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2002 MAZDA B Series / Bravo Freestyle Cab OEM Service and Repair Workshop Manual

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STEP	INSPECTION	RESULTS	ACTION
5	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 2.5T)].) — APP1 — APP2 — ECT — FUEL_PRES — IAT — MAF — MAP — MAP_V — TP_REL — O2S11 — O2S12 — SHRTFT1 — INLET_PRES • Do the PIDs indicate the correct values under the trouble condition? (See PCM INSPECTION [SKYACTIV-G 2.5T].)	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 2.5T].) ECT PID is not as specified: • Inspect the ECT sensor. (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.5T].) FUEL_PRES PID is not as specified: • Inspect the high fuel pressure sensor. (See HIGH FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) IAT PID is not as specified: • Inspect the IAT sensor No.1. (See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION [SKYACTIV-G 2.5T].) MAF PID is not as specified: • Inspect the MAF sensor. (See MASS AIR FLOW (MAF) SENSOR INSPECTION [SKYACTIV-G 2.5T].) MAP, MAP_V PIDs are not as specified: • Inspect the MAP sensor. (See MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INSPECTION [SKYACTIV-G 2.5T].) TP_REL PID is not as specified: • Inspect the TP sensor. (See THROTTLE POSITION (TP) SENSOR INSPECTION [SKYACTIV-G 2.5T].) O2S11, SHRTFT1, LONGFT1 PIDs are not as specified: • Inspect the A/F sensor. (See AIR FUEL RATIO (A/F) SENSOR INSPECTION [SKYACTIV-G 2.5T].) O2S12 PID is not as specified: • Inspect the HO2S. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.5T].) INLET_PRES PID is not as specified: • Inspect the boost pressure sensor inspection. (See BOOST PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) Repair or replace the malfunctioning part according to the inspection results. • If the malfunction remains: — Inspect communication error between TCM and PCM. • Repair or replace the malfunctioning part according to the inspection results if necessary. — Perform the "INTERMITTENT CONCERN TROUBLESHOOTING" procedure. (See INTERMITTENT CONCERN TROUBLESHOOTING [SKYACTIV-G 2.5T].)

STEP	INSPECTION	RESULTS	ACTION
13	**INSPECT FUEL PRESSURE (LOW-SIDE)** • Connect the fuel pressure gauge between fuel pump and high pressure fuel pump. • Measure the low side fuel pressure. (See FUEL LINE PRESSURE INSPECTION [SKYACTIV-G 2.5T].) • Is the low side fuel pressure within specification? **Specification:** • 545–695 kPa {5.56–7.08 kgf/cm2, 79.1–100.0 psi}	Yes	Go to the next step.
		No	Inspect the following: • Fuel line restriction • Fuel filter clogged — If there is any malfunction: • Repair or replace the malfunctioning part according to the inspection results. — If there is no malfunction: • Replace the fuel pump unit. (See FUEL PUMP UNIT REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
14	**INSPECT THROTTLE VALVE FOR CLOGGING** • Visually inspect the throttle valve. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].) • Is any foreign material adhering around the throttle valve?	Yes	Clean the throttle valve.
		No	Go to the next step.
15	**INSPECT WASTEGATE VALVE** • Switch the ignition off. • Inspect wastegate valve actuator. (See WASTEGATE VALVE ACTUATOR INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Replace the dynamic pressure turbo. (See DYNAMIC PRESSURE TURBO REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Go to the next step.
16	**INSPECT ENGINE COMPRESSION** • Measure the compression pressure for each cylinder. (See COMPRESSION INSPECTION [SKYACTIV-G 2.5T].) • Are compression pressures within specification?	Yes	Go to Step 22.
		No	Go to the next step.
17	**INSPECT ELECTRIC VARIABLE VALVE TIMING DRIVER** • Inspect the electric variable valve timing driver. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Replace the electric variable valve timing motor/driver. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Go to the next step.
18	**INSPECT ELECTRIC VARIABLE VALVE TIMING MOTOR** • Inspect the electric variable valve timing motor. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Replace the electric variable valve timing motor/driver. (See ELECTRIC VARIABLE VALVE TIMING MOTOR/DRIVER REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Go to the next step.
19	**INSPECT ELECTRIC VARIABLE VALVE TIMING ACTUATOR** • Inspect the electric variable valve timing actuator. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Replace the electric variable valve timing actuator. (See ELECTRIC VARIABLE VALVE TIMING ACTUATOR, HYDRAULIC VARIABLE VALVE TIMING ACTUATOR REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Go to the next step.
20	**INSPECT HYDRAULIC VARIABLE VALVE TIMING CONTROL SYSTEM OPERATION** • Perform the Hydraulic Variable Valve Timing Control System Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results.
		No	Go to the next step.

15	EMISSION COMPLIANCE
POSSIBLE CAUSE	• Engine overheating • Cooling system malfunction • PCM DTC is stored • Incorrect fuel injection timing • Incorrect ignition timing — Spark plug malfunction — Ignition coil malfunction — CKP sensor malfunction — CMP sensor malfunction • Purge solenoid valve malfunction • Ejector malfunction • Inadequate fuel pressure — Fuel leakage at the fuel line and/or fuel injector — 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 (built-into high pressure fuel pump) malfunction — Relief valve (built-into high pressure fuel pump) malfunction — Fuel line restriction — Fuel pump unit malfunction — Fuel pump control module malfunction • Air leakage from intake-air system • Vacuum lines leakage or blockage • Charcoal canister damage • Improper engine coolant level • Excessive carbon built-up in combustion chamber • Improper engine compression • Improper intake valve timing • Improper exhaust valve timing • Exhaust system and/or TWC restriction • Exhaust gas leakage from the exhaust system • TWC malfunction (PCM DTC is stored.) • Positive crankcase ventilation system malfunction — PCV valve malfunction or incorrect valve installation — Clogging in positive crankcase ventilation system hoses (PCV valve hose, ventilation hose) **Warning** **• The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** **— Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** **— Highly pressurized fuel may spray out if the fuel line is cut. Due to the following dangers occurring with a fuel spray, always complete the "Fuel Line Safety Procedure" to prevent the fuel from spraying. (See BEFORE SERVICE PRECAUTION [SKYACTIV-G 2.5T].)** **• Fuel may cause irritation if it comes in contact with skin and eyes.** **• If fuel ignites and causes a fire, it may lead to serious injury or death, and damage to property and facilities.** **— Fuel is highly flammable and dangerous. Fuel line spills and leakage can cause serious injury or death, and damage to equipment. Always refer to the "Quick Release Connector Removal/Installation (fuel system)" before performing the fuel hose installation, and execute the "Fuel Leakage Inspection" after installation. (See QUICK RELEASE CONNECTOR (FUEL SYSTEM) REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].) (See AFTER SERVICE PRECAUTION [SKYACTIV-G 2.5T].)**

STEP	INSPECTION	RESULTS	ACTION
8	INSPECT FUEL PRESSURE (HIGH-SIDE) • Start the engine and warm it up completely. • Access the FUEL_PRES PID using the M-MDS at idle. (See ON-BOARD DIAGNOSTIC TEST [PCM (SKYACTIV-G 2.5T)].) • Is the FUEL_PRES PID value approx. 3 MPa {31 kgf/cm^2, 435 psi}?	Yes	Go to the next step.
		No	Lower than 3 MPa {31 kgf/cm^2, 435 psi}: • 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 2.5T].) — Fuel pressure sensor (See HIGH FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) (See LOW FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) — High pressure fuel pump (See HIGH PRESSURE FUEL PUMP INSPECTION [SKYACTIV-G 2.5T].) — Fuel pump control module (See FUEL PUMP CONTROL MODULE INSPECTION [SKYACTIV-G 2.5T].) Higher than 3 MPa {31 kgf/cm^2, 435 psi}: • Inspect the following: — Fuel line and fuel injector restriction — Fuel pressure sensor (See HIGH FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) (See LOW FUEL PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) — High pressure fuel pump (Relief valve clogged) — Fuel pump control module (See FUEL PUMP CONTROL MODULE INSPECTION [SKYACTIV-G 2.5T].) Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
9	INSPECT INTAKE-AIR SYSTEM FOR AIR LEAKAGE • Inspect for leakage in intake-air system. • Is there any leakage?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
10	INSPECT RESTRICTION IN VENTILATION HOSE • Inspect for restriction in the ventilation hose. • Is there any restriction?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18.
		No	Go to the next step.
11	VERIFY IF MALFUNCTION CAUSE IS CHARCOAL CANISTER • Inspect the charcoal canister. (See CHARCOAL CANISTER INSPECTION [SKYACTIV-G 2.5T].) • Is the charcoal canister damaged?	Yes	Repair or replace the malfunctioning part according to the inspection results, then go to Step 18. (See CHARCOAL CANISTER REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
5	DETERMINE IF MALFUNCTION CAUSE IS DUE TO PCV VALVE OR INTERNAL ENGINE MALFUNCTION • Inspect the PCV valve. (See POSITIVE CRANKCASE VENTILATION (PCV) VALVE INSPECTION [SKYACTIV-G 2.5T].) • Is the PCV valve normal?	Yes	Inspect for internal engine wear, damage. • Cylinder • Piston ring • Intake/exhaust valve • Cylinder head gasket — If there is any malfunction: • Repair or replace the malfunctioning location, then go to the next step.
		No	Replace the PCV valve, then go to the Step 7. (See POSITIVE CRANKCASE VENTILATION (PCV) VALVE REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
6	VISUALLY INSPECT THE TURBOCHARGER • Remove the parts necessary to inspect the turbocharger without removing the turbocharger. (See DYNAMIC PRESSURE TURBO REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].) • Visually inspect for the oil leakage inside turbocharger compressor and turbine housing. • Is there any leakage?	Yes	Replace the intake air system parts, then go to next step. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Replace the dynamic pressure turbo. (See DYNAMIC PRESSURE TURBO REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
7	Verify the test results. • If normal, return to the diagnostic index to service any additional symptoms. (See SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-G 2.5T].) • 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.		

STEP	INSPECTION	RESULTS	ACTION
6	**INSPECT COOLING SYSTEM CAP** • Inspect the cooling system cap. (See COOLING SYSTEM CAP INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Replace the cooling system cap.
		No	Go to the next step.
7	**INSPECT RELATED PART CONDITION** • Inspect the following: — Engine coolant performance — Coolant leakage (engine internal, external) — Water and anti-freeze mixture — Thermostat (not fully open) — Radiator (clogging) — Fuses • Is there any malfunction?	Yes	Service if necessary. • Repeat this step.
		No	Go to the next step.
8	**VERIFY IF MALFUNCTION CAUSED BY LACK OF ENGINE COOLANT** • Inspect the engine coolant level. (See ENGINE COOLANT LEVEL INSPECTION [SKYACTIV-G 2.5T].) • Is there any malfunction?	Yes	Add engine coolant and verify that there is no engine coolant leakage. (See ENGINE COOLANT REPLACEMENT [SKYACTIV-G 2.5T].) (See ENGINE COOLANT LEAKAGE INSPECTION [SKYACTIV-G 2.5T].) • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results.
		No	Go to the next step.
9	**DETERMINE IF MALFUNCTION CAUSE IS THERMOSTAT OR OTHER** • Verify the radiator hose tension. **Warning** **• To prevent burns, use a cloth with your hand to verify the tension of the radiator hose.** • After the engine warms up, does the engine coolant circulate to the radiator hose?	Yes	Go to Step 11.
		No	Go to the next step.
10	**INSPECT THERMOSTAT** • Inspect the thermostat. (See THERMOSTAT INSPECTION [SKYACTIV-G 2.5T].) • Is the thermostat normal?	Yes	Inspect the water pump. • If there is any malfunction: — Repair or replace the malfunctioning part according to the inspection results. (See WATER PUMP REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)
		No	Replace the thermostat. (See THERMOSTAT REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].)

19	EXHAUST SMOKE
POSSIBLE CAUSE	**Blue smoke (Burning oil):** • PCV valve malfunction • Engine internal oil leakage • Oil leakage at the compressor or turbine end of the turbocharger **White smoke (Water in combustion):** • Cooling system malfunction (coolant loss) • Engine internal coolant leakage • Coolant leakage at the compressor or the turbine end of the turbocharger **Black smoke (Rich fuel mixture):** • Erratic signal to PCM — APP sensor or related circuit malfunction — ECT sensor or related circuit malfunction — IAT sensor No.1 (integrated in MAF sensor/IAT sensor No.1) 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 — TP sensor or related circuit malfunction — Boost pressure sensor signal — Boost air temperature sensor signal • Improper fuel injection timing and amount • Air cleaner restriction • Intake-air system is collapsed or restricted • Leakage at engine intake manifold and/or exhaust manifold • Inadequate/Excessive fuel pressure — Fuel pressure sensor 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 (built-into high pressure fuel pump) malfunction — Relief valve (built-into high pressure fuel pump) malfunction — Fuel line restricted or clogged — Fuel pump unit malfunction • Ignition system malfunction • Improper engine compression • Improper intake valve timing • Improper exhaust valve timing • Injector driver (built-into PCM) malfunction **Warning** **• The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** **— Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** **— Highly pressurized fuel may spray out if the fuel line is cut. Due to the following dangers occurring with a fuel spray, always complete the "Fuel Line Safety Procedure" to prevent the fuel from spraying. (See BEFORE SERVICE PRECAUTION [SKYACTIV-G 2.5T].)** **• Fuel may cause irritation if it comes in contact with skin and eyes.** **• If fuel ignites and causes a fire, it may lead to serious injury or death, and damage to property and facilities.** **— Fuel is highly flammable and dangerous. Fuel line spills and leakage can cause serious injury or death, and damage to equipment. Always refer to the "Quick Release Connector Removal/Installation (fuel system)" before performing the fuel hose installation, and execute the "Fuel Leakage Inspection" after installation. (See QUICK RELEASE CONNECTOR (FUEL SYSTEM)**

STEP	INSPECTION	RESULTS	ACTION
6	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 2.5T)].) — APP1 — APP2 — ECT — IAT — MAF — MAP — MAP_V — TP_REL — INLET_PRES — O2S11 — O2S12 — SHRTFT1 — LONGFT1 — INT_CO_TEMP • Monitor the PIDs under the black smoke appeared engine condition. • Do the PIDs indicate normal according to engine conditions? (See PCM INSPECTION [SKYACTIV-G 2.5T].)	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 2.5T].) ECT PID is not as specified: • Inspect the ECT sensor. (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [SKYACTIV-G 2.5T].) IAT PID is not as specified: • Inspect the IAT sensor No.1. (See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION [SKYACTIV-G 2.5T].) MAF PID is not as specified: • Inspect the MAF sensor. (See MASS AIR FLOW (MAF) SENSOR INSPECTION [SKYACTIV-G 2.5T].) MAP, MAP_V PIDs are not as specified: • Inspect the MAP sensor. (See MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INSPECTION [SKYACTIV-G 2.5T].) TP_REL PID is not as specified: • Inspect the TP sensor. (See THROTTLE POSITION (TP) SENSOR INSPECTION [SKYACTIV-G 2.5T].) INLET_PRES PID is not as specified: • Inspect the boost pressure sensor inspection. (See BOOST PRESSURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) INT_CO_TEMP PID is not as specified: • Inspect the temperature sensor inspection. (See BOOST AIR TEMPERATURE SENSOR INSPECTION [SKYACTIV-G 2.5T].) O2S11, SHRTFT1, LONGFT1 PIDs are not as specified: • Inspect the A/F sensor. (See AIR FUEL RATIO (A/F) SENSOR INSPECTION [SKYACTIV-G 2.5T].) O2S12 PID is not as specified: • Inspect the HO2S. (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [SKYACTIV-G 2.5T].) 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 2.5T].)
7	INSPECT FUEL INJECTOR OPERATION • Perform the Fuel Injector Operation Inspection. (See ENGINE CONTROL SYSTEM OPERATION INSPECTION [SKYACTIV-G 2.5T].) • Do the fuel injectors operate properly?	Yes	Go to the next step.
		No	Repair or replace the malfunctioning part according to the inspection results.
8	INSPECT INTAKE AIR SYSTEM • Inspect the following for intake-air system: — Air cleaner restriction — Collapsed or restricted air hose — Leakage at engine intake manifold • Is there any malfunction?	Yes	Repair or replace the malfunctioning part according to the inspection results.
		No	Go to the next step.

STEP	INSPECTION	RESULTS	ACTION
16	**INSPECT IF MALFUNCTION CAUSE IS ENGINE COMPRESSION OR INJECTOR DRIVER (PCM INTEGRATED)** • Measure the compression pressure for each cylinder. (See COMPRESSION INSPECTION [SKYACTIV-G 2.5T].) • Are compression pressures within specification?	Yes	Injector driver malfunction. • Replace the PCM. (See PCM REMOVAL/INSTALLATION [SKYACTIV-G 2.5T].) If the problem remains, overhaul the engine.
		No	Inspect the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper intake valve timing • Improper exhaust valve timing Service if necessary.
17	Verify the test results. • If normal, return to the diagnostic index to service any additional symptoms. (See SYMPTOM DIAGNOSTIC INDEX [SKYACTIV-G 2.5T].) • 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.		