Section B

Driveability Symptoms

Contents

Important Preliminary Checks

Checks	Action
Before Using This Section	Before using this section you should have performed the "On-Board Diagnostic System Check" and determined that: 1. The ECM and Malfunction Indicator Lamp (MIL) are operating correctly. 2. There are no Diagnostic Trouble Codes (DTCs) stored, or there is a diagnostic code but no MIL. 3. Several of the following symptom procedures call for a careful visual/physical check. The importance of visual/physical checks cannot be over stressed, because they can lead to correcting a problem without further checks and can save valuable time.
Before Starting	• Check the ECM grounds for being clean, tight, and in their proper locations. Refer to *6E3-A ECM Wiring Diagrams.* • Check the vacuum hoses for splits, kinks and proper connections, as shown on "Vehicle Emission Control Information" label. Check thoroughly for any type of leak or restriction. • Check for air leaks at all mounting areas of the intake manifold sealing surfaces. • Check the ignition wires for the following: - Cracking - Hardness - Proper routing - Carbon tracking • Check the wiring for proper connections, pinches, and cuts. Refer to *6E3-A ECM Wiring Diagrams.* • The following symptom tables contain groups of possible causes for each symptom and cover several engines. These procedures do not have to be done in consecutive order. If the scan tool readings do not indicate the problems, then proceed in a logical order, easiest to check or most likely cause first. To determine if a specific vehicle is using a particular system or component, refer to the *"ECM Wiring Diagrams"* for application.
Symptom	Verify the customer complaint, and locate the correct symptom in the table of contents. Check the items indicated under that symptom.

Intermittents

Checks	Action
Definition: The problem may or may not turn "ON" the Malfunction Indicator Lamp (MIL) or store a Diagnostic Trouble Code (DTC).	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • **Do Not** use the DTC tables in *Section 6E3-A* for intermittent problems. The fault must be present to locate the problem. If a fault is intermittent, the use of DTC tables may result in the replacement of good parts.
Faulty Electrical Connections or Wiring	Faulty electrical connections or wiring can cause most intermittent problems. Perform a careful check of the suspected circuit for the following: • Poor mating of the connector halves, or terminals, not fully seated in the connector body (backed out). • Improperly formed or damaged terminals, carefully reform or replace all the connector terminals in the problem circuit to insure the proper contact tension. • Poor terminal to wire connection, this requires removing the terminal from the connector body to check. Refer to *Electrical Diagnosis* in *Section 8-5.*
Road Test	If a visual/physical check does not locate the cause of the problem, drive the vehicle with a voltmeter connected to a suspected circuit or use a scan tool. If the wiring and connectors check OK, and a DTC was stored for a circuit having a sensor, replace the sensor.
Intermittent "Malfunction Indicator Lamp (MIL)"	The following can cause an intermittent MIL and no DTCs: • Electrical system interference caused by a defective relay, ECM driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the faulty component is operating. • The improper installation of electrical devices, such as lights, 2-way radios, electric motors, etc. • Route the Ignition Control (IC) wires away from the spark plug wires, the ignition system components and the generator. The wire for the engine ground from the ECM to the ignition system should be a good ground. • The ignition secondary shorted to ground. • The Malfunction Indicator Lamp (MIL) circuit or the diagnostic "test" terminal intermittently shorted to ground. • The ECM grounds. Refer to the *"ECM Wiring Diagrams"* in *Section 6E3-A.*
Loss of DTC Memory	To check, disconnect the Throttle Position (TP) sensor and idle the engine until the "Malfunction Indicator Lamp" comes "ON." A DTC P0121 should store and remain in memory when turning "OFF" the ignition for at least 10 seconds. If not, the ECM may be faulty, check DTC P1510.

Hard Start

Checks	Action
Definition: The engine cranks OK, but does not start for a long time. The engine does eventually run, or may start but immediately dies.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Make sure the driver is using the correct starting procedure.
Sensor Checks	• Check the Engine Coolant Temperature (ECT) sensor using the scan tool to compare the engine coolant temperature with the ambient air temperature on a cold engine. If the coolant temperature reading is more than 5°C greater or less than the ambient air temperature on a cold engine, check for a high resistance in the coolant sensor circuit or the sensor itself. Refer to "DTC P0117" in *Section 6E3-A.* • Check the Throttle Position (TP) sensor. If a sticking throttle shaft or binding linkage causes a high TP sensor voltage (open throttle indication), the ECM will not control the idle. Monitoring the TP sensor voltage, the scan tool and/or voltmeter should display less than 1.25 volts with throttle closed.
Fuel System Checks	• Check the fuel pump relay for operation. The fuel pump should operate for 2 seconds when turning "ON" the ignition. Refer to *"Table A-7A"* in *Section 6E3-A.* • Check the fuel pressure. Refer to *"Table A-7B"* in *Section 6E3-A.* • Check for water contamination in the fuel. Refer To *Section 6C.* • Check the fuel pump check valve. A faulty in-tank fuel pump check valve will allow the fuel in the lines to drain back to the tank after stopping the engine. To check for this condition: 1. Turn the ignition "OFF." 2. Disconnect the fuel line at the fuel filter. 3. Remove the tank filler cap. 4. Connect a radiator test pump to the fuel line and apply 102 kPa (15 psi) of pressure. If the pressure holds for 60 seconds, the check valve is OK.
Ignition System Checks	• Check for the proper ignition voltage output with the spark tester J 26792 or equivalent. • Check the spark plugs for the following: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits • Check for bare and/or shorted ignition wires. • Check for moisture in the distributor cap. • Check for loose ignition coil connections. • Check for a worn distributor shaft. • Check the pickup coil and connections.
Additional Check	• Check the IAC operation. *DTC P0505* in *Section 6E3-A.* • Check for no crank signal. • Check the EGR Valve operation. Refer to *Section C7.* • Check the Service Bulletins for ECM updates.

Surges and/or Chuggles Symptom

Checks	Action
Definition: The engine has a power variation under a steady throttle or cruise. The vehicle feels as if it speeds up and slows down with no change in the accelerator pedal.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Be sure the driver understands the A/C compressor operation. • Use the scan tool to make sure the reading of VSS matches vehicle speedometer. This excludes vehicles with electronic transmissions where some variation between VSS and the speedometer is normal. Refer to *DTC P0500 "Diagnostic Aids"* in *Section 6E3-A.*
Sensor Check	Check the Heated Oxygen Sensor (HO2S 1) performance. Refer to *DTC P0131, P0132, P0133, P0134* in *Section 6E3-A.*
Fuel System Checks	• Check to determine if a Rich or Lean system causes the condition. Drive the vehicle at the speed of the complaint. Monitoring the Fuel Trim will help identify the problem. - Lean - The Long Term Fuel Trim will be greater than 20%. Refer to *DTC P0171 "Diagnostic Aids"* in *Section 6E3.* - Rich - The Long Term Fuel Trim will be less than –20%. Refer to *DTC P0172 "Diagnostic Aids"* in *Section 6E3.* • Check the fuel pressure while condition exists. Refer to *"Table A-7B"* in *Section 6E3-A.*
Ignition System Checks	• Check for the proper ignition voltage output using the spark tester J 26792 or equivalent. • Check the spark plugs. Remove the spark plugs and inspect them for the following: - Wetness - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits • Check the ignition timing. Refer to *Section C4.*
Additional Checks	• Check the ECM grounds for being clean, tight, and in their proper locations. Refer to *Section 6E3-A ECM Wiring Diagrams.* • Check the generator output voltage. • Check the vacuum lines for kinks or leaks. Refer to the *"Vehicle Emission Control Information"* label. • Check for an intermittent EGR problem. Refer to *Section C7.*

Lack Of Power, Sluggish, Or Spongy

Checks	Action
Definition: The engine delivers less than expected power. There is little or no increase in speed when partially applying the accelerator pedal.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Compare the customer's vehicle with a similar unit. Make sure the customer has an actual problem. • Remove the air filter and check for dirt, or for being plugged. • Check the transmission shift pattern and down shift operation. • Check for fuel injector. Refer to *Fuel Injector Coil Test/Fuel Injector Balance Test Procedure* in *Section C2.*
Fuel System Checks	• Check for a restricted fuel filter, contaminated fuel or improper fuel pressure. Refer to *"Table A-7B"* in *Section 6E3-A.* • Check for contaminated fuel.
Ignition System Checks	• Check for the proper ignition voltage output with the spark tester J 26792 or equivalent. • Check the ignition timing and proper operation of the ignition control system. Refer to *Section C4.*
Exhaust System Checks	• Check the exhaust system for a possible restriction: Refer to the appropriate service manual. • Inspect the exhaust system for damaged or collapsed pipes. Inspect the muffler for heat distress or a possible internal failure.
Additional Checks	• Check the ECM grounds for being clean, tight, and in their proper location. Refer to the *"ECM Wiring Diagrams"* in *Section 6E3-A.* • Check the EGR Valve for being open or partly open all the time. Refer to *Section C7.* • Check the generator output voltage.
Engine Mechanical Check	• Check the engine for the following: - Compression - Valve timing - Proper or worn camshaft - Refer to the appropriate service manual.

Detonation/Spark Knock

Checks	Action
Definition: A mild to severe ping, usually worse under acceleration. The engine makes sharp metallic knocks that change with throttle opening.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Make sure the customer has an actual problem. • Check for fuel injectors. Refer To *Fuel Injector Coil Test/Fuel Injector Balance Test Procedure* in *Section C2*
Cooling System Checks	• Check for obvious overheating problems. Refer to the appropriate service manual. • Check for a low engine coolant level. • Check for a loose water pump belt. • Check for restricted air flow through the radiator, or restricted coolant flow. • Check for a faulty or incorrect thermostat. • Check for a correct coolant solution. The solution should be a 50/50 mix of anti-freeze and water.
Sensor Check	Check for an Engine Coolant Temperature (ECT) sensor that has a shift in value. Refer to *DTC* P0117 *"Diagnostic Aids"* in *Section 6E3-A.*
Fuel System Checks	• Check to determine if a lean system causes the condition. Drive the vehicle at the speed of the complaint. Monitoring the Fuel Trim will help identify the problem. If the system is Lean, the Long Term Fuel Trim will be greater than 20%. Refer to DTC P0171 *"Diagnostic Aids"* in *Section 6E3-A.* • Check the fuel pressure. Refer to *"Table A-7B"* in *Section 6E3-A.* • Check for poor fuel quality and proper octane rating. If the scan tool readings are normal and there are no engine mechanical faults, fill the fuel tank with a premium gasoline that has a minimum octane rating of 92 and re-evaluate vehicle performance.
Ignition System Checks	• Check the spark plugs for their proper heat range and gap. • Check the ignition timing. Refer to *"On Vehicle Service"* in *Section C4.*
Engine Mechanical Checks	• Check for carbon buildup. Remove the carbon with a top engine cleaner. Follow the instructions on the can. • Check for incorrect basic engine parts such as cam, heads, pistons, etc. Refer to the appropriate service manual. • Check for excessive oil entering the combustion chamber.
Additional Checks	• Check for the proper operation of the EGR valve. Refer to *Section C7.* • Check for the proper operation of the air cleaner. • Check for the proper transmission shift points. Refer to *Section 7A* of the appropriate service manual. • Check the Service Bulletins for ECM updates.

Hesitation, Sag, Stumble

Checks	Action
Definition: The vehicle has a momentary lack of response when pushing down on the accelerator. The condition can occur at any vehicle speed. The condition is usually most severe when trying to make the vehicle move, as from a stop sign. The condition may cause the engine to stall if it's severe enough.	
Preliminary Check	Refer to *"Important Preliminary Checks."*
Fuel System Checks	• Check the fuel pressure. Refer to *"Table A-7B"* in *Section 6E3-A.* • Check the TP sensor for binding or sticking. Voltage should increase at a steady rate as throttle moves toward Wide Open Throttle (WOT). • Check the MAF sensor response and accuracy. • Check for water contamination in the fuel. • Check the EVAP Canister Purge system for proper operation. Refer to *Section C3.*
Ignition System Checks	• Check for faulty spark plug wires. • Check for fouled spark plugs.
Additional Checks	• Check the Service Bulletins for service updates. • Check the generator output voltage. • Check the EGR valve operation. Refer to *Section C7.*

Cuts Out, Misses Symptom

Checks	Action
Definition: A steady pulsation or jerking that follows engine speed, usually more pronounced as the engine load increases. The exhaust has a steady spitting sound at idle, low speed or on hard acceleration.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Check for fuel spray from both fuel injectors. Refer to *Fuel Injector Coil Test/Fuel Injector Balance Test Procedure* in *Section C2.*
Ignition System Checks	• Check for a cylinder misfire: 1. Start the engine. Allow the engine to stabilize then disconnect the Idle Air Control (IAC) motor. 2. Remove one spark plug wire at a time, using insulated pliers. ***Notice:*** Do not perform this test for more than 2 minutes, as this may cause damage to the catalytic converter. 3. If there is a RPM drop on all cylinders (equal to within 50 RPM), go to the *"Rough, Unstable or Incorrect Idle, Stalling" Symptom Table.* 4. Reconnect the IAC motor with the ignition "OFF." 5. Check for spark on the suspected cylinder(s) with the J 26792 spark tester, or equivalent, if there is no RPM drop on one or more cylinders, or excessive variation in drop. 6. If there is no spark, refer to *Section 6E3-A Table A-3.* 7. If there is spark, remove the spark plug(s) in these cylinders and check for the following: - Insulation cracks - Wear - Improper gap - Burned electrodes - Heavy deposits • Check the spark plug wire resistance (should not exceed 30,000 ohms). • Check the distributor rotor and the distributor cap. • If the previous checks did not find the problem, visually check the following: - The ignition system for moisture, dust, cracks, burns, etc. - With the engine running, spray the plug wires with a fine water mist to check for shorts.
Engine Mechanical Checks	• Check the engine for the following: - Proper valve timing - Bent push rods - Worn rocker arms - Broken or weak valve springs - Worn camshaft lobes - Refer to the appropriate service manual. • Check the intake and exhaust manifold passage for casting flash. Refer to the appropriate service manual.
Fuel System Checks	• Check the fuel system for a plugged fuel filter, low fuel pressure, etc. Refer to *6E3-A Table 7-B.* • Check for water contamination in the fuel. Refer to *Section 6C.*

Poor Fuel Economy

Checks	Action
Definition: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, the economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.	
Preliminary Checks	• Refer to *"Important Preliminary Checks."* • Check the air cleaner element (filter) for dirt or for being plugged. • Visually (physically) check: Vacuum hoses for splits, kinks, and proper connections as shown on "Vehicle Emission Control Information" label. • Check owner's driving habits: - Is the A/C "ON" full time (Defroster mode "ON")? - Check the tires for being at the correct pressure? - Are exceedingly heavy loads being carried? - Is the acceleration too much, too often? • Suggest to the owner to fill the fuel tank and recheck the fuel economy.
Fuel System Checks	• Check the fuel type, quality and alcohol content. Refer to *"Diagnosis" Section 6C.* • Check the fuel pressure. Refer to *"Table A-7B"* in *Section 6E3.*
Ignition System Checks	• Check the spark plugs. Remove the spark plugs and check for the following: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits • Check the ignition wires for cracking, hardness, and proper connections. • Check the ignition timing. Refer to *Section C4.*
Cooling System Checks	• Check the engine coolant level. • Check the engine thermostat for always being open or for the wrong heat range. Refer to the appropriate service manual.
Additional Checks	• Check the transmission shift pattern. • Check for the proper calibration of speedometer. • Check for dragging brakes. Refer to the appropriate service manual.

Rough, Unstable, or Incorrect Idle, Stalling

Checks	Action
Definition: The engine runs unevenly at idle. If severe enough, the engine or vehicle may shake. The engine idle speed may vary in RPM. Either condition may be severe enough to stall the engine. The engine idles at the incorrect speed.	
Preliminary Check	Refer to *"Important Preliminary Checks."*
Sensor Checks	• Check the Heated Oxygen Sensor 1 (HO2S 1). Refer to *"DTC P0131, P0132, P0133, P0134"* in *Section 6E3-A.* • Check the Throttle Position (TP) sensor - If a sticking throttle shaft or binding linkage causes a high TP sensor voltage open throttle indication, the ECM will not control idle. Monitor the TP sensor voltage. A scan tool and/or voltmeter should read less than 1.25 volts with throttle closed. Refer to *Section 6E3-A.* • Check the Engine Coolant Temperature (ECT) sensor - Using the scan tool, compare the engine coolant temperature with the ambient air temperature on a cold engine. If the engine coolant temperature is more than 5°C greater or less than the ambient air temperature, check for a high resistance in coolant sensor circuit or the sensor itself. Refer to DTC P0117 *"Diagnostic Aids"* in *Section 6E3-A.* • Check the MAF sensor response and accuracy.
Fuel System Checks	• Check to determine if a Rich or Lean system causes the condition. Drive the vehicle at the speed of the complaint. Monitoring the Fuel Trim will help identify the problem. - Lean - The Long Term Fuel Trim will be greater than 20%. Refer to *DTC P0171 "Diagnostic Aids"* in *Section 6E3.* - Rich - The Long Term Fuel Trim will be less than –20%. Refer to *DTC P0172 "Diagnostic Aids"* in *Section 6E3.* • Check the Evaporative Emission (EVAP) control system. Refer to *Section C3.* • Check the fuel injector(s) for leakage. • Check the fuel pressure. Refer to *"Table A-7B"* in *Section 6E3-A.*
Ignition System Checks	• Check the ignition voltage output using the spark tester J 26792 or equivalent. • Check the spark plugs. Remove spark plugs and check for the following: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Blistered insulators - Heavy deposits • Check the spark plug cables by connecting an ohmmeter to the ends of each cable in question. If the meter reads over 30,000 ohms, replace the cables. • Check the ignition timing. Refer to *Section C4.*

Rough, Unstable, or Incorrect Idle, Stalling (continued)

Checks	Action
Additional Checks	• Check for vacuum leaks. Vacuum leaks can cause higher than normal idle and low Idle Air Control (IAC) counts. • Check the ECM grounds for clean, tight, and proper routing. Refer to *Section 6E3-A ECM Wiring Diagram.* • Check the scan tool to determine if the ECM is receiving an A/C signal. If a problem exists with the A/C "ON", check the A/C system operation. Refer to the appropriate service manual. • Check for the EGR being "ON" while idling, which will cause roughness, stalling, and hard starting. Refer to *Section C7.* • Check the battery cables and ground straps. They should be clean and secure. Erratic voltage will cause IAC to change its position, resulting in poor idle quality. • Check A/C refrigerant pressure for being too high or for a faulty high pressure switch. • Check the Crankcase Ventilation Valve for proper operation by placing a finger over inlet hole in valve end several times. The valve should snap back. If not, replace the valve. Refer to *Section C13.*
Engine Mechanical Check	• Check the engine for the following: - Broken motor mounts - Improper valve timing - Low compression - Bent push rods - Worn rocker arms - Broken or weak valve springs - Worn camshaft lobes - Refer to the appropriate service manual.

Dieseling, Run-On

Checks	Action
Definition: Engine continues to run when turning the key "OFF," but runs very roughly. If the engine runs smoothly, check the ignition switch and adjustment.	
Preliminary Check	Refer to *"Important Preliminary Checks."*
Fuel System Checks	• Check the Evaporative Emission (EVAP) system and fuel tank venting. • Check the fuel injector(s) for leakage. Refer to *Fuel Injector Coil Test/Fuel Injector Balance Test Procedure* in *Section C2*

Backfire

Checks	Action
Definition: The fuel ignites in the intake manifold, or in the exhaust system, making a loud popping noise.	
Preliminary Check	Refer to *"Important Preliminary Checks."*
Ignition System Checks	• Check for the proper ignition coil output voltage with the spark tester J 26792 or equivalent. • Check the spark plugs. Remove the spark plugs and check for the following: - Wet plugs - Cracks - Wear - Improper gap - Burned electrodes - Heavy deposits • Check the ignition system and ignition timing. Refer to *Section C4.* • Check for crossfire between spark plugs (distributor cap, spark plug wires, and proper routing of plug wires). Refer to the appropriate service manual.
Engine Mechanical Checks	• Check the engine for the following: - Compression - Valve timing - Manifold gaskets - Sticking or leaking valves - Refer to the appropriate service manual. • Check the intake and exhaust system for casting flash or other restrictions. Refer to the appropriate service manual.
Additional Check	Check the EGR Valve for being open all the time. Refer to *Section C7.*

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