

2-2 DRIVEABILITY AND EMISSIONS (DIESEL)

IMPORTANT PRELIMINARY CHECKS

BEFORE USING THIS SECTION

Before using this section you should have performed the "On-Board Diagnostic System Check" and determined that:

1. The control module and MIL (Service Engine Soon) are operating correctly.
 2. There are no diagnostic trouble codes stored, or there is a diagnostic code but no MIL (Service Engine Soon).
- 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

This check should include:

- Control module grounds for being clean, tight, and in their proper location. Refer to SECTION 1.
- Fuel lines, pipes and hoses for leaks or restrictions.
- 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.
- Wiring for proper connections, pinches, and cuts. Refer to SECTION 3.
- The following symptom charts contain groups of possible causes for each symptom and cover several engines. **These procedures are not necessarily meant to be done in consecutive order.** If Tech 1 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 particular system or component is used on a specific vehicle, refer to the "Control Module 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

(Page 1 of 2)

Definition: 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 Diagnostic Trouble Code (DTC) charts in SECTION 3 for intermittent problems. The fault must be present to locate the problem. If a fault is intermittent, use of diagnostic trouble code charts may result in replacement of good parts.

FAULTY ELECTRICAL CONNECTIONS OR WIRING

- Most intermittent problems are caused by faulty electrical connections or wiring. Perform careful check of suspect circuits for:
 - Poor mating of the connector halves, or terminals, not fully seated in the connector body (backed out).
 - Improperly formed or damaged terminals. All connector terminals in problem circuit should be carefully reformed or replaced to insure proper contact tension.
 - Poor terminal to wire connection. This requires removing the terminal from the connector body to check. Refer to "On-Vehicle Service" in SECTION 3.

ROAD TEST

- If a visual/physical check does not locate the cause of the problem, the vehicle can be driven with a voltmeter connected to a suspected circuit or a Tech 1 scan tool may be used. An abnormal voltage or scan reading, when the problem occurs, indicates the problem may be in that circuit. If the wiring and connectors check OK, and a diagnostic trouble code was stored for a circuit having a sensor, replace the sensor.

2-4 DRIVEABILITY AND EMISSIONS (DIESEL)

INTERMITTENTS

(Page 2 of 2)

Definition: Problem may or may not turn "ON" the Malfunction Indicator Lamp (MIL), or store a Diagnostic Trouble Code (DTC).

INTERMITTENT "MALFUNCTION INDICATOR LAMP (MIL)"

- An intermittent MIL and No Diagnostic Trouble Codes (DTCs), may be caused by:
 - Electrical system interference caused by a defective relay, control module driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the faulty component is operated.
 - Improper installation of electrical devices, such as lights, 2-way radios, electric motors, etc.
 - Ignition secondary shorted to ground.
 - CKT 419 Malfunction Indicator Lamp (MIL) or CKT 451 (diagnostic "test" terminal) intermittently shorted to ground.
 - Control module grounds. Refer to "Component Locations," in SECTION 1.

LOSS OF DIAGNOSTIC TROUBLE CODE MEMORY

- To check, disconnect Engine Coolant Temperature (ECT) sensor and idle engine until the "Malfunction Indicator Lamp" comes "ON." DTC 15 should be stored, and kept in memory when the ignition is turned "OFF" for at least 10 seconds. If not, the control module is faulty.

HARD START

(Page 1 of 2)

Definition: Engine cranks OK, but does not start for a long time. 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.
- Check fuel quality. Refer to "Fuel Specific Gravity Check" in SECTION 4.
- Check engine oil level and quality.
- Remove air cleaner filter and check for being plugged, replace as necessary.

SENSORS

- **CHECK:** Engine Coolant Temperature (ECT) sensor - Using a scan tool, compare engine coolant temperature with ambient temperature on a cold engine.
 - If coolant temperature reading is 5 degrees greater than or less than ambient air temperature on a cold engine, check for high resistance in coolant sensor circuit or sensor itself. Refer to "DTC 15" in SECTION 3 and compare resistance values.

FUEL SYSTEM

- **CHECK:** Supply to injection pump. Refer to SECTION 4.
- **CHECK:** Fuel return from injection pump. Refer to SECTION 4.
- **CHECK:** Engine shut-off solenoid operation. Refer to SECTION 3.
- **CHECK:** Fuel injection nozzles. Refer to SECTION 4.
- **CHECK:** Fuel tank cap vent.
- **CHECK:** Internal injection pump problem.

2-6 DRIVEABILITY AND EMISSIONS (DIESEL)

HARD START

(Page 2 of 2)

Definition: Engine cranks OK, but does not start for a long time. Does eventually operate, or may start but immediately stalls.

ELECTRICAL SYSTEMS

- **CHECK:** Glow plug operation. Refer to SECTION 7.
- **CHECK:** Slow cranking speed. Refer to SECTION 6A in appropriate service manual.

AIR INTAKE SYSTEMS

- **CHECK:** Air cleaner and air intake ducts for restriction.
- **CHECK:** Restriction in turbo charger inlet duct.
- **CHECK:** Restriction in intake manifold.

EXHAUST SYSTEM

- **CHECK:** Exhaust system for possible restriction. Refer to SECTION 3.

ADDITIONAL CHECKS

- **CHECK:** No crank signal. Refer to SECTION 3.
- **CHECK:** Service Bulletins for PROM updates.

SURGES AND/OR CHUGGLES

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

PRELIMINARY CHECKS

- Refer to "Important Preliminary Checks."
- Be sure driver understands Torque Converter Clutch (TCC) and A/C compressor operation in owners manual.
- Use a scan tool to make sure reading of VSS matches vehicle speedometer except vehicles with electronic transmissions where some variation between VSS and speedometer is normal. Refer to "DTC 24 Diagnostic Aids" in SECTION 3.

FUEL SYSTEM

- **CHECK:** Fuel pressure while condition exists. Refer to SECTION 4.

ADDITIONAL CHECKS

- **CHECK:** Control module grounds for being clean, tight, and in their proper locations.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.
- **CHECK:** Vacuum lines for kinks or leaks.
- **CHECK:** For intermittent EGR. Refer to SECTION 9.
- **CHECK:** TCC operation. Refer to SECTION 10 or SECTION 7 of the appropriate vehicle service manual.

2-8 DRIVEABILITY AND EMISSIONS (DIESEL)

LACK OF POWER, SLUGGISH, OR SPONGY

(Page 1 of 2)

Definition: Engine delivers less than expected power. Little or no increase in speed, when accelerator pedal is partially applied.

PRELIMINARY CHECKS

- Refer to "Important Preliminary Checks."
- Compare customer's vehicle with a similar unit. Make sure the customer has an actual problem.
- Remove air filter and check for dirt, or for air ducts being plugged clean or, replace as necessary.
- Transmission shift pattern and down shift operation. Refer to "Functional Test Procedure," SECTION 7 of appropriate service manual.
- Check fuel quality refer to fuel specific gravity check in SECTION 4.
- Check engine oil level and quality.

FUEL SYSTEM

- **CHECK:** Fuel supply to injection pump and fuel return from inspection pump. Refer to SECTION 4.
- **CHECK:** For faulty fuel injection nozzles. Refer to SECTION 4.

EXHAUST SYSTEM

- **CHECK:** For restricted exhaust system. Refer to SECTION 3.

TURBO CHARGER

- **CHECK:** For air leakage or restriction in air inlet ducts or intake manifold.
- **CHECK:** For worn or damaged turbo charger turbine wheel, shaft or compressor wheel. Refer to SECTION 6J of appropriate service manual.

LACK OF POWER, SLUGGISH, OR SPONGY

(Page 2 of 2)

Definition: Engine delivers less than expected power. Little or no increase in speed, when accelerator pedal is pushed down part way.

ADDITIONAL CHECKS

- **CHECK:** Control module grounds for being clean, tight, and in their proper location. Refer to "Component Locations" in SECTION 1.
- **CHECK:** EGR operation for being open or partly open all the time. Refer to SECTION 9.
- **CHECK:** Torque Converter Clutch (TCC) operation. Refer to SECTION 10 or SECTION 7 of the appropriate vehicle service manual.
- **CHECK:** A/C operation. Refer to SECTION 3.
- **CHECK:** Generator output voltage. Repair if less than 9 or more than 16 volts.

ENGINE MECHANICAL

- **CHECK:** Engine compression, valve timing, and for proper or worn camshaft. Refer to SECTION 6A of the appropriate service manual.

2-10 DRIVEABILITY AND EMISSIONS (DIESEL)

FUEL KNOCK/COMBUSTION NOISE

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 fuel quality. Refer to "Specific Gravity Check" in SECTION 4.

FUEL SYSTEM

- **CHECK:** For air leaks in fuel supply to injection pump. Refer to "Fuel System Diagnosis" in SECTION 4.
- **CHECK:** Injection pump static timing. Refer to SECTION 4.
- **CHECK:** Injection nozzles. Refer to SECTION 4.

SENSOR

- **CHECK:** Engine Coolant Temperature (ECT) sensor - Using a scan tool, compare engine coolant temperature with ambient temperature on a cold engine.
 - If coolant temperature reading is 5 degrees greater than or less than ambient air temperature on a cold engine, check for high resistance in coolant sensor circuit or sensor itself. Refer to "DTC 15" in SECTION 3 and compare resistance values.

ENGINE MECHANICAL

- **CHECK:** For incorrect basic engine parts such as cam, heads, pistons, etc.
- **CHECK:** For excessive oil entering combustion chamber.

ADDITIONAL CHECKS

- **CHECK:** Service Bulletins for PROM updates.

POOR FUEL ECONOMY

Definition: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, 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 air cleaner element (filter) for dirt or being plugged.
- Visually (physically) check: Vacuum hoses for splits, kinks, and proper connections.
- Perform "On-Board Diagnostic System Check."
- Check owners driving habits.
 - Is A/C "ON" full time (Defroster mode "ON")?
 - Are tires at correct pressure?
 - Are excessively heavy loads being carried?
 - Is acceleration too much, too often?
- Suggest owner fill fuel tank and recheck fuel economy.
- Suggest driver read "Important Facts on Fuel Economy" in Owners Manual.

FUEL SYSTEM

- **CHECK:** Fuel type, quality. Refer to "Diagnosis" in SECTION 4.
- **CHECK:** Fuel pressure. Refer to "CHART A-6" in SECTION 3.

COOLING SYSTEM

- **CHECK:** Engine coolant level.
- **CHECK:** Engine thermostat for faulty part (always open) or for wrong heat range. Refer to SECTION 6B1 of appropriate service manual.

ADDITIONAL CHECKS

- **CHECK:** Transmission shift pattern.
- **CHECK:** TCC operation - Refer to SECTION 10 or SECTION 7 of appropriate vehicle service manual. A scan tool should indicate an RPM drop when the TCC is commanded "ON."
- **CHECK:** For proper calibration of speedometer.
- **CHECK:** For dragging brakes. Refer to SECTION 5 of the appropriate service manual.

2-12 DRIVEABILITY AND EMISSIONS (DIESEL)

EXCESSIVE SMOKE

(Page 1 of 2)

Definition: White, black, gray or blue smoke under load or at idle hot or cold engine.

PRELIMINARY CHECKS

- Refer to "Important Preliminary Checks."
- Make sure the customer has an actual problem.
- Check fuel quality. Refer to "Specific Gravity Check" in SECTION 4.

FUEL SYSTEM

- **CHECK:** For air leaks in fuel supply to injection pump. Refer to "Fuel System Diagnosis" in SECTION 4.
- **CHECK:** Injection pump timing. Refer to SECTION 4.
- **CHECK:** Injection nozzles. Refer to SECTION 4.

SENSOR

- **CHECK:** Engine Coolant Temperature (ECT) sensor - Using a scan tool, compare engine coolant temperature with ambient temperature on a cold engine.
 - If coolant temperature reading is 5 degrees greater than or less than ambient air temperature on a cold engine, check for high resistance in coolant sensor circuit or sensor itself. Refer to "DTC 15" in SECTION 3 and compare resistance values.
- **CHECK:** Glow plug system operation. Refer to SECTION 7.
- **CHECK:** Exhaust Gas Recirculation (EGR) system operation. Refer to SECTION 9.

EXCESSIVE SMOKE

(Page 2 of 2)

Definition: White, black, gray or blue smoke under load or at idle hot or cold engine.

AIR INTAKE SYSTEM

- **CHECK:** Air cleaner and air intake ducts for restriction.
- **CHECK:** Restriction in turbo charger inlet duct.
- **CHECK:** Restriction in intake manifold.

ENGINE MECHANICAL

- **CHECK:** For incorrect basic engine parts such as cam, heads, pistons, ect.
- **CHECK:** For excessive oil entering combustion chamber.

ADDITIONAL CHECKS

- **CHECK:** Service Bulletins for PROM updates.

2-14 DRIVEABILITY AND EMISSIONS (DIESEL)

BLANK