)
		No	DTC troubleshooting completed.

DESCRIPTION	P0442:00 • Evaporative gas leakage (leakage amount: low) P0455:00 • Evaporative gas leakage (leakage amount: large) P0456:00 • Evaporative gas leakage (leakage amount: extremely low)	
DETECTION CONDITION	Determination conditions	P0442:00 • Hole of 0.04 in (1.0 mm) or more in evaporative gas passage
		P0455:00 • Hole of 0.09 in (2.25 mm) or more in evaporative gas passage
		P0456:00 • Hole of 0.02 in (0.5 mm) or more in evaporative gas passage
	Preconditions	P0442:00 and P0455:00 • Evaporative gas flow amount: Exceeds 10,000 cm^3/min or fuel tank vacuum is high • Fuel tank pressure: −4,340.2−4,030.1 Pa {−442.57−410.95 kgf/m^2, −0.62949−0.58452 psi} *1 • IAT sensor No.1: 4.44−43.33 °C {40.0−109.9 °F} *1 • Vehicle speed: 64−145 km/h {40.0−90.0 mph} *1 • Barometric pressure: 72.23 kPa {0.7365 kgf/cm^2, 10.48 psi} or more • Period ignition is switched off before engine starts: 210 min or more • Fuel level in fuel tank: 15−85 % *1 • Minimum value of intake manifold vacuum: 4 kPa {0.04 kgf/cm^2, 0.6 psi} or more • Minimum value of intake air amount: more than 2 g/sec • Battery voltage: more than 11 V *1 • The following DTCs are not detected: — ECT sensor No.1: P0117:00 and P0118:00 — TP sensor No.1: P0122:00 and P0123:00 — TP sensor No.2: P0222:00 and P0223:00 — Purge solenoid valve: P0443:00 — CV solenoid valve: P0446:00 — MAF sensor: P0100:00 — Fuel tank pressure sensor: P0451:00, P0452:00, and P0453:00 — IAT sensor No.1: P0110:00 — MAP sensor: P0069:00, P0107:00, and P0108:00 — BARO sensor: P2226:00, P2228:00, and P2229:00 — VSS signal: P0500:00 — Fuel gauge sender unit: P0460:00, P0461:00, P0462:00, and P0463:00 P0456:00 • Fuel level in fuel tank: 15−85 % *1 • Period ignition is switched off before engine starts: 210 min or more • Barometric pressure: 72.23 kPa {0.7365 kgf/cm^2, 10.48 psi} or more • Time elapsed from engine start: 15−90 min • Desired ambient air temperature: 4.44−37.78 °C {40.0−100.0 °F} *1 • The following DTCs are not detected: — Fuel tank pressure sensor: P0451:00, P0452:00, and P0453:00 — Purge solenoid valve: P0443:00 — CV solenoid valve: P0446:00 — EVAP monitor: P00FE, P0442:00, P0455:00, P0457:00, and P0496:00 — Fuel gauge sender unit: P0460:00, P0461:00, P0462:00, and P0463:00 *1: Standard can be verified by displaying PIDs using M-MDS

P0442:00, P0455:00

1. Set the remaining fuel quantity in the fuel tank between 30–85 %.
2. Start the engine and switch the ignition off after 5 s have elapsed.
3. Leave the vehicle for 6 h or more.
4. Start the engine and leave it idling for 2 min.
5. Drive the vehicle for 30 min at a speed of 68 km/h {42 mph} or more (to increase temperature in fuel tank and generate evaporative gas).

Note

• If driving the vehicle for 30 min at a speed of 68 km/h {42 mph} or more is not feasible, the vehicle can be driven for a continuous 15 min or more with the engine coolant temperature at 80 °C {176 °F} or more.

P0456:00

1. Set the remaining fuel quantity in the fuel tank between 30–85 %.
2. Verify that OBD-II information (such as FREEZE FRAME DATA) has been obtained and recorded.
3. Clear the DTC from the PCM memory using the M-MDS. (See CLEARING DTC [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].)
4. Start the engine and switch the ignition off after 5 s have elapsed.
5. Leave the vehicle for 6 h or more.
6. Start the engine and leave it idling for 2 min.
7. Drive the vehicle for 30 min at a speed of 50 km/h {31 mph} or more (to increase temperature in fuel tank and generate evaporative gas).

Note

• If driving the vehicle for 30 min at a speed of 50 km/h {31 mph} or more is not feasible, the vehicle can be driven for a continuous 15 min or more with the engine coolant temperature at 80 °C {176 °F} or more.

8. Stop the engine.
9. Leave the vehicle for 1 h or more.

PID Item/Simulation Item Used In Diagnosis

PID/DATA monitor item table

Item	Definition	Unit	Condition/Specification
BARO	Actually measured barometric pressure input from barometric pressure sensor built into PCM	KPa {MPA}, mBar {BAR}, psi, in H20	• Displays BARO
EVAPCP	Purge solenoid valve control duty value	%	• Idle (after warm up): 0% (Engine coolant temperature 59 °C {140 °F} or less) • Racing (Engine speed 2,000 rpm): 4.7% • Racing (Engine speed 4,000 rpm): 35.35%
EVAPCV	CV solenoid valve operation status	Off/On	• CV solenoid valve is open: Off • CV solenoid valve is close: On
FCL	Check fuel cap warning light illumination status	Off/On	• Check fuel cap warning light not illuminated: Off • Check fuel cap warning light illuminated: On

STEP	INSPECTION	RESULTS	ACTION
8	PURPOSE: DETERMINE IF MALFUNCTION CAUSED BY CONTROL PART (CV SOLENOID VALVE) REQUIRED FOR DIAGNOSIS • Start the engine and idle it. • Access the EVAPCV PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Is the EVAPCV PID value normal? (See PCM INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)	Yes	Go to the next step.
		No	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 10.
9	PURPOSE: DETERMINE IF MALFUNCTION CAUSED BY CONTROL PART (FUEL TANK PRESSURE SENSOR) REQUIRED FOR DIAGNOSIS • Start the engine and idle it. • Access the FTP PID using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) • Is the FTP PID value normal? (See PCM INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)	Yes	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.
		No	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 11.
10	PURPOSE: INSPECTION OF EVAPORATIVE GAS LEAKAGE • Test the EVAP system for leakage using the dual purpose diagnostic leak detector. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Is evaporative gas leakage detected?	Yes	Repair or replace the malfunctioning part. Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 12.
		No	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure

- Step 1–2
  - — Inspect for evaporative gas leakage from the fuel-filler opening.
- Step 3–5
  - — Inspect for evaporative gas leakage from the fuel tank side.
- Step 6–8
  - — Inspect for evaporative gas leakage from the charcoal canister side.
- Step 9–11
  - — Inspect control parts for normal operation.
- Step 12–13
  - — Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: INSPECTION OF EVAPORATIVE GAS LEAKAGE FROM FUEL-FILLER CAP • Verify that the fuel-filler cap is completely closed. • Is the fuel-filler cap completely closed?	Yes	Go to the next step.
		No	Close the fuel-filler cap completely, then go to Step 12.

DTC P0301:00, P0302:00, P0303:00, P0304:00 [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	**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	• Any one of the following conditions is met: — 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	• Battery voltage: 9–18 V *1 • Engine speed: 500–4,500 rpm *1 (Mexico spec.) • Engine speed: 500–7,500 rpm *1 (except Mexico spec.) • Engine coolant temperature: -10 °C {14 °F} or more or 21 °C {70 °F} or more *1 (standard differs depending on engine coolant temperature at engine start) • Not cranking (except Mexico spec.) • Not stalling (except Mexico spec.) • Fuel-cut control not implemented • Crankshaft installation tolerance learning completed • Engine condition is stabilized (not directly after gear change) *1: Standard can be verified by displaying PIDs using M-MDS
	Malfunction determination period	• 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	• CKP sensor • MAF sensor • MAP sensor
FAIL-SAFE FUNCTION	• Limits intake air amount • Implement fuel-cut control (if the catalytic converter may be damaged, perform fuel-cut on cylinder misfiring the most).	

Item	Definition	Unit	Condition/Specification
ECT	Engine coolant temperature input from ECT sensor	°C, °F	• Displays ECT
	ECT sensor voltage	V	• 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 input from IAT sensor No.1 via SENT communication	°C, °F	• Displays IAT (No.1)
	IAT sensor No.1 voltage	V	• 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
MAF	Mass air flow input from MAF sensor	g/Sec	• Displays MAF
	MAF sensor voltage	V	• Ignition switched ON (engine off) (MAF: 0.00 g/s {0 lb/min}): Approx. 1.69 V (ECT is 53 °C {127 °F}) • Idle (after warm up) (MAF: 2.50 g/s {0.331 lb/min}): Approx. 1.89 V (ECT is 93 °C {199 °F}) • Racing (engine speed is 2,000 rpm) (MAF: 3.80 g/s {0.503 lb/min}): Approx. 2.02 V (ECT is 95 °C {203 °F})
MAP	Manifold absolute pressure input from MAP sensor	KPa {MPA}, mBar {BAR}, psi, in H20	• Displays MAP
MAP_V	MAP sensor voltage	V	• Ignition switched ON (engine off) (MAP:100 kPa {1.02 kgf/cm ^{2}, 14.5 psi}): Approx. 4.04 V • Idle (after warm up) (MAP: 35 kPa {0.36 kgf/cm ^{2}, 5.1 psi}): Approx. 1.40 V • Racing (engine speed is 2,000 rpm) (MAP: 26 kPa {0.27 kgf/cm ^{2}, 3.8 psi}): Approx. 1.01 V
MF_CAT1	Number of misfires in No.1 cylinder leading to catalytic converter temperature increase (catalytic converter temperature increases due to fuel combustion around catalytic converter after misfire)	–	• Displays number of misfires corresponding to possible catalytic converter damage (No.1 cylinder)
MF_CAT_2	Number of misfires in No.2 cylinder leading to catalytic converter temperature increase (catalytic converter temperature increases due to fuel combustion around catalytic converter after misfire)	–	• Displays number of misfires corresponding to possible catalytic converter damage (No.2 cylinder)
MF_CAT_3	Number of misfires in No.3 cylinder leading to catalytic converter temperature increase (catalytic converter temperature increases due to fuel combustion around catalytic converter after misfire)	–	• Displays number of misfires corresponding to possible catalytic converter damage (No.3 cylinder)
MF_CAT_4	Number of misfires in No.4 cylinder leading to catalytic converter temperature increase (catalytic converter temperature increases due to fuel combustion around catalytic converter after misfire)	–	• Displays number of misfires corresponding to possible catalytic converter damage (No.4 cylinder)
MF_EMI1	Number of misfires in No.1 cylinder under conditions required by emission regulations	–	• Displays number of misfires possibly affecting emission (No.1 cylinder)

STEP	INSPECTION	RESULTS	ACTION
7	PURPOSE: VERIFY IF MISFIRE CAUSE IS BAD SPARK PLUGS • Switch the spark plugs on a cylinder that is misfiring and a cylinder that is not misfiring. (See SPARK PLUG REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Start the engine. • Verify all accessory loads (A/C, headlights, blower fan, rear window defogger) are off. • Under no-load conditions (P or N position), increase the engine speed to 3,000 rpm. • Display the misfire rate and record the number of misfires. — Access the following PIDs using the M-MDS (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) (See PCM INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • 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 Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.
		No	Go to the next step.
8	PURPOSE: VERIFY IF MISFIRE CAUSE IS BAD IGNITION COIL • 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 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • Start the engine. • Verify all accessory loads (A/C, headlights, blower fan, rear window defogger) are off. • Under no-load conditions (P or N position), increase the engine speed to 3,000 rpm. • Display the misfire rate and record the number of misfires. — Access the following PIDs using the M-MDS (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) (See PCM INSPECTION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) • 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 Troubleshooting Diagnostic Procedure to perform the procedure from Step 2.
		No	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 3.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure

• Step 1–2

DTC P0421:00 [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	**Catalytic converter system**	
DETECTION CONDITION	Determination conditions	• The PCM detects that the HO2S output fluctuates from lean to rich in a short amount of time at specified times continuously after recovery from fuel cut control.
	Preconditions	• Catalytic converter (WU-TWC) is activated sufficiently. • A/F sensor is activated sufficiently. • HO2S is activated sufficiently. • The following DTCs are not detected: — Misfire: P0300:00, P0301:00, P0302:00, P0303:00, P0304:00 — Fuel injection correction: P0171:00, P0172:00, P2096:00, P2097:00 — A/F sensor: P0130:00, P0131:00, P0132:00, P0133:00, P0134:00, P064D:00, P2237:00, P2243:00, P2251:00 — HO2S: P0137:00, P0138:00, P013A:00, P013B:00, P0140:00 — A/F sensor heater: P0031:00, P0032:00 — HO2S heater: P0037:00, P0038:00
	Drive cycle	• 1
	Self test type	• CMDTC self test
	Sensor used	• A/F sensor, HO2S
FAIL-SAFE FUNCTION	• Not applicable	
VEHICLE STATUS WHEN DTCs ARE OUTPUT	• Illuminates check engine light.	
POSSIBLE CAUSE	• HO2S malfunction — HO2S loose • A/F sensor malfunction — A/F sensor loose — Exhaust system leakage — A/F sensor deterioration • Catalytic converter (WU-TWC) deterioration or malfunction • PCM malfunction	

System Wiring Diagram

• Not applicable

Function Explanation (DTC Detection Outline)

• The PCM monitors the oxygen storage amount proportional to the catalytic converter purification characteristic.

STEP	INSPECTION	RESULTS	ACTION
6	PURPOSE: INSPECT RELATED SENSOR WIRING HARNESS AND CONNECTOR • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION))].) — O2S11 — O2S12 • When the PCM, A/F sensor and HO2S are shaken, does the PID value include a PID item which has changed?	Yes	Inspect the related wiring harness and connector. • Repair or replace the malfunctioning part. Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 8.
		No	Go to Troubleshooting Diagnostic Procedure to perform the procedure from Step 1.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure

• Step 1–2

— Perform inspection of HO2S and A/F sensor signal related parts.

• Step 3–7

— Perform inspection of each separate part.

• Step 8–9

— Verify that the primary malfunction is resolved and there are no other malfunctions.

STEP	INSPECTION	RESULTS	ACTION
1	PURPOSE: INSPECT INSTALLATION OF HO2S • Inspect installation of HO2S. • Is the HO2S installed securely?	Yes	Go to the next step.
		No	Retighten the HO2S, then go to Step 8. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
2	PURPOSE: INSPECT INSTALLATION OF A/F SENSOR • Inspect installation of A/F sensor. • Is the A/F sensor installed securely?	Yes	Replace the A/F sensor and/or HO2S, then go to Step 8. (See AIR FUEL RATIO (A/F) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].) (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
		No	Retighten the A/F sensor, then go to Step 8. (See AIR FUEL RATIO (A/F) SENSOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)
3	PURPOSE: INSPECT INSTALLATION OF HO2S • Inspect installation of HO2S. • Is the HO2S installed securely?	Yes	Go to the next step.
		No	Retighten the HO2S, then go to Step 8. (See HEATED OXYGEN SENSOR (HO2S) REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITHOUT CYLINDER DEACTIVATION)].)