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2003 MAZDA 2 / Demio OEM Service and Repair Workshop Manual

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SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)]

SM2897114

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• Verify malfunction symptoms using the following diagnostic index, then go to the appropriate troubleshooting chart.

Diagnostic Index

–: Not applicable

No.	TROUBLESHOOTING ITEM	DESCRIPTION
1	Blown fuses	–
2	Check engine light illuminates	• Check engine light illuminates incorrectly.
3	Will not crank	• Starter does not work.
4	Hard to start/long crank/erratic start/erratic crank	• Starter cranks engine at normal speed but engine requires excessive cranking time before starting. • Battery is operating normally.
5	Engine stalls-after start/at idle	• Stalling occurs if vehicle is left idling under no load. • Stalling occurs when load (electric, A/C) is applied during idling. • Stalling occurs if the accelerator pedal is depressed from an idling condition when accelerating from a stop.
6	Cranks normally but will not start	• Cranking occurs but no ignition.
7	Engine oil warning light illuminated/message related to engine hydraulic pressure malfunction indicated in display	• Engine oil warning light illuminated. • Message related to engine hydraulic pressure indicated in display.
8	Engine runs rough/rolling idle	• Idle speed lower than the specification. • Idling speed unstable, increases/decreases.
9	Fast idle/runs on	• Engine speed continues at fast idle after warm-up. • Engine runs after ignition is switched off.
10	Low idle/stalls during deceleration	• Engine speed decreases when the accelerator pedal is released. • Stalls during deceleration with the accelerator pedal fully released. • When the accelerator pedal is fully released, vehicle stalls directly after vehicle stops.
11	Engine stalls/quits, engine runs rough, misses, buck/jerk, hesitation/stumble, surges	• Stalling occurs while driving with the throttle open.
12	Lack/loss of power-acceleration/cruise	• Engine speed increase delays when the accelerator pedal is fully depressed.
13	Knocking/pinging-acceleration/cruise	• Abnormal combustion occurs under the condition such as the temperature in the combustion chamber is too high resulting in abnormal noise. • Knocking sound occurs from the engine compartment during acceleration.
14	Poor fuel economy	• Fuel economy is unsatisfactory.
15	Emission compliance	• Fails emissions test.
16	High oil consumption/leakage	• Oil consumption is excessive.
17	Cooling system concerns-overheating	• The engine coolant temperature is abnormally high.
18	Cooling system concerns-runs cold	• Engine does not reach normal operating temperature.
19	Exhaust smoke	• Blue, black, or white smoke from exhaust system.
20	Fuel odor (in engine compartment)	• Gasoline fuel smell or visible leakage.
21	Engine noise	• Engine noise from under hood.

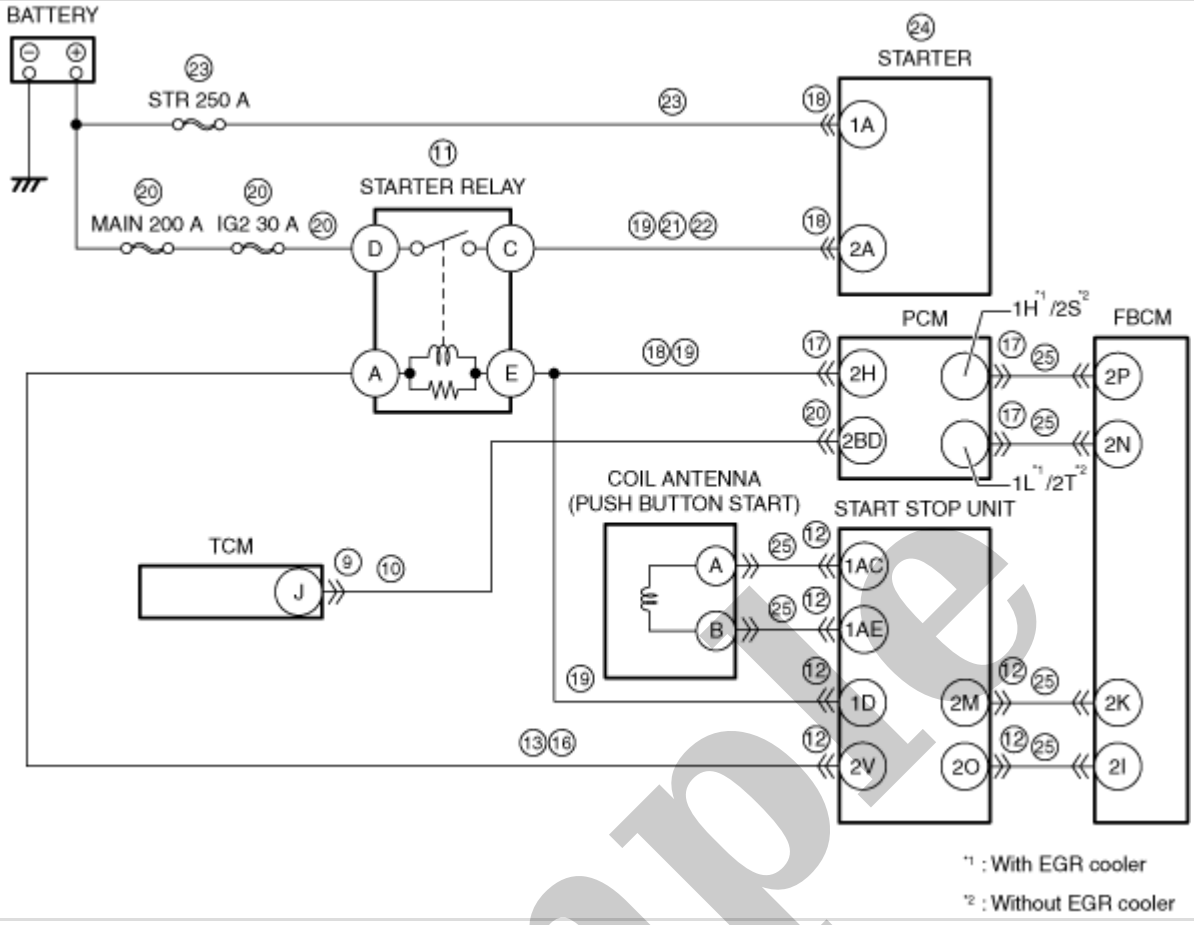
6	CRANKS NORMALLY BUT WILL NOT START
POSSIBLE CAUSE	• Because engine is started with accelerator pedal fully depressed, it goes into dechoke mode and fuel is not injected • Engine overheating • PCM DTC is stored • Erratic signal to PCM — APP sensor or related circuit malfunction — ECT sensor or related circuit malfunction — MAF sensor or related circuit malfunction — A/F sensor or related circuit malfunction — HO2S or related circuit malfunction — Improper air/fuel mixture ratio control • Power is not supplied from main relay • Power is not supplied from sub relay and/or fuel pump relay • Improper operation of drive-by-wire control system • Purge solenoid valve malfunction • No signal from MAF sensor • Poor fuel quality • Air leakage from intake-air system • Intake-air system restriction • Electrical connector disconnected • No battery power supply to PCM or poor ground • Fuse malfunction • Fuel leakage • Vacuum leakage • No signal from CMP sensor — Loose installation — Damaged trigger wheel (exhaust camshaft) — Open or short circuit in related wiring harness • No signal from CKP sensor — Loose installation — Damaged trigger wheel (crankshaft pulley) — Open or short circuit in related wiring harness • Inadequate fuel pressure (high or low pressure side) — Open or short circuit in the fuel pump (low-side) body or related wiring harness — Fuel pressure sensor or related circuit malfunction — High pressure fuel pump malfunction — Spill valve control solenoid valve control circuit malfunction (damage to driver in PCM caused by short circuit to ground system) — Spill valve control solenoid valve malfunction (built-into high pressure fuel pump) — Fuel line restriction — Fuel filter clogged — Fuel pump (low-side) body mechanical malfunction • Incorrect fuel injection timing • Fuel injector malfunction • Improper operation of electric variable valve timing control system (PCM DTC is stored.) • Improper operation of hydraulic variable valve timing control system • Low engine compression • Improper intake valve timing • Improper exhaust valve timing • Ignition system malfunction • Ignition coil malfunction • Vapor occurs around fuel pump (fuel problem) • Because vapor occurs in high pressure fuel pump, fuel injector cannot adjust fuel injection to correct amount • Exhaust system and/or TWC restricted • PCV valve malfunction • Injector driver (built-into PCM) malfunction

STEP	INSPECTION	RESULTS	ACTION
4	VERIFY CURRENT INPUT SIGNAL STATUS Caution • While performing this step, always operate the vehicle in a safe and lawful manner. • 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. • Access the following PIDs using the M-MDS: (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].) — APP1 — APP2 — ECT — MAF — O2S11 — O2S12 — SHRTFT1 — LONGFT1 • Do the PIDs indicate the correct values under the malfunction condition? (See PCM INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)	Yes	Go to the next step.
		No	APP1, APP2 PIDs are not as specified: • Inspect the APP sensor. (See ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) ECT PID is not as specified: • Inspect the ECT sensor. (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G (WITHOUT EGR COOLER)].) (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G (WITH EGR COOLER)].) MAF PID is not as specified: • Inspect the MAF sensor. (See MASS AIR FLOW (MAF) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) O2S11, SHRTFT1, LONGFT1 PIDs are not as specified: • Inspect the A/F sensor. (See AIR FUEL RATIO (A/F) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) O2S12 PID is not as specified: • Inspect the HO2S. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) Repair or replace the malfunctioning part according to the inspection results. • If the malfunction remains: — Perform the "INTERMITTENT CONCERN TROUBLESHOOTING" procedure. (See INTERMITTENT CONCERN TROUBLESHOOTING [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
5	DETERMINE IF MALFUNCTION CAUSE IS DRIVE-BY-WIRE CONTROL SYSTEM OR OTHER • Will the engine run smoothly at part throttle?	Yes	Go to Step 7.
		No	Go to the next step.
6	INSPECT DRIVE-BY-WIRE CONTROL SYSTEM OPERATION • Perform the Electronic Control Throttle Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) • Does the drive-by-wire control system work properly?	Yes	Visually inspect the throttle body (damage/scratching). • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results. • If there is no malfunction: — Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results.
7	INSPECT PURGE CONTROL SYSTEM OPERATION • Perform the Purge Control System Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) • Does the purge solenoid valve work properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results.

STEP	INSPECTION	RESULTS	ACTION
12	**INSPECT FUEL PRESSURE (HIGH-SIDE)** • Access the FUEL_PRES PID using the M-MDS while cranking the engine. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].) • Is the FUEL_PRES PID value within specification? **Specification:** • Approx. 10 MPa {102 kgf/cm^2, 1,450 psi}	Yes	Go to Step 14.
		No	Lower than specification: • Inspect the following: — Fuel leakage at the fuel line and fuel injector — Fuel pump • Perform the Fuel Pump (Low-pressure Side) Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) — Fuel pressure sensor (See FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G (WITHOUT EGR COOLER)].) (See HIGH FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G (WITH EGR COOLER)].) — High pressure fuel pump (See HIGH PRESSURE FUEL PUMP INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results. • If there is no malfunction: — Go to the next step. Higher than specification: • Go to the next step.
13	**INSPECT SPILL VALVE CONTROL SOLENOID VALVE CONTROL CIRCUIT FOR SHORT TO GROUND** • Switch the ignition off. • Disconnect the high pressure fuel pump and PCM connectors. • Inspect for continuity between high pressure fuel pump terminal A (wiring harness-side) and body ground. • Is there continuity?	Yes	Refer to the wiring diagram and verify whether or not there is a common connector between high pressure fuel pump terminal A and PCM terminal 1DI. **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 malfunction remains: • Replace the PCM. (damage to driver in PCM) (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
		No	Replace the high pressure fuel pump. (See HIGH PRESSURE FUEL PUMP REMOVAL/INSTALLATION [SKYACTIV-G (WITHOUT EGR COOLER)].) (See HIGH PRESSURE FUEL PUMP REMOVAL/INSTALLATION [SKYACTIV-G (WITH EGR COOLER)].)

STEP	INSPECTION	RESULTS	ACTION
27	Verify the test results. • If normal, return to the diagnostic index to service any additional symptoms. (See SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) • If the malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If the vehicle is repaired, troubleshooting is completed. — If the vehicle is not repaired or additional diagnostic information is not available, reprogram the PCM if a later calibration is available. Retest.		

3	WILL NOT CRANK



STEP	INSPECTION	RESULTS	ACTION
5	VERIFY IMMOBILIZER SYSTEM DTC • Retrieve the immobilizer system DTC using the M-MDS. (See DTC INSPECTION [START STOP UNIT].) • Are any DTCs present?	Yes	Go to the applicable DTC inspection. (See DTC TABLE [START STOP UNIT].)
		No	Go to the next step.
6	VERIFY PCM DTC • Retrieve PCM DTCs using the M-MDS. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].) • Are any continuous memory DTCs present?	Yes	Continuous memory DTC is displayed: • Go to the applicable DTC inspection. (See DTC TABLE [PCM (SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION))].) Communication error message is displayed: • Inspect the following: — Open circuit in wiring harness between main relay terminal E and PCM terminal 2B — Open circuit in wiring harness between main relay terminal C and PCM terminal 2BO or 2BR — Main relay (stuck open) — Open or short circuit in wiring harness between DLC-2 and PCM terminal 1H or 1L (With EGR cooler) — Open or short circuit in wiring harness between DLC-2 and PCM terminal 2S or 2T (Without EGR cooler) — Open or poor ground circuit (PCM terminal 2BQ and 2BT) — Poor connection of vehicle body ground • Repair or replace the malfunctioning part according to the inspection results.
		No	Go to the next step.
7	DETERMINE IF MALFUNCTION CAUSE IS STARTER RELAY CONTROL SIGNAL CIRCUIT OR OTHER • Switch the ignition ON (engine on). • Is a clicking sound heard from the starter relay?	Yes	Go to Step 17.
		No	Go to the next step.
8	INSPECT TCM CONNECTOR CONDITION • Switch the ignition off. • Disconnect the TCM 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 repeat Step 7.
		No	Go to the next step.
9	INSPECT TCM CIRCUIT FOR OPEN CIRCUIT • Verify that the TCM connector is disconnected. • Inspect for continuity between TCM terminal J (wiring harness-side) and PCM terminal 2BD (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 TCM terminal J and PCM terminal 2BD. **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. Repeat Step 7.
10	INSPECT STARTER RELAY • Remove the starter relay. (See RELAY LOCATION.) • Inspect the starter relay. (See RELAY INSPECTION.) • Is there any malfunction?	Yes	Replace the starter relay. Repeat Step 7.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
20	**INSPECT STARTER POWER SUPPLY CIRCUIT FOR SHORT TO GROUND** • Verify that the starter relay is removed. • Verify that the starter connector is disconnected. • Inspect for continuity between starter relay terminal C (wiring harness-side) and body ground. • Is there continuity?	Yes	Repair or replace the wiring harness, then go to Step 27.
		No	Go to the next step.
21	**INSPECT STARTER POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Verify that the starter relay is removed. • Verify that the starter connector is disconnected. • Inspect for continuity between starter relay terminal C (wiring harness-side) and starter terminal 2A (wiring harness-side). • Is there continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 27.
22	**INSPECT STARTER POWER SUPPLY CIRCUIT FOR SHORT TO GROUND OR OPEN CIRCUIT** • Verify that the starter connector is disconnected. • Switch the ignition off. • Measure the voltage at the starter terminal 1A (wiring harness-side) • Is the voltage B+?	Yes	Go to the next step.
		No	Inspect the STR 250 A fuse. • If the fuse is blown: — Repair or replace the wiring harness for a possible short to ground. — Replace the fuse. • If the fuse is deteriorated: — Replace the fuse. • If the fuse is normal: — Repair or replace the wiring harness for a possible open circuit. Go to Step 27.
23	**INSPECT STARTER** • Inspect the starter. (See STARTER INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].) • Is the starter normal?	Yes	Go to the next step.
		No	Replace the starter, then go to Step 27. (See STARTER REMOVAL/INSTALLATION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)

4	HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK
POSSIBLE CAUSE	**Note** **• If the ignition is not switched off (to LOCK or ACC) after the engine stalls, and then an engine restart is attempted, the PCM corrects the difference between CKP sensor and CMP sensor signals caused by engine stalling, which may result in more time needed to restart the engine.** • Engine overheating • PCM DTC is stored • Erratic signal to PCM — ECT sensor or related circuit malfunction — MAF sensor or related circuit malfunction — MAP sensor or related circuit malfunction — A/F sensor or related circuit malfunction — HO2S or related circuit malfunction — Improper air/fuel mixture ratio control • Improper operation of drive-by-wire control system • Incorrect fuel injection timing • Fuel injector malfunction • Purge solenoid valve malfunction • Contamination in MAF sensor • Under the condition in which the engine starts and stops repeatedly while the vehicle is not driven, the fuel injected prior to complete ignition during engine start may drop into the oil pan from the cylinder and mix with the engine oil. The situation in which excess quantities of fuel continue to be injected due to an engine coolant temperature signal error is the same. • Intermittent open circuit in PCM ground circuit • Poor fuel quality • Fuel leakage • Air leakage from intake-air system • Intake-air system restriction • Vacuum leakage • Improper engine oil viscosity • Erratic signal from CMP sensor — Loose installation — Damaged trigger wheel (intake camshaft and/or exhaust camshaft) — Open or short circuit in related wiring harness • Erratic signal from CKP sensor — Loose installation — Damaged trigger wheel (crankshaft pulley) — Open or short circuit in related wiring harness • Inadequate fuel pressure (high or low pressure side) — Fuel pressure sensor or related circuit malfunction — High pressure fuel pump malfunction — Spill valve control solenoid valve control circuit malfunction (damage to driver in PCM caused by short circuit to ground system) — Spill valve control solenoid valve malfunction (built-into high pressure fuel pump) — Relief valve (built-into high pressure fuel pump) malfunction — Fuel line restriction — Fuel filter clogged — Fuel pump unit malfunction • Starting system malfunction • Low engine compression • Improper intake valve timing • Improper exhaust valve timing • Improper operation of electric variable valve timing control system — Electric variable valve timing driver malfunction — Electric variable valve timing motor malfunction — Electric variable valve timing actuator malfunction