SUBJECT: EXCESSIVE CRANKCASE PRESSURE

ADDITIONS, REVISIONS, OR UPDATES

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<td>EPA07 DD15</td>
<td>5.1 Crankcase Pressure Test</td>
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NOTE: Page numbers are based on the most recent version of the individual publication and may be adjusted throughout the annual print cycle.
5.1 CRANKCASE PRESSURE TEST

Check the engine crankcase pressure as follows:

| CAUTION: |
| To avoid injury before starting and running the engine, ensure the vehicle is parked on a level surface, parking brake is set, and the wheels are blocked. |

| WARNING: |
| ENGINE EXHAUST |
| To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic. |

1. Start the engine.
2. Run the engine and bring the engine coolant temperature to normal operating range, 88-96°C (190-205°F).
3. Install an adapter on to the oil fill opening. Attach a water manometer, calibrated to read pressure as in. \( \text{H}_2\text{O} \), on to the adaptor.
4. Run the vehicle to full load and rated speed with a loaded trailer or dyno.
5. Measure and record crankcase pressure.
6. Shut down the engine.
7. Remove the adaptor from the oil fill opening.
8. The correct crankcase pressure should be below 5 in. \( \text{H}_2\text{O} \) at full load. If the crankcase pressure is over 5 in. \( \text{H}_2\text{O} \), determine the cause. Refer to section 5.2 "Low Compression."
5.2 LOW COMPRESSION

If a weak cylinder or low compression is suspected, perform an electronic cylinder compression test using DDDL. Refer to section 5.2.1 "Electronic Compression Test." If results indicate a weak cylinder, perform the mechanical compression test. Refer to section 5.2.2 "Mechanical Cylinder Compression Test." Compression past the piston rings could cause high crankcase pressure.

If low compression is found, check the following for possible causes of low compression:

- Valve lash/valve train damage
- Cam timing
- Cylinder liner/ring or piston damage
- Injector hold-downs and bolts
- Blown head gasket
- Cracked liner or head
- Valve or seat damage

Repair any causes of low compression found using the *EPA07 DD15 Workshop Manual* (DDC-SVC-MAN-0002). Once repairs are made, verify repairs.
5.2.1 ELECTRONIC COMPRESSION TEST

Using DDDL the electronic compression test is carried out through the cranking phase of engine start-up. The test measures relative compression of each cylinder with the “best” one shown as 100% and the others displayed as a percentage of the best cylinder. When the results appear on the screen, look for cylinders that are more than 10% lower than the highest cylinder. This will be the suspected bad cylinder. Use the mechanical compression test to verify the test results. Refer to section 5.2.2 "Mechanical Compression Test."

Test as follows:

1. Turn the ignition ON, (key ON, engine OFF).
2. Choose Compression Test from the Actions menu to display the Compression Test dialog box.
3. Press the “Run Test” button.

4. Follow the instructions given on the screen.
   [a] Use the results to determine a possible damaged cylinder.
   [b] If the electronic compression test identifies a bad cylinder, use the mechanical compression test to verify repairs. Refer to section 5.2.2 "Mechanical Compression Test."
   [c] If all six cylinders are within 10% (100% to 90%) of each other, refer to section 5.3 "Obstruction or Damage to Breather System."
5.2.2 MECHANICAL CYLINDER COMPRESSION TEST

Perform the following steps for a mechanical compression test on a DD15 Engine:

**WARNING:**
PERSONAL INJURY
To avoid injury from hot surfaces, wear protective gloves, or allow engine to cool before removing any component.

**WARNING:**
PERSONAL INJURY
To avoid injury when working on or near an operating engine, wear protective clothing, eye protection, and hearing protection.

**NOTE:**
First perform the electronic cylinder compression test using DDDL 7.X. If results indicate a weak cylinder, perform this mechanical compression test.

1. Run the engine and bring the engine coolant temperature to normal operating range, 88-96°C (190-205°F).
2. Disconnect the batteries.
3. Drain fuel system.
4. Remove rocker cover. Refer to section 1.9 “Rocker Cover” in the *EPA07 DD15 Workshop Manual* (DDC-SVC-MAN-0002).
5. Remove both injector harnesses.
   
   [a] Disconnect electrical contacts at the injectors.
   
   [b] Disconnect the two wiring terminals going to the Jake® brake solenoids.
   
   [c] Disconnect 14-pin injector harness connector.
   
   [d] Remove the spring clip holding the injector harness connectors to camshaft frame.
   
   [e] Remove the injector wiring harnesses.
5. Remove high pressure fuel line from the suspect cylinder.
7. Remove the injector. Refer to section 2.2 “Common Rail Injector” in the *EPA07 DD15 Workshop Manual* (DDC-SVC-MAN-0002).

8. Remove excess fuel from cylinder using a vacuum pump.

9. Install the compression test adapter (J-47411) into the injector bore in the cylinder head.

10. Install the injector hold-down clamp and bolt. Torque the bolt to 20 N·m (14 lb·ft) + 90 degrees.

11. Install the fuel rail plug (J-48404).

12. Install a hold-down bolt onto the Jake Brake solenoid and snug the bolt.

13. Reconnect the batteries.

14. Crank the engine over five compression strokes using the starter motor. Record the compression reading on the gauge.
NOTE:
Verify that the battery voltage does not go low enough to affect engine cranking speed. If the cranking speed is affected then the results will be inaccurate. If needed, connect a battery charger to maintain an acceptable battery voltage.

15. The compression reading should be 3102-3793 kPa (450-550 psi) with no two cylinders differing by more than 276 kPa (50 psi). If compression readings are below specifications, repeat step 14 to be certain of the reading.

16. Remove the injector hold-down clamps. Discard the hold-down bolt and remove the compression test adaptors.

NOTE:
Injector hold-down bolts are a one-time use.

17. Repeat steps for all suspect cylinders.

18. Repair engine as necessary.
5.3 OBSTRUCTION OR DAMAGE TO BREATHER SYSTEM

Check as follows:

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1. Check the engine crankcase pressure and record the reading. Refer to section 5.1 "Crankcase Pressure Test."

   [a] If the engine crankcase pressure is less than 5 in. H\textsubscript{2}O, no further troubleshooting is required.

   [b] If the engine crankcase pressure is greater than 5 in. H\textsubscript{2}O, check the crankcase breather system for blockage or any damage to the breather, inlet, or outlet tubes. Make sure that the spinning element in the breather is not locked up or broken. If any damage is found, refer to section in the EPA07 DD15 Workshop Manual (DDC-SVC-MAN-0002). Verify repairs.

   [c] If the engine crankcase pressure is greater than 5 in. H\textsubscript{2}O and the breather is OK, refer to section 5.4 "Defective Air Compressor."
5.4 DEFECTIVE AIR COMPRESSOR

Check as follows:

1. Perform a crankcase pressure test and record the test results. For test procedures, refer to section 5.1 "Crankcase Pressure Test."
   
   [a] If crankcase pressure is below 5 in. H₂O, there is no problem found.
   
   [b] If crankcase pressure is above 5 in. H₂O, go to next step.

2. Disconnect the air outlet line (2) from the air compressor; refer to section "Air Compressor" in the “Special Equipment” chapter of the EPA07 DD15 Workshop Manual (DDC-SVC-MAN-0002).

3. Perform a crankcase pressure test. Refer to section 5.1 "Crankcase Pressure Test."

4. Compare the results of the first test with the second test.
   
   [a] If the engine crankcase pressure remained the same, reinstall the air outlet line and check the turbocharger; refer to section 5.5 "Defective Turbocharger."
   
   [b] If the engine crankcase pressure decreased, replace the air compressor. Refer to section10.1 "Air Compressor" in the “Special Equipment” chapter of the EPA07 DD15 Workshop Manual (DDC-SVC-MAN-0002). Go to next step.

5. Start and run the engine allowing air tanks to achieve full air pressure.
6. Perform a crankcase pressure test. Refer to section 5.1 "Crankcase Pressure Test."

   [a] If the engine crankcase pressure exceeds 1.25 kPa (5 in. H₂O), refer to section 5.5 "Defective Turbocharger."

   [b] If the engine crankcase pressure is less than 1.25 kPa (5 in. H₂O), no further troubleshooting is required.
5.5 DEFECTIVE TURBOCHARGER

Check as follows:

| NOTICE: | Ensure that the engine is not allowed to operate longer than necessary to perform the crankcase pressure test. A complete loss of crankcase oil will severely damage the engine. |

1. Perform a crankcase pressure test and record the test results. For test procedures, refer to section 5.1 "Crankcase Pressure Test."
   
   [a] If crankcase pressure is below 5 in. H₂O, there is no problem found.
   
   [b] If crankcase pressure is above 5 in. H₂O, go to next step.

2. Remove the turbocharger drain line connected to the crankcase and place the drain line into a suitable container. Plug the return hole in the engine block with an expandable rubber plug; refer to section "Turbocharger" in the “Air Intake System” chapter of the EPA07 DD15 Workshop Manual (DDC-SVC-MAN-0002).

3. Compare the results of the first test with the second.
   
   [a] If the engine crankcase pressure remained the same, reinstall the turbocharger drain line and check for low compression. Refer to section 5.2 "Low Compression."
   
   [b] If the engine crankcase pressure decreased, replace the turbocharger, refer to section "Turbocharger" in the “Air Intake System” chapter of the EPA07 DD15 Workshop Manual (DDC-SVC-MAN-0002).

ADDITIONAL SERVICE INFORMATION

Additional service information is available in Power Service Literature.