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1988 MAZDA RX-7 (FC) OEM Service and Repair Workshop Manual

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STEP	INSPECTION		ACTION
6	PURPOSE: VERIFY CONNECTOR CONNECTIONS • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-D 2.2)].) — MAP_DSD — INTK_MAPA • When the following parts are shaken, does the PID value include a PID item which has changed? — MAP sensor No.2 — PCM	Yes	Inspect the related wiring harness and connector. • Repair or replace the malfunctioning part. Go to the troubleshooting procedure to perform the procedure from Step 11.
		No	Go to the troubleshooting procedure to perform the procedure from Step 1.

Troubleshooting Diagnostic Procedure

Intention of troubleshooting procedure

• Step 1

— Verify whether malfunction is related wiring harness or other.

• Step 2–5

— Perform inspection of piping and hoses in intake air system and exhaust system.

• Step 6–10

— Perform inspection of each separate part.

• Step 11–12

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

STEP	INSPECTION		ACTION
1	**PURPOSE: INSPECT WHETHER MALFUNCTION IS WIRING HARNESS OR OTHER** • Perform the KOEO self test. (See KOEO/KOER SELF TEST [PCM (SKYACTIV-D 2.2)].) • Is the regulating solenoid valve, regulating valve position sensor and/or wastegate solenoid valve related DTC present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [PCM (SKYACTIV-D 2.2)].)
		No	Go to the next step.
2	**PURPOSE: INSPECT EXHAUST SYSTEM FOR LEAKAGE** • Visually inspect for exhaust gas leakage from the exhaust system. • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 11.
		No	Go to the next step.
3	**PURPOSE: INSPECT INTAKE AIR SYSTEM FOR AIR SUCTION** • Inspect for air leakage at the following: — Around connection of turbocharger and intake manifold **Note** **• Engine speed may change when rust penetrating agent is sprayed on the air suction area.** • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 11.
		No	Go to the next step.

DTC P3101:00, P3103:00, P3105:00, P3107:00 [PCM (SKYACTIV-D 2.2)]

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Note

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

Details On DTCs

DESCRIPTION	**Fuel injection amount correction control malfunction between cylinders:** **• P3101:00: Fuel injection correction amount of cylinder No.1 is too much** **• P3103:00: Fuel injection correction amount of cylinder No.2 is too much** **• P3105:00: Fuel injection correction amount of cylinder No.3 is too much** **• P3107:00: Fuel injection correction amount of cylinder No.4 is too much**	
DETECTION CONDITION	Determination conditions	• The PCM detects that the FCCB(Fuel Compensation for Cylinders Balancing) correction amount reaches the upper limit during the specified rotation.
	Preconditions	• Fuel-cut control is not implemented. • The following DTCs are not detected: — ECT sensor: P0116:00, P0117:00, P0118:00 — Fuel pressure sensor (built-into fuel injector): P10C4:00, P10C5:00, P10C6:00, P10C7:00, P10C8:00, P10C9:00, P10CD:00 — Suction control valve: P062A:00 — Fuel injector: P0201:00, P0202:00, P0203:00, P0204:00, P1378:00, P1379:00, P2146:00, P2147:00, P2148:00, P2149:00, P2150:00, P2151:00, P2696:00, P268C:00, P268D:00, P268E:00, P268F:00 — Fuel system: P01CB:00, P01CC:00, P01CD:00, P01CE:00, P01CF:00, P01D0:00, P01D1:00, P01D2:00, P020A:00, P020B:00, P020C:00, P020D:00, P1051:00, P1052:00, P1053:00, P1054:00, P1055:00, P1056:00, P1057:00, P1058:00 — Misfire: P0301:00, P0302:00, P0303:00, P0304:00 — LIN communication error: U1201:00, U1202:00, U1203:00, U1204:00 — PCM: P0606:00, P060A:00, P062B:00 — Common rail: P0089:00, P1282:00, P1329:00 — Fuel pressure control system: P0093:00 — CKP sensor: P0016:00, P0336:00, P0338:00 — CMP sensor: P0341:00, P0343:00
	Malfunction determination period	• 58,320 deg CA (Accumulate)
	Drive cycle	• 2
	Self test type	• CMDTC self test
	Sensor used	• Fuel injector No.1 • Fuel injector No.2 • Fuel injector No.3 • Fuel injector No.4 • CKP sensor • ECT sensor No.1 • CMP sensor • APP sensor • Fuel pressure sensor/fuel temperature sensor No.2 (built-into fuel injector No.2) • Fuel pressure sensor/fuel temperature sensor No.3 (built-into fuel injector No.3)

DESCRIPTION	Fuel injection amount correction control malfunction between cylinders: • P3101:00: Fuel injection correction amount of cylinder No.1 is too much • P3103:00: Fuel injection correction amount of cylinder No.2 is too much • P3105:00: Fuel injection correction amount of cylinder No.3 is too much • P3107:00: Fuel injection correction amount of cylinder No.4 is too much
	• Insufficient engine compression • Fuel system malfunction — Suction control valve malfunction — Supply pump malfunction — Fuel line restricted or leakage • Fuel pressure sensor No.2 (built-into fuel injector No.2) malfunction • Fuel pressure sensor No.3 (built-into fuel injector No.3) malfunction
POSSIBLE CAUSE	• Cylinder No.1 power system malfunction (such as piston, cylinder) • Cylinder No.2 power system malfunction (such as piston, cylinder) • Cylinder No.3 power system malfunction (such as piston, cylinder) • Cylinder No.4 power system malfunction (such as piston, cylinder) • Turbocharger malfunction • Poor fuel quality • PCM malfunction

System Wiring Diagram

STEP	INSPECTION	RESULTS	ACTION
3	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.
4	PURPOSE: VERIFY IF THERE IS PID ITEM CAUSING DRASTIC CHANGES OF ACCELERATION FLUCTUATION BY INPUT SIGNAL TO PCM • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-D 2.2)].) — APP — ECT — EGR_C_BP_ACT — EGRP_ACT — IAT — MAF — O2S11 — RPM — VSS • Is there any signal that is far out of specification?	Yes	Go to the next step.
		No	Go to the troubleshooting procedure to perform the procedure from Step 1.
5	PURPOSE: VERIFY CONNECTOR CONNECTIONS • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-D 2.2)].) — APP — ECT — EGR_C_BP_ACT — EGRP_ACT — IAT — MAF — O2S11 — RPM — VSS • When the following parts are shaken, does the PID value include a PID item which has changed? — APP sensor — ECT sensor No.1 — EGR cooler bypass valve position sensor — EGR valve position sensor — IAT sensor No.1 — MAF sensor — A/F sensor — CKP sensor — CMP sensor — VSS	Yes	Inspect the related wiring harness and connector. • Repair or replace the malfunctioning part. Go to the troubleshooting procedure to perform the procedure from Step 22.
		No	Go to the troubleshooting procedure to perform the procedure from Step 1.

Troubleshooting Diagnostic Procedure

Caution

STEP	INSPECTION	RESULTS	ACTION
8	**PURPOSE: INSPECT FUEL INJECTOR CIRCUIT FOR SHORT TO POWER SUPPLY** • Verify that the fuel injector No.1, No.2, No.3, No.4 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): — Fuel injector No.1 terminal F — Fuel injector No.1 terminal E — Fuel injector No.2 terminal F — Fuel injector No.2 terminal E — Fuel injector No.3 terminal F — Fuel injector No.3 terminal E — Fuel injector No.4 terminal F — Fuel injector No.4 terminal E • 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: • Fuel injector No.1 terminal F—PCM terminal 1EA • Fuel injector No.1 terminal E—PCM terminal 1EE • Fuel injector No.2 terminal F—PCM terminal 1CW • Fuel injector No.2 terminal E—PCM terminal 1CT • Fuel injector No.3 terminal F—PCM terminal 1DA • Fuel injector No.3 terminal E—PCM terminal 1CS • Fuel injector No.4 terminal F—PCM terminal 1DW • Fuel injector No.4 terminal E—PCM terminal 1EF **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 22.
9	**PURPOSE: INSPECT FUEL INJECTOR CIRCUITS FOR SHORT TO EACH OTHER** • Verify that the fuel injector No.1, No.2, No.3, No.4 and PCM connectors are disconnected. • Switch the ignition off. • Inspect for continuity between the following terminals (wiring harness-side): — Fuel injector No.1 terminal F—Fuel injector No.1 terminal E — Fuel injector No.2 terminal F—Fuel injector No.2 terminal E — Fuel injector No.3 terminal F—Fuel injector No.3 terminal E — Fuel injector No.4 terminal F—Fuel injector No.4 terminal E • Is there continuity?	Yes	Refer to the wiring diagram and verify whether or not there is a common connector between the following terminals: • Fuel injector No.1 terminal F—PCM terminal 1EA • Fuel injector No.1 terminal E—PCM terminal 1EE • Fuel injector No.2 terminal F—PCM terminal 1CW • Fuel injector No.2 terminal E—PCM terminal 1CT • Fuel injector No.3 terminal F—PCM terminal 1DA • Fuel injector No.3 terminal E—PCM terminal 1CS • Fuel injector No.4 terminal F—PCM terminal 1DW • Fuel injector No.4 terminal E—PCM terminal 1EF **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 each other. • Repair or replace the malfunctioning part. **If there is no common connector:** • Repair or replace the wiring harness which has a short to each other. Go to Step 22.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
21	**PURPOSE: INSPECT TURBOCHARGER** • Inspect the turbocharger. (See TURBOCHARGER INSPECTION [SKYACTIV-D 2.2].) • Is there any malfunction?	Yes	Replace the turbocharger, then go to the next step. (See TURBOCHARGER REMOVAL/INSTALLATION [SKYACTIV-D 2.2].)
		No	Go to the next step.
22	**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-D 2.2)].) • Implement the repeatability verification procedure. (See Repeatability Verification Procedure.) • Perform the Pending Trouble Code Access Procedure. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-D 2.2)].) • 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-D 2.2].) Go to the next step.
		No	Go to the next step.
23	**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-D 2.2)].)
		No	DTC troubleshooting completed.

DESCRIPTION	Fuel injection amount correction control malfunction between cylinders: • P3102:00: Fuel injection correction amount of cylinder No.1 is too little • P3104:00: Fuel injection correction amount of cylinder No.2 is too little • P3106:00: Fuel injection correction amount of cylinder No.3 is too little • P3108:00: Fuel injection correction amount of cylinder No.4 is too little
POSSIBLE CAUSE	• ECT sensor No.1 signal malfunction • IAT sensor No.1 signal malfunction • MAF sensor signal malfunction • CKP sensor signal malfunction • CMP sensor signal malfunction • APP sensor signal malfunction • A/F sensor signal malfunction • EGR valve position sensor signal malfunction • EGR cooler bypass valve position sensor signal malfunction • VSS malfunction • Fuel injector No.1 malfunction • Fuel injector No.2 malfunction • Fuel injector No.3 malfunction • Fuel injector No.4 malfunction • Fuel injector No.1 connector or terminals malfunction • Fuel injector No.2 connector or terminals malfunction • Fuel injector No.3 connector or terminals malfunction • Fuel injector No.4 connector or terminals malfunction • PCM connector or terminals malfunction • Short to ground in wiring harness between the following terminals: — Fuel injector No.1 terminal F—PCM terminal 1EA — Fuel injector No.1 terminal E—PCM terminal 1EE — Fuel injector No.2 terminal F—PCM terminal 1CW — Fuel injector No.2 terminal E—PCM terminal 1CT — Fuel injector No.3 terminal F—PCM terminal 1DA — Fuel injector No.3 terminal E—PCM terminal 1CS — Fuel injector No.4 terminal F—PCM terminal 1DW — Fuel injector No.4 terminal E—PCM terminal 1EF • Short to power supply in wiring harness between the following terminals: — Fuel injector No.1 terminal F—PCM terminal 1EA — Fuel injector No.1 terminal E—PCM terminal 1EE — Fuel injector No.2 terminal F—PCM terminal 1CW — Fuel injector No.2 terminal E—PCM terminal 1CT — Fuel injector No.3 terminal F—PCM terminal 1DA — Fuel injector No.3 terminal E—PCM terminal 1CS — Fuel injector No.4 terminal F—PCM terminal 1DW — Fuel injector No.4 terminal E—PCM terminal 1EF • Fuel injector No.1 circuits are shorted to each other • Fuel injector No.2 circuits are shorted to each other • Fuel injector No.3 circuits are shorted to each other • Fuel injector No.4 circuits are shorted to each other • Open circuit in wiring harness between the following terminals: — Fuel injector No.1 terminal F—PCM terminal 1EA — Fuel injector No.1 terminal E—PCM terminal 1EE — Fuel injector No.2 terminal F—PCM terminal 1CW — Fuel injector No.2 terminal E—PCM terminal 1CT — Fuel injector No.3 terminal F—PCM terminal 1DA — Fuel injector No.3 terminal E—PCM terminal 1CS — Fuel injector No.4 terminal F—PCM terminal 1DW — Fuel injector No.4 terminal E—PCM terminal 1EF • Air suction in intake air system • MAF sensor malfunction • CMP sensor malfunction • CKP sensor malfunction • CKP sensor pulse wheel malfunction

Repeatability Verification Procedure

1. Start the engine and leave it idling for 1 min.

PID Item/Simulation Item Used In Diagnosis

PID/DATA monitor item table

Item	Definition	Unit	Condition/Specification
APP	Accelerator pedal position	%	• Accelerator pedal released: Approx. 0% • Accelerator pedal fully depressed: Approx. 100%
ECT	Engine coolant temperature	°C, °F	• Displays the ECT.
EGR_C_BP_ACT	Actual measured EGR cooler bypass valve opening angle	%	ECT: above 70 °C {158 °F} • Idle: Approx. 0 % (after 20−30 s have elapsed since start the engine) • Racing (engine speed 2,000 rpm): 0 %
EGRP_ACT	EGR valve actual opening angle	%	ECT: above 70 °C {158 °F} • Idle: Approx. 0 % (after 20−30 s have elapsed since start the engine) • Racing (engine speed 2,000 rpm): Approx. 60 %
IAT	Intake air temperature (No.1)	°C, °F	• Displays the intake air temperature (No.1).
MAF	Mass air flow	g/sec	• Switch the ignition ON (engine off): Approx. 1.00 g/s {0.132 lb/min} • Idle: Approx. 5.47 g/s {0.724 lb/min} • Racing (engine speed 2,000 rpm): Approx. 13.84 g/s {1.831 lb/min} • Racing (engine speed 4,000 rpm): Approx. 85.13 g/s {11.26 lb/min}
O2S11	A/F sensor current	µA	• Idle: Approx. 1.01 mA • Deceleration fuel cut: Approx. 3.84 mA
	A/F sensor voltage	V	• Switch ignition ON (engine off): 3.24 V • Deceleration fuel cut: Approx. 3.74 V
RPM	Engine speed	RPM	• Displays the engine speed.
VSS	Vehicle speed	KPH, MPH	• Displays the vehicle speed.

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: IDENTIFY TRIGGER DTC FOR FREEZE FRAME DATA • Is the DTC P3102:00, P3104:00, P3106:00 or P3108:00 on FREEZE FRAME DATA?	Yes	Go to the next step.
		No	Go to the troubleshooting procedure for DTC on FREEZE FRAME DATA. (See DTC TABLE [PCM (SKYACTIV-D 2.2)].)

STEP	INSPECTION	RESULTS	ACTION
5	PURPOSE: INSPECT FUEL INJECTOR No.4 CONNECTOR CONDITION • Disconnect the fuel injector No.4 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 20.
		No	Go to the next step.
6	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 20.
		No	Go to the next step.
7	PURPOSE: INSPECT FUEL INJECTOR CIRCUIT FOR SHORT TO GROUND • Verify that the fuel injector No.1, No.2, No.3, No.4 and PCM connectors are disconnected. • Inspect for continuity between the following terminals (wiring harness-side) and body ground: — Fuel injector No.1 terminal F — Fuel injector No.1 terminal E — Fuel injector No.2 terminal F — Fuel injector No.2 terminal E — Fuel injector No.3 terminal F — Fuel injector No.3 terminal E — Fuel injector No.4 terminal F — Fuel injector No.4 terminal E • Is there continuity?	Yes	Refer to the wiring diagram and verify whether or not there is a common connector between the following terminals: • Fuel injector No.1 terminal F—PCM terminal 1EA • Fuel injector No.1 terminal E—PCM terminal 1EE • Fuel injector No.2 terminal F—PCM terminal 1CW • Fuel injector No.2 terminal E—PCM terminal 1CT • Fuel injector No.3 terminal F—PCM terminal 1DA • Fuel injector No.3 terminal E—PCM terminal 1CS • Fuel injector No.4 terminal F—PCM terminal 1DW • Fuel injector No.4 terminal E—PCM terminal 1EF 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. Go to Step 20.
		No	Go to the next step.
8	PURPOSE: INSPECT FUEL INJECTOR CIRCUIT FOR SHORT TO POWER SUPPLY • Verify that the fuel injector No.1, No.2, No.3, No.4 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): — Fuel injector No.1 terminal F — Fuel injector No.1 terminal E — Fuel injector No.2 terminal F — Fuel injector No.2 terminal E — Fuel injector No.3 terminal F — Fuel injector No.3 terminal E — Fuel injector No.4 terminal F — Fuel injector No.4 terminal E • 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: • Fuel injector No.1 terminal F—PCM terminal 1EA • Fuel injector No.1 terminal E—PCM terminal 1EE • Fuel injector No.2 terminal F—PCM terminal 1CW • Fuel injector No.2 terminal E—PCM terminal 1CT • Fuel injector No.3 terminal F—PCM terminal 1DA • Fuel injector No.3 terminal E—PCM terminal 1CS • Fuel injector No.4 terminal F—PCM terminal 1DW • Fuel injector No.4 terminal E—PCM terminal 1EF 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 20.