

SYMPTOM DIAGNOSIS

IMPORTANT PRELIMINARY CHECKS

Important : Several symptom procedures call for a careful visual/physical inspection. Always perform the visual/physical test first. Visual inspections may lead to correcting a problem without further checks and can save valuable time.

Step	Action	Value(s)	Yes	No
1	Perform the On–Board Diagnostic (OBD II) System Check. Are any diagnostic trouble code(s) (DTCs) stored in the engine control module (ECM) memory?		Go to Appropriate DTC Table	Go to Step 2
2	1. Inspect all of the ECM ground connections. 2. Inspect all of the vacuum hoses for splits, kinks, and proper connections. 3. Check for air leaks at all of the mounting areas of the intake manifold sealing surfaces. 4. Inspect the ignition wires for cracking, hardness, proper routing, and carbon tracking. 5. Inspect the wiring for proper connections, pinches, and cuts. Are all checks complete?		Go to Appropriate Symptom Table	

INTERMITTENTS

The problem may or may not turn on the malfunction indicator lamp (MIL) or store a diagnostic trouble code (DTC).

Important : Do not use the diagnostic trouble code (DTC) tables for intermittent problems. A fault must be present in order to locate the problem. If a fault is intermittent, use of diagnostic trouble code tables may result in the replacement of good parts.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to Step 2	Go to "Important Preliminary Checks"
2	1. Perform a careful inspection of any suspect circuits. 2. Inspect for poor mating of the connector halves, or terminals not fully seated into the connector body. 3. Inspect for improperly formed or damaged terminals. 4. Inspect for poor terminal–to–wire connections. This requires removing the terminal from the connector body to inspect it. Are any problems present?		Go to Step 3	Go to Step 4
3	Repair the electrical connections as needed. Is the repair complete?		System OK	
4	Road test the vehicle with a voltmeter connected to a suspected circuit or a scan tool connected to the data link connector (DLC). Did the voltmeter or the scan tool indicate an abnormal voltage or scan reading?		Go to Step 5	Go to Step 6

Step	Action	Value(s)	Yes	No
5	Replace the sensor in the affected circuit, if a diagnostic trouble code (DTC) was stored for this circuit (except for the DTCs P0171 and P0172). Is the repair complete?		System OK	
6	Does an intermittent Malfunction Indicator Lamp (MIL) or DTC occur?		Go to <i>Step 7</i>	Go to <i>Step 8</i>
7	<ol style="list-style-type: none"> 1. Check for a faulty relay, engine control module (ECM) driven solenoid, or switch. 2. Check for improper installation of electrical devices, such as lights, two-way radios, electric motors, etc. 3. Inspect the ignition control wires for proper routing (away from ignition wires, ignition system components, and the generator). 4. Check for a short-to-ground in the MIL circuit or the DLC "test" terminal. 5. Inspect the ECM ground connections. 6. Correct or repair the affected circuits as needed. Is the repair complete?		System OK	
8	<ol style="list-style-type: none"> 1. Check for a loss of DTC memory. 2. Disconnect the throttle position sensor. 3. Run the engine at idle until the MIL comes on. 4. Turn the ignition OFF. Is DTC P0122 stored in memory?		Go to <i>Step 10</i>	Go to <i>Step 9</i>
9	Replace the ECM. Is the repair complete?		System OK	
10	Does the vehicle stall while driving?		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	Monitor the oxygen sensor and the injector base pulse width with the scan tool. Does the scan tool display a steady low voltage (about 0 mv) for the oxygen sensor with the control module commanding an injector base pulse width of the value specified?	8 ms	Go to <i>Step 9</i>	Go to <i>Step 12</i>
12	<ol style="list-style-type: none"> 1. Check for an open diode across the A/C clutch and for other open diodes. 2. Repair or replace any components as needed. Is the repair complete?		System OK	

HARD START

The engine cranks OK, but does not start for a long time. The engine eventually runs or may start and immediately die.

Important : Ensure that the driver is using the correct starting procedure. Before diagnosing, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Connect the scan tool to the data link connector (DLC). 2. Check the engine coolant temperature (ECT) sensor and the intake air temperature (IAT) sensor using the scan tool. 3. Compare the coolant temperature and the intake air temperature with the ambient temperature when the engine is cold. Do the ECT and the IAT readings differ from the ambient temperature by more than the value specified?	3°C (5°F)	Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	1. Measure the resistance of the ECT sensor and the IAT sensor. 2. Compare the resistance value to specifications using the Temperature Vs. Resistance tables for DTCs P0118 and P0113. 3. If the resistance is not the same, replace the faulty sensor. Is the repair complete?		System OK	
4	1. Check for a sticking throttle shaft or a binding linkage that may cause a high throttle position (TP) sensor voltage. Repair or replace as needed. 2. Check the TP sensor voltage reading with the throttle closed. Does the voltage measure within the value specified?	0.4–0.8 v	Go to <i>Step 5</i>	Go to <i>Step 26</i>
5	1. Check the manifold absolute pressure (MAP) sensor response and accuracy. 2. Replace the MAP sensor as needed. Is the repair complete?		System OK	Go to <i>Step 6</i>
6	Check the fuel pump operation. Does the fuel pump operate for the specified time when the ignition switch is turned ON?	2 sec	Go to <i>Step 7</i>	Go to "Fuel Pump Relay Circuit Check"
7	Check the fuel system pressure. Is the fuel pressure within the specifications?	284–325 kPa (41–47 psi)	Go to <i>Step 29</i>	Go to <i>Step 8</i>
8	Check for water contamination in the fuel. Is fuel contaminated?		Go to <i>Step 9</i>	Go to <i>Step 10</i>
9	Replace the contaminated fuel. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
10	1. Check the fuel injector driver circuit. 2. Disconnect all of the fuel injector harness connectors at the fuel injectors. 3. Connect an injector test light between the harness terminals of each fuel injector connector. 4. Note the test light while cranking the engine. Does the test light blink at all connectors?		Go to <i>Step 13</i>	Go to <i>Step 11</i>
11	Check the fuel injector driver wiring harness, the connectors, and the connector terminals for the proper connections. Is the problem found?		Go to <i>Step 12</i>	Go to <i>Step 30</i>
12	Repair the wiring harness, the connector, or the connector terminal as needed. Is the repair complete?		System OK	
13	Measure the resistance of each fuel injector. Is the fuel injector resistance within the value specified (20°C [68°F] – the resistance will increase slightly at higher temperatures)?	11.6–12.4 Ω	Go to <i>Step 15</i>	Go to <i>Step 14</i>
14	Replace any fuel injector with a resistance that is out of specifications. Is the repair complete?		System OK	
15	Perform an injector diagnosis. Is the problem found?		Go to <i>Step 16</i>	Go to <i>Step 17</i>
16	Replace any restricted or leaking fuel injectors as needed. Is the repair complete?		System OK	
17	1. Check for the proper ignition voltage output for each cylinder with a spark tester. 2. Inspect the spark plugs for cracks, wear, improper gap, burned electrodes, or heavy deposits. 3. Inspect the ignition wires for short conditions. 4. Inspect all of the ignition grounds for loose connections. 5. Inspect the Engine Control Module (ECM) for the proper operation. Is the problem found?		Go to <i>Step 18</i>	Go to <i>Step 19</i>
18	Correct or replace any faulty ignition components. Is the repair complete?		System OK	
19	Does the engine misfire or cut out under load or at idle?		Go to "Ignition System Check"	Go to <i>Step 20</i>
20	Does the engine start, but then immediately stall?		Go to <i>Step 21</i>	Go to <i>Step 23</i>
21	1. Remove the Crankshaft Position (CKP) sensor. 2. Inspect for faulty connections and repair as needed. Is the problem found?		Go to <i>Step 22</i>	Go to <i>Step 25</i>
22	Repair the faulty connections as needed. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
23	1. Check for the proper valve timing. 2. Check the cylinder compression. 3. Inspect the pushrods, the rocker arms, the valve springs, and the camshaft lobes for excessive wear. 4. Inspect the intake manifold and the exhaust manifold passages for casting flash. Is the problem found?		Go to <i>Step 24</i>	Go to <i>Step 25</i>
24	Repair or replace any components as needed. Is the repair complete?		System OK	
25	Check the idle air control valve operation. Repair or replace components as needed. Is the repair complete?		System OK	
26	Check the base idle setting of the throttle body. Is the base idle setting properly adjusted?		Go to <i>Step 28</i>	Go to <i>Step 25</i>
27	Check the throttle position sensor circuit for proper operation. Repair or replace components as needed. Is the repair complete?		System OK	
28	Adjust the base idle setting to specifications. Is the repair complete?		System OK	
29	Repair the fuel system as needed. Is the repair complete?		System OK	
28	Replace the ECM. Is the repair complete?		System OK	

SURGES OR CHUGGLES

Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and slows down with no change in the accelerator pedal position.

Important : Make sure the driver understands A/C compressor operation as described in the owner's manual.

The speedometer reading and the speed reading on the scan tool should be equal.

Before diagnosing the symptom, check service bulletins for updates..

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	Connect the scan tool to the data link connector (DLC). Does the oxygen sensor (O2S 1) respond quickly to different throttle positions?		Go to <i>Step 4</i>	Go to <i>Step 3</i>
3	1. Check the O2S 1 for silicone or other contaminants from fuel or use of improper room temperature vulcanizing (RTV) sealant. 2. Replace the contaminated O2S 1. Is the repair complete?		System OK	
4	1. Drive the vehicle at the speed of the complaint. 2. Monitor the long term fuel trim reading using the scan tool. Is the long term fuel trim reading within the value specified?	115–150 counts	Go to <i>Step 7</i>	Go to <i>Step 5</i>

Step	Action	Value(s)	Yes	No
5	Is the long term fuel trim reading below the value specified?	115 counts	Go to "Diagnostic Aids for DTC P0172"	Go to Step 6
6	Is the long term fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC P0171"	
7	Check the fuel system pressure while the condition exists. Is the fuel system pressure within specifications?	(284–325 kPa) 41–47 psi	Go to Step 8	Go to Step 17
8	Check the in-line fuel filter. Is the filter dirty or plugged?		Go to Step 18	Go to Step 9
9	Perform an injector diagnosis. Did the injector diagnosis pinpoint the problem?		Go to Step 19	Go to Step 10
10	1. Check for proper ignition voltage output using a spark tester. 2. Inspect the spark plugs for cracks, wear, improper gap, burned electrodes, or heavy deposits. Is the problem found?		Go to Step 11	Go to Step 12
11	Repair or replace any ignition system components as needed. Is the repair complete?		System OK	
12	1. Inspect the ECM grounds for being clean, tight, and in their proper locations. 2. Inspect the vacuum lines for kinks or leaks. Is the problem found?		Go to Step 13	Go to Step 14
13	Repair the electrical connections or the vacuum lines as needed. Is the repair complete?		System OK	
14	Check the generator output voltage. Is the generator voltage within the value specified?	12–16 v	Go to Step 16	Go to Step 15
15	Repair the generator. Is the repair complete?		System OK	
16	1. Check for intermittent exhaust gas recirculation (EGR) valve operation. 2. Repair or replace any components as needed. Is the repair complete?		System OK	
17	Repair the fuel system as needed. Is the repair complete?		System OK	
18	Replace the fuel filter. Is the repair complete?		System OK	
19	Replace the leaking or restricted fuel injectors. Is the repair complete?		System OK	

LACK OF POWER, SLUGGISHNESS, OR SPONGINESS

The engine delivers less than expected power. There is little or no increase in speed when the accelerator pedal is partially applied.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to Step 2	Go to "Important Preliminary Checks"
2	1. Verify the customer's complaint. 2. Compare the performance of the customer's vehicle with a similar unit. Does the problem exist?		Go to Step 3	System OK
3	1. Inspect the air filter for excessive contamination. 2. Replace the air filter as needed. 3. Check the transaxle shift pattern and down shift operation. Does the transaxle operate properly?		Go to Step 4	Go to Step 5
4	Check the fuel system pressure. Is the fuel system pressure within specifications?	(284–325 kPa) 41–47 psi	Go to Step 7	Go to Step 6
5	Repair the transaxle as needed. Is the repair complete?		System OK	
6	Repair the fuel system as needed. Is the repair complete?		System OK	
7	Check for a restricted fuel filter or contaminated fuel. Is the problem found?		Go to Step 8	Go to Step 9
8	Repair or replace any components as needed. Is the repair complete?		System OK	
9	1. Check the ignition system output for all of the cylinders using a spark tester. 2. Check for proper ignition control operation. Is the ignition system operating properly?		Go to Step 10	Go to Step 11
10	1. With the engine at normal operating temperature, connect a vacuum gauge to a vacuum port on the intake manifold. 2. Operate the engine at 1000 rpm. 3. Record the vacuum reading. 4. Increase the engine speed to 2500 rpm. 5. Note the vacuum reading at a steady 2500 rpm. Does the vacuum decrease more than the value specified?	10 kPa (3 in. Hg)	Go to Step 12	Go to Step 15
11	Repair or replace any ignition system components as needed. Is the repair complete?		System OK	
12	Inspect the exhaust system for restrictions and damaged or collapsed pipes. Is the problem found?		Go to Step 13	Go to Step 14
13	Repair or replace any components as needed. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
14	1. Check the cylinder compression and valve timing. 2. Inspect the camshaft for excessive wear. Is the problem found?		Go to <i>Step 15</i>	Go to <i>Step 16</i>
15	Repair or replace any engine components as needed. Is the repair complete?		System OK	
16	1. Check the engine control module (ECM) grounds for being clean, tight, and in their proper location. 2. Check the exhaust recirculation valve for being open or partially open all the time. 3. Check the torque converter clutch operation. 4. Check the A/C system operation. 5. Check the generator output. 6. Repair the generator if the output is not within the specified range. Are all checks and repairs complete?	12–16 v	System OK	

DETONATION/SPARK KNOCK

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Fill the fuel tank with a known good grade of gasoline that has the octane rating of the value specified. 2. Reevaluate the vehicle's performance. Does the detonation problem still exist?	87–89 octane	Go to <i>Step 3</i>	System OK
3	1. Inspect for low engine coolant. 2. Check for restricted airflow to the radiator or restricted coolant flow. 3. Check for a faulty thermostat. . 4. Check for an incorrect coolant solution Is the problem found?		Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	Repair or replace any cooling system components as needed. Is the repair complete?		System OK	
5	1. Check the voltage using the scan tool. 2. Replace the engine coolant temperature (ECT) sensor if the resistance is not within specifications as listed in the Diagnostic Aids for diagnostic trouble code P0118. Is the problem found?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	Replace the ECT sensor or repair the circuit as needed. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
7	1. Check the ignition system output with a spark tester. 2. Inspect the spark plugs for the proper heat range and gap. 3. Check for the proper operation of the ignition controls. Is the ignition system operating properly?		Go to Step 9	Go to Step 8
8	Repair or replace the ignition system components as needed. Is the repair complete?		System OK	
9	1. Connect the scan tool to the data link connector (DLC). 2. Road test the vehicle at the speed of the complaint. 3. Monitor the long term fuel trim reading from the scanner data stream. Is the long term fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC P0171"	Go to Step 10
10	Check the fuel system pressure. Is the problem found?	(284–325 kPa) 41–47 psi	Go to Step 11	Go to Step 12
11	Repair or replace the fuel system components as needed. Is the repair complete?		System OK	
12	1. Inspect for carbon buildup inside the engine. 2. Remove the carbon with a top engine cleaner. Follow the instructions supplied with the product. 3. Check the basic engine parts such as the camshaft, the cylinder head, the pistons, etc. for excessive wear. 4. Replace any excessively worn parts. Is the procedure complete?		Go to Step 13	
13	1. Check the exhaust gas recirculation valve for proper operation. 2. Check the air intake system for proper operation. 3. Check the torque converter clutch operation and transaxle shift points. 4. Check the service bulletins for programmable read-only memory (PROM) updates. 5. Check the cylinder compression. 6. Repair or replace any faulty components. Are all checks and repairs complete?		System OK	

HESITATION, SAG, STUMBLE

Momentary lack of response as the accelerator is pushed down. This can occur at any vehicle speed. It is usually the most severe when first trying to make the vehicle move, as from a stop. Hesitation, sag, or

stumble may cause the engine to stall if severe enough.

Important : Before diagnosing this condition, check service bulletins for PROM updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Check the fuel system pressure. If the pressure is not within the value specified, service the fuel system as needed. 2. Inspect the throttle position (TP) sensor for binding or sticking. The TP sensor voltage should increase at a steady rate as the throttle is moved toward wide open throttle (WOT). Is the problem found?	(284–325 kPa) 41–47 psi	Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	Repair the electrical connections as needed. Is the repair complete?		System OK	
4	1. Check the manifold absolute pressure (MAP) sensor response and accuracy. 2. Inspect the fuel for water contamination. 3. Check the evaporative (EVAP) emission canister purge system for proper operation. Is the problem found?		Go to <i>Step 5</i>	Go to <i>Step 6</i>
5	Repair or replace any components as needed. Is the repair complete?		System OK	
6	1. Disconnect all of the fuel injector harness connectors. 2. Connect an injector test light between the harness terminals of each fuel injector. 3. Note the test light while cranking the engine. Does the test light blink on all connectors?		Go to <i>Step 8</i>	Go to <i>Step 7</i>
7	1. Repair or replace the faulty fuel injector drive harness, the connector, or the connector terminal. 2. If the connections and the harnesses are good, replace the engine control module (ECM) for an internal open in the fuel injector driver circuit. Is the repair complete?		System OK	
8	Measure the resistance of each fuel injector. Is the fuel injector resistance within the value specified (the resistance will increase slightly at higher temperatures)?	11.6–12.4 Ω	Go to <i>Step 10</i>	Go to <i>Step 9</i>
9	Replace any of the fuel injectors with a resistance that is out of specifications. Is the repair complete?		System OK	
10	Perform an injector diagnosis. Is the problem found?		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	Replace any restricted or leaking fuel injectors. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
12	Check the fuel system pressure after a cold start or during moderate or full throttle acceleration. Is the fuel pressure within specifications?	(284–325 kPa) 41–47 psi	Go to <i>Step 14</i>	Go to <i>Step 13</i>
13	Repair the restriction in the fuel system or replace the faulty fuel pump. Is the repair complete?		System OK	
14	1. Check for faulty ignition wires. 2. Inspect for fouled spark plugs. 3. Check the ignition system output on each cylinder with a spark tester. Is the problem found?		Go to <i>Step 15</i>	Go to <i>Step 16</i>
15	Repair or replace any ignition components as needed. Is the repair complete?		System OK	
16	1. Check the generator output voltage. 2. Repair or replace the generator if the generator output is less than the value specified. 3. Check the Exhaust Gas Recirculation (EGR) valve operation. Are all checks and needed repairs complete?	12–16 v	System OK	

CUTS OUT, MISSES

Steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases. The exhaust has a steady spitting sound at idle or low speed.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	Check the ignition system voltage output for all of the cylinders using a spark tester. Is spark present on all of the cylinders?		Go to <i>Step 3</i>	Go to "Ignition System Check"
3	1. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 2. Check the resistance of the ignition wires. Replace any ignition wires that have a resistance greater than the value specified. Is the problem found?	30,000 Ω	Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	Repair or replace any components as needed. Is the repair complete?		System OK	
5	With the engine running, spray the ignition wires with a fine water mist to check for arcing and shorting to ground. Is the problem found?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	Replace the ignition wires. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
7	1. Perform a cylinder compression test. 2. If the compression is low, repair the engine as needed. 3. Inspect for proper valve timing, bent pushrods, worn rocker arms, broken or weak valve springs, and worn camshaft lobes. 4. Inspect the intake manifold and the exhaust manifold passages for casting flash. Is the problem found?		Go toStep 8	Go toStep 9
8	Repair or replace any components as needed. Is the repair complete?		System OK	
9	1. Check the fuel system for a plugged in-line fuel filter. 2. Check the fuel system for low fuel pressure. If the fuel pressure is below the value specified, service the fuel system as needed. 3. Inspect for contaminated fuel. Is the problem found?	(284–325 kPa) 41–47 psi	Go toStep 10	Go toStep 11
10	Repair or replace any components as needed. Is the repair complete?		System OK	
11	1. Disconnect all of the fuel injector harness connectors at the fuel injectors. 2. Connect an injector test light to the harness terminals of each fuel injector connector. 3. Note the test light while cranking the engine for each fuel injector. Does the test light blink for all of the fuel injectors?		Go toStep 13	Go toStep 12
12	1. Repair or replace the faulty injector drive circuit harness, the connector, or the connector terminal. 2. If the harness, the connectors, and the terminals are OK, replace the engine control module (ECM). Is the repair complete?		System OK	
13	Measure the resistance of each fuel injector. Is the injector resistance within the value specified (the resistance will increase slightly at higher temperatures)?	11.6–12.4 Ω	Go toStep 15	Go toStep 14
14	Replace any fuel injectors with a resistance that is out of specifications. Is the repair complete?		System OK	
15	Perform an injector diagnosis. Is the problem found?		Go toStep 16	Go toStep 17
16	Replace any restricted or leaking fuel injectors. Is the repair complete?		System OK	

1F – 360 ENGINE CONTROLS

Step	Action	Value(s)	Yes	No
17	1. Check for electromagnetic interference. 2. Monitor the engine rpm with a scan tool. Does the scan tool rpm change greatly with little change in actual engine rpm?		Go to <i>Step 18</i>	
18	1. Inspect the routing of the ignition wires. 2. Inspect all of the ignition system grounds. 3. Correct the routing or repair the ground connections as needed. Are all checks and needed repairs complete?		System OK	

POOR FUEL ECONOMY

Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, fuel economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.

Important : Driving habits affect fuel economy. Check the owner's driving habits by asking the following questions:

1. Is the A/C system (i.e. defroster mode) turned on all the time?
 2. Are the tires at the correct air pressure?
 3. Have excessively heavy loads been carried?
 4. Does the driver accelerate too much and too often?
- Suggest the driver read the section in the owner's manual about fuel economy.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Inspect the air filter for excessive contamination. 2. Inspect for fuel system leaks. Are all needed checks complete?		Go to <i>Step 3</i>	
3	1. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 2. Replace any faulty spark plugs. 3. Inspect the ignition wires for cracking, hardness, and proper connections. Are all needed checks and repairs complete?		Go to <i>Step 4</i>	
4	1. Inspect the engine coolant level. 2. Check the thermostat for being always open or for an incorrect heat range. 3. Replace the thermostat as needed. Are all needed checks and repairs complete?		Go to <i>Step 5</i>	
5	1. Check the transaxle shift pattern. Ensure all transaxle gears are functioning. 2. Check for proper calibration of the speedometer. 3. Check the brakes for dragging. 4. Check the cylinder compression. 5. Repair, replace, or adjust any components as needed. Are all checks and needed repairs complete?		System OK	

ROUGH, UNSTABLE, OR INCORRECT IDLE, STALLING

The engine runs unevenly at idle. If the condition is bad enough, the vehicle may shake. Also, the idle varies in rpm (called "hunting"). Either condition may be severe enough to cause stalling. The engine idles at incorrect idle speed.

Important : Before diagnosing the symptom, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Connect the scan tool to the Data Link Connector (DLC). 2. Monitor the oxygen sensor (O2S 1) reading at different throttle positions. Does the O2S 1 change quickly from rich to lean at the different throttle positions?		Go to <i>Step 5</i>	Go to <i>Step 3</i>
3	Check the O2S 1 for contamination from fuel or improper use of RTV sealant. Is the O2S 1 contaminated?		Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	Replace the contaminated O2S 1 as needed. Is the repair complete?		System OK	
5	1. Check for a sticking throttle shaft or binding throttle linkage that may cause incorrect throttle position (TP) sensor voltage. 2. Check the TP sensor voltage reading with the throttle closed. Is the TP sensor voltage within the value specified?	0.4–0.8 v	Go to <i>Step 6</i>	Go to "Diagnostic Aids for DTC P0123"
6	1. Check the engine coolant temperature (ECT) sensor voltage reading using the scan tool. 2. Compare the ECT sensor reading with the ambient temperature when the engine is cold. Does the ECT sensor temperature reading differ from the ambient temperature by more than the value specified?	3°C (5°F)	Go to <i>Step 7</i>	Go to <i>Step 9</i>
7	Check for high resistance in the ECT sensor circuit or the sensor itself. Is the problem found?		Go to <i>Step 8</i>	Go to <i>Step 9</i>
8	Replace the ECT sensor or repair the circuit as needed. Is the repair complete?		System OK	
9	Check the Manifold Absolute Pressure (MAP) sensor for response and accuracy. Is the problem found?		Go to <i>Step 10</i>	Go to <i>Step 11</i>
10	Replace the MAP sensor or repair the MAP sensor circuit as needed. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
11	1. Road test the vehicle at the speed of the complaint. 2. Monitor the fuel trim reading using the scan tool. Is the fuel trim reading within the value specified?	115–150 counts	Go to <i>Step 14</i>	Go to <i>Step 12</i>
12	Is the long term fuel trim reading below the value specified?	115 counts	Go to "Diagnostic Aids for DTC P0172"	Go to <i>Step 13</i>
13	Is the long term fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC P0171"	
14	1. Disconnect all of the fuel injector harness connectors at the fuel injectors. 2. Connect an injector test light between the harness terminals of each fuel injector connector. 3. Note the test light while cranking the engine. Does the test light blink for all of the fuel injectors?		Go to <i>Step 16</i>	Go to <i>Step 15</i>
15	1. Repair or replace the faulty injector drive circuit harness, the connector, or the connector terminals as needed. 2. If the harness, the connectors, and the terminals are OK, replace the engine control module (ECM). Is the repair complete?		System OK	
16	Measure the resistance of each of the fuel injectors. Is the resistance within the value specified (the resistance will increase slightly at higher temperatures)?	11.6–12.4 Ω	Go to <i>Step 18</i>	Go to <i>Step 17</i>
17	Replace any fuel injectors with a resistance that out of specifications. Is the repair complete?		System OK	
18	Perform an injector diagnosis. Is the problem found?		Go to <i>Step 19</i>	Go to <i>Step 20</i>
19	Replace any leaking or restricted fuel injectors. Is the repair complete?		System OK	
20	1. With the engine OFF, disconnect the fuel pressure regulator vacuum hose. 2. Thoroughly inspect the fuel pressure regulator vacuum port and the fuel pressure regulator vacuum hose for the presence of fuel. Is the problem found?		Go to <i>Step 21</i>	Go to <i>Step 22</i>
21	Replace the fuel pressure regulator as needed. Is the repair complete?		System OK	
22	1. Check the ignition system output voltage for all of the cylinders using a spark tester. 2. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 3. Inspect the ignition wires for cracking, hardness, or improper connections. 4. Replace any ignition wires with a resistance over the value specified. Is the problem found?	30,000 Ω	Go to <i>Step 23</i>	Go to <i>Step 24</i>

Step	Action	Value(s)	Yes	No
23	Repair or replace any ignition system components as needed. Is the repair complete?		System OK	
24	1. Inspect for vacuum leaks. 2. Check for proper Positive Crankcase Ventilation (PCV) operation. 3. Check the Idle Air Control (IAC) valve operation. 4. Inspect the ECM ground connections. Is the problem found?		Go to <i>Step 25</i>	Go to <i>Step 26</i>
25	Repair or replace any components as needed. Is the repair complete?		System OK	
26	1. Check the exhaust gas recirculation (EGR) valve for proper operation. 2. Inspect the battery cables and the ground straps for proper connections. 3. Check the generator voltage output. Repair or replace the generator if the voltage output is not within the value specified. Is the problem found?	12–16 v	Go to <i>Step 27</i>	Go to <i>Step 28</i>
27	Repair or replace any components as needed. Is the repair complete?		System OK	
28	1. Inspect for broken engine mounts. 2. Check for proper valve timing. 3. Perform a cylinder compression test. 4. Inspect for bent pushrods, worn rocker arms, broken or weak valve springs, and a worn camshaft. 5. Perform repairs as needed. Are all of the checks and needed repairs complete?		System OK	

EXCESSIVE EXHAUST EMISSIONS OR ODORS

A vehicle fails an emission test. The vehicle has an excessive rotten egg smell. Excessive odors do not necessarily indicate excessive emissions.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Run the engine until it reaches operating temperature. 2. Perform an emission test. Did the vehicle pass the emission test?		System OK	Go to <i>Step 3</i>
3	1. Connect the scan tool to the Data Link Connector (DLC). 2. Road test the vehicle. 3. Monitor the long term fuel trim memory. Is the long term fuel trim memory within the value specified?	115–150 counts	Go to <i>Step 6</i>	Go to <i>Step 4</i>
4	Is the long term fuel trim memory below the value specified?	115 counts	Go to "Diagnostic Aids for DTC P0172"	Go to <i>Step 5</i>
5	Is the long term fuel trim memory below the value specified?	150 counts	Go to "Diagnostic Aids for DTC P0171"	
6	1. Check for a properly installed fuel cap. 2. Check the fuel system pressure. 3. Perform an injector diagnosis. Is the problem found?		Go to <i>Step 7</i>	Go to <i>Step 8</i>
7	1. Repair or replace any fuel system components as needed. 2. Perform an emission test. Did the vehicle pass the emission test?		System OK	
8	1. Check the ignition system for proper operation. 2. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 3. Check the ignition wires for cracking, hardness, or improper connections. Is the problem found?		Go to <i>Step 9</i>	Go to <i>Step 10</i>

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Step	Action	Value(s)	Yes	No
9	1. Repair or replace any ignition system components as needed. 2. Perform an emission test. Did the vehicle pass the emission test?		System OK	
10	1. Inspect for vacuum leaks. 2. Inspect the catalytic converter for contamination. 3. Inspect for carbon buildup on the throttle body and the throttle plate and inside the engine. Remove with a top engine cleaner. 4. Check the Exhaust Gas Recirculation (EGR) valve for not opening. 5. Check for proper Positive Crankcase Ventilation (PCV) operation. Are all checks and needed repairs complete?		System OK	

DIESELING, RUN-ON

An engine continues to run after the ignition switch is turned OFF.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	Does the engine run smoothly after the ignition switch is turned OFF?		Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	1. Check the ignition switch and the ignition switch adjustment. 2. Replace the ignition switch if needed. Is the repair complete?		System OK	
4	1. Check the evaporative emission system. 2. Check for leaking fuel injectors. 3. Check the Idle Air Control (IAC) valve operation. 4. Inspect for vacuum leaks. 5. Check for the proper base idle setting. Are all checks and repairs complete?		System OK	

BACKFIRE

Fuel ignites in the intake manifold, or in the exhaust system, making a loud popping noise.

Important : Before diagnosing the symptom, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?		Go to <i>Step 2</i>	Go to "Important Preliminary Checks"
2	1. Inspect for crossed or crossfiring ignition wires. 2. Check the ignition system output voltage for all cylinders using a spark tester. 3. Inspect the spark plugs for excessive wear, burned electrodes, improper gap, or heavy deposits. Is the problem found?		Go to <i>Step 3</i>	Go to <i>Step 4</i>
3	Repair or replace any ignition system components as needed. Is the repair complete?		System OK	
4	1. Check the fuel system operation. 2. Check the fuel injectors by performing an injector diagnosis. Is the problem found?		Go to <i>Step 5</i>	Go to <i>Step 6</i>
5	Repair or replace any fuel system components as needed. Is the repair complete?		System OK	
6	1. Inspect the exhaust gas recirculation (EGR) gasket for a leak or a loose fit. 2. Check the EGR valve for proper operation. 3. Inspect the intake manifold and the exhaust manifold for a casting flash. Is the problem found?		Go to <i>Step 7</i>	Go to <i>Step 8</i>
7	Repair or replace any components as needed. Is the repair complete?		System OK	
8	1. Inspect the timing belt for proper installation and tension. 2. Check the engine compression. 3. Inspect the intake manifold gasket and the exhaust manifold gasket for leaks. 4. Check for sticking or leaking valves. 5. Repair or replace any components as needed. Are all checks and corrections complete?		System OK	